# Downtown Brantford Municipal Class

## Roundabout Screening Study

**Project Location:**

Dalhousie Street; Colborne Street; Brant Avenue; King; Queen; Market; Charlotte Street; Clarence Street, ON

**Prepared for:**

City of Brantford
100 Wellington Square, Brantford, ON

**Prepared by:**

MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

January 10, 2023

**MTE File No.:** 46995-100

*Engineers, Scientists, Surveyors.*

MTE Consultants
520 Bingemans Centre Drive, Kitchener, Ontario N2B 3X9

# Contents

# Background

MTE Consultants Inc. ("MTE") was retained by the City of Brantford (the "City") to complete Roundabout ("RAB") Screening Reports along Colborne Street and Dalhousie Street in support of the Downtown Brantford Streetscape Environmental Assessment (EA). The scope of the EA encompasses the area below:

- Colborne Street East from Brant Avenue/Icomm Drive to Dalhousie Street/Colborne Street East Conjunction;
- Dalhousie Street from Brant Avenue to Colborne Street East/ Dalhousie Street junction;
- Brant Avenue from Dalhousie Street to Icomm Drive;
- Clarence Street from Dalhousie Street to Colborne Street East;
- King Street, Queen Street, Charlotte Street all from Dalhousie Street to Colborne Street East;
- Market Street/Square from Dalhousie Street to Colborne Street East; and,
- Brant Avenue/Icomm Drive/Colborne Street East/Colborne Street West intersection.

The Corridors extend approximately 2.1 kilometers (km), beginning at Brant Avenue, continuing easterly along Dalhousie Street and Colborne Street East to the junction between the two streets.

In 2022, the City of Brantford implemented a new roundabout screening program that requires the City to screen for potential implementation of a roundabout when replacing or introducing any signalized intersection. The City's screening includes evaluating the impacts to property, capital and maintenance costs, as well as functionality.

The scope of this study is to investigate implementation of roundabouts at all signalized intersections within the EA study area. MTE was tasked with conducting the screening for each intersection, and providing recommendations for proceeding with further roundabout studies.

MTE completed a full roundabout screening report for each signalized intersection within the corridor, and the full reports are attached. This document is included as a summary of the findings of each of the screening reports.

# 1.0 Cost Summary

The cost estimates for each intersection were developed using the following three (3) categories:

- **Implementation/Capital Costs** – Includes initial capital investment, property acquisition, illumination, engineering and contingency costs.
- **Injury Collision Costs** - The injury collision costs were developed using an Intersection Control Studies Safety Assessment Sheet prepared by the Region of Waterloo to generate a 20-year forecast total capital costs for both alternatives of each intersection. The analysis represents the social costs associated with a signalized intersection versus a roundabout.

- **Total Life Cycle Costs** - The total life cycle costs were developed by calculating the maintenance net present value, at a rate of 3%, by adding the cost it will take to maintain the streetlights and signals at the signalised intersections and the streetlights at roundabouts.

The final costs for each intersection are found below. All cost estimate data can be found in **Appendix A** of the individual intersection reports.

## 1.1 Final Costs (Colborne Street Corridor)

### 1.1.1 Brant Avenue

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,154,000 | $1,445,000 |
| **Injury Collision Cost** | $ 6,606,000 | $ 4,753,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $7,889,000 | $6,219,000 |

### 1.1.2 Queen Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $938,000 | $1,432,000 |
| **Injury Collision Cost (20 Year NPV)** | $ 751,000 | $ 234,000 |
| **NPV Maintenance** | $129,000 | $21,000 |
| **TOTAL** | $1,818,000 | $1,687,000 |

### 1.1.3 Clarence Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,052,000 | $1,441,000 |
| **Injury Collision Cost** | $ 3,897,000 | $ 3,633,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $5,078,000 | $5,095,000 |

### 1.1.4 Alfred Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

### 1.1.5 Murray Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

### 1.1.6 Rawdon Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

### 1.1.7 Dalhousie Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,302,000 | $1,892,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,431,000 | $1,913,000 |

## 1.2 Final Costs (Dalhousie Street Corridor)

### 1.2.1 Brant Avenue

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,104,000 | $1,562,000 |
| **Injury Collision Cost** | $1,654,000 | $2,559,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $2,887,000 | $4,142,000 |

### 1.2.2 King Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $986,000 | $1,050,000 |
| **Injury Collision Cost** | $ 765,000 | $ 511,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,880,000 | $1,582,000 |

### 1.2.3 Queen Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | $742,654.46 | $593,701.28 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,821,654.46 | $2,326,701.28 |

### 1.2.4 Market Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $938,000 | $1,432,000 |
| **Injury Collision Cost (20 Year NPV)** | $ 311,958.92 | $ 187,087.03 |
| **NPV Maintenance** | $129,000 | $21,000 |
| **TOTAL** | $1,378,958.92 | $1,640,087.03 |

### 1.2.5 Clarence Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,052,000 | $1,441,000 |
| **Injury Collision Cost** | $ 4,674,635.21 | $ 3,937,238.58 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $5,855,635.21 | $5,399,238.58 |

### 1.2.6 Murray Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

### 1.2.7 Rawdon Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

### 1.2.8 Stanley Street

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $975,000 | $1,225,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,104,000 | $1,246,000 |

# 2.0 Conclusions and Recommendations

Upon review of each of the reports, MTE found that there was only 1 intersection within the study area that warranted further investigation for roundabout implementation, and that is the intersection of Colborne Street and Dalhousie Street. This intersection has adequate space to implement a roundabout, the cost benefit summary indicates that the cost between the alternatives when injury collision over the 20-year timeframe will be similar.

At the remainder of the signalized intersections, there were a number of factors that deter the feasibility of a roundabout.

1) Very difficult to implement this on one-way street corridors, and the benefit of a roundabout is reduced from a traffic management perspective.
2) A number of the properties adjacent to the intersections has building faces at property line, or have property that would greatly affected by a roundabout. This impact would result in full buy outs of property in many cases, which would vastly increase the capital cost of a roundabout.
3) The overall cost of a RAB was the more expensive alternative for majority of the intersections. This includes the social benefits associated with the implementation of roundabouts. This indicates that the signalized alternative provides similar levels of overall safety to that of the roundabout.

From the results of the screening reports, MTE provides the following recommendations to the City of Brantford:

- Proceed with a complete transportation study for the Colborne Street and Dalhousie Street intersection to determine necessary lane configurations for a potential roundabout.
- Confirm the findings of the Roundabout screening based on the traffic study.

We trust that the findings of this roundabout screening study are satisfactory.

**MTE Consultants Inc.**

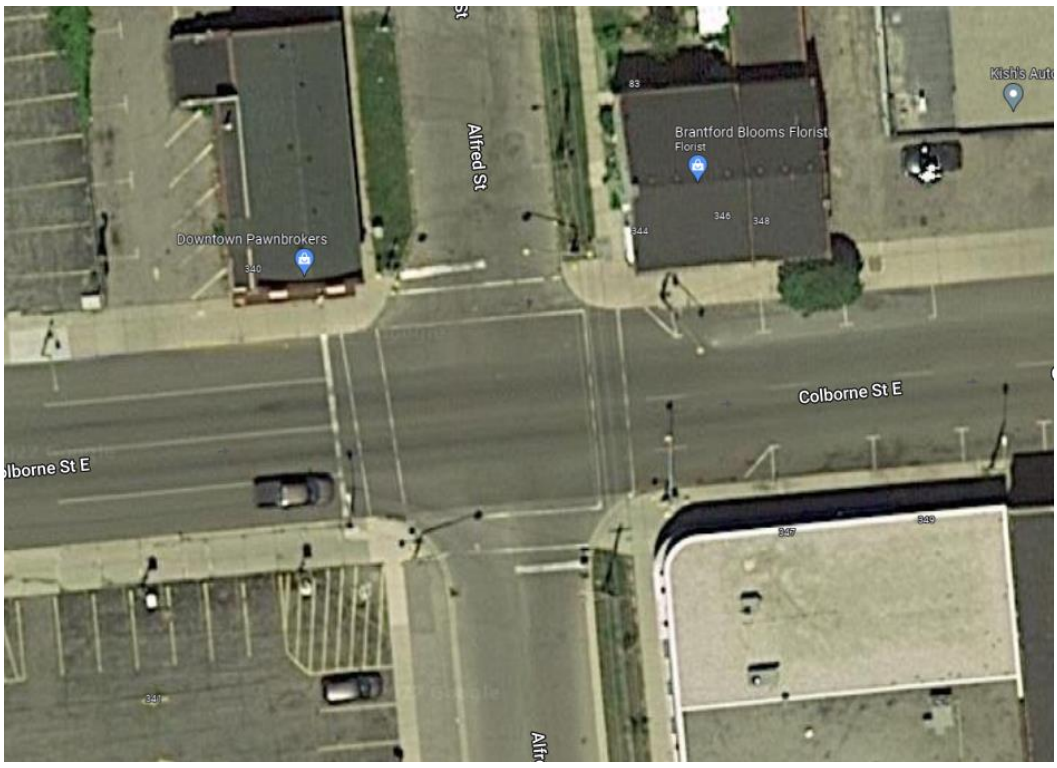
**Vince Pugliese, P.Eng., MBA, PMP**
Technical Manager, Municipal
519-743-6500 ext. 1347
vpugliese@mte85.com

VXP:zeg
M:\46995\100\06 Reports\Roundabout Screening\46995-100_RAB Screening Report.docx

# Appendix A

# Individual Intersection Reports

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Alfred Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs between Colborne and Clarence Street. Clarence Street is a four lane north/south arterial with an additional right turn only lane on the south leg, and Colborne Street is a two lane, one-way arterial approaching from the west with additional right and left turn only lanes on the west leg, which becomes on-street parking on both sides on the east leg. |
| |  |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are no operational problems identified with this intersection. |

| | |
|---|---|
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Clarence Street, which is a 4-way signalized intersection with full pedestrian movements. The intersection to the east is Park Avenue, which is a 4-way intersection stop controlled on Park Avenue only. There is no traffic analysis completed for this intersection. Given this intersection is east of Clarence Street, it is unlikely that the rail line would result in queuing at this intersection. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain two lanes of traffic on Colborne Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are commercial buildings on the northeast, northwest, southeast corners of the intersection that have buildings on property line. The southwest corner is a surface level parking lot. The buildings on each corner will act as constraints at this intersection. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, and one lanes north/south on Alfred Street. Refer. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. Traffic data was not available for this intersection. |

| | |
|---|---|
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

| | |
|---|---|
| **12** | Conclusion and Recommendations: |

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $762,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Alfred Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization.

# Figure 1

# Proposed Traffic Lights – Colborne at Alfred

ALFRED STREET

COLBORNE STREET

2 STOREY
BRICK BUILDING

#342 COLBORNE ST.

Asphalt
Driveway

Concrete Sidewalk

Grass

Asph.

Grass

Brick Wall

Conc.

Garden

Conc.

Garden

2 STOREY
BRICK BUILDING

#344–348 COLBORNE
ST.

1 STOREY
MECHANIC GARAGE
#350 COLBORNE ST.

Asphalt
Parking Lot

Conc.

Conc.

Concrete Sidewalk

Concrete Sidewalk

Concrete Sidewalk

Concrete Sidewalk

TL

TL

TL

TL

Asphalt
Parking Lot

Concrete Sidewalk

Asph.

Grass

Grass

Concrete Sidewalk

1 STOREY
STEEL SLAT COVERED
BUILDING

347 COLBORNE ST.

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST.
& ALFRED ST.
PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Colborne at Alfred

ALFRED ST

COLBORNE ST

2m CONCRETE SIDEWALK. MATCH INTO EXIST. TYP.

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

Direction of Traffic

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.7m CONCRETE SEMI-MOUNTABLE CURB AND WIDE GUTTER AS PER OPSD 600.020

0.25m CONCRETE CURB AND NARROW GUTTER AS PER OPSD 600.080

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

N

Date: Oct.21/22
Scale: 1:250

**Example RAB**

Colborne St. @ Alfred St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

# Appendix A

# Cost Estimates

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)
## Colborne St. and Alfred St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

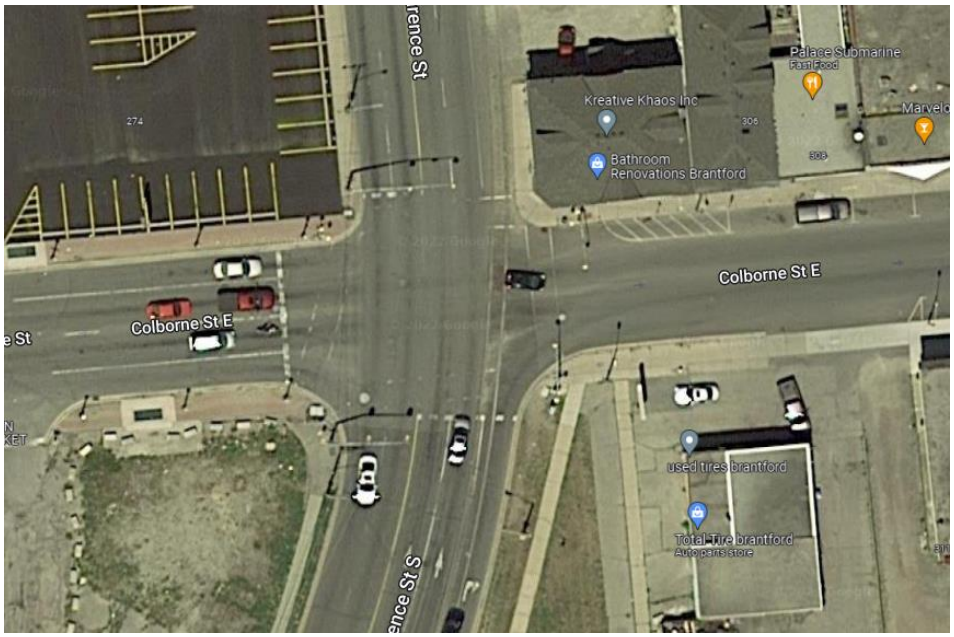
| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$820,824.60** | **$820,000.00** |
| | | | | **Engineering (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Contingency (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,714,926.64** | **$1,712,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Colborne St. and Alfred St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Clarence Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs between Colborne and Clarence Street. Clarence Street is a four lane north/south arterial with an additional right turn only lane on the south leg, and Colborne Street is a two lane, one-way arterial approaching from the west with additional right and left turn only lanes on the west leg, which becomes on-street parking on both sides on the east leg. |
| |  |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | This intersection may experience operational problems as it is expected to operate with a Level of Service B for the morning peak and a Level of Service D for the afternoon peak in the 2051 design horizon. There is congestion at this intersection during peak periods. |

| | |
|---|---|
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Colborne and Charlotte Street, and is a three leg one-way stop intersection with a non-signalized pedestrian crossings on the Charlotte Street leg. The intersection to the east is Colborne and Alfred Street, which is a four leg three-way signalized stop intersection with signalized pedestrian crossings on each leg. The traffic analysis indicates that the adjacent intersections should not experience high queueing.<br>Clarence Street has an active rail line that runs parallel to the road on the east side. This rail line is a physical constraint to any intersection redesign. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain two lanes of traffic on Dalhousie Street with right and left turn only lanes and one-street parking on both sides after crossing the intersection. Findings from the EA recommend that Clarence Street be widened to include a 2 way left turn lane between Colborne Street and Dalhousie Street. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 47 collisions were recorded for this intersection. See Figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Road users should be able to utilize the intersection efficiently without experiencing sight distance issues as there are no building structures directly beside the right lane on each leg. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |

| | |
|---|---|
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, and two lanes north/south on Clarence Street. Refer Appendix A for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,052,000 | $1,441,000 |
| **Injury Collision Cost** | $ 3,897,000 | $ 3,633,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $5,078,000 | $5,095,000 |

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%)

Implementation and Net Present Value Estimates can be found in Appendix B.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 47 collisions in the past 5 years (17 Property Damage only)
- The roundabout is the higher cost alternative over the 20-Year life cycle cost, when the social impacts of the intersection are included. The difference in capital cost of the roundabout is approximately $389,000.
- Roundabout would require property taking. While estimates are included for property taking, there are properties that may be more greatly impacted, and the property taking costs could be substantially higher.
- Adjacent active rail line makes introducing a roundabout a significant challenge, and should be avoided unless the rail line is addressed.

The recommendation for the Clarence Street intersection is that the City proceed with a signalized intersection. The signalized intersection functions very well in the 2051 planning horizon, requires no property, avoids conflicts with adjacent rail line, and is the less expensive alternative.

Figure 1

# Collisions at Clarence

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** QUEEN ST @ COLBORNE ST **Municipality.....** BRANTFORD

**Traffic Control....** **Total Collisions....** 8

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-45983 | 2017-Nov-30, Thu,15:19 | Rain | Angle | P.D. only | South | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | East | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-48925 | 2017-Dec-23, Sat,14:35 | Clear | Sideswipe | P.D. only | East | Wet | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | East | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-024582 | 2018-Jun-26, Tue,16:52 | Clear | SMV other | P.D. only | East | Dry | Going ahead | Automobile, station wagon | Pole (utility, power) | Lost control | |
| **Comments:** | | | | | | Dry | | | | | |
| 18-03966 | 2018-Jan-30, Tue,08:00 | Clear | SMV other | P.D. only | East | Ice | Going ahead | Truck - tractor | Pole (sign, parking meter) | Driving properly | |
| **Comments:** | | | | | | Packed snow | | | | | |
| 18-10960 | 2018-Mar-03, Sat,16:15 | | Rear end | P.D. only | East | Dry | Going ahead | Pick-up truck | Other motor vehicle | Lost control | |
| **Comments:** | | | | | East | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 19-12329 | 2019-Apr-06, Sat,14:34 | Clear | SMV other | Non-fatal injury | South | Dry | Turning left | Automobile, station wagon | Pedestrian | Improper turn | |
| **Comments:** | HTA 142(1) 9106017Z | | | | | | | | | | |
| 19-32787 | 2019-Aug-26, Mon,09:09 | Clear | SMV other | Non-fatal injury | East | Dry | Turning left | Automobile, station wagon | Pedestrian | Failed to yield right-of-way | |
| **Comments:** | | | | | | | | | | | |
| 19-33701 | 2019-Sep-01, Sun,16:18 | Rain | Rear end | P.D. only | East | Wet | Slowing or stopping | Police vehicle | Other motor vehicle | Following too close | |
| **Comments:** | | | | | East | Wet | Stopped | Police vehicle | Other motor vehicle | Driving properly | |

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** CLARENCE ST @ COLBORNE ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 47

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 009613 | 2017-Mar-18, Sat,13:00 | Clear | Sideswipe | | South | Wet | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 017748 | 2017-May-16, Tue,17:15 | Clear | Angle | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 019109 | 2017-May-26, Fri,00:13 | Clear | SMV other | Non-fatal injury | North | Wet | Going ahead | Motorcycle | Curb | Driving properly | |
| **Comments:** | | | | | | Wet | | | | | |
| 020435 | 2017-Jun-03, Sat,18:19 | Clear | Turning movement | P.D. only | North | Dry | Turning right | Truck - open | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 022761 | 2017-Jun-19, Mon,08:30 | Clear | Rear end | | East | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close | |
| **Comments:** | | | | | East | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-001655 | 2017-Jan-14, Sat,23:45 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-007603 | 2017-Mar-02, Thu,10:53 | Clear | Sideswipe | P.D. only | North | Dry | Turning left | Delivery van | Other motor vehicle | Improper turn | |
| **Comments:** | | | | | North | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-022761 | 2017-Jun-19, Mon,08:30 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | | | | | | |
| 17-031018 | 2017-Aug-14, Mon,12:40 | Clear | SMV other | Non-fatal injury | North | Dry | Turning right | Motorcycle | Other | Driving properly | |
| **Comments:** | | | | | | Dry | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17-032739 | 2017-Aug-25, Fri,20:52 | Clear | SMV other | Non-fatal injury | South | Dry | Going ahead | Automobile, station wagon | Pedestrian | Driving properly |
| **Comments:** | | | | | | Dry | | | | |
| 17-035615 | 2017-Sep-16, Sat,02:00 | Clear | Angle | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 17-038390 | 2017-Oct-05, Thu,07:50 | Clear | SMV other | P.D. only | East | Dry | Turning right | Truck - open | Pole (utility, power) | Improper turn |
| **Comments:** | | | | | | Dry | | | | |
| 17-040228 | 2017-Oct-17, Tue,16:25 | Clear | Sideswipe | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| 17-040239 | 2017-Oct-18, Wed,23:20 | Clear | Sideswipe | | South | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 17-041274 | 2017-Oct-23, Mon,18:30 | Rain | Rear end | | South | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 17-43895 | 2017-Nov-14, Tue,20:10 | Clear | Rear end | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-47145 | 2017-Dec-09, Sat,10:00 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-47529 | 2017-Dec-12, Tue,15:30 | Snow | Sideswipe | Non-reportable | North | Loose snow | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | North | Loose snow | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-017342 | 2018-May-09, Wed,17:16 | Clear | Rear end | Non-fatal injury | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | North | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-019727 | 2018-May-25, Fri,15:25 | Clear | Turning movement | | East | Dry | Turning left | Pick-up truck | Other motor vehicle | Improper turn |
| **Comments:** | | | | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-024996 | 2018-Jun-29, Fri,11:20 | Clear | Sideswipe | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other |
| **Comments:** | | | | | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Other |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-025715 | 2018-Jul-04, Wed,10:37 | Clear | SMV other | Non-fatal injury | North | Dry | Going ahead | Motorcycle | Other | Lost control |
| **Comments:** | | | | | | Dry | | | | |
| 18-028234 | 2018-Jul-21, Sat,10:00 | Clear | Angle | P.D. only | South | Dry | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | | Driving properly |
| 18-028814 | 2018-Jul-25, Wed,16:45 | Clear | Rear end | P.D. only | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-038957 | 2018-Oct-03, Wed,09:00 | Clear | Sideswipe | P.D. only | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 18-040186 | 2018-Oct-10, Wed,18:00 | Clear | Rear end | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | East | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-043001 | 2018-Oct-30, Tue,06:30 | Clear | Turning movement | | North | Dry | Turning right | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-046908 | 2018-Nov-26, Mon,12:39 | Rain | SMV other | Non-fatal injury | East | Wet | Turning left | Automobile, station wagon | Pedestrian | Failed to yield right-of-way |
| **Comments:** | | | | | | Wet | | | | |
| 18-047764 | 2018-Dec-02, Sun,21:20 | Rain | Angle | P.D. only | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | East | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-05014 | 2018-Feb-07, Wed,07:47 | Snow | Sideswipe | Non-reportable | North | Packed snow | Going ahead | Pick-up truck | Other motor vehicle | Improper passing |
| **Comments:** | | | | | North | Packed snow | Going ahead | Municipal transit bus | Other motor vehicle | Driving properly |
| 18-05036 | 2018-Feb-07, Wed,10:15 | Snow | Rear end | | South | Loose snow | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | Loose snow | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-050678 | 2018-Dec-24, Mon,14:00 | Clear | Turning movement | | South | Wet | Turning left | Automobile, station wagon | Other motor vehicle | |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-09104 | 2018-Mar-10, Sat,11:55 | Clear | Other | | East | Dry | Stopped | Pick-up truck | Other motor vehicle | Driving properly |
| **Comments:** | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-10395 | 2018-Mar-21, Wed,02:25 | Clear | SMV other | P.D. only | South | Dry | Going ahead | Motorcycle | Skidding/sliding | Lost control |
| **Comments:** | | | | | | Dry | | | | |
| 18-13629 | 2018-Apr-13, Fri,13:00 | Clear | Sideswipe | | East | Dry | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-05604 | 2019-Feb-13, Wed,16:50 | Snow | Sideswipe | P.D. only | North | Slush | Changing lanes | Automobile, station wagon | | Failed to yield right-of-way |
| **Comments:** | | | | | North | Slush | Stopped | Automobile, station wagon | | Driving properly |
| 19-06744 | 2019-Feb-21, Thu,17:05 | Clear | Sideswipe | P.D. only | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-06915 | 2019-Feb-22, Fri,18:30 | Clear | Turning movement | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | Vehicle 2 info missing from collision report. | | | | | Dry | | Automobile, station wagon | | |
| 19-10613 | 2019-Mar-25, Mon,08:05 | Clear | SMV other | Non-fatal injury | East | Dry | Going ahead | Pick-up truck | Pedestrian | Disobeyed traffic control |
| **Comments:** | CCC 320(13)(2) PTA | | | | | | | | | |
| 19-18562 | 2019-May-21, Tue,17:21 | Clear | Rear end | Non-fatal injury | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-22650 | 2019-Jun-17, Mon,18:45 | Clear | Rear end | P.D. only | North | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | North | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-29415 | 2019-Aug-02, Fri,13:55 | Clear | Rear end | P.D. only | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close |
| 19-42000 | 2019-Oct-29, Tue,20:03 | Clear | Turning movement | Non-fatal injury | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Exceeding speed limit |
| **Comments:** | D1 CCC 320(14)(1)(B) | | | | South | Dry | Turning left | Pick-up truck | Other motor vehicle | Driving properly |
| 19-42088 | 2019-Oct-30, Wed,13:10 | Rain | Rear end | P.D. only | South | Wet | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | Wet | Stopped | Pick-up truck | Other motor vehicle | Driving properly |

Figure 2

# Proposed Traffic Lights – Colborne at Clarence

EX. ASPHALT
PARKING LOT

EX. RAILWAY

EX. GRAVEL
PARKING LOT

N

Asph.

Asph.

Concrete Sidewalk

2 STOREY
BRICK AND FRAME
BUILDING

#298-310 COLBORNE ST.

TL

Concrete Sidewalk

TL

COLBORNE STREET

TL

Concrete Sidewalk

ECHO STREET

Asph.

Concrete Sidewalk

CLARENCE STREET

EX. RAILWAY

Grass

Concrete Sidewalk

Grass

Asphalt Path

Concrete Sidewalk

BRI

#313

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST.
& CLARENCE ST.
PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

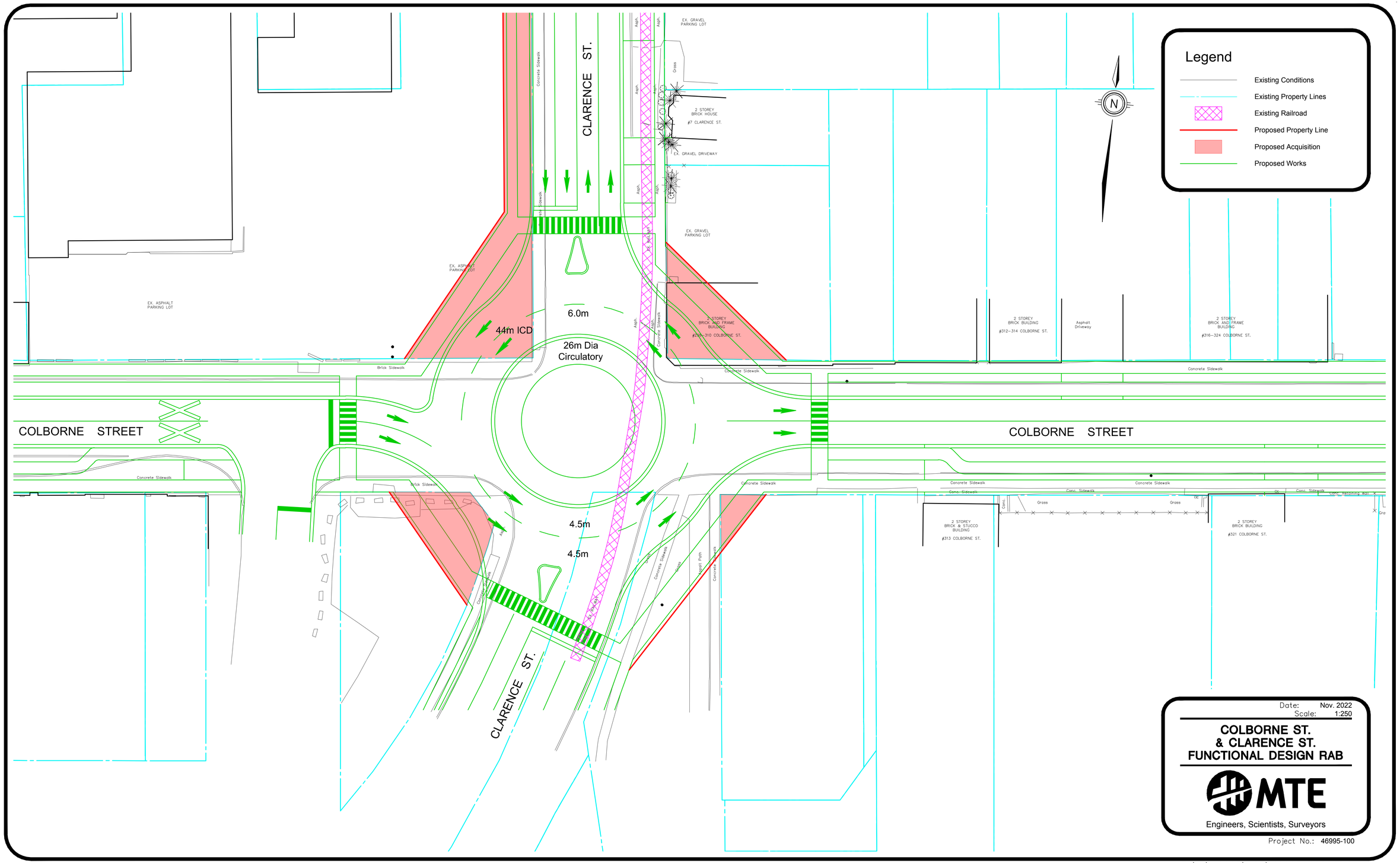
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Colborne at Clarence




Date: Nov. 2022
Scale: 1:250

**COLBORNE ST.**
**& CLARENCE ST.**
**FUNCTIONAL DESIGN RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

November 4, 2022 — 9:59 a.m. — Plotted By: EMcDonald

P:\P\46995\100\46995-100-FD4.dwg

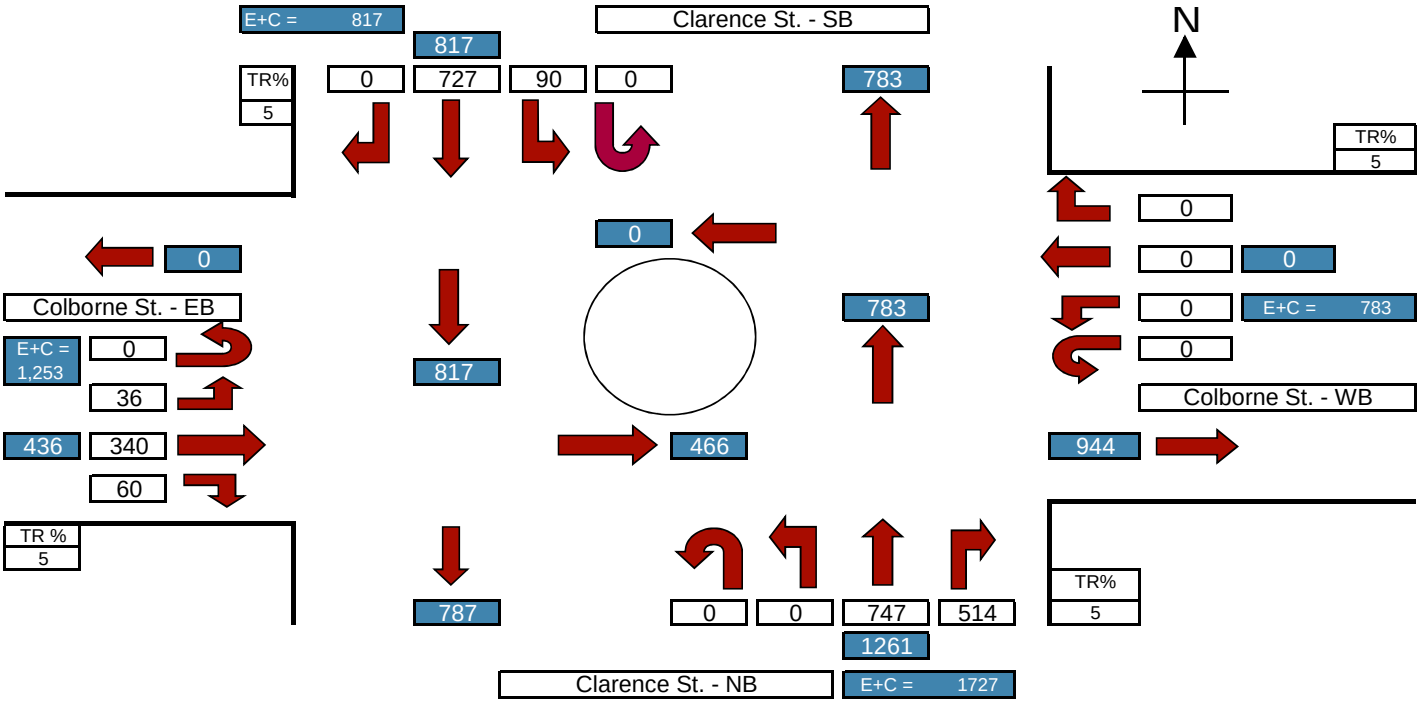
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Clarence Street
**Time Period:** **AM PEAK 2021**

**Prepared By:** EVM
**Sheet:** **1 of 4**

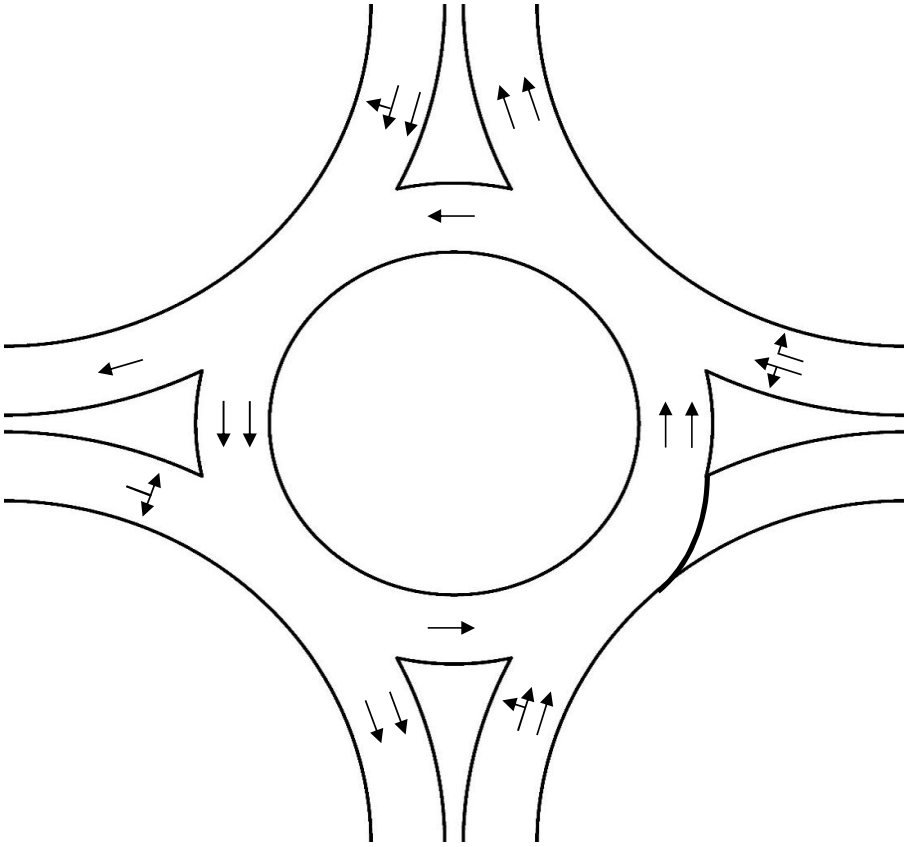



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

**Model Inputs**

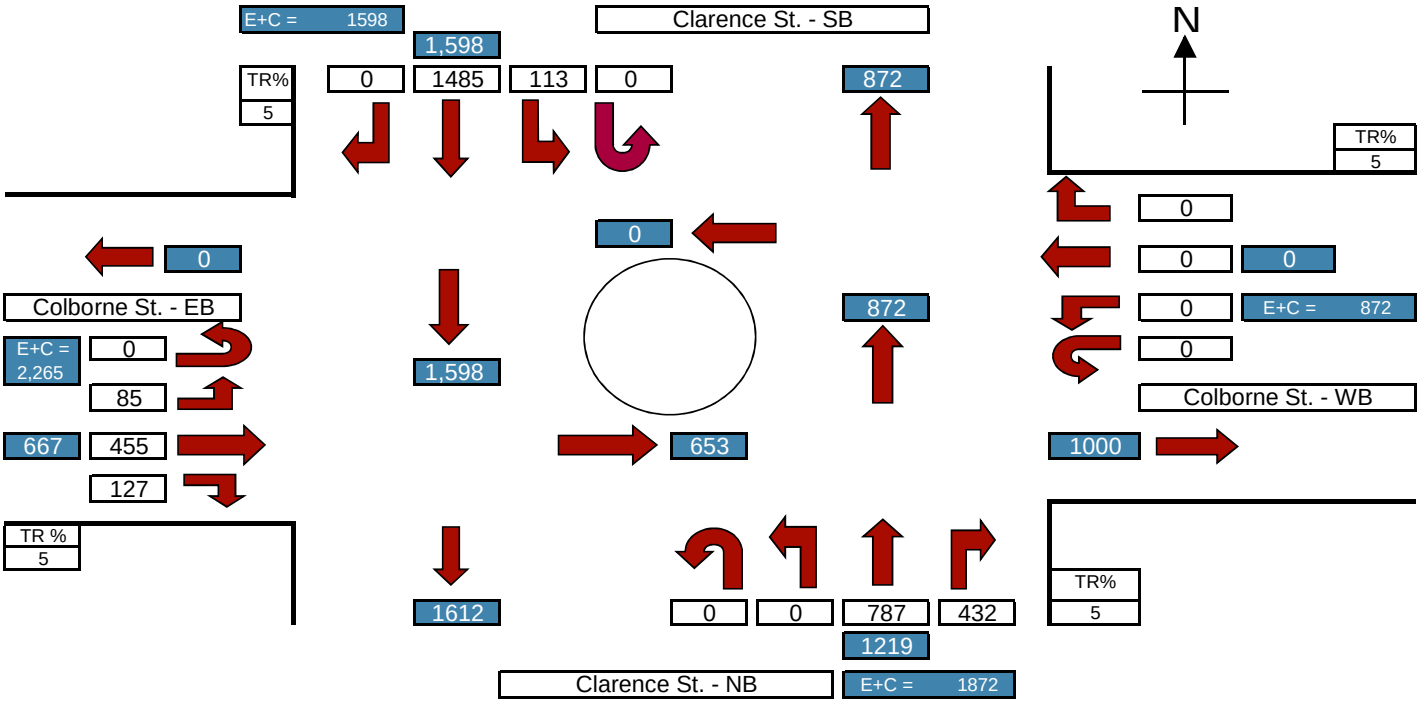
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
|---|---|---|---|---|---|
| Clarence St. - SB | 1.05 | 0 | 727 | 90 | 0 |
| Colborne St. - EB | 1.05 | 60 | 340 | 36 | 0 |
| Clarence St. - NB | 1.05 | 514 | 747 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne St. & Clarence St.
**Time Period:** **PM PEAK 2021**

**Prepared By:** EVM
**Sheet:** **2 of 4**

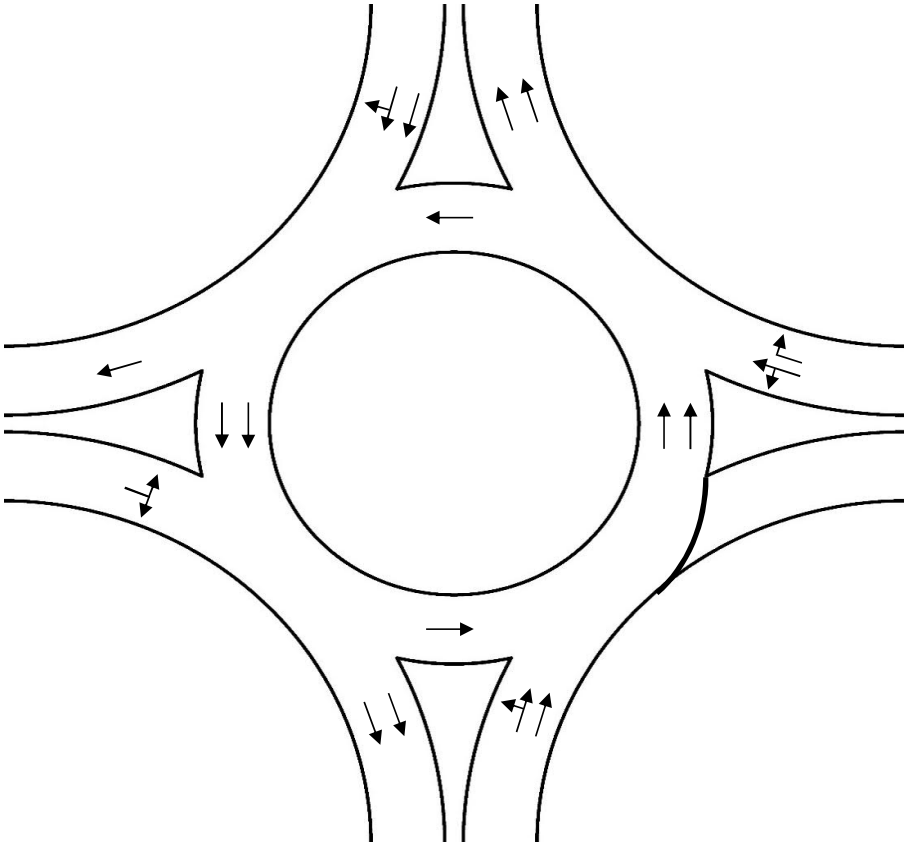



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

**Model Inputs**

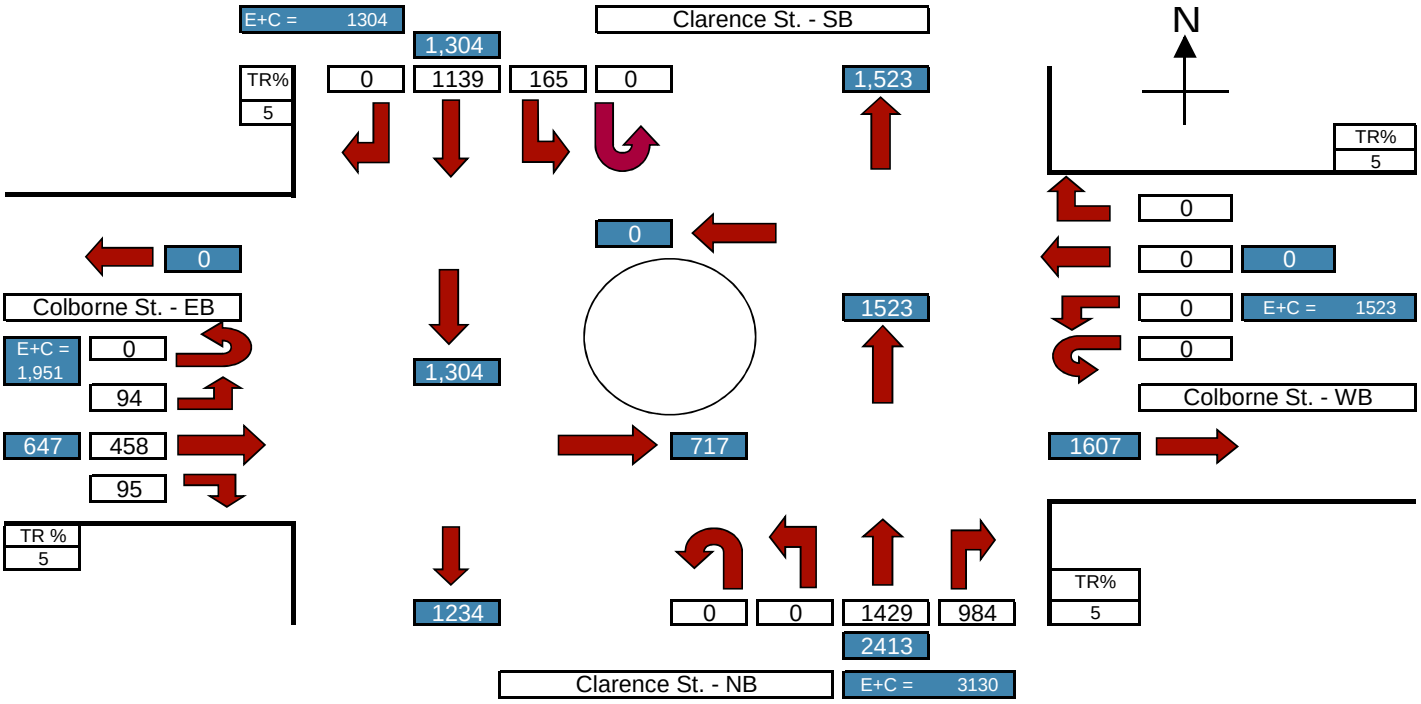
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
|---|---|---|---|---|---|
| Clarence St. - SB | 1.05 | 0 | 1485 | 113 | 0 |
| Colborne St. - EB | 1.05 | 127 | 455 | 85 | 0 |
| Clarence St. - NB | 1.05 | 432 | 787 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Clarence Street.
**Time Period:** **AM PEAK 2051**

**Prepared By:** EVM
**Sheet:** **3 of 4**

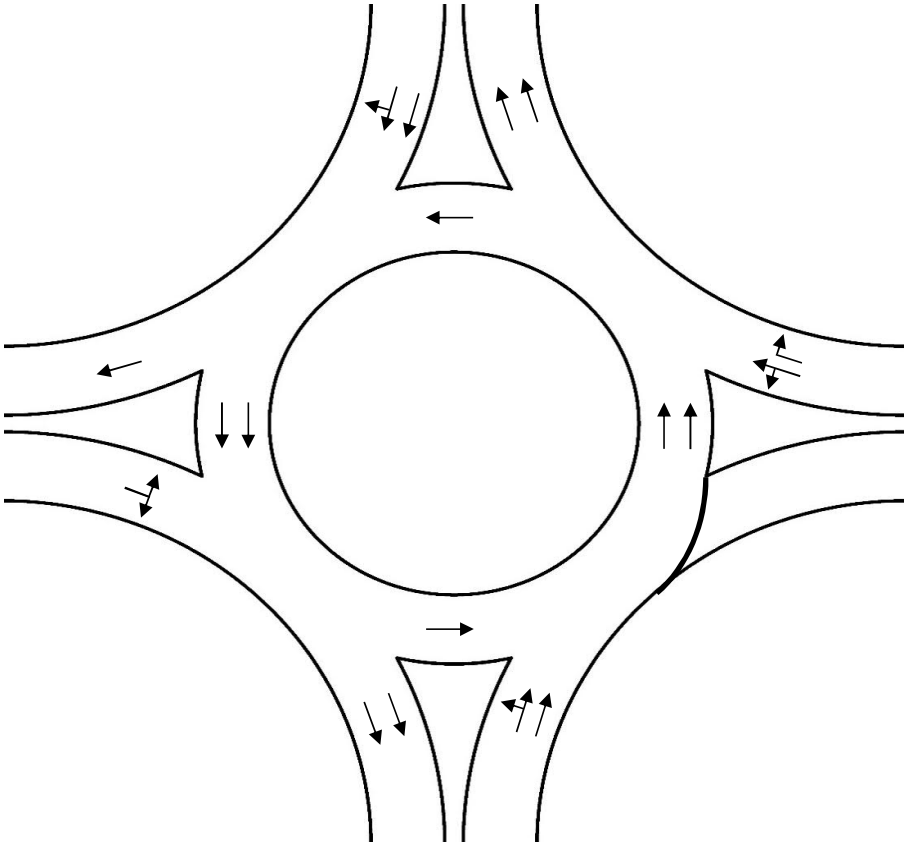



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

**Model Inputs**

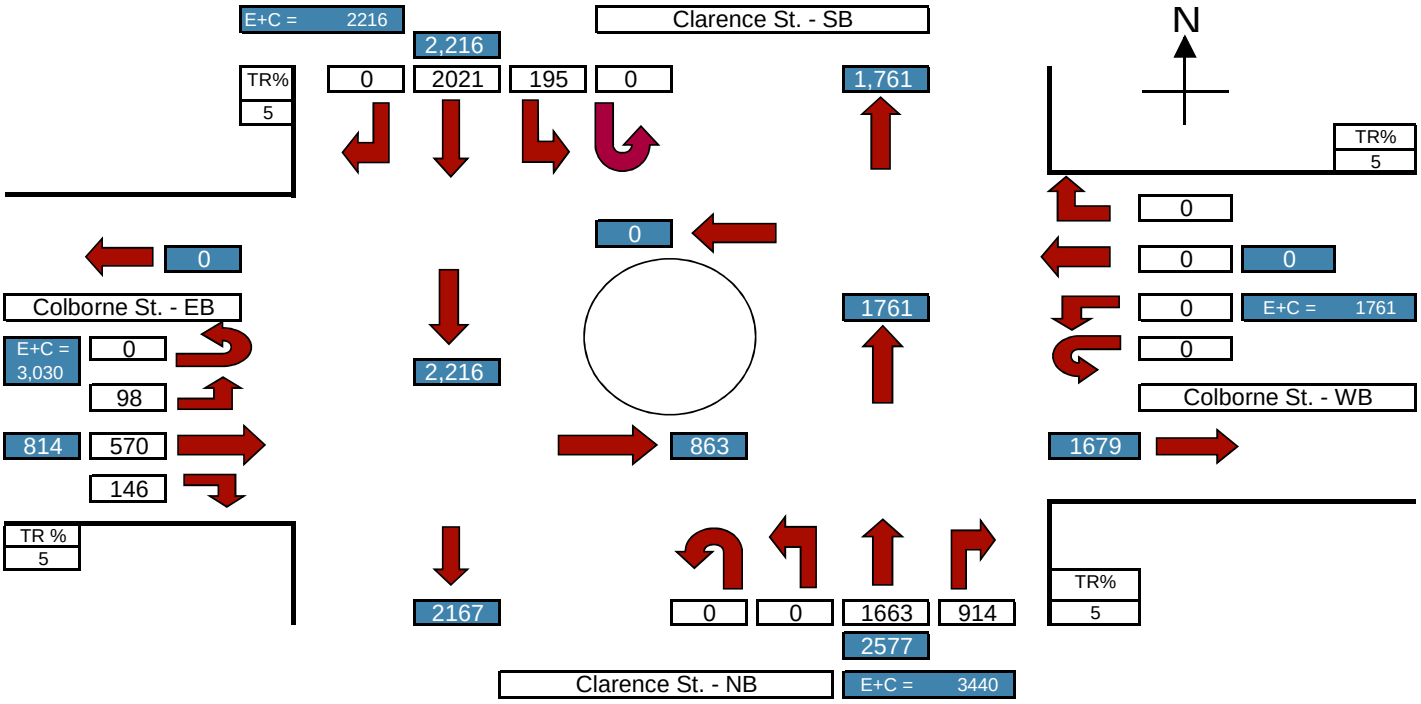
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
|---|---|---|---|---|---|
| Clarence St. - SB | 1.05 | 0 | 1139 | 165 | 0 |
| Colborne St. - EB | 1.05 | 95 | 458 | 94 | 0 |
| Clarence St. - NB | 1.05 | 984 | 1429 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne St. & Clarence St.
**Time Period:** **PM PEAK 2051**

**Prepared By:** EVM
**Sheet:** **4 of 4**

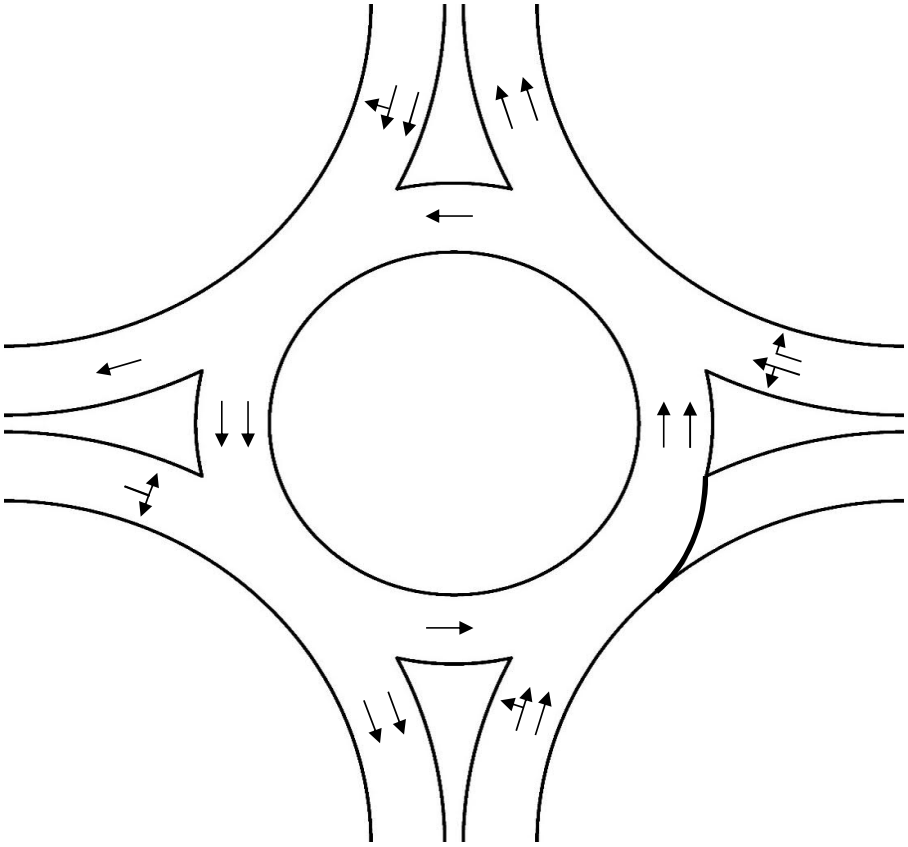



Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

**Model Inputs**

| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
|---|---|---|---|---|---|
| Clarence St. - SB | 1.05 | 0 | 2021 | 195 | 0 |
| Colborne St. - EB | 1.05 | 146 | 570 | 98 | 0 |
| Clarence St. - NB | 1.05 | 914 | 1663 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Colborne St. & Clarence St. ICS

**Major Road:** Colborne St.

**Minor Road:** Clarence St.

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Stop Control |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |

| | |
|---|---|
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | YES |
| **Will the proposed intersection have illumination:** | YES |

| | |
|---|---|
| **5-Year Total Collisions:** | 47 |
| **5-Year PDO Collisions:** | 17 |

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 16,790

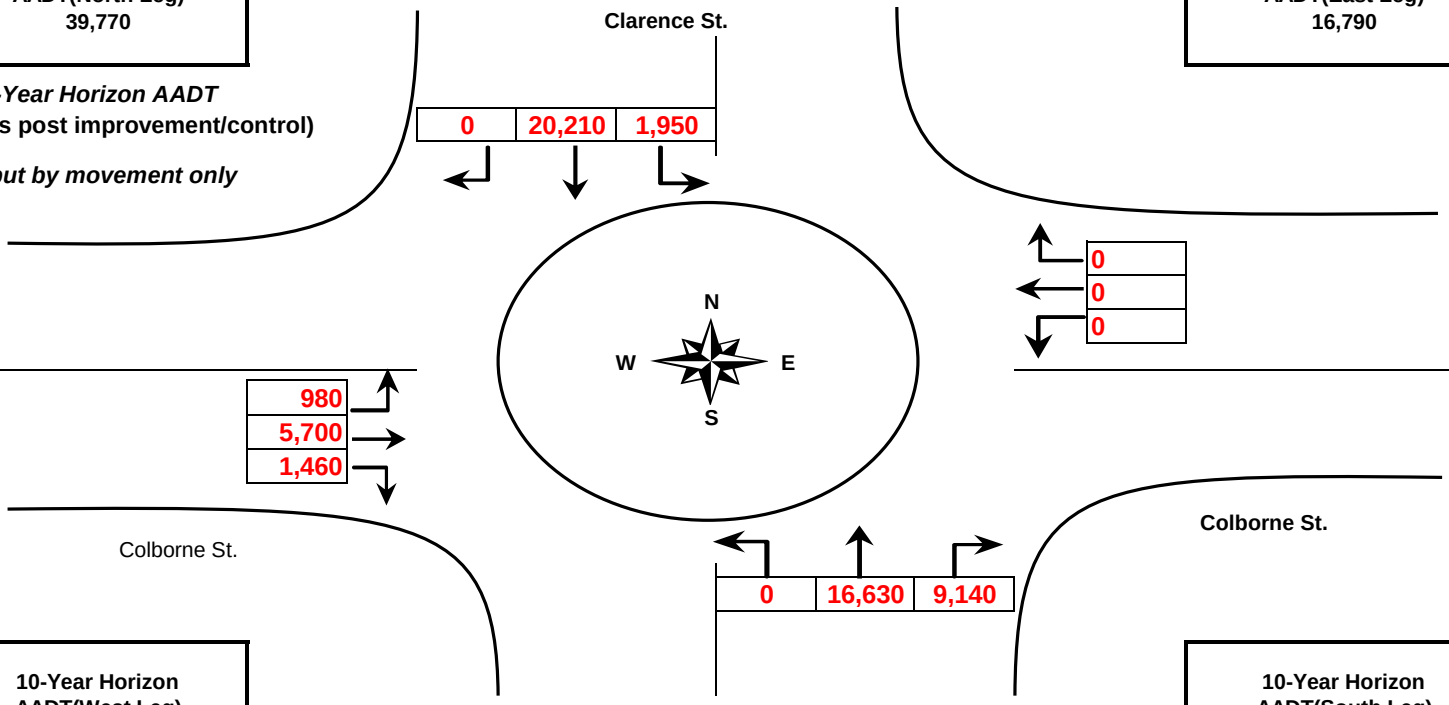
**Minor Road (mid-block) 10-Year Horizon AADT:** 47,440

**10-Year Horizon AADT(North Leg) 39,770**

**10-Year Horizon AADT(East Leg) 16,790**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 8,140**

**10-Year Horizon AADT(South Leg) 47,440**

**Direct Capital Costs**

| | |
|---|---|
| Fatal = | $1,656,500 |
| Injury = | $60,500 |
| $PDO_{SIG}$ = | $5,000 |
| $PDO_{RA}$ = | $4,500 |
| Discount Rate = | 0.06 |

## 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Stop Control | $3,896,699.28 | $172,622.31 | $3,192,079.08 | $531,997.89 |
| Roundabout | $3,632,312.09 | $1,456,521.18 | $2,175,790.90 | $0.00 |

* Roundabout calibration Factor - 1.5

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** **Colborne St. & Clarence St. ICS**

**Major Road:** **Colborne St.**
**Minor Road:** **Clarence St.**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Stop Control

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **48850**

**5-Year Total Collisions:** **47**

**5-Year PDO Collisions:** **17**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Stop Control | **7.64** | **3.01** | **4.60** | **0.03** |
| Roundabout | **31.35** | **28.22** | **3.14** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 4-Leg Intersection | **-8.9** | **0.82** | **0.25** | **0.33** | **0.006** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 4-Leg Intersection | **-8.74** | **0.77** | **0.23** | **0.4** | **0.006** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **0.84** | Total | PDO |
| | | | | **1.703864574** | **1.154940051** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Colborne St. and Clarence St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1800** | $11,700.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$181,133.00** | **$182,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $81,604.60 | 1 | $81,604.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$621,604.60** | **$622,000.00** |
| | | | | **Engineering (20%)** | **$205,925.52** | **$205,000.00** |
| | | | | **Contingency (20%)** | **$205,925.52** | **$205,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,441,478.64** | **$1,441,000.00** |

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Colborne St. and Queen St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1800** | $11,700.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$181,133.00** | **$182,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $810.00 | $11,340.00 | |
| A2.2 | Roadway Paving | | | **1,350** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,519 | $22,781.25 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 506 | $10,125.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 338 | $33,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 169 | $25,312.50 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$298,200.75** | **$300,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $95,866.75 | 1 | $95,866.75 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$270,866.75** | **$270,000.00** |
| | | | | **Engineering (20%)** | **$150,040.10** | **$150,000.00** |
| | | | | **Contingency (20%)** | **$150,040.10** | **$150,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,050,280.70** | **$1,052,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Dalhousie Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection is a three leg intersection where Colborne Street and Dalhousie Street converge. East of the intersection, Colborne Street is five lanes and accommodates two-way traffic. At the intersection Colborne Street and Dalhousie Street diverge, with two lanes heading west on Dalhousie Street, with two eastbound incoming lanes on Colborne Street. There is a parking lot to the south of the intersection which has an entrance. |


| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently unsignalized, however, there is a signalized entrance from the parking lot to the south of the intersection. There is a dedicated eastbound left turn lane from Colborne Street onto Dalhousie Street. Westbound on Colborne Street, all traffic is directed onto Dalhousie Street, which become one-way. |

| | |
|---|---|
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are some expected operational problems at the entrance to the new development. Additional traffic will increase the number of in and out movements. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | To the east is the intersection of Kiwanis Way and Colborne Street. This intersection is signalized and has protected pedestrian movement on three legs of the intersection. Stanley Street is the intersection immediately to the west, and crosses both Colborne Street and Dalhousie Street. It is signalized at Dalhousie Street, and unsignalized at Colborne Street. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain two lanes of traffic on Colborne Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There is a residential development occurring within the property to the south of the intersection. The property has a signalized entrance currently, which allows for right turn and straight through movements. There is a large triangular median that separates the east and westbound traffic. All of the adjacent properties are residential. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would be to leave the intersection as it exists currently. The EA has indicated that one-way traffic is the preferred alternative, and so the intersection will continue to function well as traffic converges and diverges. The feasibility of a roundabout is also being evaluated at this intersection. The expected traffic demand being generated by the residential development will increase the northbound movement at the intersection. Figure 1 represents the signalized intersection which mimics the existing conditions. |

| | |
|---|---|
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, and two north on Dalhousie, and one lane south into the development. Figure 2 is a representation of a roundabout that could be implemented at this intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,302,000 | $1,892,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,431,000 | $1,913,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

| | |
|---|---|
| **12** | Conclusion and Recommendations: |

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $482,000.
- Roundabout would require minimal property taking, but will not impact any structures.
- While traffic results were not available for this intersection, a roundabout does address the entrance to the development to the south of the intersection.

Given that a traffic study was not available for this intersection, we recommend that the City further investigate the possible implementation of a roundabout. While capital costs are slightly higher than signalization, collision costs are not factored in. We recommend that further studies be conducted at this intersection to determine the viability of a roundabout, as initial functional drawings show that many of the complications of the entrance to the development south of the intersection could be addressed with a roundabout.

Figure 1

# Proposed Traffic Lights – Colborne at Dalhousie

DALHOUSIE STREET

COLBORNE STREET

N

Grass
Steel Guard Rail
Concrete Sidewalk
Asph.
Conc.
TL
Asphalt Path
Concrete Sidewalk
Path
Sidewalk
Asphalt Driveway

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST.**
**& DALHOUSIE ST.**
**PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

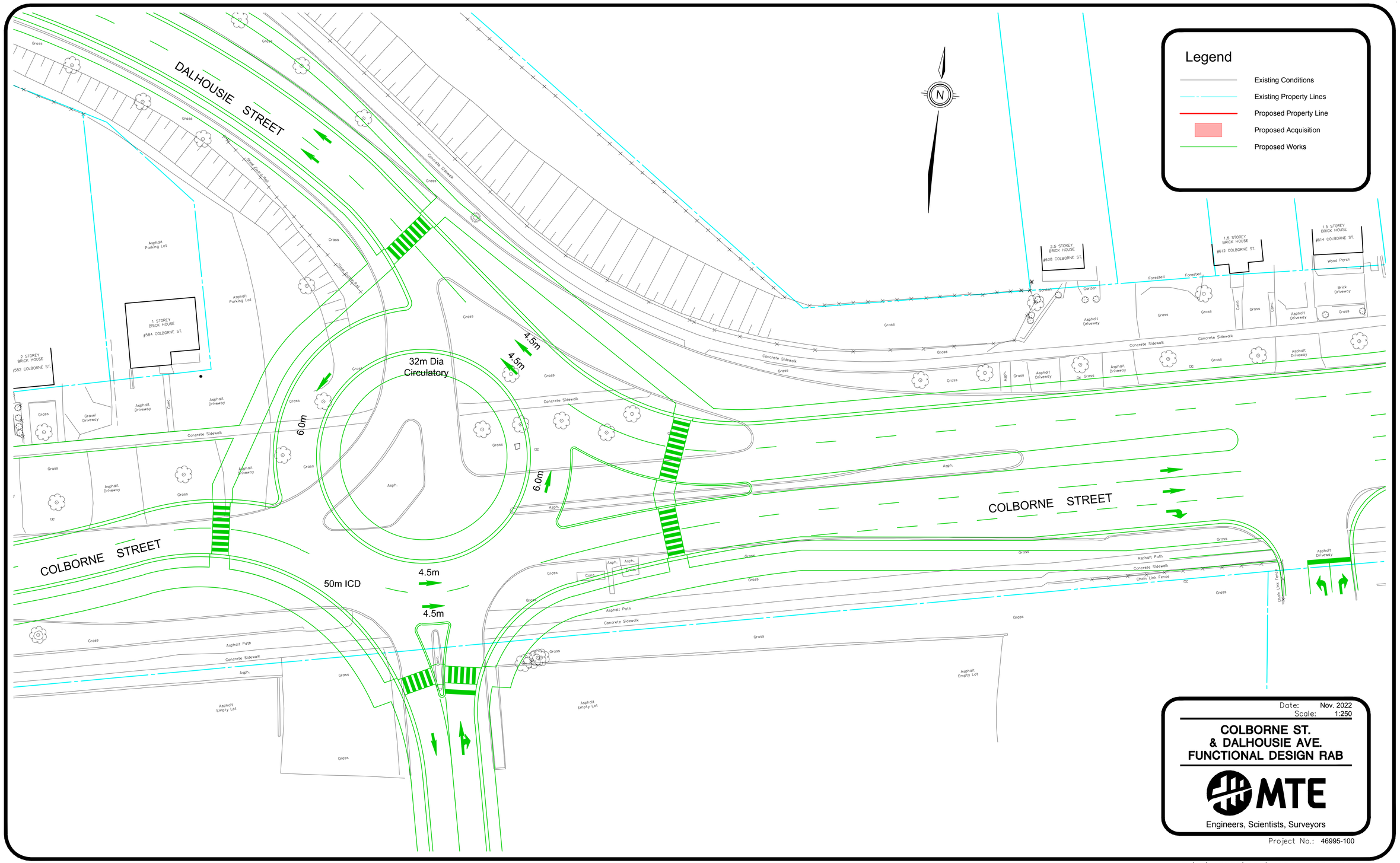
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Colborne at Dalhousie




Date: Nov. 2022
Scale: 1:250

**COLBORNE ST. & DALHOUSIE AVE. FUNCTIONAL DESIGN RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

November 4, 2022 — 9:59 a.m. — Plotted By: EMcDonald

P:\P\46995\100\46995-100-FD4.dwg

# Appendix A

# Cost Estimates

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie St. and Colborne St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **3200** | $20,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **301** | $3,311.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **548** | $4,384.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **2115** | $84,600.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **19** | $22,800.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$255,895.00** | **$256,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,800.00 | $25,200.00 | |
| A2.2 | Roadway Paving | | | **3,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 3,375 | $50,625.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 1,125 | $22,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 750 | $93,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 375 | $69,375.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **631** | $34,705.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **1,982** | $118,920.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **22** | $6,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$421,675.00** | **$421,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $135,514.00 | 1 | $135,514.00 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$675,514.00** | **$675,000.00** |
| | | | | **Engineering (20%)** | **$270,616.80** | **$270,000.00** |
| | | | | **Contingency (20%)** | **$270,616.80** | **$270,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,894,317.60** | **$1,892,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie St. and Colbourne St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **3200** | $20,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **301** | $3,311.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **548** | $4,384.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **2115** | $84,600.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **19** | $22,800.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$255,895.00** | **$256,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,920.00 | $26,880.00 | |
| A2.2 | Roadway Paving | | | **3,200** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 3,600 | $54,000.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 1,200 | $24,000.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 800 | $80,000.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 400 | $60,000.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **547** | $30,085.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | **120** | $5,400.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **220** | $12,760.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **1,058** | $63,480.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **20** | $6,000.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$372,925.00** | **$374,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $125,764.00 | 1 | $125,764.00 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$300,764.00** | **$300,000.00** |
| | | | | **Engineering (20%)** | **$185,916.80** | **$186,000.00** |
| | | | | **Contingency (20%)** | **$185,916.80** | **$186,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,301,417.60** | **$1,302,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Murray Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs between Colborne and Murray Street. Murray Street is a three lane north/south arterial with an additional right turn only lane on the south leg and left turn only lane on the north leg. Colborne Street is a two lane, one-way arterial approaching from the west with on-street parking on both sides on the east and west leg. The intersection connects at right angles between Colborne Street and Murray Street.   |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are no operational problems identified with this intersection. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Colborne and Peel Street, and is a four leg two-way stop intersection with non-signalized pedestrian crossings on the Peel Street leg. The intersection to the east is Colborne and Brock Street, which is a four leg two-way stop intersection with non-signalized pedestrian crossings on the Brock Street leg. There are no adjacent queuing issues identified. |

| | |
|---|---|
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain two lanes of traffic on Colborne Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are commercial buildings on the northeast, northwest, southwest corners of the intersection that have buildings on property line. The southeast corner is a church. The buildings on each corner will act as constraints at this intersection. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, and two lanes north/south on Murray Street. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

| | |
|---|---|
| | Injury Collision Costs were not available for this intersection, as traffic data was not available.<br>Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).<br>Implementation and NPV cost estimates can be found in Appendix A. |
| **12** | Conclusion and Recommendations: |
| | Conclusions are based on the results of the roundabout screening:<br>• The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $654,000.<br>• Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.<br>The recommendation for the Murray Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization. |

Figure 1

# Proposed Traffic Lights – Colborne at Murray

MURRAY STREET

COLBORNE STREET

Demolished Building

Empty Dirt Lot

2 STOREY BRICK BUILDING

#430 COLBORNE ST.

2 STOREY BRICK BUILDING

#432–434 COLBORNE ST.

2 STOREY BRICK BUILDING

#436–442 COLBORNE ST.

2 STOREY STUCCO BUILDING

#427–433 COLBORNE ST.

Concrete Sidewalk

Brick

Asphalt Driveway

Grass

Conc. Blocks

Garden

Bench

Rock

Hedge

Conc.

TL

N

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST. & MURRAY ST. PROPOSED TRAFFIC LIGHTS**

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Colborne at Murray

MURRAY ST

COLBORNE ST

2m CONCRETE SIDEWALK. MATCH INTO EXIST. TYP.

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

Direction of Traffic

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.7m CONCRETE SEMI-MOUNTABLE CURB AND WIDE GUTTER AS PER OPSD 600.020

0.25m CONCRETE CURB AND NARROW GUTTER AS PER OPSD 600.080

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

N

Date: Oct.21/22
Scale: 1:250

**Example RAB**

Colborne St. @ Murray St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

# Appendix A

# Cost Estimates

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Colborne St. and Murray St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$820,824.60** | **$820,000.00** |
| | | | | **Engineering (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Contingency (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,714,926.64** | **$1,712,000.00** |

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Colborne St. and Murray St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Queen Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of three legs in which Queen Street is a two-lane north/south arterial, Colborne Street is a two lane, one-way arterial approaching from the west. The intersection connects at a tee between Queen Street and Colborne Street. |
| |   |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently all-way stop controlled. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | No operational problems have been experienced at this intersection. Intersection is expected to operate with a Level of Service A in the 2051 design horizon. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Colborne and King Street, and is a one-way stop three leg intersection with pedestrian crossings on the King Street leg only. The intersection to the east is |

| | |
|---|---|
| | Colborne Street and Market Street, which is a signalized intersection for pedestrians. The traffic analysis indicates that the adjacent intersections should not experience high queueing. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the intersection is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain 2 lanes of traffic on Colborne Street, with on-street parking on both sides. A recommendation in the EA is that Queen Street be converted to one-way traffic (north to south), with the addition of bike lanes on each side of the road, and improved pedestrian facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 8 collisions were recorded for this intersection. See Figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Existing buildings are at property line on each side of Queen Street, extending to the intersection. No availability for property taking for daylight triangles or improving site distances. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 3 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, with a single lane north/south on Queen Street. Refer Appendix A for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $938,000 | $1,432,000 |
| **Injury Collision Cost (20 Year NPV)** | $ 751,000 | $ 234,000 |
| **NPV Maintenance** | $129,000 | $21,000 |
| **TOTAL** | $1,818,000 | $1,687,000 |

Attach collision cost calculation sheets

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

See Appendix B for 20 Year NPV and Implementation cost estimates.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 8 collisions in the past 5 years (6 Property Damage only)
- The roundabout is the lower cost alternative over the 20-Year life cycle cost, when the social impacts of the intersection are included. The capital cost of the roundabout is approximately $494,000.
- Roundabout would require property taking. While estimates are included for property taking, buildings that extend to property line may require full buyouts. The property taking costs could be substantially higher.

The recommendation for the Colborne Street at Queen Street intersection is that the City proceed with a signalized intersection. The signalized intersection functions very well in the 2051 planning horizon and requires no property taking.

Figure 1

# Collisions – Colborne at Queen

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

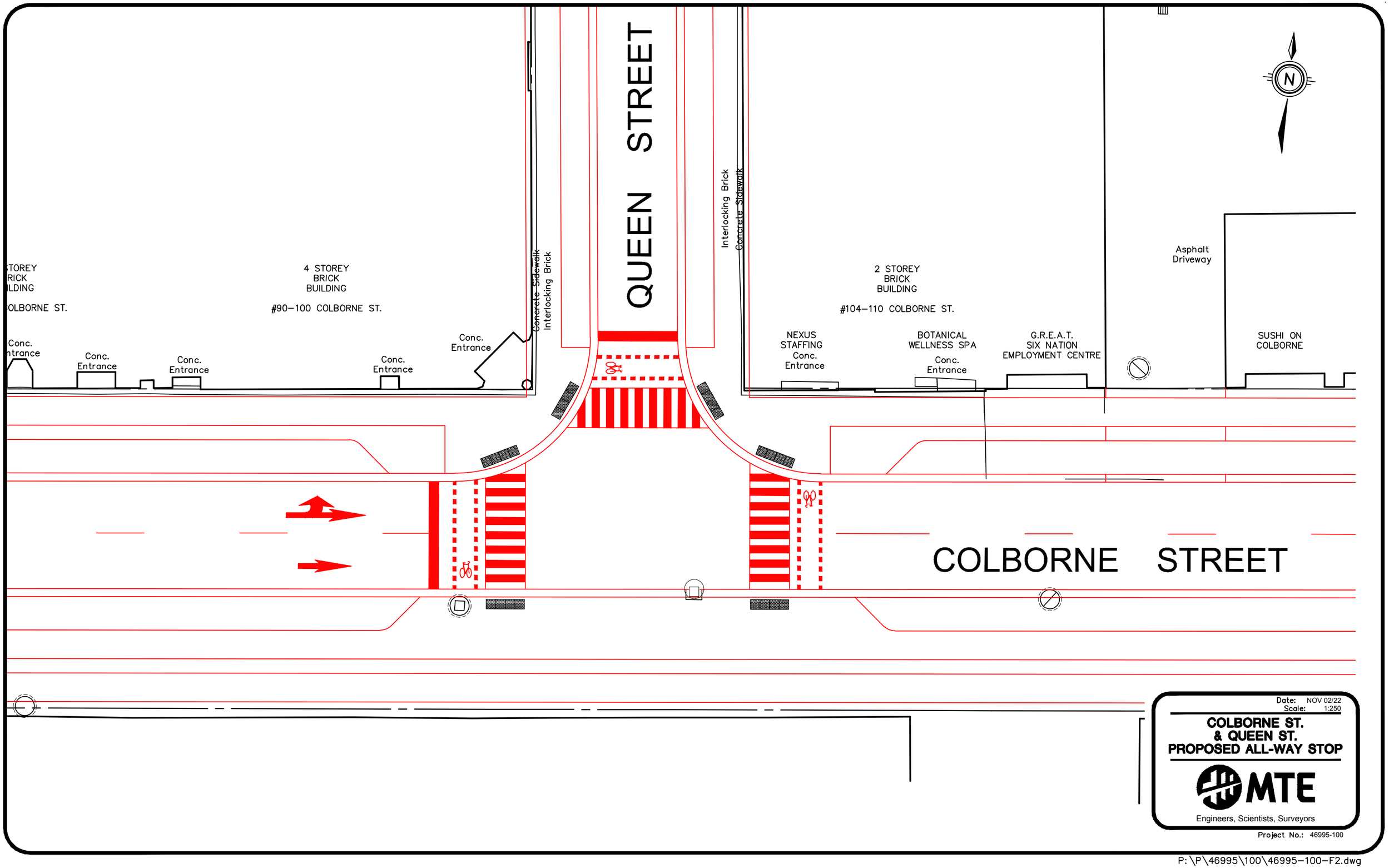
**Location .....** QUEEN ST @ COLBORNE ST **Municipality.....** BRANTFORD

**Traffic Control....** **Total Collisions....** 8

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-45983 | 2017-Nov-30, Thu,15:19 | Rain | Angle | P.D. only | South | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | East | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-48925 | 2017-Dec-23, Sat,14:35 | Clear | Sideswipe | P.D. only | East | Wet | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | East | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-024582 | 2018-Jun-26, Tue,16:52 | Clear | SMV other | P.D. only | East | Dry | Going ahead | Automobile, station wagon | Pole (utility, power) | Lost control | |
| **Comments:** | | | | | | Dry | | | | | |
| 18-03966 | 2018-Jan-30, Tue,08:00 | Clear | SMV other | P.D. only | East | Ice | Going ahead | Truck - tractor | Pole (sign, parking meter) | Driving properly | |
| **Comments:** | | | | | | Packed snow | | | | | |
| 18-10960 | 2018-Mar-03, Sat,16:15 | | Rear end | P.D. only | East | Dry | Going ahead | Pick-up truck | Other motor vehicle | Lost control | |
| **Comments:** | | | | | East | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 19-12329 | 2019-Apr-06, Sat,14:34 | Clear | SMV other | Non-fatal injury | South | Dry | Turning left | Automobile, station wagon | Pedestrian | Improper turn | |
| **Comments:** | HTA 142(1) 9106017Z | | | | | | | | | | |
| 19-32787 | 2019-Aug-26, Mon,09:09 | Clear | SMV other | Non-fatal injury | East | Dry | Turning left | Automobile, station wagon | Pedestrian | Failed to yield right-of-way | |
| **Comments:** | | | | | | | | | | | |
| 19-33701 | 2019-Sep-01, Sun,16:18 | Rain | Rear end | P.D. only | East | Wet | Slowing or stopping | Police vehicle | Other motor vehicle | Following too close | |
| **Comments:** | | | | | East | Wet | Stopped | Police vehicle | Other motor vehicle | Driving properly | |

Figure 2

# Proposed Traffic Lights – Colborne at Queen




Date: NOV 02/22
Scale: 1:250

**COLBORNE ST.**
**& QUEEN ST.**
**PROPOSED ALL-WAY STOP**

MTE
Engineers, Scientists, Surveyors

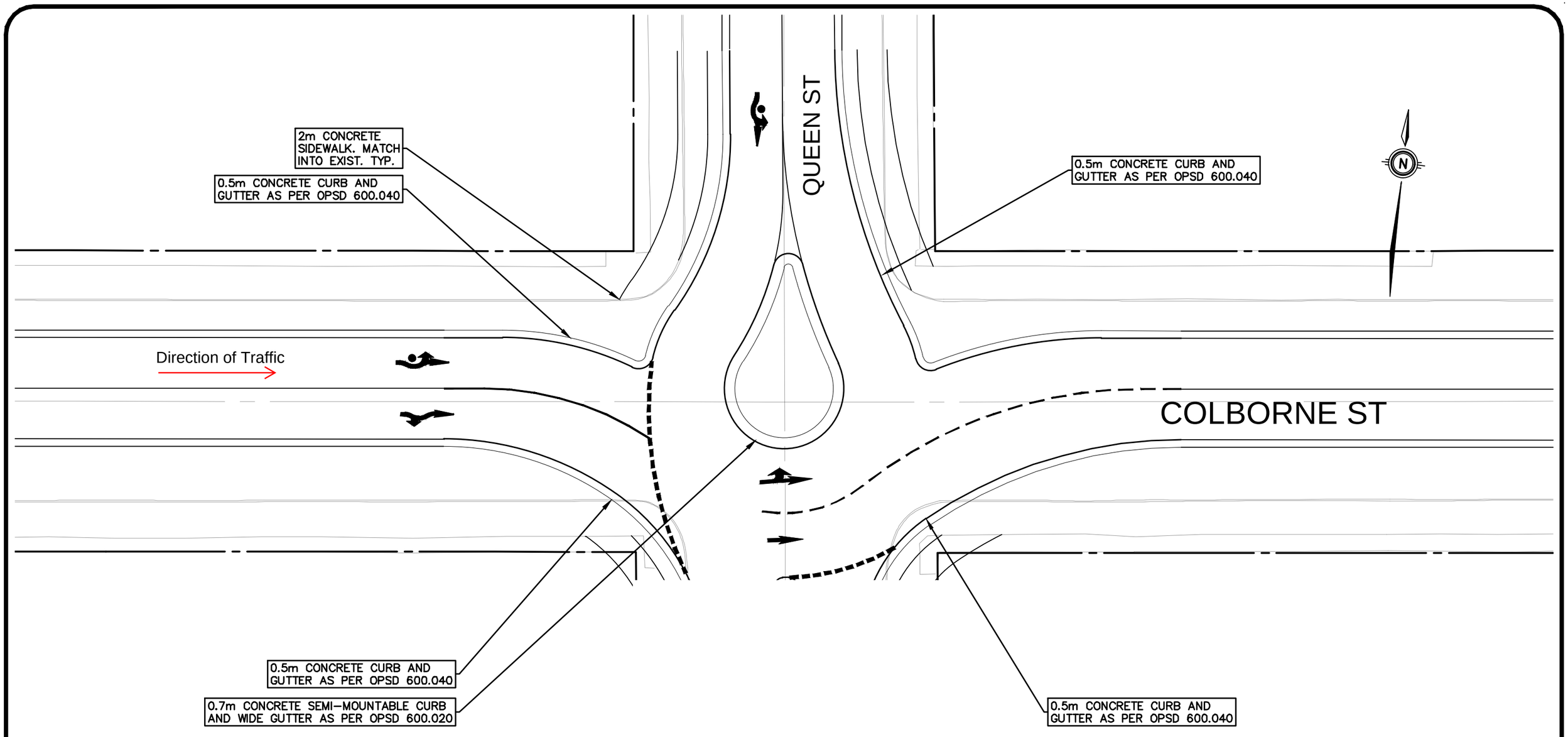
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Colborne at Queen




FD3.2

Date: Oct.21/22

Scale: 1:250

**Example RAB**

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

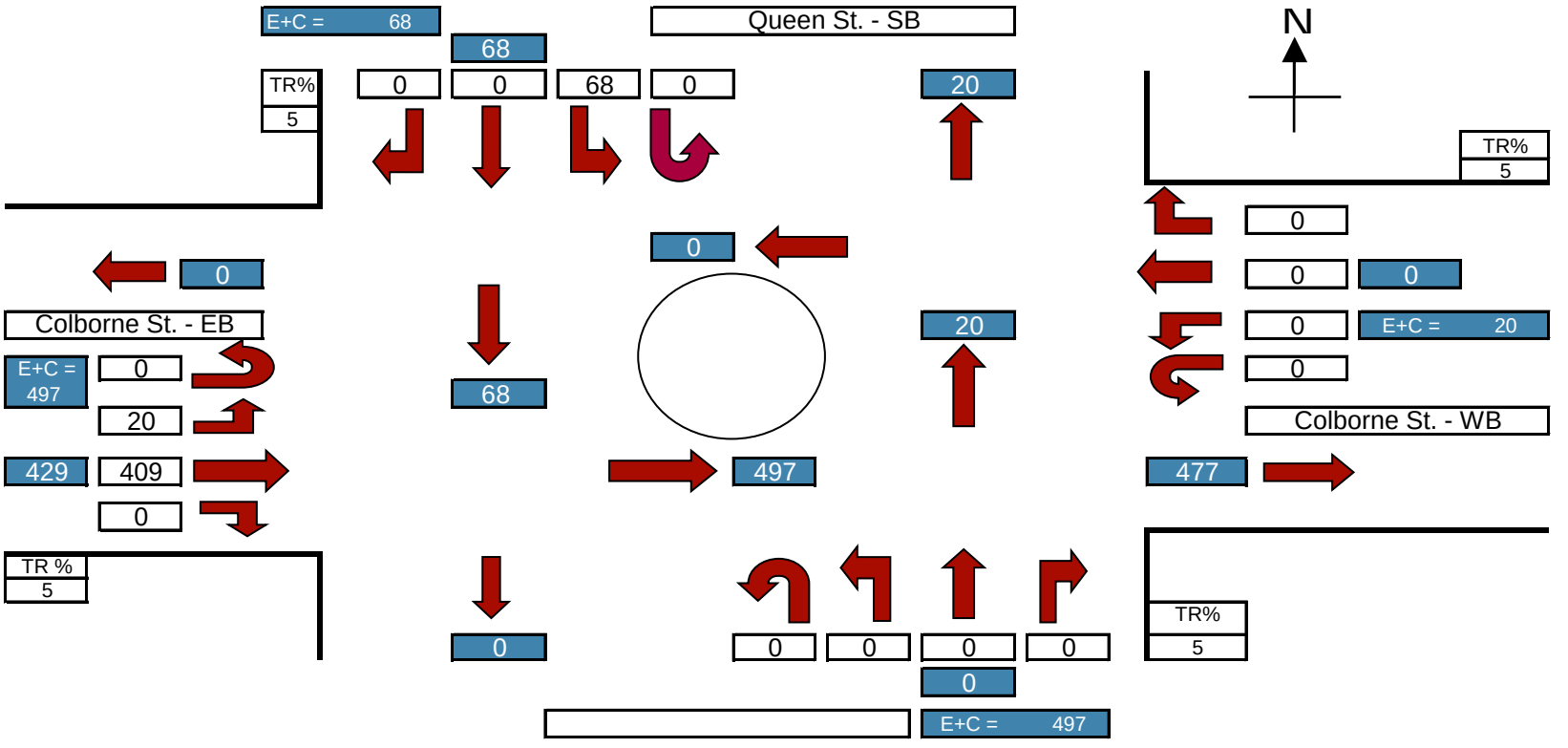
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Queen Street
**Time Period:** **AM PEAK 2021**

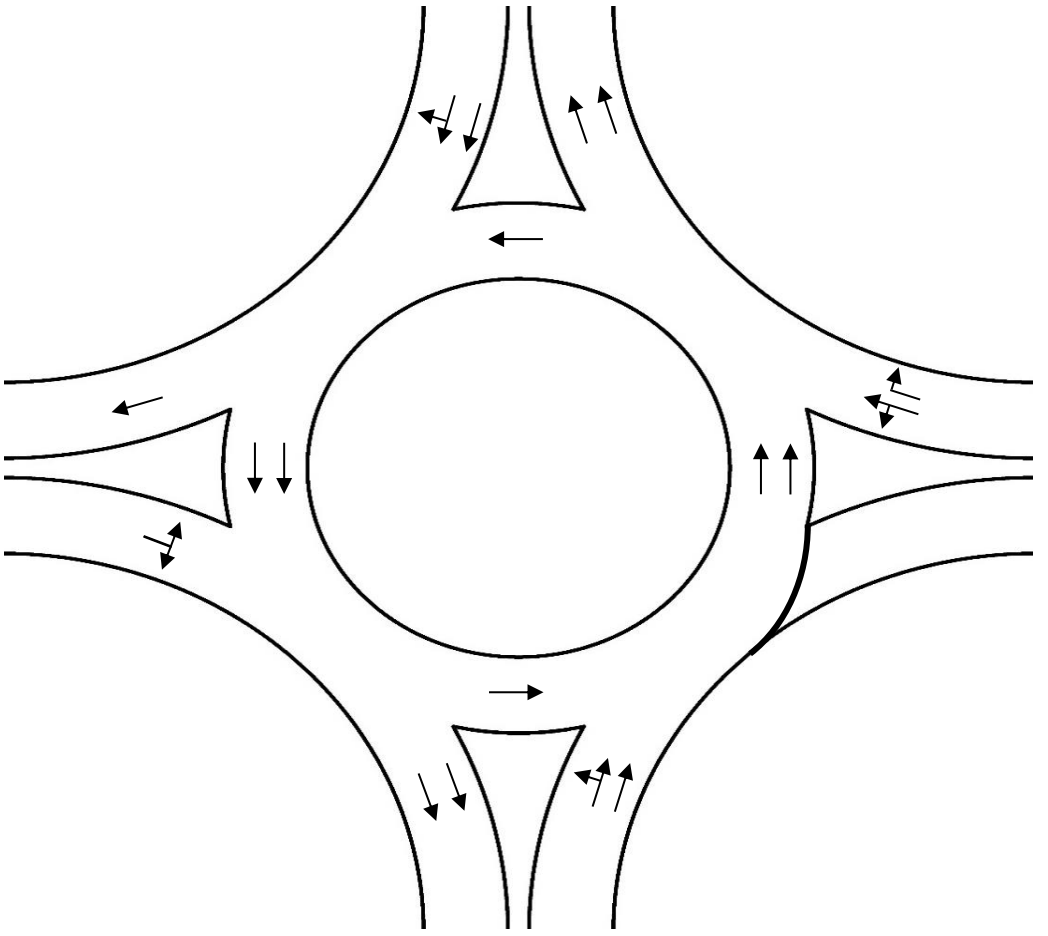
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

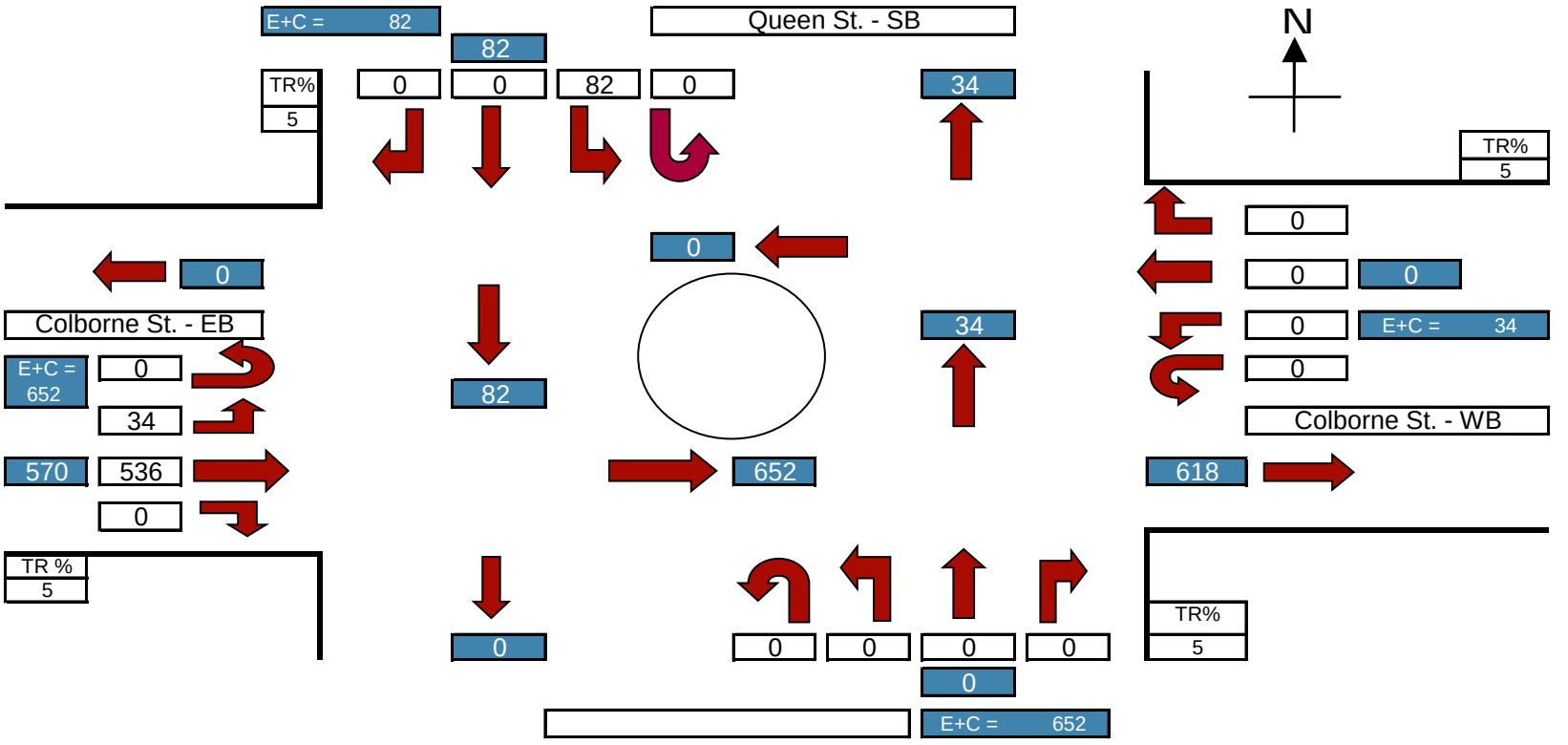
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 0 | 0 | 68 | 0 |
| Colborne St. - EB | 1.05 | 0 | 409 | 20 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne St. & Queen St.
**Time Period:** **PM PEAK 2021**

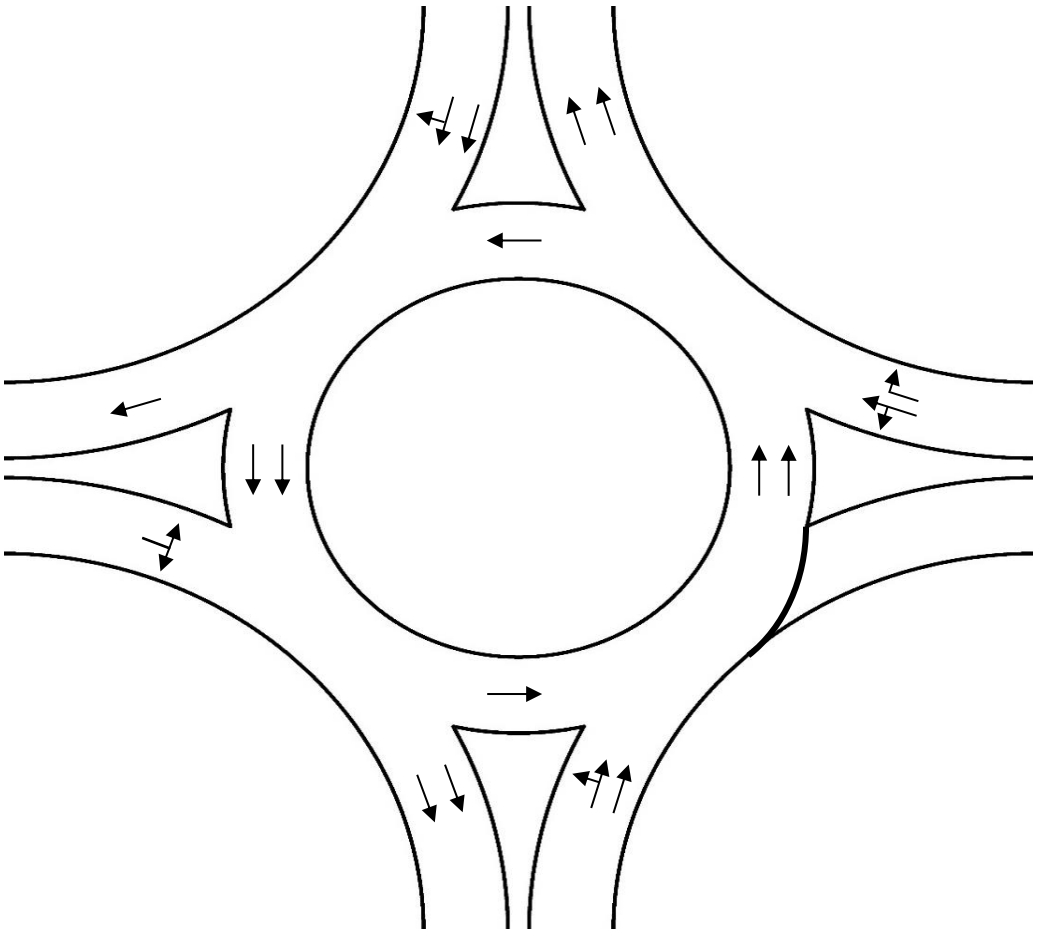
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

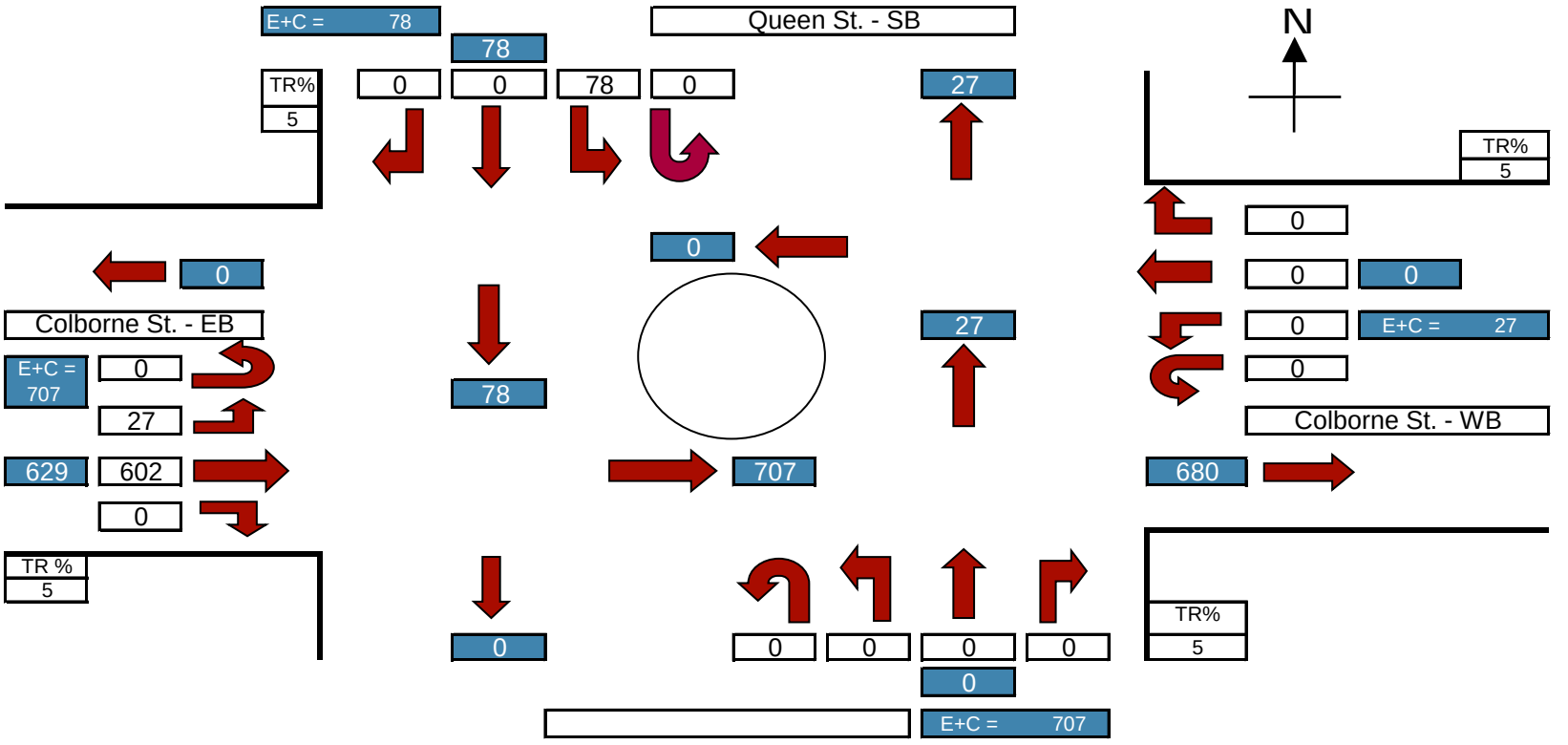
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 0 | 0 | 82 | 0 |
| Colborne St. - EB | 1.05 | 0 | 536 | 34 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne St. & Queen St.
**Time Period:** **AM PEAK 2051**

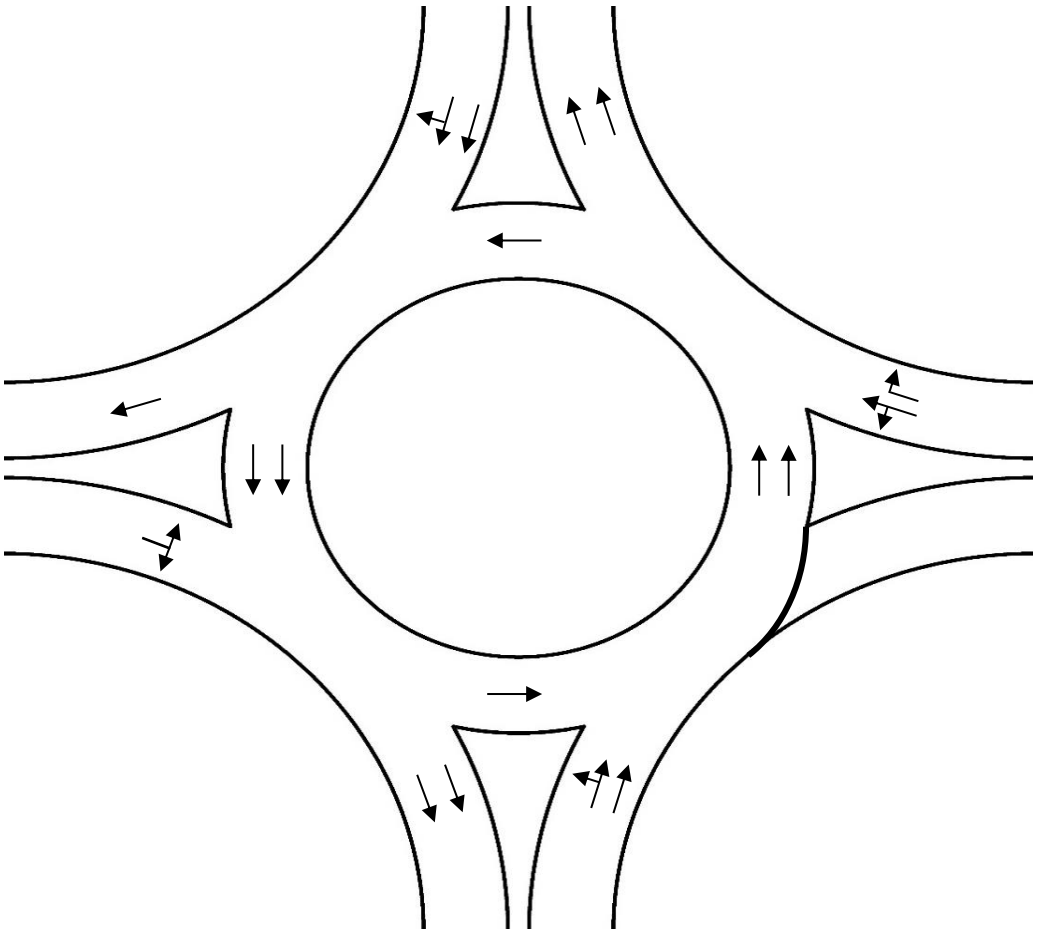
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

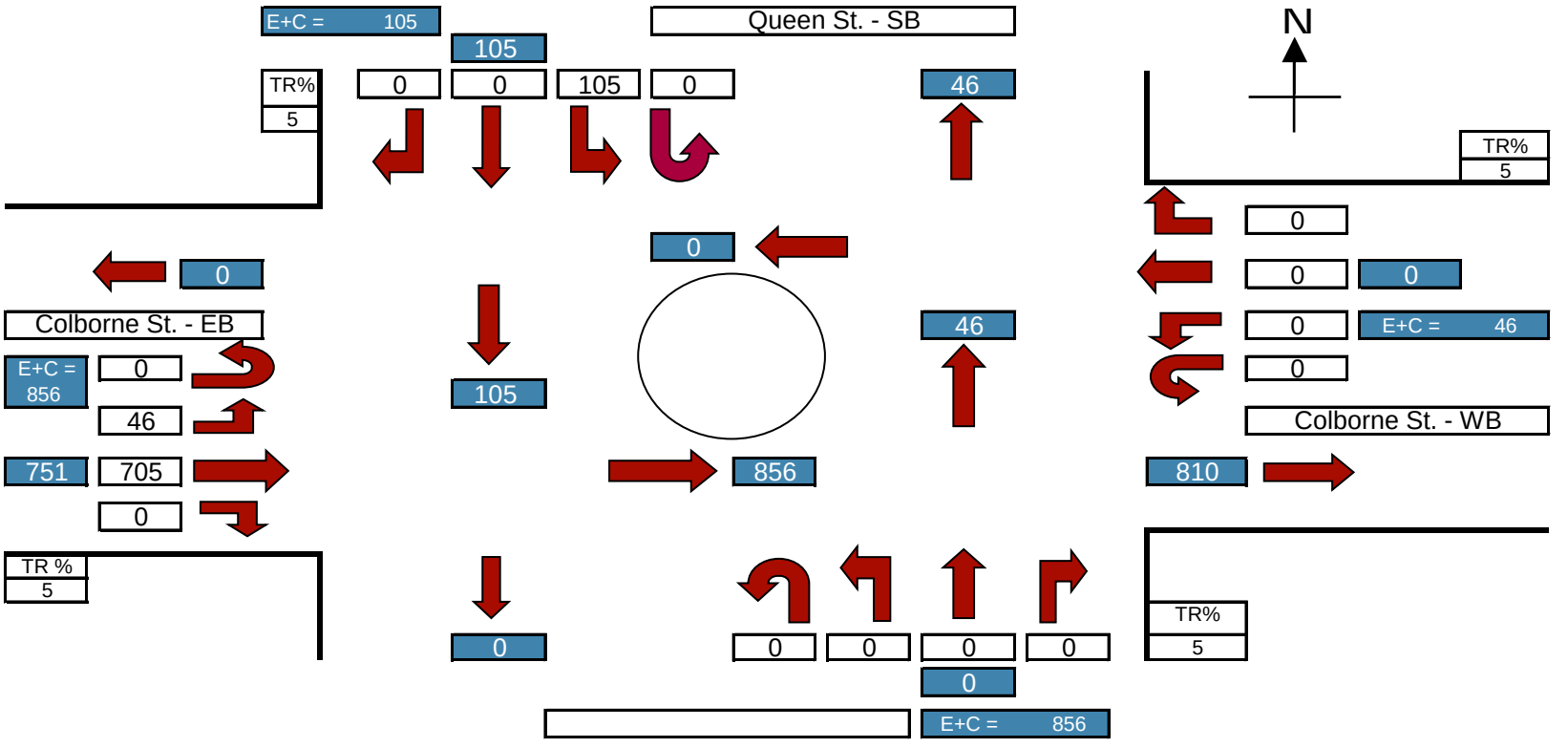
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 0 | 0 | 78 | 0 |
| Colborne St. - EB | 1.05 | 0 | 602 | 27 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne St. & Queen St.
**Time Period:** **PM PEAK 2051**

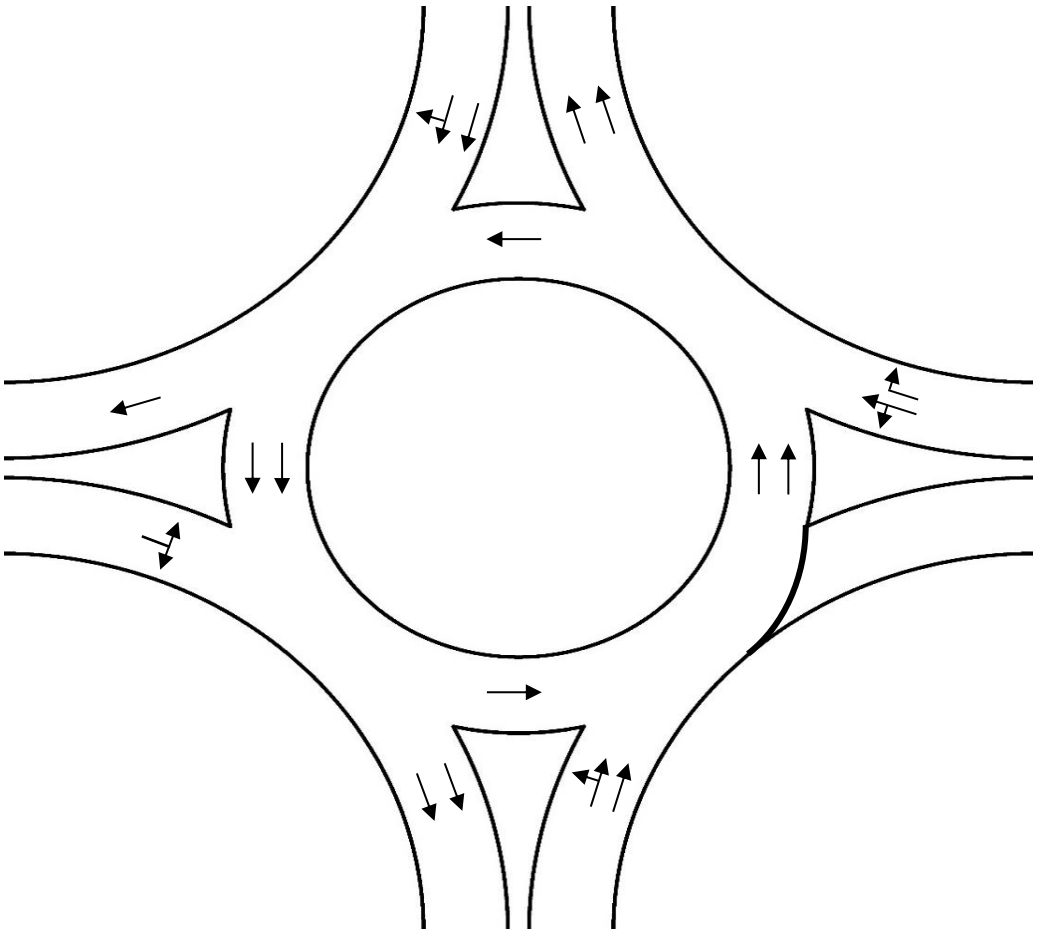
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 0 | 0 | 105 | 0 |
| Colborne St. - EB | 1.05 | 0 | 705 | 46 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Colborne St. & Queen St. ICS

**Major Road:** Colborne Street

**Minor Road:** Queen Street

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Signalized |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | NO |
| **Will the proposed intersection have illumination:** | YES |

**5-Year Total Collisions:** 8

**5-Year PDO Collisions:** 6

**Proposed RA Configuration?** SINGLE - 3 x 1

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 8,100

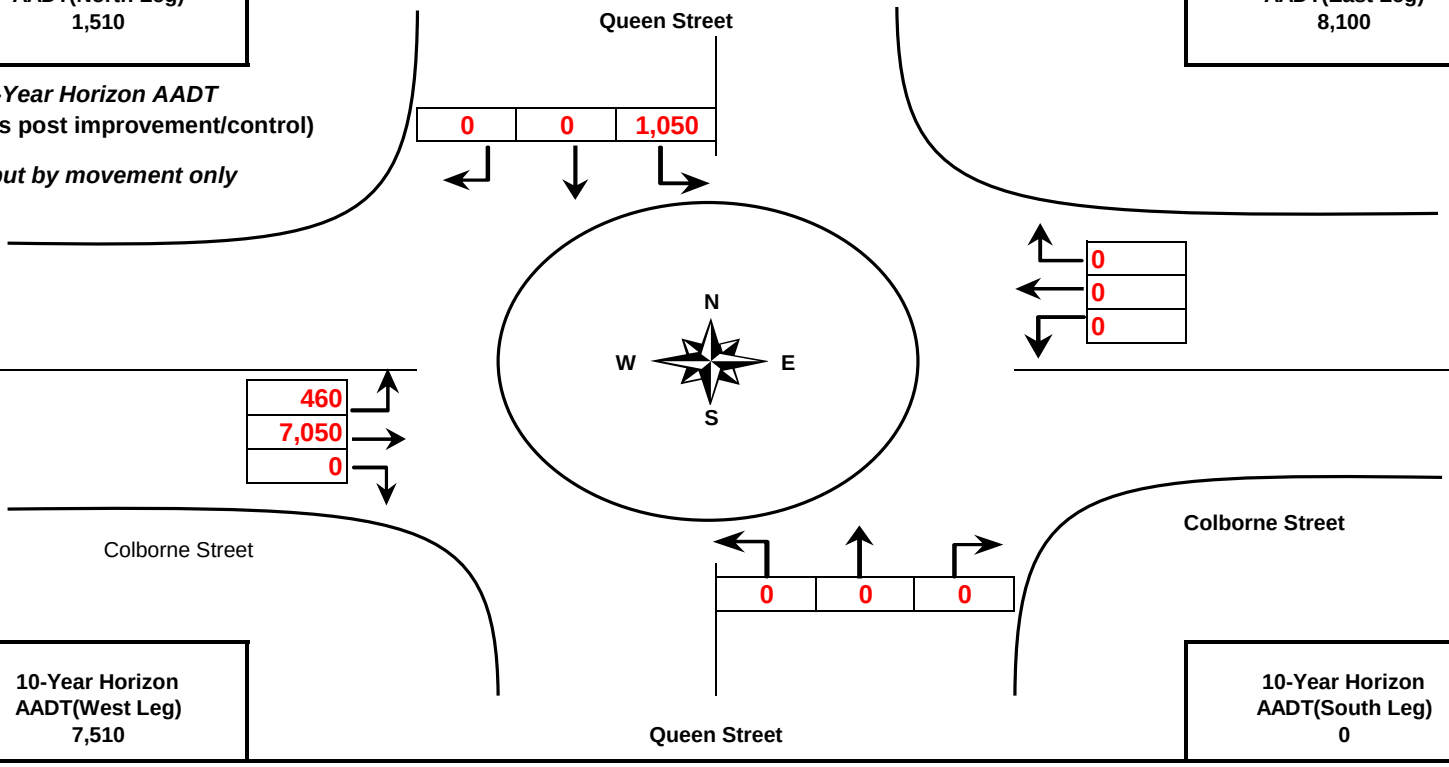
**Minor Road (mid-block) 10-Year Horizon AADT:** 1,510

**10-Year Horizon AADT(North Leg) 1,510**

**10-Year Horizon AADT(East Leg) 8,100**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 7,510**

**10-Year Horizon AADT(South Leg) 0**

**Direct Capital Costs**

Fatal = $1,656,500
Injury = $60,500
PDO$_{SIG}$ = $5,000
PDO$_{RA}$ = $4,500

Discount Rate = 0.06

| 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS) | | | | |
|---|---|---|---|---|
| **Collisions by Severity** | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **$749,593.76** | **$100,935.31** | **$610,658.61** | **$37,999.85** |
| Roundabout | **$233,491.46** | **$93,627.76** | **$139,863.69** | **$0.00** |

* Roundabout calibration Factor - 0.9

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

*Last Rev JAN 2021*

Region of Waterloo

**Scenario:** **Colborne St. & Queen St. ICS**

**Major Road:** **Colborne Street**
**Minor Road:** **Queen Street**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Signalized

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **3150**

**5-Year Total Collisions:** **8**

**5-Year PDO Collisions:** **6**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **2.64** | **1.76** | **0.88** | **0.00** |
| Roundabout | **2.02** | **1.81** | **0.20** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-10.99** | **1.07** | **0.23** | **N/A** | **0.002** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-11.02** | **1.02** | **0.24** | **N/A** | **0.002** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **2.1** | Total | PDO |
| | | | | **N/A** | **N/A** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Colborne St. and Queen St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$620,824.60** | **$620,000.00** |
| | | | | **Engineering (20%)** | **$204,989.52** | **$205,000.00** |
| | | | | **Contingency (20%)** | **$204,989.52** | **$205,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,434,926.64** | **$1,432,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

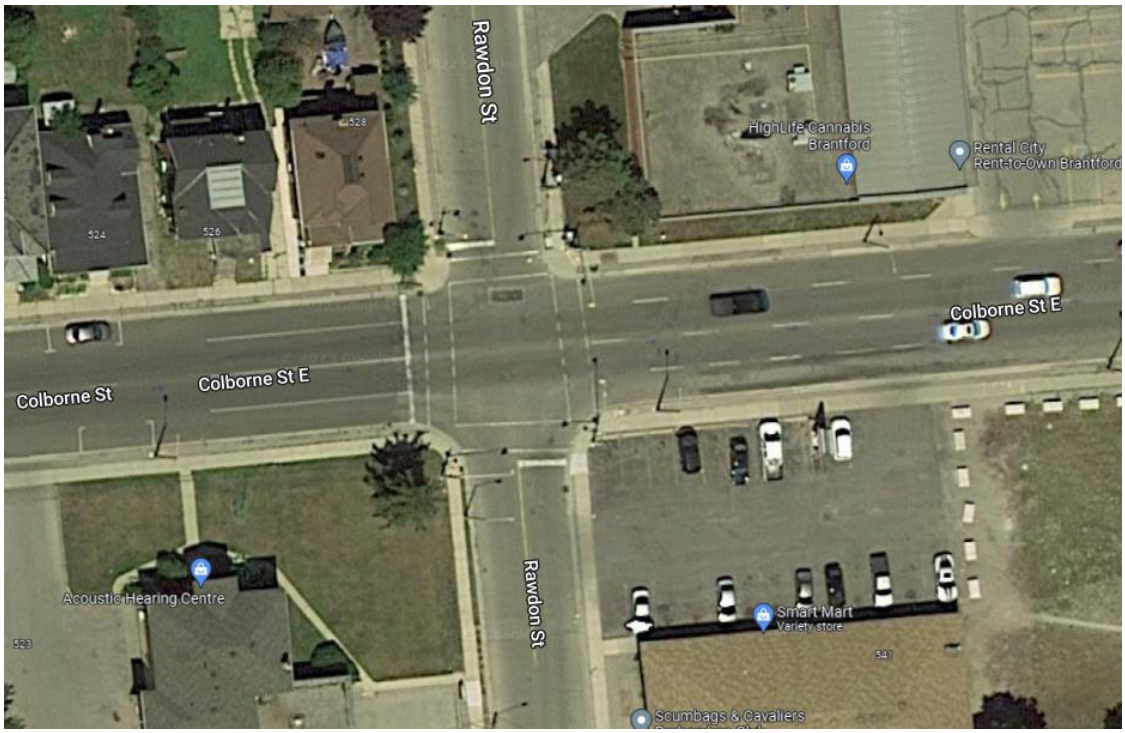
## Colborne St. and Queen St. Intersection
## Intersection Improvements EA
## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $306.00 | $4,284.00 | |
| A2.2 | Roadway Paving | | | **510** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 574 | $8,606.25 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 191 | $3,825.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 128 | $12,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 64 | $9,562.50 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$233,919.75** | **$235,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $82,230.55 | 1 | $82,230.55 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$257,230.55** | **$258,000.00** |
| | | | | **Engineering (20%)** | **$133,676.66** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$133,676.66** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$935,736.62** | **$938,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Rawdon Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs between Colborne and Rawdon Street. Rawdon Street is a two lane north/south arterial and Colborne Street is a two lane, one-way arterial approaching from the west with on-street parking on both sides on the west leg. The intersection connects at right angles between Colborne Street and Rawdon Street. |




| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are no operational problems identified with this intersection. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |

| | |
|---|---|
| | The intersection to the west is Colborne and Drummond Street, and is a four leg two-way stop intersection with non-signalized pedestrian crossings on the Drummond Street leg. The intersection to the east is Colborne and Stanley Street, which is a three leg two-way stop intersection with non-signalized pedestrian crossings on the Stanley Street leg. There are no adjacent queuing issues identified. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Colborne Street will remain. The street will remain two lanes of traffic on Colborne Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are commercial buildings on the northeast, and northwest corners of the intersection that have buildings on property line. The southeast corner is parking lot, while the southwest corner is a commercial building, but set back a fair distance from the intersection. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Colborne Street, and two lanes north/south on Rawdon Street. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $654,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Rawdon Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization.

Figure 1

# Proposed Traffic Lights – Colborne at Rawdon

RAWDON STREET

COLBORNE STREET

2 STOREY BRICK HOUSE #526 COLBORNE ST.

2 STOREY BRICK HOUSE #528 COLBORNE ST.

1 STOREY BRICK STRIP MALL #10 STANLEY ST.

SHED

Asphalt Driveway

Grass

Enclosed Sunroof

Concrete Driveway

Conc.

Wood Steps

Grass

Wood Porch

Wood Steps

Garden

Garden

Garden

Grass

Concrete Sidewalk

Asph.

Concrete Sidewalk

Asph.

Concrete Sidewalk

Grass

Grass

Conc.

Grass

Grass

Concrete Sidewalk

Asph.

TL

TL

Asph.

Concrete Sidewalk

Asph.

Asph.

Concrete Sidewalk

Conc.

Garden

Grass

Asphalt Parking Lot

Asph.

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST. & RAWDON ST. PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

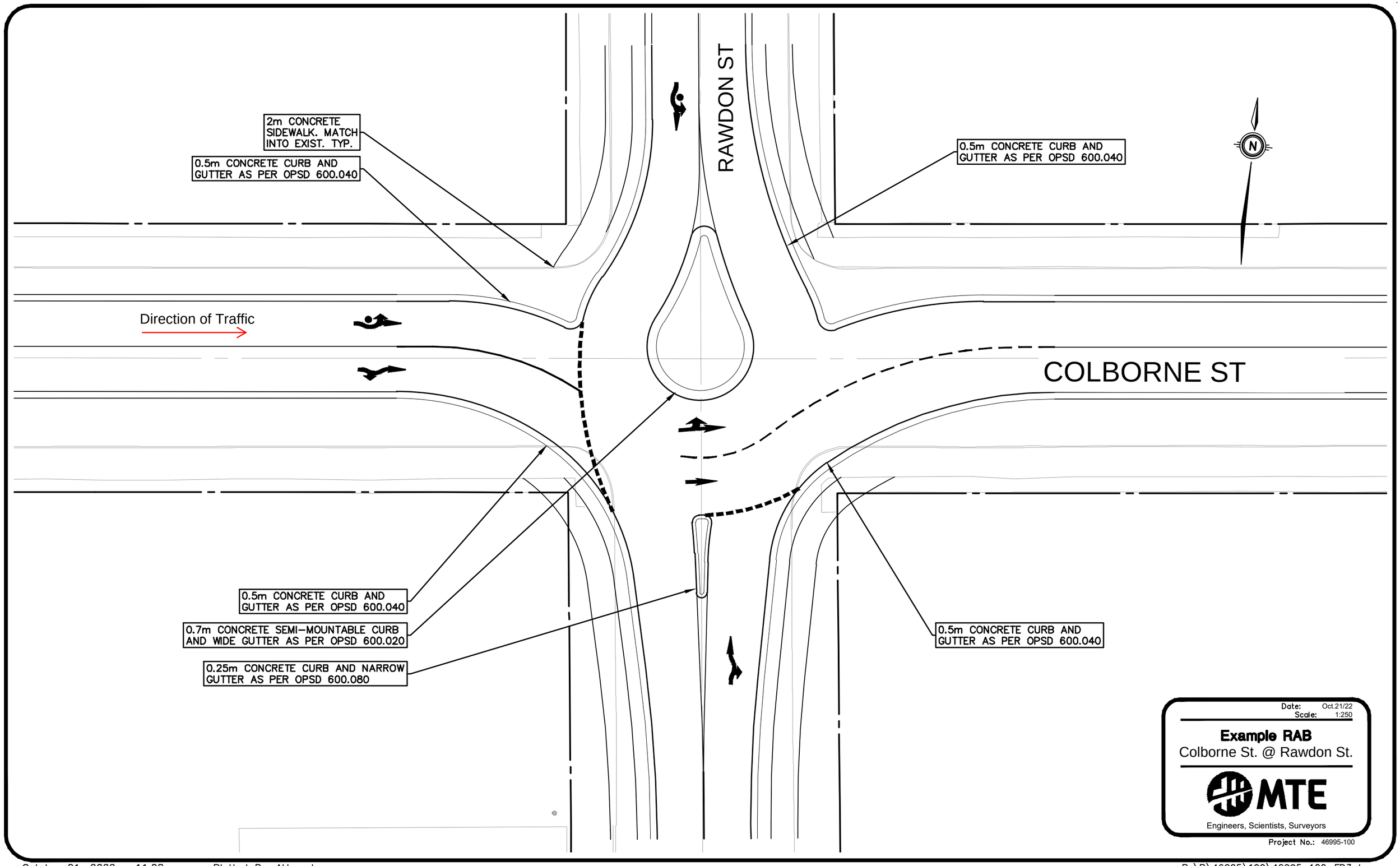
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Colborne at Rawdon




Date: Oct.21/22
Scale: 1:250

**Example RAB**

Colborne St. @ Rawdon St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

# Appendix A

# Cost Estimates

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)
## Colborne St. and Rawdon St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$820,824.60** | **$820,000.00** |
| | | | | **Engineering (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Contingency (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,714,926.64** | **$1,712,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Colborne St. and Rawdon St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Colborne Street & Brant Avenue | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Brant Avenue is a four lane north/south arterial with a slip road heading west, and Colborne Street is a five lane arterial which changes to a one-way two lane arterial across the intersection. The intersection is skewed between Colborne Street and Brant Avenue (north leg) and Icomm Drive (south leg).<br>  <br> |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | No operational problems have been experienced at this intersection. Intersection is expected to operate with a Level of Service B in the 2051 design horizon. |

| | |
|---|---|
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Dalhousie Street and Brant Avenue, and is a signalized four leg intersection with signalized pedestrian crossings on each leg. The intersection to the east is Colborne Street and King Street, which is a non-signalized three-leg intersection with pedestrian crossing on King Street. The traffic analysis indicates that the adjacent intersections should not experience high queueing. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Colborne is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the two-way traffic along Brant Avenue and Icomm Drive will remain. The street will remain 4 lanes of traffic on Brant Avenue and 5 lanes of traffic on Icomm Drive, with on-street parking prohibited. Colborne Street will remain as a one way street and see no changes as a result of the EA. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 48 collisions were recorded for this intersection. See Figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Road users should be able to utilize the intersection efficiently without experiencing sight distance issues as there are no buildings on the northwest, southeast, southwest quadrants and the building on the northeast quadrant is not close to the corner. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4-leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on King Street. Refer Appendix A |

for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection.

**11** Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control.

Base Year AADT: 10-year AADT:

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,154,000 | $1,445,000 |
| **Injury Collision Cost** | $ 6,606,000 | $ 4,753,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $7,889,000 | $6,219,000 |

Attach collision cost calculation sheets

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%)

See Appendix B for 20 Year NPV and Implementation cost estimates

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 48 collisions in the past 5 years (19 Property Damage only).
- The roundabout is the lower cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $1,670,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Brant Avenue intersection is that the City proceed with a signalized intersection. Despite the overall cost of the roundabout being lower when including collision costs, the property impacts and cost of property acquisition could be substantial. The analysis also does not consider the impacts to the traffic coming from the bridge, and whether there are any impacts to the structure itself.

Figure 1

# Collisions - Colborne at Brant

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** COLBORNE ST W @ ICOMM DR **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 48

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 008454 | 2017-Mar-09, Thu,18:43 | Clear | Sideswipe | P.D. only | South | Dry | Changing lanes | Delivery van | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close | |
| 010738 | 2017-Mar-27, Mon,20:55 | Fog, mist, smoke, dust | Rear end | | East | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Speed too fast for condition | |
| **Comments:** | | | | | East | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 015538 | 2017-May-01, Mon,20:00 | Rain | Rear end | | South | Wet | Slowing or stopping | Truck - tractor | Other motor vehicle | Following too close | |
| **Comments:** | | | | | South | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 024309 | 2017-Jun-30, Fri,15:15 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-003680 | 2017-Jan-31, Tue,08:45 | Snow | Rear end | | South | Slush | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Speed too fast for condition | |
| **Comments:** | | | | | South | Slush | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-008270 | 2017-Mar-07, Tue,14:30 | Clear | Other | | East | Wet | Changing lanes | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | West | Wet | Reversing | Tow truck | Other motor vehicle | Driving properly | |
| 17-008290 | 2017-Mar-07, Tue,14:20 | Clear | Sideswipe | | East | Wet | Stopped | Pick-up truck | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | East | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-008454 | 2017-Mar-09, Thu,06:43 | Clear | Sideswipe | P.D. only | South | Dry | Changing lanes | Delivery van | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close | |
| 17-014720 | 2017-Apr-25, Tue,08:10 | Rain | Turning movement | | North | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Improper turn | |
| **Comments:** | | | | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17-020139 | 2017-May-31, Wed,21:51 | Clear | Sideswipe | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-024229 | 2017-Jun-30, Fri,04:02 | Rain | Angle | Non-fatal injury | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | East | Wet | Going ahead | Pick-up truck | Other motor vehicle | Speed too fast for condition |
| 17-028382 | 2017-Jul-27, Thu,00:00 | Clear | SMV other | Non-reportable | East | Dry | Going ahead | Passenger van | Pedestrian | Driving properly |
| **Comments:** | | | | | | Dry | | | | |
| 17-032515 | 2017-Aug-24, Thu,12:15 | Clear | Sideswipe | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-033123 | 2017-Aug-28, Mon,14:10 | Clear | Rear end | | South | Dry | Going ahead | Passenger van | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | | | | | |
| 17-035371 | 2017-Sep-14, Thu,15:20 | Clear | SMV other | P.D. only | West | Dry | Turning left | Automobile, station wagon | Other | Other |
| **Comments:** | | | | | West | Dry | Turning left | Automobile, station wagon | Curb | Other |
| 17-036978 | 2017-Sep-25, Mon,16:16 | Clear | Rear end | P.D. only | East | Dry | Going ahead | Passenger van | Other motor vehicle | Driving properly |
| **Comments:** | | | | | East | Dry | Stopped | Passenger van | Other motor vehicle | Driving properly |
| 17-038219 | 2017-Oct-03, Tue,20:00 | Clear | Sideswipe | | South | Dry | Going ahead | Motorcycle | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | | Driving properly |
| 17-038274 | 2017-Oct-03, Tue,15:30 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 17-039940 | 2017-Oct-14, Sat,15:55 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 17-040562 | 2017-Oct-20, Fri,16:00 | Clear | Rear end | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-45990 | 2017-Nov-30, Thu,16:13 | Clear | Sideswipe | P.D. only | East | Wet | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | East | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17-47898 | 2017-Dec-15, Fri,14:30 | Snow | Rear end | | South | Slush | Going ahead | Automobile, station wagon | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | Loose snow | Stopped | Truck-other | Other motor vehicle | Driving properly |
| 17-49568 | 2017-Dec-29, Fri,14:45 | Clear | Sideswipe | P.D. only | South | Wet | Changing lanes | Truck - closed | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Wet | Going ahead | Truck - closed | Other motor vehicle | Driving properly |
| 18-019273 | 2018-May-22, Tue,15:35 | Clear | SMV other | Non-fatal injury | South | Dry | Turning right | Truck - closed | | Driving properly |
| **Comments:** | | | | | | Dry | Overtaking | | | |
| 18-033785 | 2018-Aug-29, Wed,12:05 | Clear | Turning movement | P.D. only | North | Dry | Turning left | Pick-up truck | Other motor vehicle | Improper turn |
| **Comments:** | | | | | South | Dry | Going ahead | Truck - dump | Other motor vehicle | Driving properly |
| 18-03880 | 2018-Jan-29, Mon,15:36 | Snow | Rear end | | South | Ice | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Following too close |
| **Comments:** | | | | | South | Ice | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-040099 | 2018-Oct-10, Wed,18:30 | Clear | Turning movement | Non-fatal injury | West | Dry | Turning right | Automobile, station wagon | Cyclist | Failed to yield right-of-way |
| **Comments:** | | | | | East | Dry | Going ahead | Bicycle | Other motor vehicle | Other |
| 18-044078 | 2018-Nov-06, Tue,11:42 | Clear | | | South | Dry | Stopped | Pick-up truck | Other motor vehicle | Driving properly |
| **Comments:** | | | | | | | | | | |
| 18-04774 | 2018-Feb-05, Mon,06:20 | Clear | Rear end | Non-fatal injury | East | Ice | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Other |
| **Comments:** | | | | | East | Ice | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-04794 | 2018-Feb-05, Mon,08:40 | Clear | Rear end | | South | Ice | Slowing or stopping | Pick-up truck | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | Ice | Stopped | Passenger van | Other motor vehicle | Driving properly |
| 18-049236 | 2018-Dec-13, Thu,23:30 | Clear | Rear end | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 18-10196 | 2018-Mar-18, Sun,16:30 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-001563 | 2019-Jan-11, Fri,19:00 | Clear | Rear end | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-002482 | 2019-Jan-19, Sat,19:24 | Snow | Rear end | P.D. only | South | Loose snow | Going ahead | Automobile, station wagon | Other motor vehicle | Lost control |
| **Comments:** | | | | | South | Loose snow | Stopped | Pick-up truck | Other motor vehicle | Driving properly |
| 19-003490 | 2019-Jan-19, Sat,16:45 | Snow | Rear end | | South | Loose snow | Slowing or stopping | Pick-up truck | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | Loose snow | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-003515 | 2019-Jan-26, Sat,19:30 | Clear | Sideswipe | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-004059 | 2019-Feb-01, Fri,06:30 | Clear | SMV other | | East | Ice | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Driving properly |
| **Comments:** | | | | | | | | | | |
| 19-11230 | 2019-Mar-29, Fri,08:45 | Clear | Rear end | P.D. only | South | Dry | Going ahead | Passenger van | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-15369 | 2019-Apr-29, Mon,15:00 | Rain | Rear end | P.D. only | North | Wet | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Following too close |
| **Comments:** | | | | | North | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-19902 | 2019-May-25, Sat,14:00 | Clear | Turning movement | P.D. only | East | Dry | Turning left | Delivery van | Other motor vehicle | Driving properly |
| **Comments:** | | | | | East | Dry | Turning left | Passenger van | Other motor vehicle | Driving properly |
| 19-22151 | 2019-Jun-14, Fri,09:40 | Clear | Sideswipe | P.D. only | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 19-22812 | 2019-Jun-18, Tue,19:40 | Clear | Sideswipe | P.D. only | South | Dry | Changing lanes | Passenger van | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-34993 | 2019-Sep-10, Tue,16:10 | Clear | Sideswipe | P.D. only | East | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | East | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-40450 | 2019-Oct-17, Thu,19:18 | Clear | Rear end | P.D. only | East | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | East | Dry | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-44755 | 2019-Nov-20, Wed,13:45 | Clear | Rear end | P.D. only | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | South | Dry | Stopped | | Other motor vehicle | |
| 19-44994 | 2019-Nov-21, Thu,08:30 | Clear | Rear end | P.D. only | East | Wet | Slowing or stopping | Pick-up truck | Other motor vehicle | Following too close |
| **Comments:** | | | | | East | Wet | Stopped | | Other motor vehicle | |
| 19-47373 | 2019-Dec-10, Tue,14:40 | Clear | Sideswipe | P.D. only | South | Dry | Changing lanes | Pick-up truck | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-49785 | 2019-Dec-30, Mon,00:17 | Rain | Angle | P.D. only | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | D1 HTA 200(1)(A) PART3, D1 HTA 144(18) PART 3 | | | | East | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |

Figure 2

# Proposed Traffic Lights – Colborne at Brant

BRANT AVENUE

COLBORNE STREET (LORNE BRIDGE)

COLBORNE STREET

ICOMM DRIVE

2 STOREY
BRICK
BUILDING

ROYAL BANK OF CANADA

#22 COLBORNE ST.

Garden
0.6m Concrete Retaining Wall
Interlocking Brick
0.9m Concrete Retaining Wall
Garden
Garden
Interlocking Brick
Concrete Stairs with Handrail
Garden
Garden
Garden
Garden
Interlocking Brick
1.2m Concrete Retaining Wall
1.2m Concrete Retaining Wall
1.2m Concrete Retaining Wall
0.9m Concrete Retaining Wall
0.6m Concrete Retaining Wall

Garden
Concrete Sidewalk
Grass
Interlocking Brick
Concrete Sidewalk
Interlocking Brick
Grass
Concrete Sidewalk
Concrete Guardrail
Interlocking Brick
Concrete Guardrail
Concrete Sidewalk
Grass
Garden
Rocks
Garden
Concrete Sidewalk
Grass
Concrete Sidewalk
Brick
Asph.
Brick
Concrete Sidewalk
Grass

Hydro Vault
Traffic Control Box
Grass
Grass

TL
TL
TL

Date: NOV 02/22
Scale: 1:250

**COLBORNE ST.
& BRANT AVE.
PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

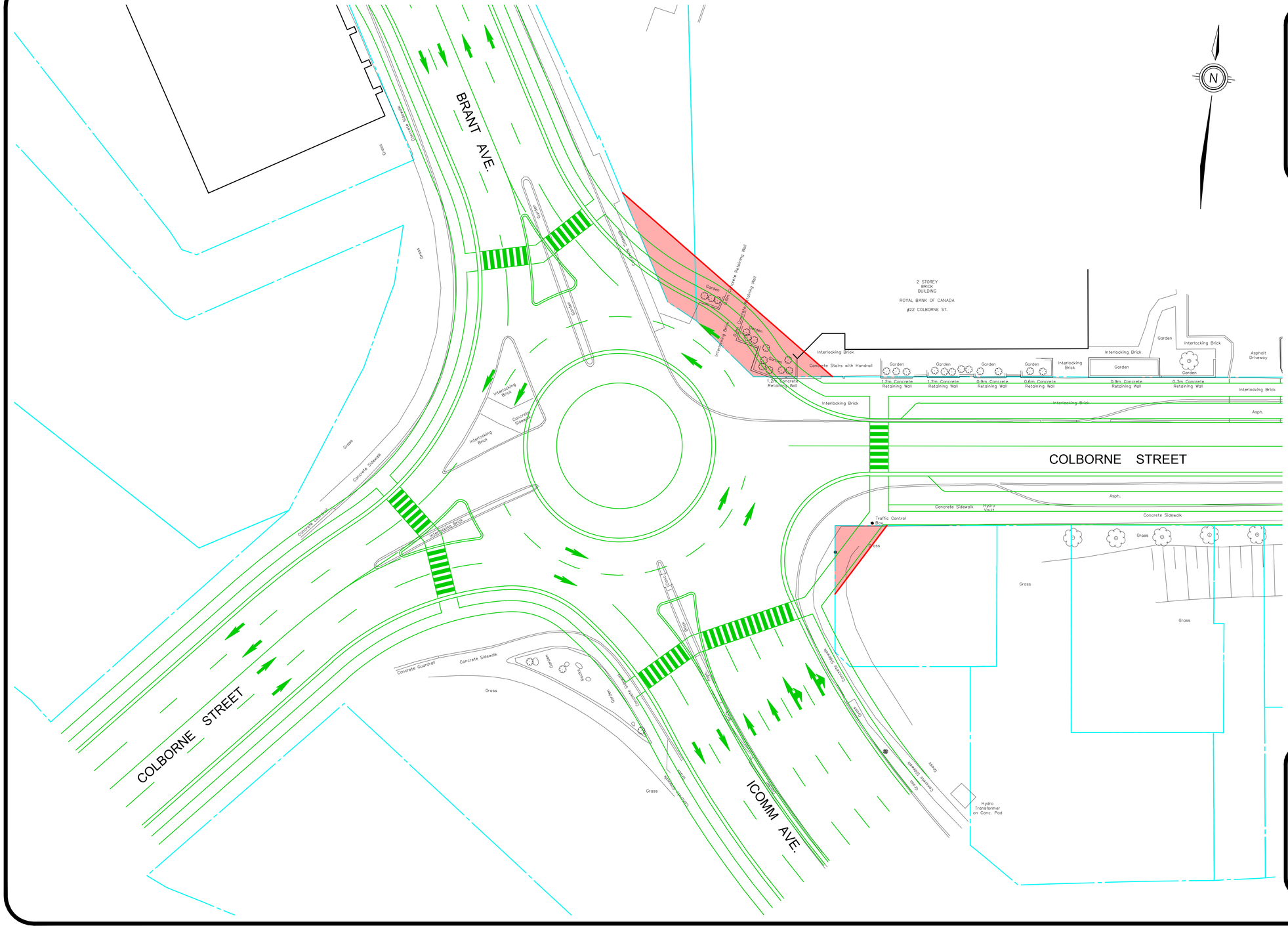
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Colborne at Brant




Date: Nov. 2022
Scale: 1:250

**COLBORNE ST.**
**& BRANT AVE.**
**FUNCTIONAL DESIGN RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

November 4, 2022 — 9:59 a.m. — Plotted By: EMcDonald

P:\P\46995\100\46995-100-FD4.dwg

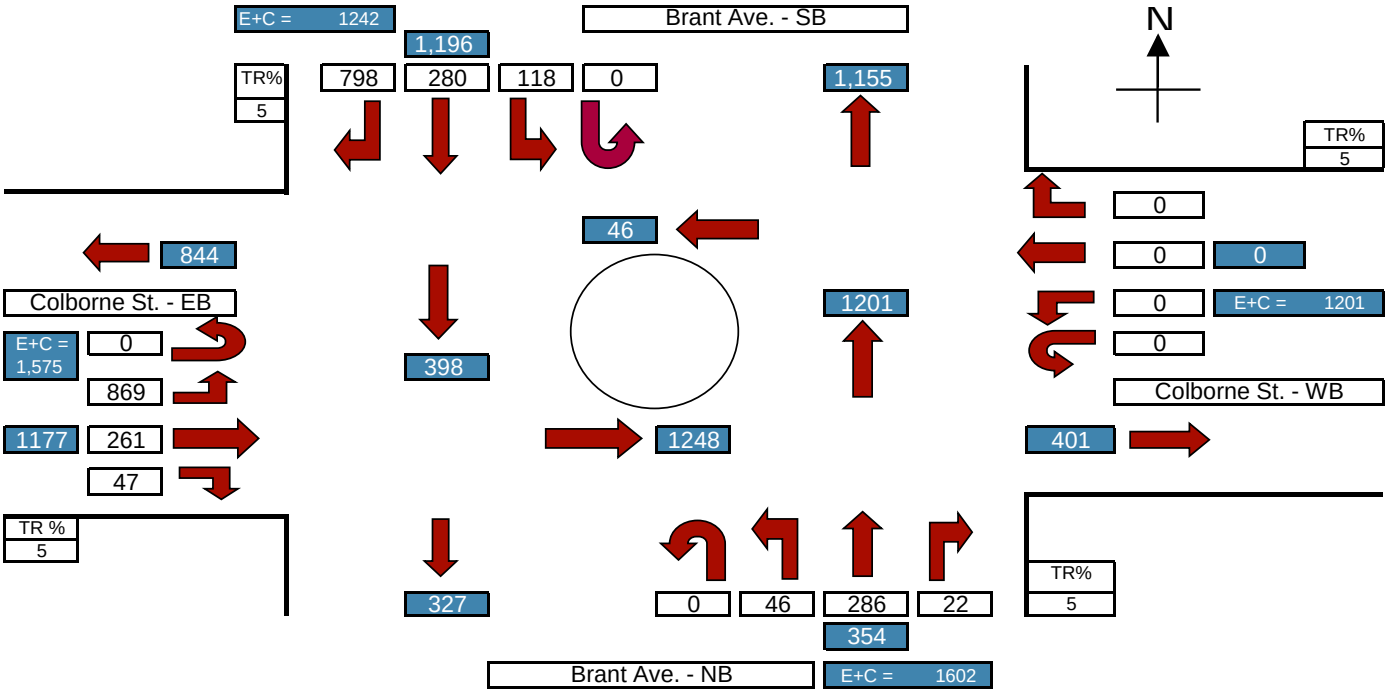
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Brant Avenue
**Time Period:** **AM PEAK 2021**

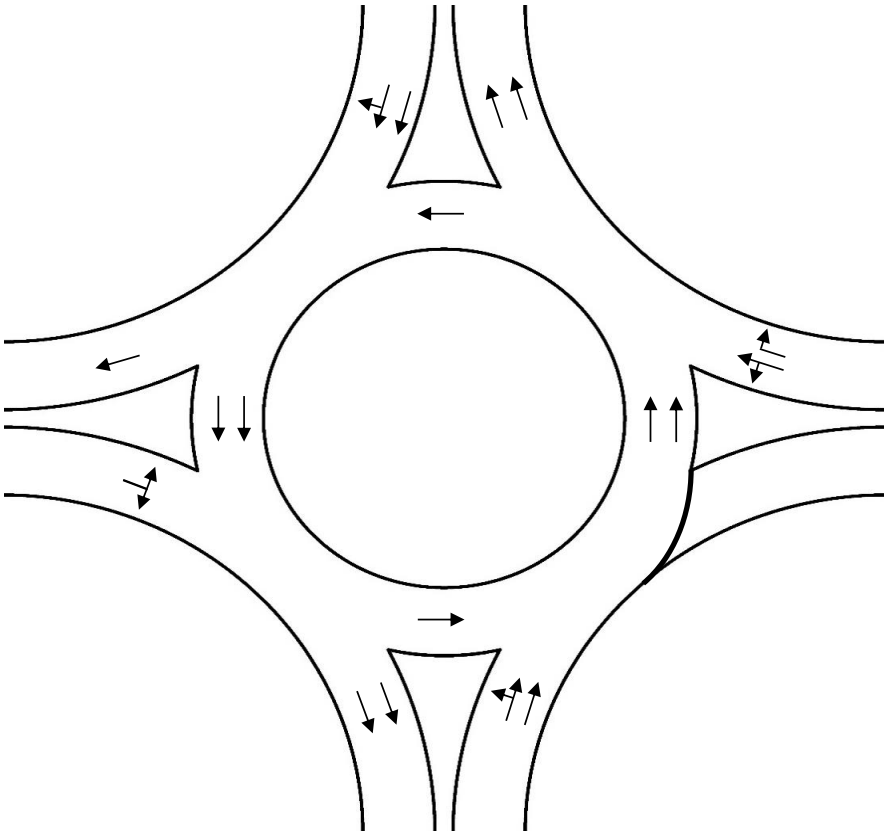
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

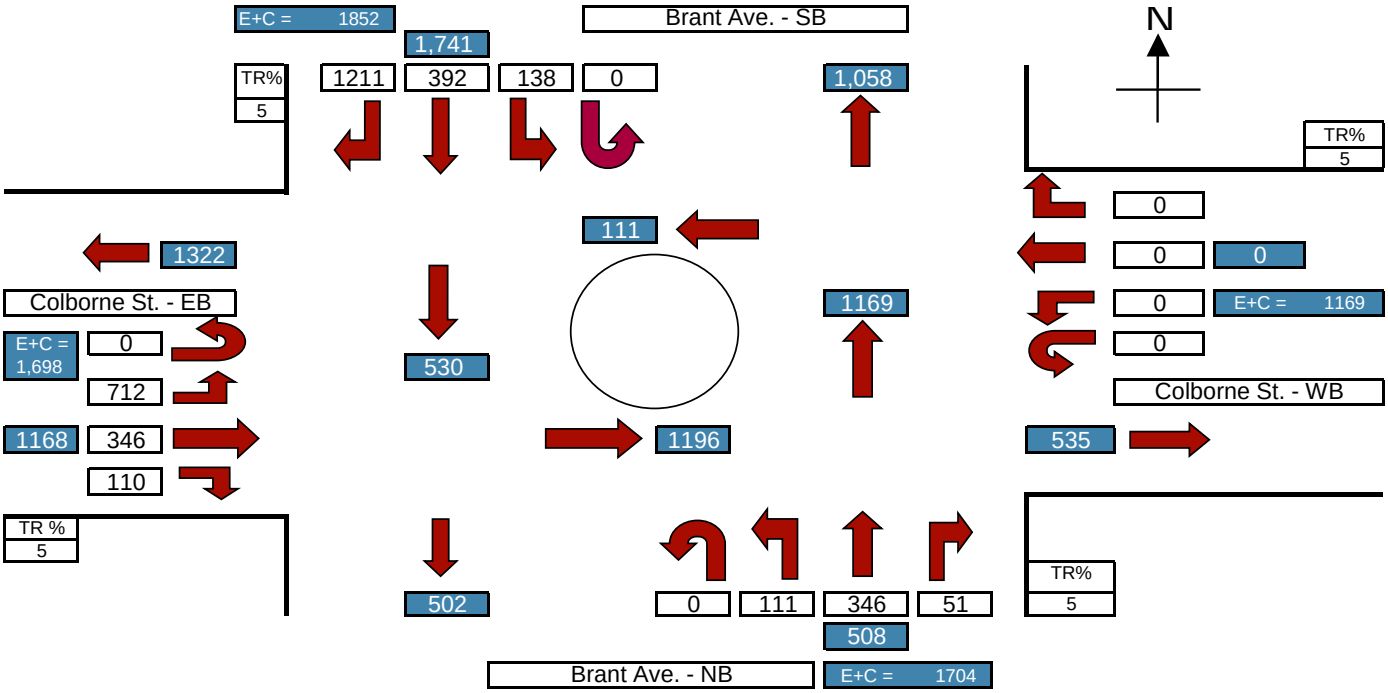
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 798 | 280 | 118 | 0 |
| Colborne St. - EB | 1.05 | 47 | 261 | 869 | 0 |
| Brant Ave. - NB | 1.05 | 22 | 286 | 46 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Brant Avenue
**Time Period:** **PM PEAK 2021**

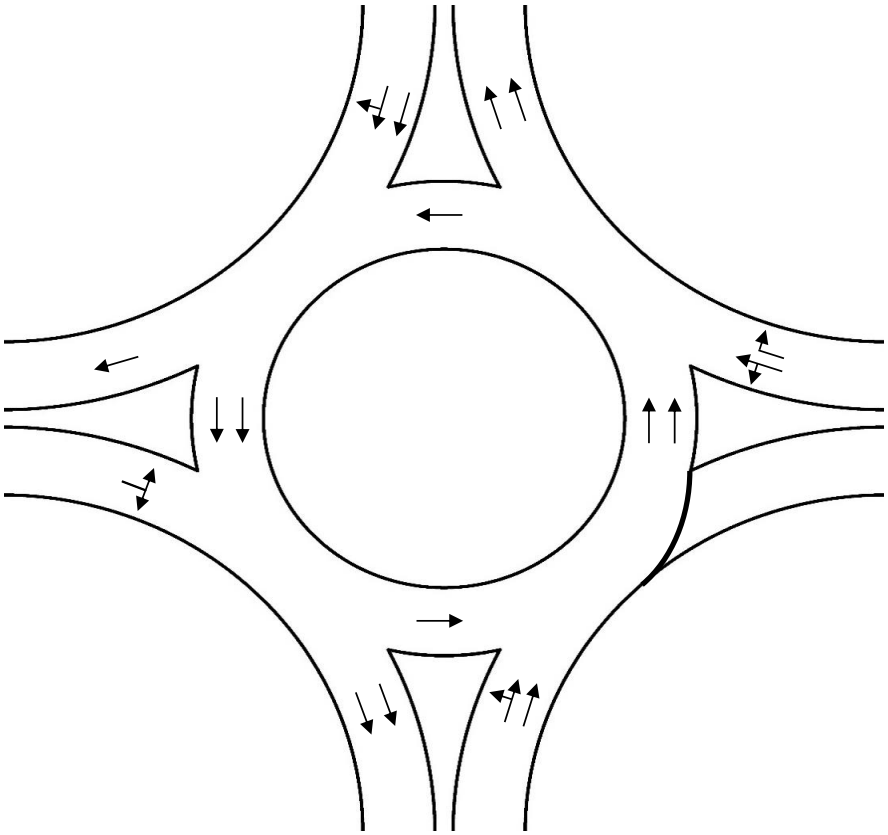
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

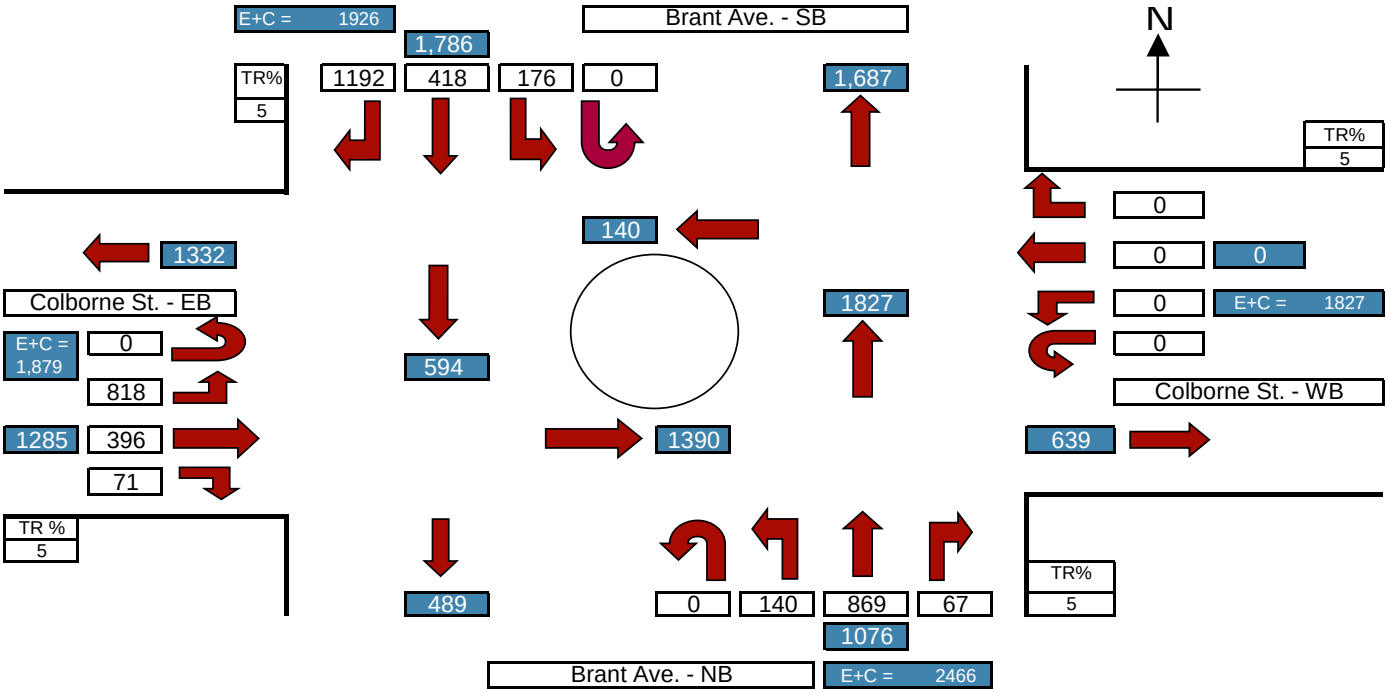
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 1211 | 392 | 138 | 0 |
| Colborne St. - EB | 1.05 | 110 | 346 | 712 | 0 |
| Brant Ave. - NB | 1.05 | 51 | 346 | 111 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Brant Avenue
**Time Period:** **AM PEAK 2051**

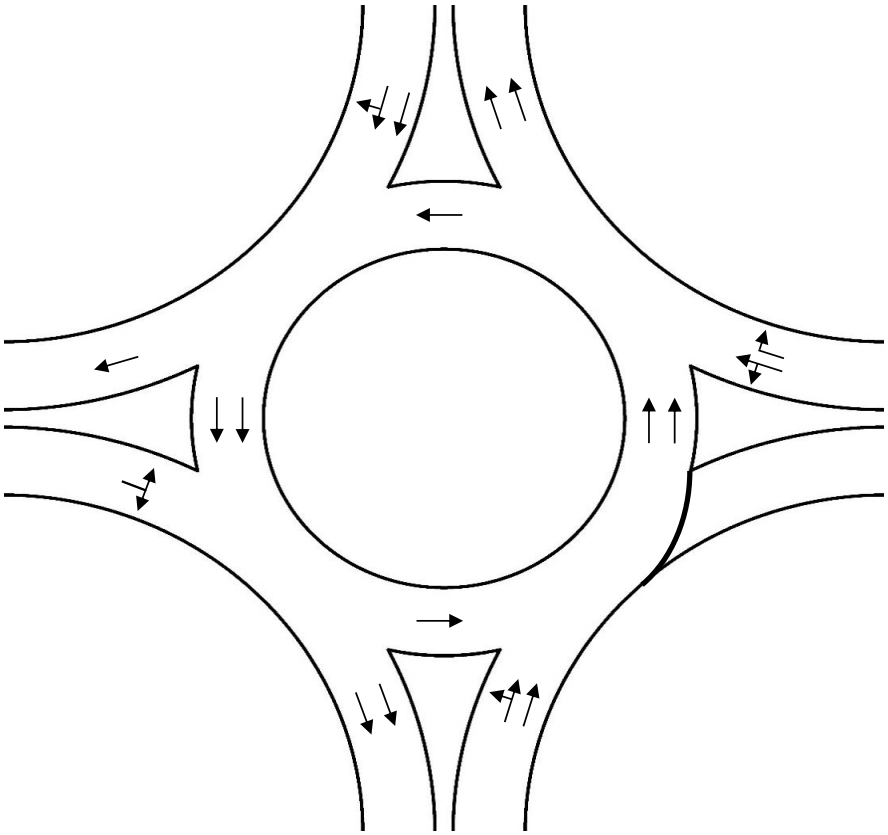
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

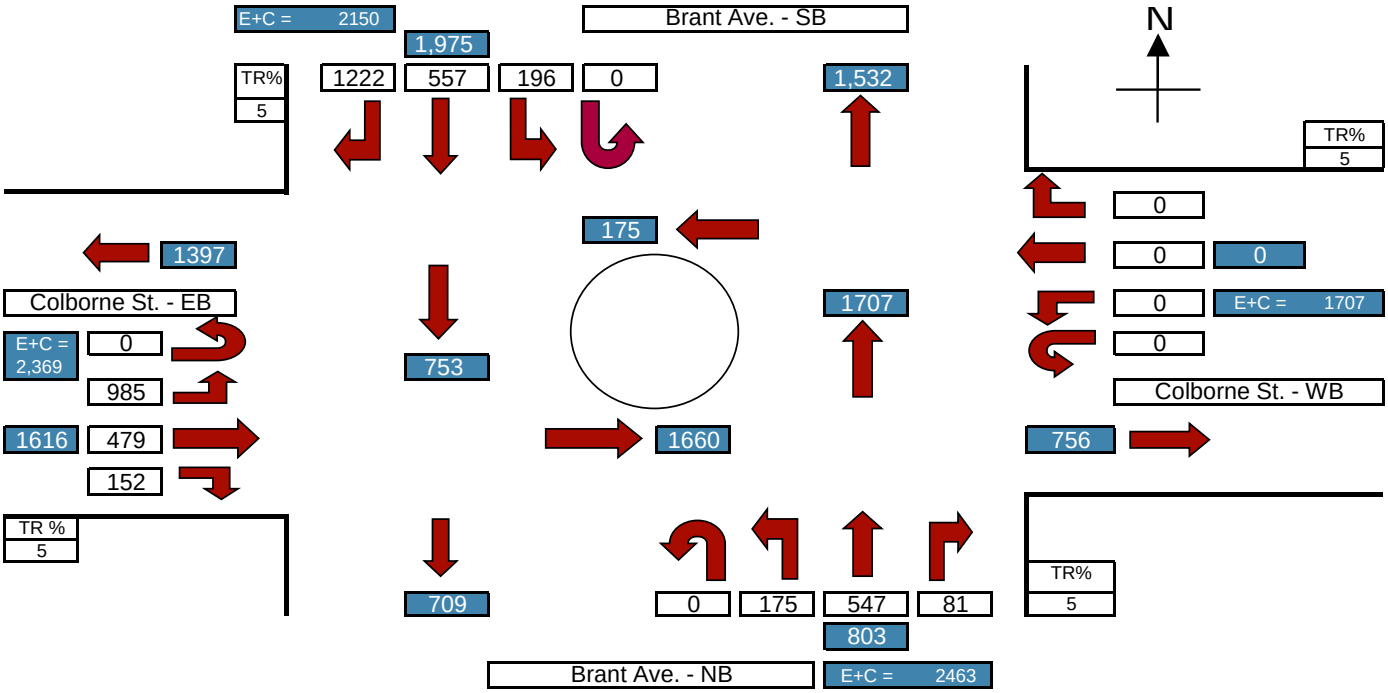
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 1192 | 418 | 176 | 0 |
| Colborne St. - EB | 1.05 | 71 | 396 | 818 | 0 |
| Brant Ave. - NB | 1.05 | 67 | 869 | 140 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Colborne Street & Brant Avenue
**Time Period:** **PM PEAK 2051**

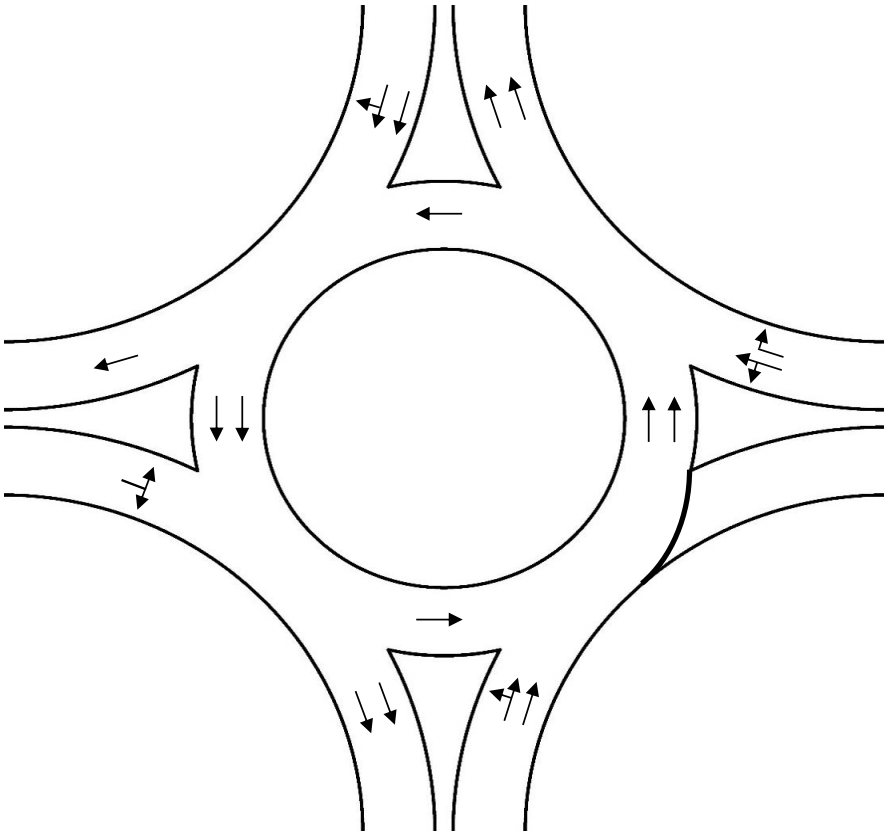
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 1222 | 557 | 196 | 0 |
| Colborne St. - EB | 1.05 | 152 | 479 | 985 | 0 |
| Brant Ave. - NB | 1.05 | 81 | 547 | 175 | 0 |
| Colborne St. - WB | 1.05 | 0 | 0 | 0 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Colborne St. & Brant Ave. ICS

**Major Road:** Colborne Street

**Minor Road:** Brant Avenue

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Signalized |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

**Is there going to be any fully protected left-turn phasing?** YES

**Number of approaches with FPLTP:** N/A

**Is the proposed intersection "new" or is it existing:** EXISTING

**Does control and number of approaches remain the same:** NO

**Will the proposed intersection have illumination:** YES

**5-Year Total Collisions:** 48

**5-Year PDO Collisions:** 19

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 30,130

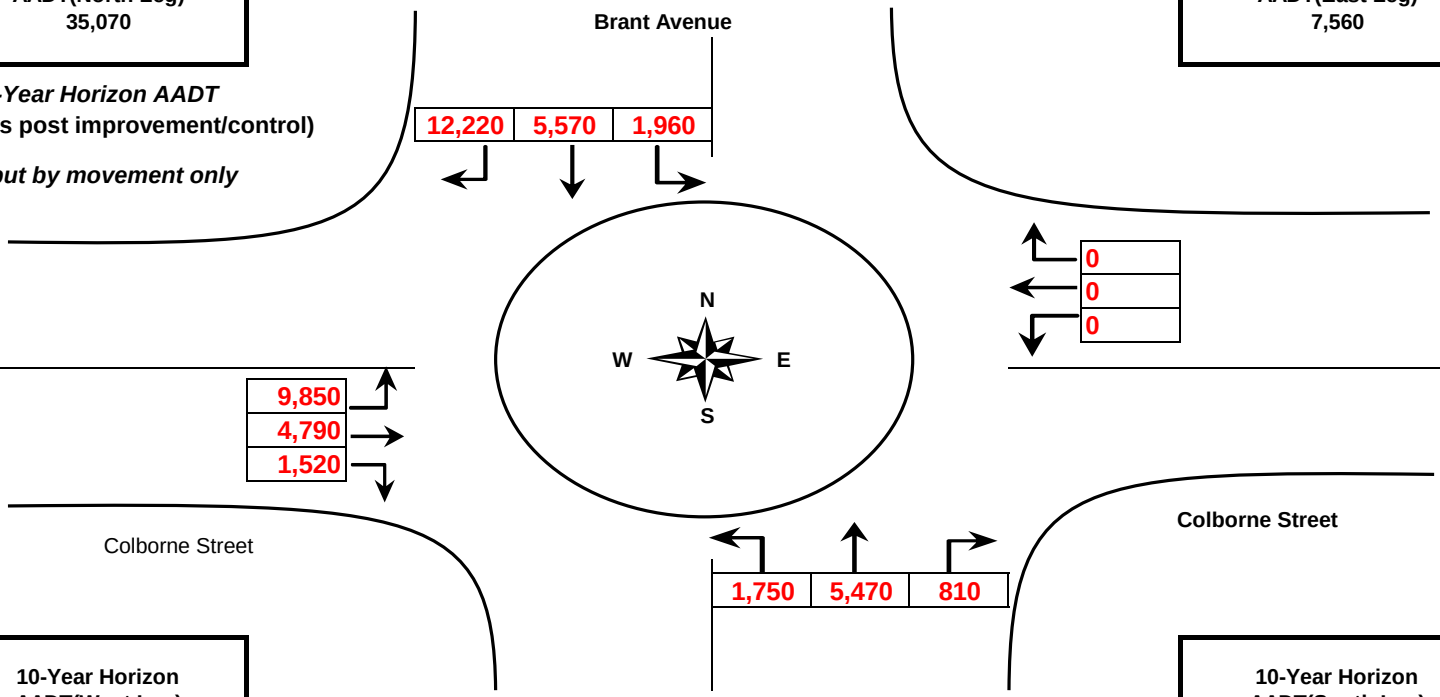
**Minor Road (mid-block) 10-Year Horizon AADT:** 35,070

**10-Year Horizon AADT(North Leg) 35,070**

**10-Year Horizon AADT(East Leg) 7,560**

***10-Year Horizon AADT (10ys post improvement/control)***

***Input by movement only***




**10-Year Horizon AADT(West Leg) 30,130**

**10-Year Horizon AADT(South Leg) 15,120**

**Direct Capital Costs**

Fatal = $1,656,500

Injury = $60,500

$PDO_{SIG}$ = $5,000

$PDO_{RA}$ = $4,500

Discount Rate = 0.06

## 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Signalized | **$6,605,000.01** | **$818,952.38** | **$5,482,048.85** | **$303,998.79** |
| Roundabout | **$4,752,961.31** | **$1,905,890.43** | **$2,847,070.88** | **$0.00** |

* Roundabout calibration Factor - 1.5

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** **Colborne St. & Brant Ave. ICS**

**Major Road:** **Colborne Street**
**Minor Road:** **Brant Avenue**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Signalized

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **67950**

**5-Year Total Collisions:** **48**

**5-Year PDO Collisions:** **19**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **22.19** | **14.28** | **7.90** | **0.02** |
| Roundabout | **41.03** | **36.93** | **4.10** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-10.99** | **1.07** | **0.23** | **N/A** | **0.002** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-11.02** | **1.02** | **0.24** | **N/A** | **0.002** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **2.1** | Total | PDO |
| | | | | **N/A** | **N/A** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Colborne Street, Brant Avenue and Icomm Drive Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

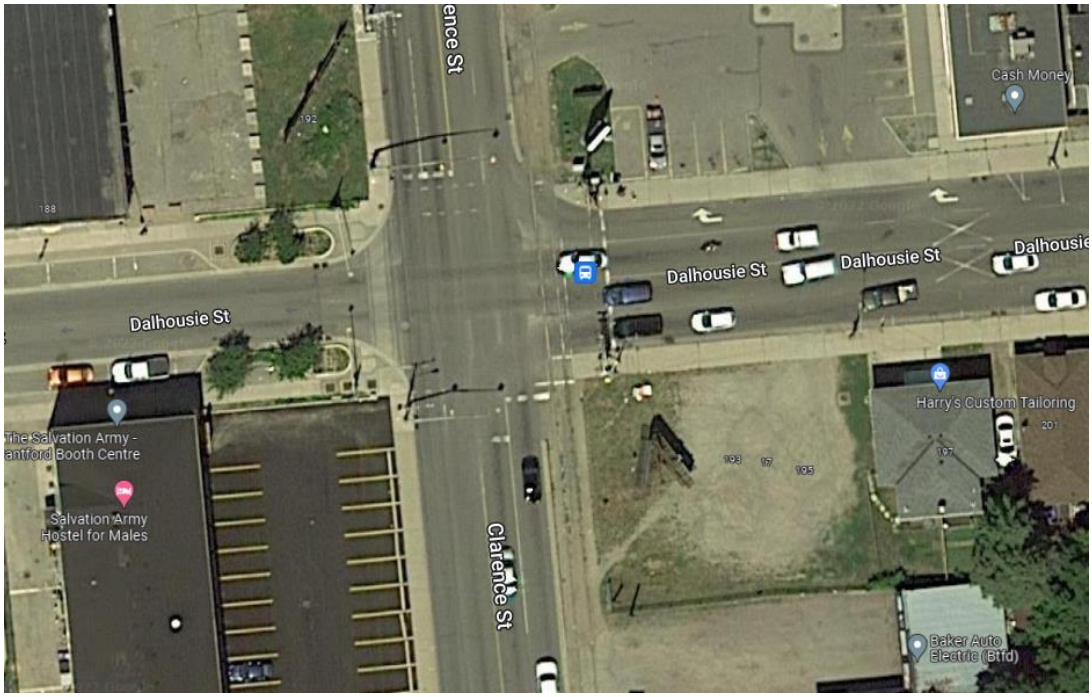
| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **3300** | $21,450.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **694** | $7,634.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **257** | $2,056.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **1329** | $53,160.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **10** | $12,000.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$259,300.00** | **$258,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,380.00 | $19,320.00 | |
| A2.2 | Roadway Paving | | | **2,300** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 2,588 | $38,812.50 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 863 | $17,250.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 575 | $71,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 288 | $53,187.50 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **437** | $24,035.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **890** | $53,400.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **42** | $12,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$290,480.00** | **$290,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Reloaction | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $40,000.00 | 1 | $40,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $109,956.00 | 1 | $109,956.00 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$484,956.00** | **$485,000.00** |
| | | | | **Engineering (20%)** | **$206,947.20** | **$206,000.00** |
| | | | | **Contingency (20%)** | **$206,947.20** | **$206,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,448,630.40** | **$1,445,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Colborne Street, Brant Avenue and Icomm Drive Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $18,000.00 | 1 | $18,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **3300** | $21,450.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **694** | $7,634.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **257** | $2,056.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **1329** | $53,160.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **10** | $12,000.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$269,300.00** | **$268,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,980.00 | $27,720.00 | |
| A2.2 | Roadway Paving | | | **3,300** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 3,713 | $55,687.50 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 1,238 | $24,750.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 825 | $82,500.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 413 | $61,875.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **257** | $14,135.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 200 | $9,000.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **764** | $45,840.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **75** | $1,200.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **38** | $11,400.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$356,379.50** | **$356,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 15% Miscellaneous | lump sum | $93,851.93 | 1 | $93,851.93 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$268,851.93** | **$270,000.00** |
| | | | | **Engineering (20%)** | **$130,590.29** | **$130,000.00** |
| | | | | **Contingency (20%)** | **$130,590.29** | **$130,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,155,712.00** | **$1,154,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Clarence Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Clarence Street is a four lane north/south arterial, and Dalhousie Street is a four lane, one-way arterial approaching from the east which reduces to two once it crosses Clarence Street. The intersection connects at right angles between Dalhousie Street and Clarence Street. |




| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control?. |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | This intersection may experience operational problems as it is expected to operate with a Level of Service C for the morning peak and a Level of Service F for the afternoon peak in the 2051 design horizon. There is congestion at this intersection during peak periods. |

| | |
|---|---|
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Dalhousie Street and Charlotte St, and is a four leg 2-way stop intersection with non-signalized pedestrian crossings on each leg. The intersection to the east is Dalhousie Street and Alfred Street, which is a four leg 2-way stop intersection with non-signalized pedestrian crossings on each leg. The traffic analysis indicates that the adjacent intersections should not experience high queueing.<br>Clarence Street has an active rail line that runs parallel to the road on the east side. This rail line is a physical constraint to any intersection redesign. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street with right and left turn only lanes and one-street parking on both sides after crossing the intersection. Findings from the EA recommend that Clarence Street be widened to include a 2 way left turn lane between Colborne Street and Dalhousie Street. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 60 collisions were recorded for this intersection. See figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | The northeast and southwest corners of the intersection have parking lots right to the property line. The northwest and southeast corners have vacant lots on them. The lot on the northwest corner is a small lot that would likely require a full buyout if any property taking was required. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |

| | |
|---|---|
| | For this intersection a four-leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, and two lanes north/south on Clarence Street. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,052,000 | $1,441,000 |
| **Injury Collision Cost** | $ 4,674,635.21 | $ 3,937,238.58 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $5,855,635.21 | $5,399,238.58 |

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%)

Implementation and Net Present Value Estimates can be found in Appendix B

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 60 collisions in the past 5 years (19 Property Damage only)
- The roundabout is the lower cost alternative over the 20-Year life cycle cost, when the social impacts of the intersection are included. The difference in capital cost of the roundabout is approximately $389,000.
- Roundabout would require property taking. While estimates are included for property taking, there are properties that may be more greatly impacted, and the property taking costs could be substantially higher.
- Adjacent active rail line makes introducing a roundabout a significant challenge, and should be avoided unless the rail line is addressed.

The recommendation for the Clarence Street intersection is that the City proceed with a signalized intersection. The signalized intersection functions well in the 2051 planning horizon, requires no property, avoids conflicts with adjacent rail line, and is the less expensive alternative.

Figure 1

# Collisions – Dalhousie at Clarence

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** CLARENCE ST @ DALHOUSIE ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 60

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 016572 | 2017-May-09, Tue,08:33 | Clear | Angle | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 024148 | 2017-Jun-29, Thu,14:00 | Clear | Sideswipe | | South | Dry | Changing lanes | Truck-other | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 024318 | 2017-Jun-30, Fri,16:10 | Clear | Sideswipe | | North | Dry | Changing lanes | Pick-up truck | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 025865 | 2017-Jul-10, Mon,18:22 | Clear | Rear end | Non-fatal injury | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Following too close | |
| **Comments:** | | | | | South | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-002375 | 2017-Jan-20, Fri,14:45 | Rain | Rear end | | South | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | | | | | | |
| 17-003660 | 2017-Jan-31, Tue,14:45 | Snow | Rear end | | South | Slush | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | | | | | | |
| 17-004699 | 2017-Feb-08, Wed,09:30 | Clear | Angle | Non-fatal injury | North | Dry | Going ahead | Passenger van | Other motor vehicle | Disobeyed traffic control | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-007725 | 2017-Mar-03, Fri,08:45 | Clear | Rear end | | West | Loose snow | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close | |
| **Comments:** | | | | | West | Loose snow | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-020095 | 2017-May-30, Tue,14:47 | Clear | Angle | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | West | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17-029471 | 2017-Jul-24, Mon,13:00 | Clear | Rear end | | North | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | North | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-030694 | 2017-Aug-12, Sat,02:17 | Rain | Sideswipe | P.D. only | West | Wet | Turning right | Automobile, station wagon | Other motor vehicle | Improper turn |
| **Comments:** | | | | | West | Wet | Stopped | Pick-up truck | Other motor vehicle | Driving properly |
| 17-038037 | 2017-Sep-30, Sat,21:30 | Clear | Turning movement | | North | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | | Driving properly |
| 17-040434 | 2017-Oct-19, Thu,16:50 | Clear | Angle | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-040987 | 2017-Oct-23, Mon,16:10 | Rain | Rear end | | North | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | North | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-42191 | 2017-Nov-01, Wed,09:24 | Clear | Angle | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 17-44845 | 2017-Nov-21, Tue,22:36 | Rain | SMV other | Non-fatal injury | South | Wet | Turning left | Automobile, station wagon | Skidding/sliding | Lost control |
| **Comments:** | | | | | | Wet | | | | |
| 17-47001 | 2017-Dec-07, Thu,18:20 | Clear | Sideswipe | | North | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-01337 | 2018-Jan-10, Wed,19:00 | Rain | Angle | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-018534 | 2018-May-17, Thu,14:30 | Clear | Sideswipe | | West | Dry | Changing lanes | Passenger van | Other motor vehicle | Other |
| **Comments:** | | | | | West | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-021248 | 2018-Jun-03, Sun,17:30 | Rain | Rear end | | South | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | Dry | Stopped | | Other motor vehicle | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-02164 | 2018-Jan-13, Sat,20:30 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 18-022461 | 2018-Jun-12, Tue,13:20 | Clear | Turning movement | | West | Dry | Turning left | Truck - tractor | Other motor vehicle | Driving properly |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-025006 | 2018-Jun-28, Thu,20:45 | Clear | Rear end | | South | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-029453 | 2018-Jul-27, Fri,21:30 | Clear | Sideswipe | | North | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-033944 | 2018-Aug-30, Thu,15:50 | Clear | Angle | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-034696 | 2018-Sep-04, Tue,23:30 | Clear | Rear end | | North | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | North | | | | | |
| 18-034738 | 2018-Sep-04, Tue,15:35 | Clear | Angle | P.D. only | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 18-037579 | 2018-Sep-23, Sun,12:25 | Clear | Angle | P.D. only | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-038450 | 2018-Sep-29, Sat,17:10 | Clear | SMV other | Non-fatal injury | South | Dry | Turning left | Automobile, station wagon | Pedestrian | Other |
| **Comments:** | | | | | | Dry | | | | |
| 18-04114 | 2018-Jan-31, Wed,12:00 | Clear | SMV other | Non-fatal injury | West | Wet | Turning right | Automobile, station wagon | Pedestrian | Failed to yield right-of-way |
| **Comments:** | | | | | | Wet | | | | |
| 18-046528 | 2018-Nov-23, Fri,15:20 | Clear | Angle | Non-fatal injury | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-04686 | 2018-Feb-04, Sun,13:20 | Snow | Angle | P.D. only | South | Wet | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Wet | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18-047820 | 2018-Dec-02, Sun,20:50 | Rain | Angle | | South | Wet | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Wet | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 18-049748 | 2018-Dec-17, Mon,12:25 | Clear | Angle | | North | Wet | Going ahead | Pick-up truck | Other motor vehicle | |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-07728 | 2018-Feb-27, Tue,16:55 | Clear | Angle | Non-fatal injury | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-07912 | 2018-Feb-28, Wed,20:50 | Clear | SMV other | Non-fatal injury | West | Dry | Turning left | Automobile, station wagon | Pedestrian | Failed to yield right-of-way |
| **Comments:** | | | | | | Dry | | | | |
| 18-10203 | 2018-Mar-19, Mon,10:15 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-10833 | 2018-Mar-23, Fri,23:14 | Clear | Angle | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other |
| **Comments:** | | | | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other |
| 18-11925 | 2018-Mar-30, Fri,11:30 | Clear | Sideswipe | | South | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-02808 | 2019-Jan-22, Tue,14:15 | Clear | Turning movement | | West | Wet | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-03281 | 2019-Jan-26, Sat,13:10 | Clear | Turning movement | | South | Dry | Going ahead | Truck - closed | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Dry | Turning right | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-03908 | 2019-Jan-31, Thu,12:58 | Clear | Angle | Non-fatal injury | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | HTA 130 9105224Z traffic signal | | | Failed to stop for | North | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-05089 | 2019-Feb-08, Fri,19:00 | Snow | Rear end | P.D. only | North | Ice | Stopped | Automobile, station wagon | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | North | Ice | Going ahead | Truck - closed | Skidding/sliding | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-05097 | 2019-Feb-08, Fri,20:30 | Snow | Rear end | P.D. only | South | Ice | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Driving properly |
| **Comments:** | | | | | South | Ice | Stopped | Passenger van | Other motor vehicle | Other |
| 19-06174 | 2019-Feb-17, Sun,23:00 | Snow | Angle | P.D. only | West | Ice | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | North | Slush | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-07413 | 2019-Feb-27, Wed,17:38 | Clear | Angle | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-07589 | 2019-Feb-28, Thu,22:31 | Clear | Angle | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | South | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 19-08782 | 2019-Mar-10, Sun,12:00 | Clear | Angle | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-13168 | 2019-Apr-13, Sat,01:56 | Clear | Rear end | Non-fatal injury | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other |
| **Comments:** | HTA 130(1) TC1166831 | | | | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-13799 | 2019-Apr-18, Thu,01:22 | Rain | Angle | P.D. only | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | vehicle 2 info mmising from collision report | | | | North | Wet | | | | |
| 19-21771 | 2019-Jun-11, Tue,20:51 | Clear | Angle | Non-fatal injury | North | Dry | Going ahead | Pick-up truck | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-27585 | 2019-Jul-21, Sun,14:41 | Clear | Angle | Non-fatal injury | North | Dry | Going ahead | Truck-other | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 19-38239 | 2019-Oct-02, Wed,15:50 | Rain | Sideswipe | P.D. only | South | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-43790 | 2019-Nov-12, Tue,14:50 | Clear | Angle | P.D. only | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-43822 | 2019-Nov-12, Tue,20:30 | Clear | SMV other | Non-fatal injury | West | Packed snow | Turning left | Automobile, station wagon | Pedestrian | Failed to yield right-of-way |
| **Comments:** | | | | | | | | | | |
| 19-46505 | 2019-Dec-03, Tue,19:48 | Clear | Angle | Non-fatal injury | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | |
| 19-47232 | 2019-Dec-09, Mon,13:52 | Rain | Angle | P.D. only | North | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-47238 | 2019-Dec-09, Mon,14:30 | Rain | Rear end | P.D. only | North | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | North | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-47357 | 2019-Dec-10, Tue,12:50 | Clear | SMV other | Non-fatal injury | North | Dry | Turning left | Other school vehicle/bus | Pedestrian | Driving properly |
| **Comments:** | | | | | | | | | | |
| 19-49251 | 2019-Dec-25, Wed,00:00 | Clear | SMV other | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Pole (sign, parking meter) | Lost control |
| **Comments:** | D1 CCC 320(14)(1)(A) | | | | | | | | | |

Figure 2

# Proposed Traffic Lights – Dalhousie at Clarence

CLARENCE STREET

DALHOUSIE STREET

2 STOREY
AUTO PARTS

#187 DALHOUSIE ST.

Ex. Asphalt
Parking Lot

Grass

Billboard

Billboard

Grass

Dirt

EX. RAILWAY

Dirt

Dirt

EX. SIGN

Grass

Asph.

Gravel

Conc.

Asph.

Asph.

Conc.

Concrete Side

1 ST(
COMMERCIA

#196 DALH

Concrete Sidewalk

TL

TL

TL

TL

TL

TL

Concrete Sidewalk

Grass

Conc.

Conc.
Porch

Grass

Grass

Gra

EX. GRAVEL
VACANT LOT

3 STOREY
BRICK AND VINYL
BUILDING

#187 DALHOUSIE ST

EX. ASPHALT
PARKING LOT

Dirt

EX. RAILWAY

Dirt

Grass

N

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST.
& CLARENCE ST.
PROPOSED TRAFFIC LIGHTS**

MTE

Engineers, Scientists, Surveyors

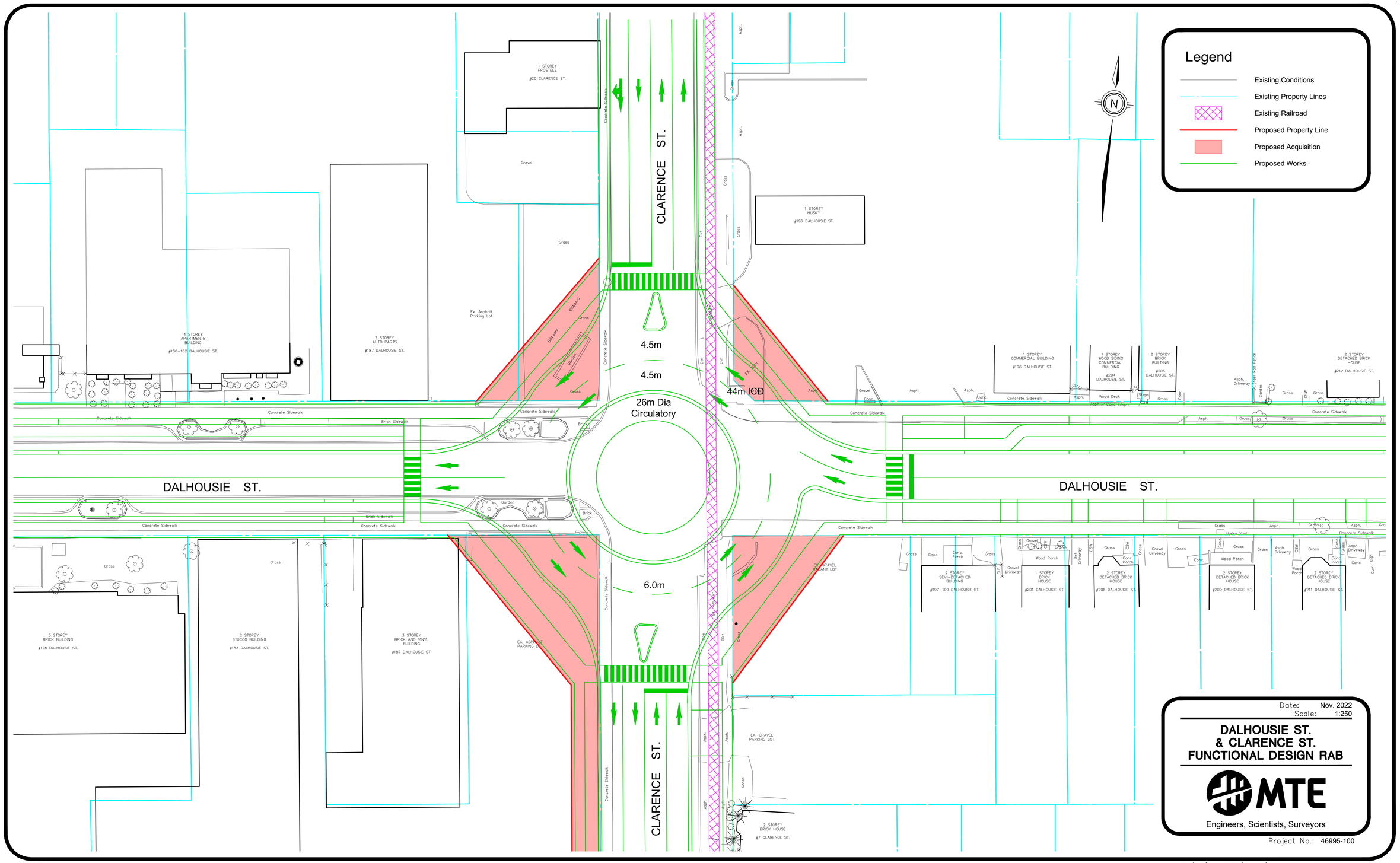
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Dalhousie at Clarence




Date: Nov. 2022
Scale: 1:250

**DALHOUSIE ST. & CLARENCE ST. FUNCTIONAL DESIGN RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

November 4, 2022 — 9:59 a.m. — Plotted By: EMcDonald

P:\P\46995\100\46995-100-FD4.dwg

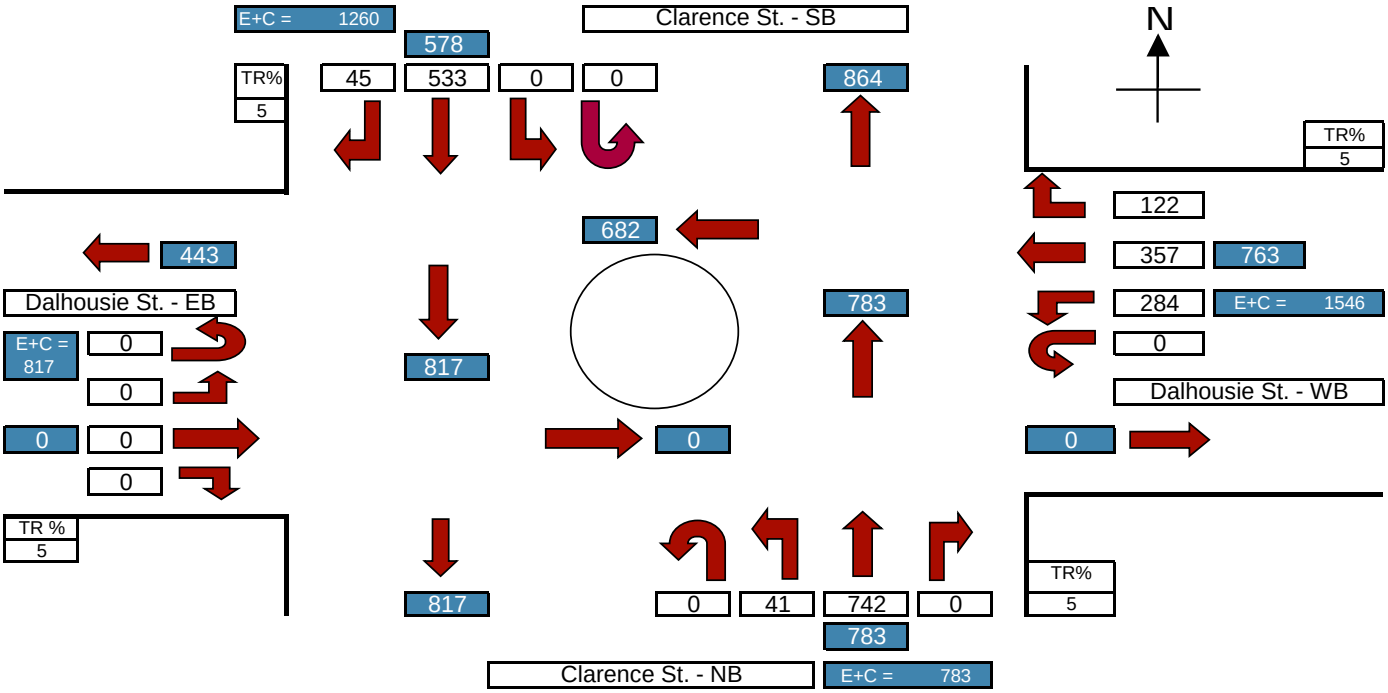
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Clarence Street
**Time Period:** **AM PEAK 2021**

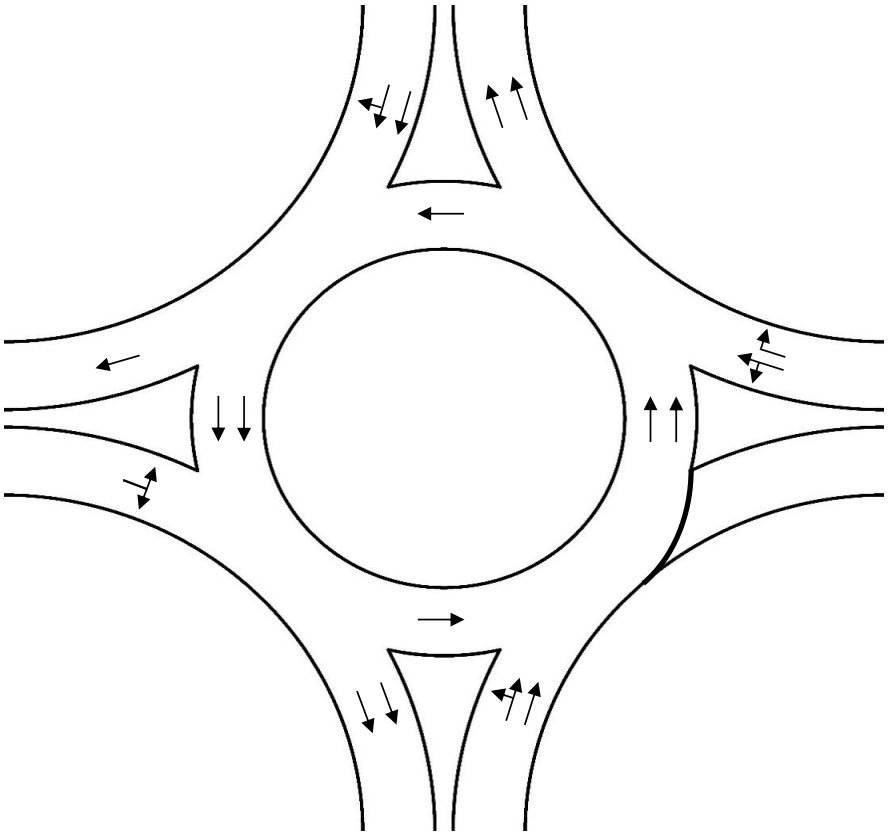
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

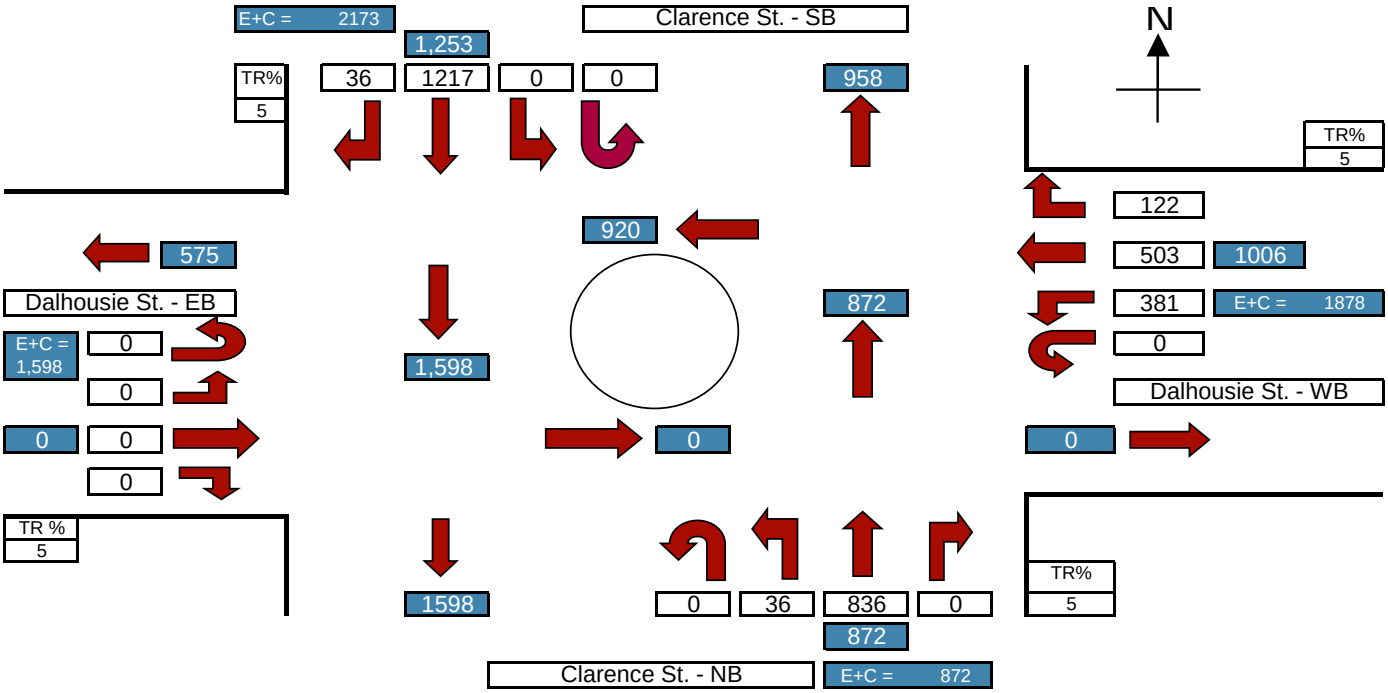
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Clarence St. - SB | 1.05 | 45 | 533 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Clarence St. - NB | 1.05 | 0 | 742 | 41 | 0 |
| Dalhousie St. - WB | 1.05 | 122 | 357 | 284 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Clarence Street
**Time Period:** **PM PEAK 2021**

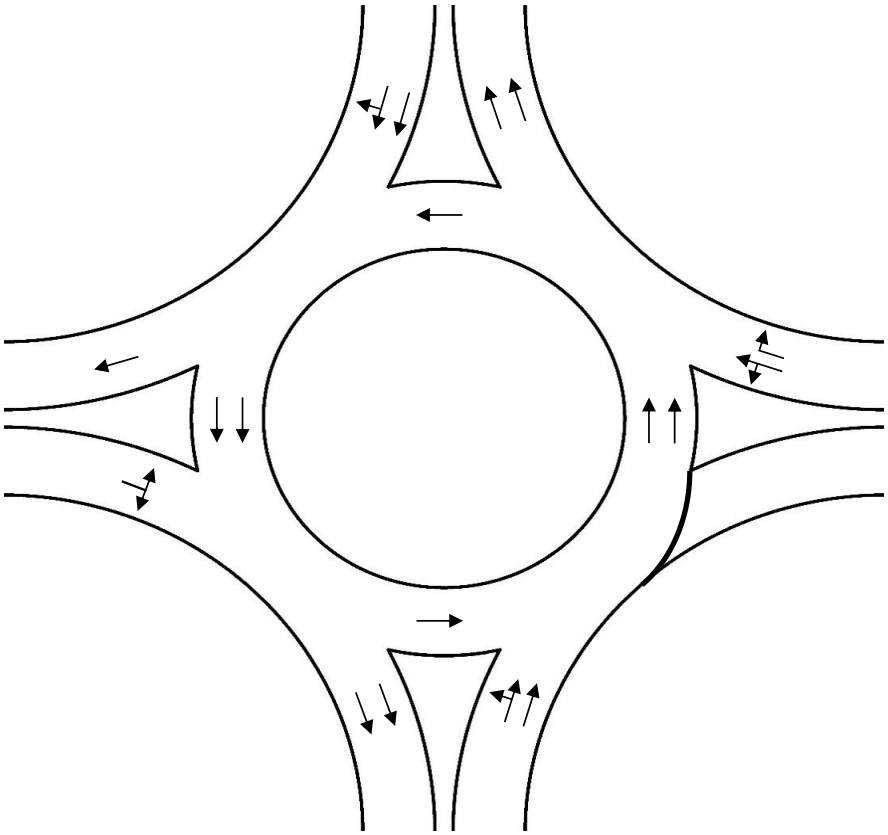
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

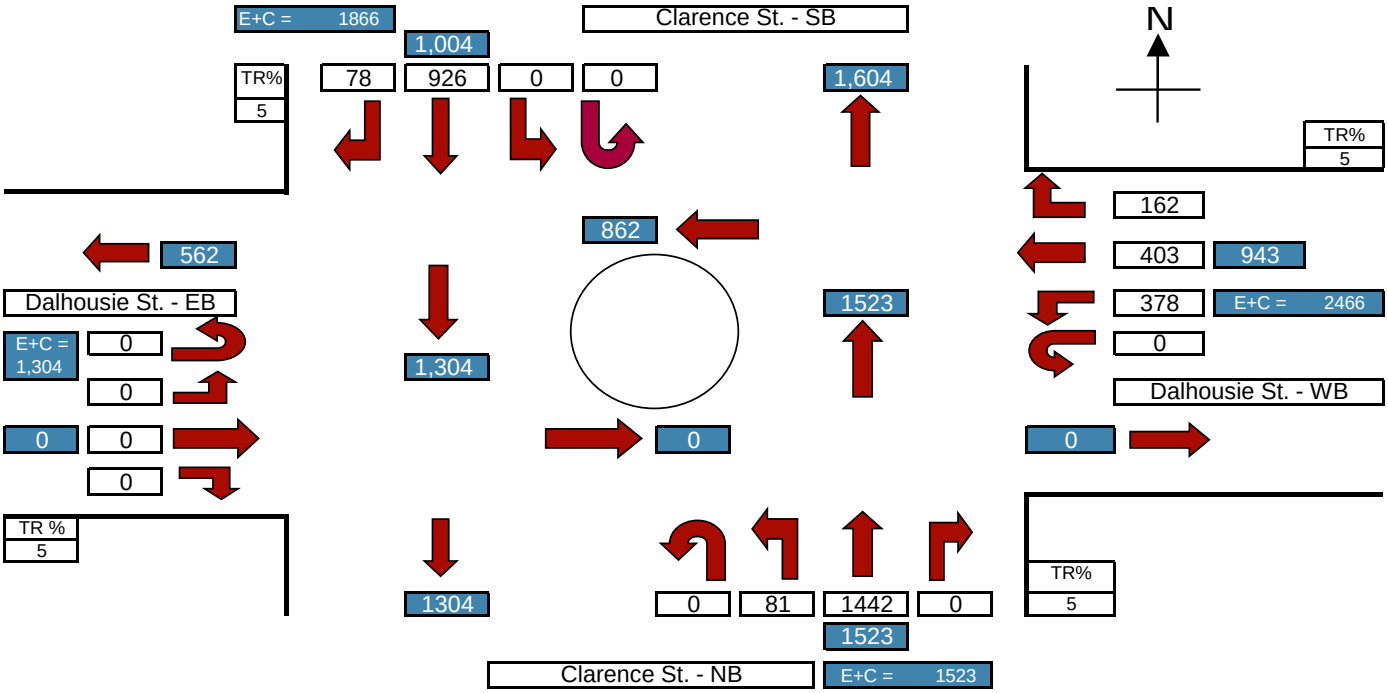
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Clarence St. - SB | 1.05 | 36 | 1217 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Clarence St. - NB | 1.05 | 0 | 836 | 36 | 0 |
| Dalhousie St. - WB | 1.05 | 122 | 503 | 381 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Clarence Street
**Time Period:** **AM PEAK 2051**

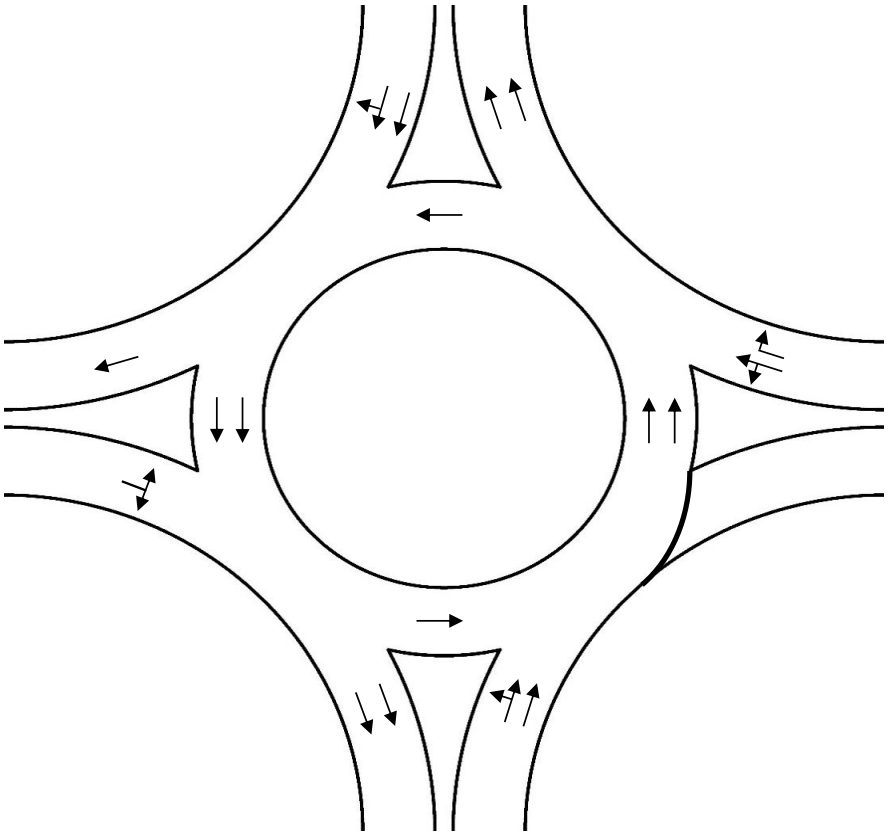
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

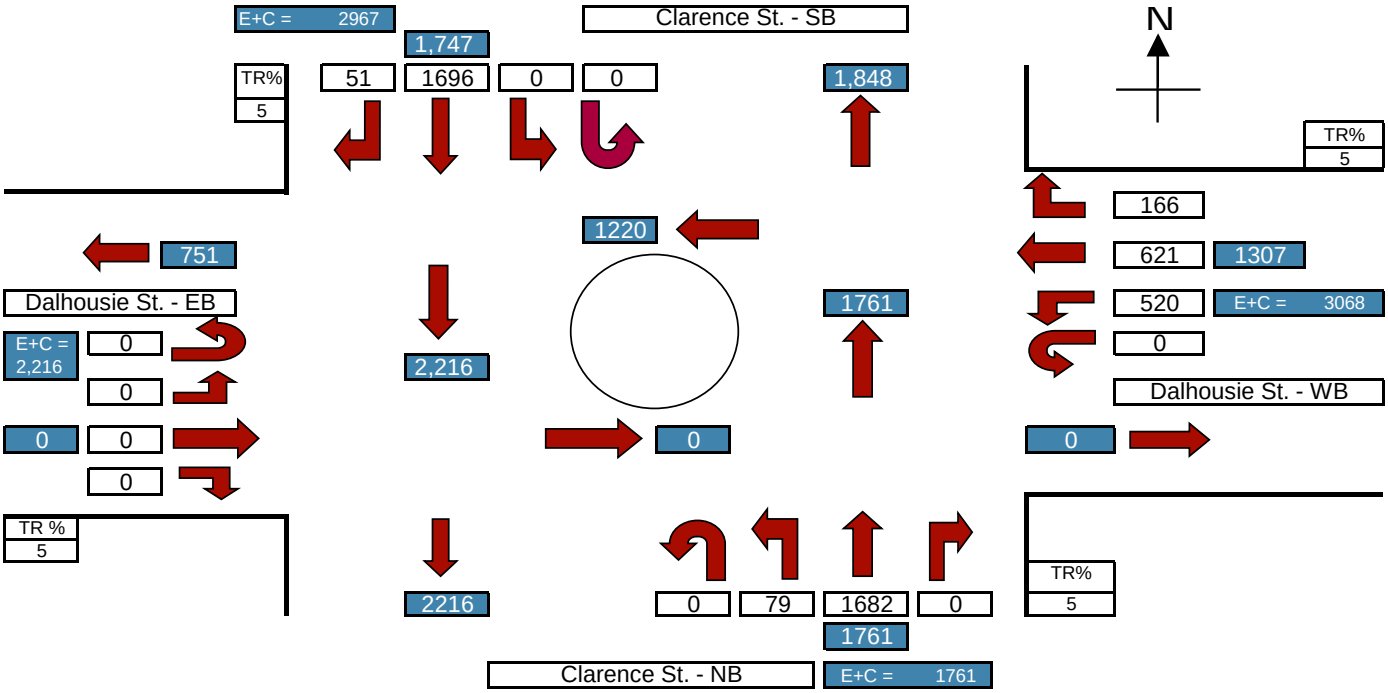
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Clarence St. - SB | 1.05 | 78 | 926 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Clarence St. - NB | 1.05 | 0 | 1442 | 81 | 0 |
| Dalhousie St. - WB | 1.05 | 162 | 403 | 378 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Clarence Street
**Time Period:** **PM PEAK 2051**

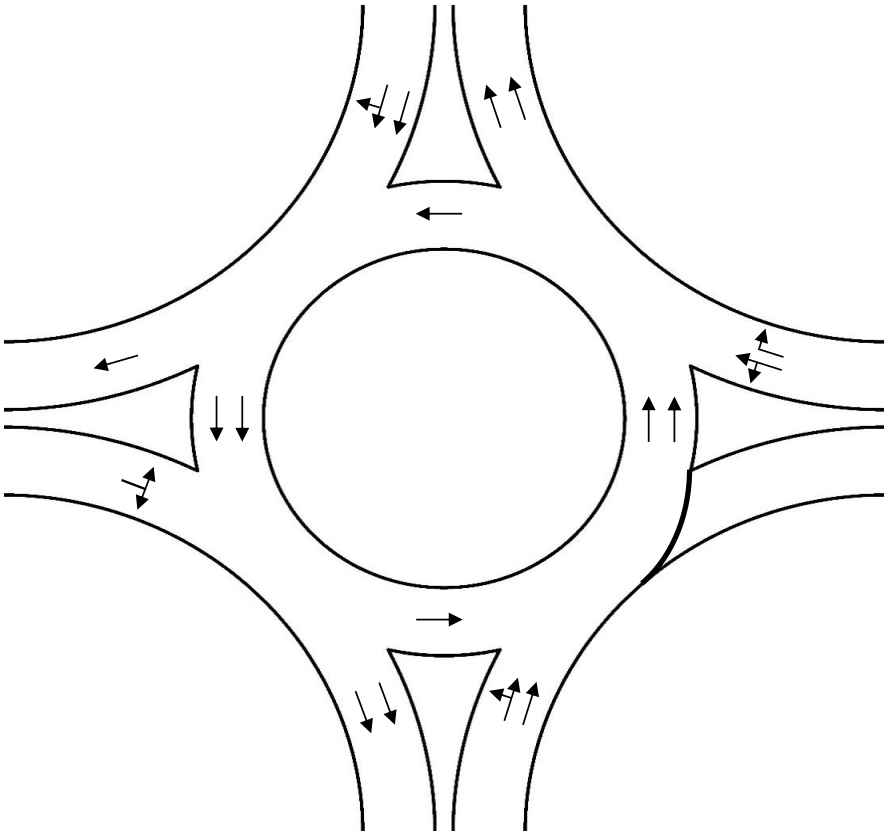
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Clarence St. - SB | 1.05 | 51 | 1696 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Clarence St. - NB | 1.05 | 0 | 1682 | 79 | 0 |
| Dalhousie St. - WB | 1.05 | 166 | 621 | 520 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Dalhousie St. & Clarence St. ICS

**Major Road:** Dalhousie St.

**Minor Road:** Clarence St.

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Stop Control |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | YES |
| **Will the proposed intersection have illumination:** | YES |

**5-Year Total Collisions:** 60

**5-Year PDO Collisions:** 19

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 13,070

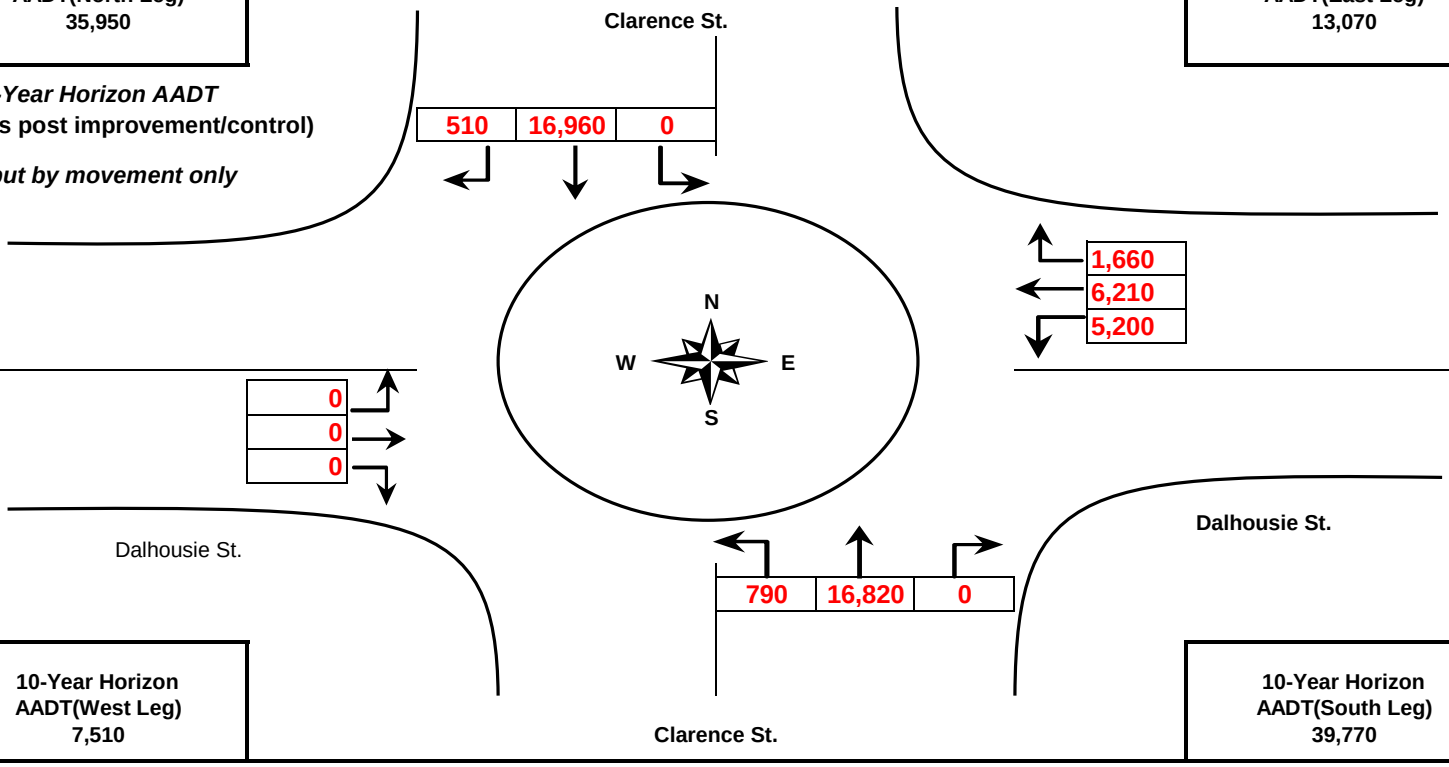
**Minor Road (mid-block) 10-Year Horizon AADT:** 39,770

**10-Year Horizon AADT(North Leg) 35,950**

**10-Year Horizon AADT(East Leg) 13,070**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 7,510**

**10-Year Horizon AADT(South Leg) 39,770**

**Direct Capital Costs**

| | |
|---|---|
| Fatal = | $1,656,500 |
| Injury = | $60,500 |
| $PDO_{SIG}$ = | $5,000 |
| $PDO_{RA}$ = | $4,500 |
| Discount Rate = | 0.06 |

| 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS) | | | | |
|---|---|---|---|---|
| **Collisions by Severity** | **Total** | **PDO** | **Injury** | **Fatal** |
| Stop Control | **$4,674,635.21** | **$163,446.38** | **$3,865,191.40** | **$645,997.43** |
| Roundabout | **$3,937,238.58** | **$1,578,793.69** | **$2,358,444.89** | **$0.00** |

* Roundabout calibration Factor - 1.5

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** **Dalhousie St. & Clarence St. ICS**

**Major Road:** **Dalhousie St.**
**Minor Road:** **Clarence St.**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Stop Control

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **53930**

**5-Year Total Collisions:** **60**

**5-Year PDO Collisions:** **19**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Stop Control | **8.45** | **2.85** | **5.57** | **0.03** |
| Roundabout | **33.99** | **30.59** | **3.40** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 4-Leg Intersection | **-8.9** | **0.82** | **0.25** | **0.33** | **0.006** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 4-Leg Intersection | **-8.74** | **0.77** | **0.23** | **0.4** | **0.006** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **0.84** | Total | PDO |
| | | | | **2.419047541** | **1.379926514** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Dalhousie St. and Clarence St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1800** | $11,700.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$181,133.00** | **$182,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $81,604.60 | 1 | $81,604.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$621,604.60** | **$622,000.00** |
| | | | | **Engineering (20%)** | **$205,925.52** | **$205,000.00** |
| | | | | **Contingency (20%)** | **$205,925.52** | **$205,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,441,478.64** | **$1,441,000.00** |

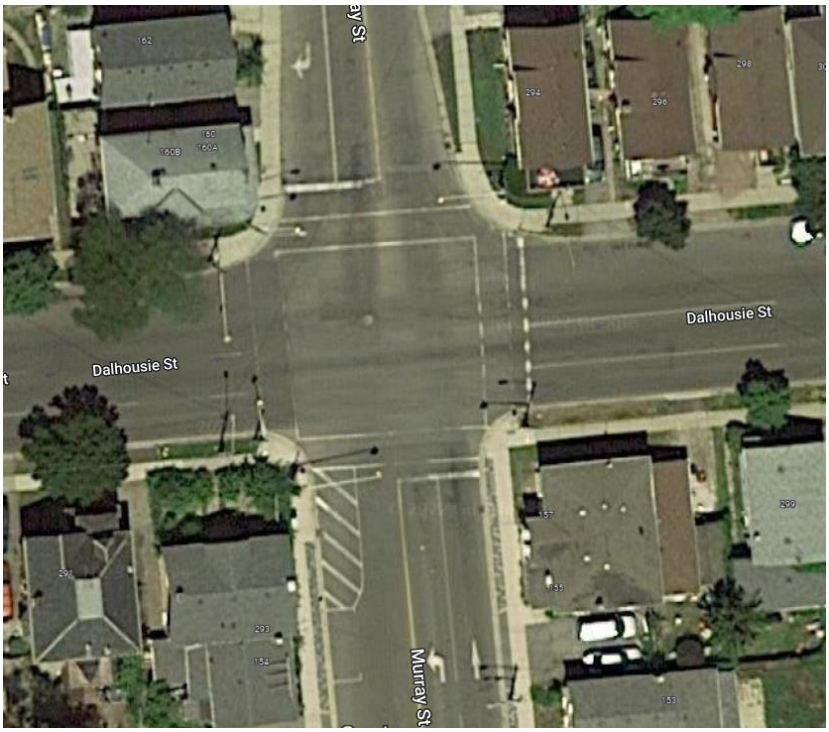
# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Clarence St. Intersection
## Intersection Improvements EA
## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1800** | $11,700.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$181,133.00** | **$182,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $810.00 | $11,340.00 | |
| A2.2 | Roadway Paving | | | **1,350** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,519 | $22,781.25 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 506 | $10,125.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 338 | $33,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 169 | $25,312.50 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$298,200.75** | **$300,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $95,866.75 | 1 | $95,866.75 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$270,866.75** | **$270,000.00** |
| | | | | **Engineering (20%)** | **$150,040.10** | **$150,000.00** |
| | | | | **Contingency (20%)** | **$150,040.10** | **$150,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,050,280.70** | **$1,052,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Murray Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Murray Street is a three-lane north/south arterial with two lanes going south and one north, Dalhousie Street is a three lane, one-way arterial approaching from the east. The intersection connects at right angles between Murray Street and Dalhousie Street.<br>  |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are no operational problems identified with this intersection. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |

| | |
|---|---|
| | The intersection to the west is Dalhousie Street and Peel Street, which is a two-way stop four-leg intersection with two non-signalized pedestrian crossings on Peel Street.<br>The intersection to the east is Dalhousie Street and Brock Street, which is a two-way stop four-leg intersection with two non-signalized pedestrian crossings on Brock Street. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are residential buildings on each corner of the intersection. Any property taking would result in impact to the buildings, resulting in complete buy outs for property. There are physical constraints on each corner. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on Murray Street. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |
| | **20 Year Life Cycle Cost Comparison** |

| Cost Item | Stop/Signal Control | Roundabout |
|---|---|---|
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $654,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Murray Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization.

Figure 1

# Proposed Traffic Lights – Dalhousie at Murray

MURRAY STREET

DALHOUSIE STREET

N

2 STOREY BRICK HOUSE #288 DALHOUSIE ST.

2 STOREY BRICK HOUSE #160 MURRAY ST.

2 STOREY BRICK HOUSE #294 DALHOUSIE ST.

2 STOREY BRICK HOUSE #296 DALHOUSIE ST.

2 STOREY BRICK HOUSE #298 DALHOUSIE ST.

2 STOREY BRICK HOUSE #300 DALHOUSIE ST.

2 STOREY BRICK HOUSE #302 DALHOUSIE ST.

2 STOREY BRICK HOUSE #304 DALHOUSIE ST.

2 STOREY BRICK HOUSE #291 DALHOUSIE ST.

2 STOREY BRICK HOUSE #293 DALHOUSIE ST.

2 STOREY BRICK HOUSE #155–157 MURRAY ST.

2 STOREY BRICK HOUSE #299 DALHOUSIE ST.

2 STOREY BRICK HOUSE #301 DALHOUSIE ST.

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST. & MURRAY ST. PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

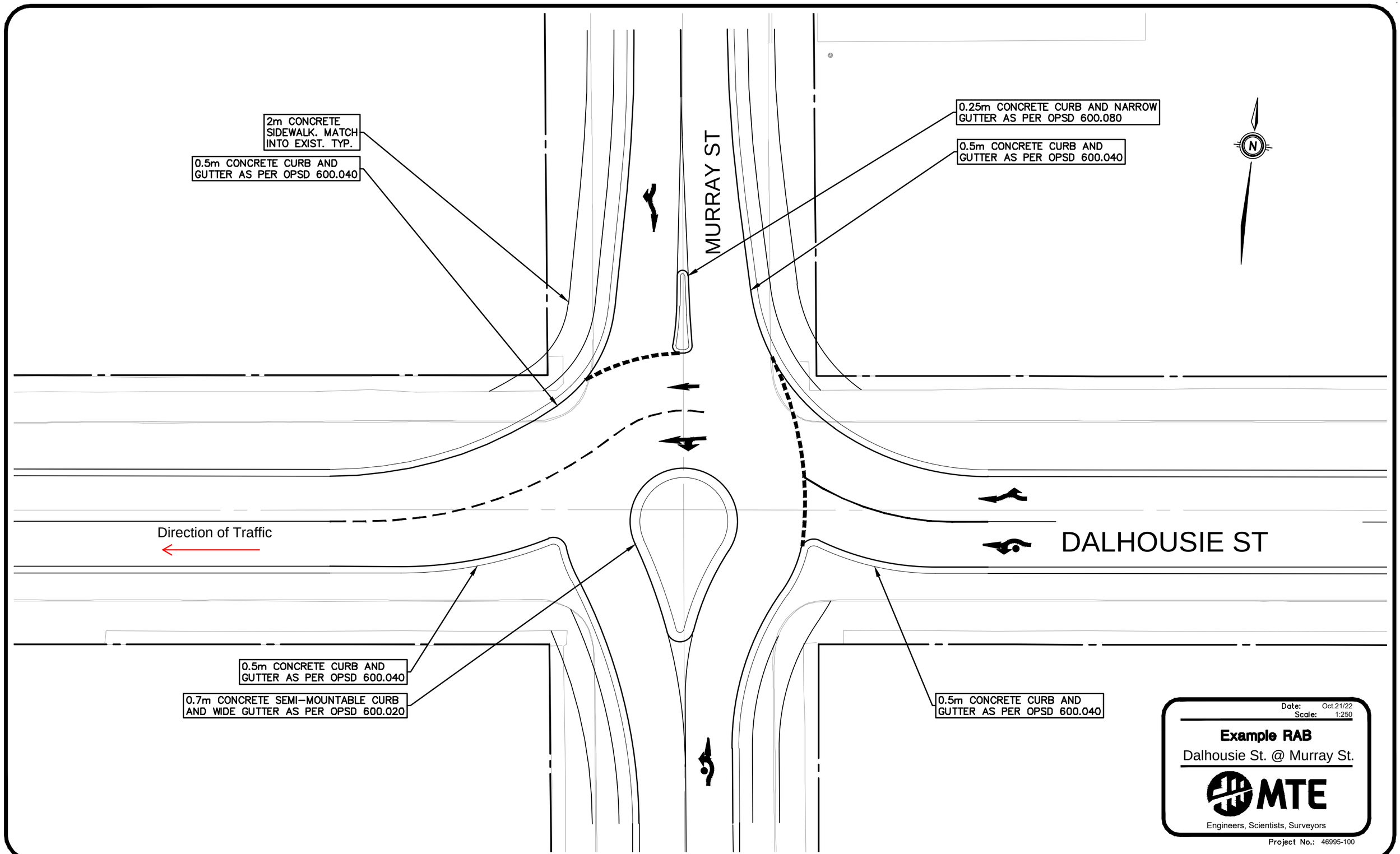
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Dalhousie at Murray




Date: Oct.21/22
Scale: 1:250

**Example RAB**

Dalhousie St. @ Murray St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

# Appendix A

# Cost Estimates

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Dalhousie St. and Murray St. Intersection
## Intersection Improvements EA
## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | **Subtotal Section A1 - Site Preparation & Removals** | | | | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | **Subtotal Section A2 - Road Works** | | | | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | **Subtotal Section A6 - Miscellaneous/Provisional Items** | | | | **$820,824.60** | **$820,000.00** |
| | **Engineering (20%)** | | | | **$244,989.52** | **$245,000.00** |
| | **Contingency (20%)** | | | | **$244,989.52** | **$245,000.00** |
| | **Total Estimated Construction Cost** | | | | **$1,714,926.64** | **$1,712,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Murray St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Rawdon Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Rawdon Street is a two lane north/south arterial, and Dalhousie Street is a two lane, one-way arterial approaching from the east. The intersection connects at right angles between Dalhousie Street and Rawdon Street. |
| |  |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | There are no operational problems identified with this intersection. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Dalhousie Street and Drummond Street, and is a four leg two-way stop intersection with non-signalized pedestrian crossings on the Drummond Street leg. The |

| | |
|---|---|
| | intersection to the east is Dalhousie and Stanley Street, which is a four way fully signalized intersection. There are no adjacent queuing issues identified. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are residential and commercial buildings on each corner of the intersection. Any property taking would result in impact to the buildings, resulting in complete buy outs for property. There are physical constraints on each corner. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on Rawdon Street. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| **20 Year Life Cycle Cost Comparison** | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |

| | | |
|---|---|---|
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | N/A | N/A |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,079,000 | $1,733,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $654,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Rawdon Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization.

Figure 1

# Proposed Traffic Lights – Dalhousie at Rawdon

RAWDON STREET

DALHOUSIE STREET

#36

1 STOREY BRICK HOUSE
#350 DALHOUSIE ST.

2 STOREY BRICK HOUSE
#352 DALHOUSIE ST.

1 STOREY BRICK HOUSE
DAVE AUTO MUFFLER REPAIR
#362 DALHOUSIE ST.

1 STOREY BRICK HOUSE
#351 DALHOUSIE ST.

2 STOREY BRICK HOUSE
#353 DALHOUSIE ST.

1 STOREY BRICK STRIP MALL
#10 STANLEY ST.

Asphalt Driveway
Concrete Sidewalk
Conc. Porch
Conc. Steps
Wood Porch
Garden
Grass
Asph.
Conc.
TL

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST. & RAWDON ST. PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Dalhousie at Rawdon

2m CONCRETE SIDEWALK. MATCH INTO EXIST. TYP.

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.25m CONCRETE CURB AND NARROW GUTTER AS PER OPSD 600.080

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

RAWDON ST

N

Direction of Traffic

DALHOUSIE ST

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.7m CONCRETE SEMI-MOUNTABLE CURB AND WIDE GUTTER AS PER OPSD 600.020

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

Date: Oct.21/22
Scale: 1:250

**Example RAB**

Dalhousie St. @ Rawdon St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

# Appendix A

# Cost Estimates

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)
## Dalhousie St. and Rawdon St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$820,824.60** | **$820,000.00** |
| | | | | **Engineering (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Contingency (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,714,926.64** | **$1,712,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Rawdon St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Stanley Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Stanley Street is a two lane north/south arterial, and Dalhousie Street is a three lane, one-way arterial approaching from the east. |


| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | No operational problems have been experienced at this intersection. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |

| | |
|---|---|
| | The intersection to the west is Dalhousie Street and Rawdon Street, it is a signalized four leg intersection with signalized pedestrian crossings on each leg.<br>The intersection to the east is Dalhousie Street and Colborne Street. This intersection consists of 3 entrances onto Dalhousie from Colborne, one approaching from the west, one from the east and the third from an empty lot which seems to have been a well visited developed area as it is signalized with pedestrian signals. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Collision history for this intersection is not available. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | There are commercial buildings on the southeast and northeast corners, of which both have drive throughs. There is a vacant lot on the northwest corner, and a commercial retailer with a large parking lot on the southwest corner. This intersection does not have any physical constraints that would be a significant concern. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 1, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4 leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on Stanley Street. Figure 2 provides a sketch of a potential roundabout configuration for the intersection. |

| | |
|---|---|
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $975,000 | $1,225,000 |
| **Injury Collision Cost** | $ | $ |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,104,000 | $1,246,000 |

Injury Collision Costs were not available for this intersection, as traffic data was not available.

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

| | |
|---|---|
| **12** | Conclusion and Recommendations: |

Conclusions are based on the results of the roundabout screening:

- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $250,000.
- Roundabout would require property taking, which is not physically constrained by buildings. However, with the 2 businesses that have drive-throughs at the intersection, tit may be difficult to implement the geometry of a roundabout without impacting traffic movements.

The recommendation for the Stanley Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout will be higher than maintaining signalization.

# Figure 1

# Proposed Traffic Lights – Dalhousie at Stanley

STANLEY STREET

DALHOUSIE STREET

Grass
Asph.
Concrete Sidewalk
Gravel Parking
Concrete Pad
Asphalt Drive Thru
Garden
TL

FAST EDDIE'S
TAKE OUT
TILED BUILDING
#9 STANLEY ST.

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST.**
**& STANLEY ST.**
**PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

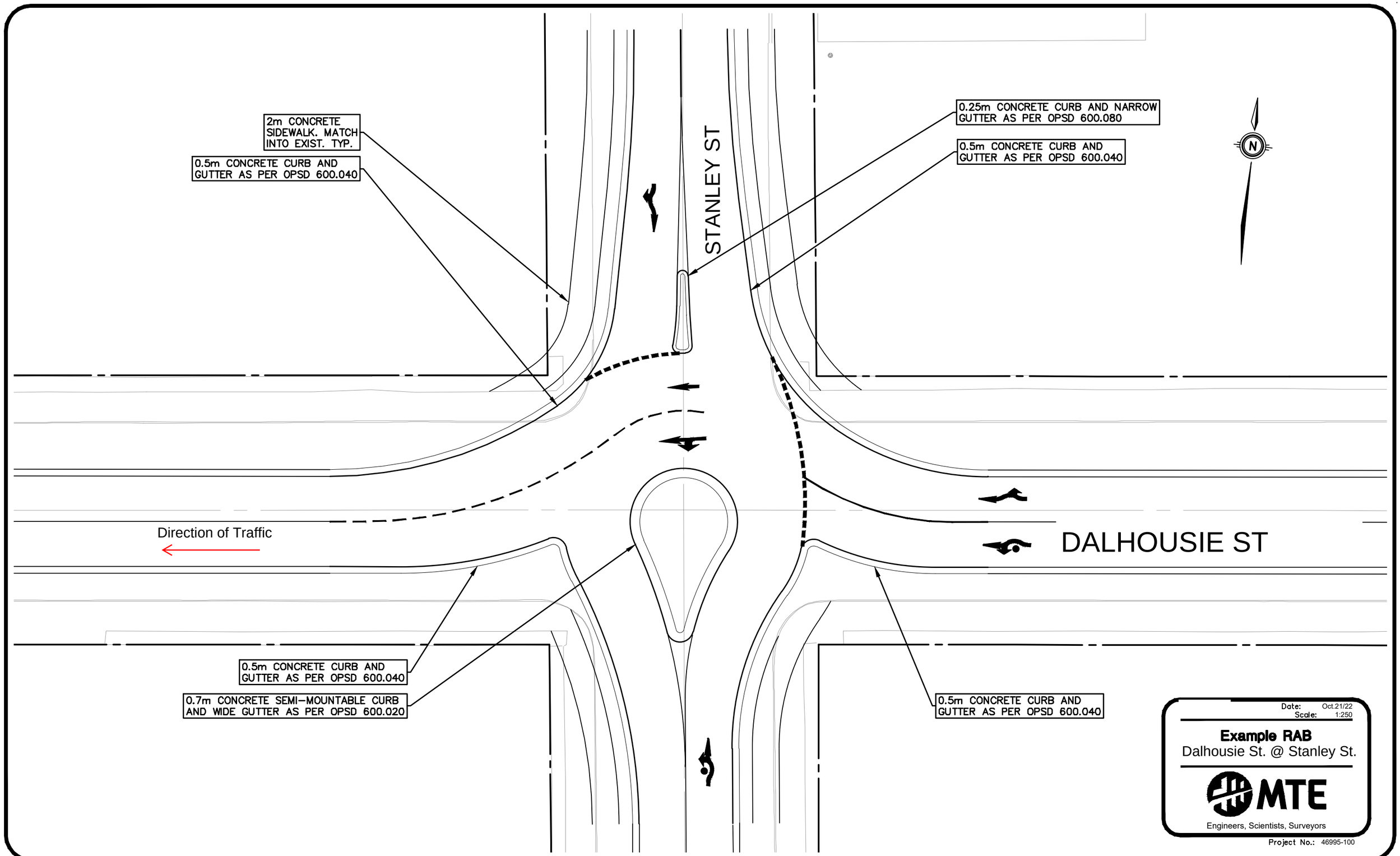
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 2

# RAB Example – Dalhousie at Stanley




Date: Oct.21/22
Scale: 1:250

**Example RAB**

Dalhousie St. @ Stanley St.

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

# Appendix A

# Cost Estimates

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Dalhousie Street and Stanley Street Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | **Subtotal Section A1 - Site Preparation & Removals** | | | | **$177,233.00** | **$177,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | **Subtotal Section A2 - Road Works** | | | | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $150,000.00 | 1 | $150,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | **Subtotal Section A6 - Miscellaneous/Provisional Items** | | | | **$470,824.60** | **$471,000.00** |
| | **Engineering (20%)** | | | | **$174,989.52** | **$175,000.00** |
| | **Contingency (20%)** | | | | **$174,989.52** | **$175,000.00** |
| | **Total Estimated Construction Cost** | | | | **$1,224,926.64** | **$1,225,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Stanley St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$177,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $480.00 | $6,720.00 | |
| A2.2 | Roadway Paving | | | **800** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 900 | $13,500.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 300 | $6,000.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 200 | $20,000.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 100 | $15,000.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$256,112.00** | **$256,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $86,669.00 | 1 | $86,669.00 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$261,669.00** | **$262,000.00** |
| | | | | **Engineering (20%)** | **$139,002.80** | **$140,000.00** |
| | | | | **Contingency (20%)** | **$139,002.80** | **$140,000.00** |
| | | | | **Total Estimated Construction Cost** | **$973,019.60** | **$975,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Brant Avenue | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Brant Avenue is a four lane north/south arterial, Dalhousie is a four lane, one-way arterial approaching from the east and Prince Crescent is a two lane local street on the west leg. The intersection is skewed between Dalhousie St. and Brant Ave.<br>  <br><br>Refer to Figure 1.0 for intersection overview and Turning Movement Data |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |

| | |
|---|---|
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | The intersection experiences high volumes of traffic at peak periods but has a Level of Service A and B indicating that there may be no operational issues. Intersection is expected to operate with a Level of Service B and C in the 2051 design horizon. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the south is Colborne Street and Brant Avenue, and is a signalized four leg intersection with signalized pedestrian crossings on each leg. The intersection to the east is Dalhousie Street and King Street, which is a signalized four-leg intersection with signalized pedestrian crossings on each leg. The traffic analysis indicates that the adjacent intersections should not experience high queueing. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain four lanes of one-way traffic on Dalhousie Street with right and left turn only lanes and on-street parking on both sides after crossing the Dalhousie and King Street intersection. Brant Avenue will remain four lanes of two-way traffic and see no changes as a result of the EA. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 24 collisions were recorded for this intersection. See figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Road users should be able to utilize the intersection efficiently without experiencing sight distance issues as there are no buildings on the northwest, northeast and southeast quadrants. When approaching the intersection from Prince Crescent there is a Canada National Defense building on the southwest quadrant which would pose sight distance issues. Any property taking would result in impact to the building, resulting in complete buy out for the property. |

| | |
|---|---|
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a 4-leg roundabout would be considered with two lanes in each direction north/south on Brant Avenue, two lanes of one-way westbound traffic on Dalhousie Street and two lanes of traffic in each direction east/west on Prince Crescent. Refer Appendix A for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $1,104,000 | $1,562,000 |
| **Injury Collision Cost** | $1,654,000 | $2,559,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $2,887,000 | $4,142,000 |

Attach collision cost calculation sheets

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%)

Implementation and NPV cost estimates can be found in Appendix A.

| | |
|---|---|
| **12** | Conclusion and Recommendations: |

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 24 collisions in the past 5 years (10 Property Damage only)
- The stop/signal control is the lower cost alternative over the 20-Year life cycle cost, when the social impacts of the intersection are included. The difference in capital cost of the roundabout is approximately $1,255,000.
- Roundabout would require property taking. While estimates are included for property taking, there are properties that may be more greatly impacted, and the property taking costs could be substantially higher.
- The major challenge to implementing a roundabout at this intersection is that it would greatly impact Prominence Point Park and the War Memorial Park. It is assumed that the City would want to limit disturbance to these parks. State challenge

The recommendation for the Brant Avenue intersection is that the City proceed with a signalized intersection. The signalized intersection functions well in the 2051 planning horizon, requires no property, avoids conflicts with adjacent rail line, and is the less expensive alternative.

M:\46995\100\06 Reports\Roundabout Screening\Dalhousie\Dalhousie & Brant\46995-100 - Dalhousie & Brant RAB Screening.docx

Figure 1

# Collisions – Dalhousie at Brant

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** BRANT AVE @ DALHOUSIE ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 24

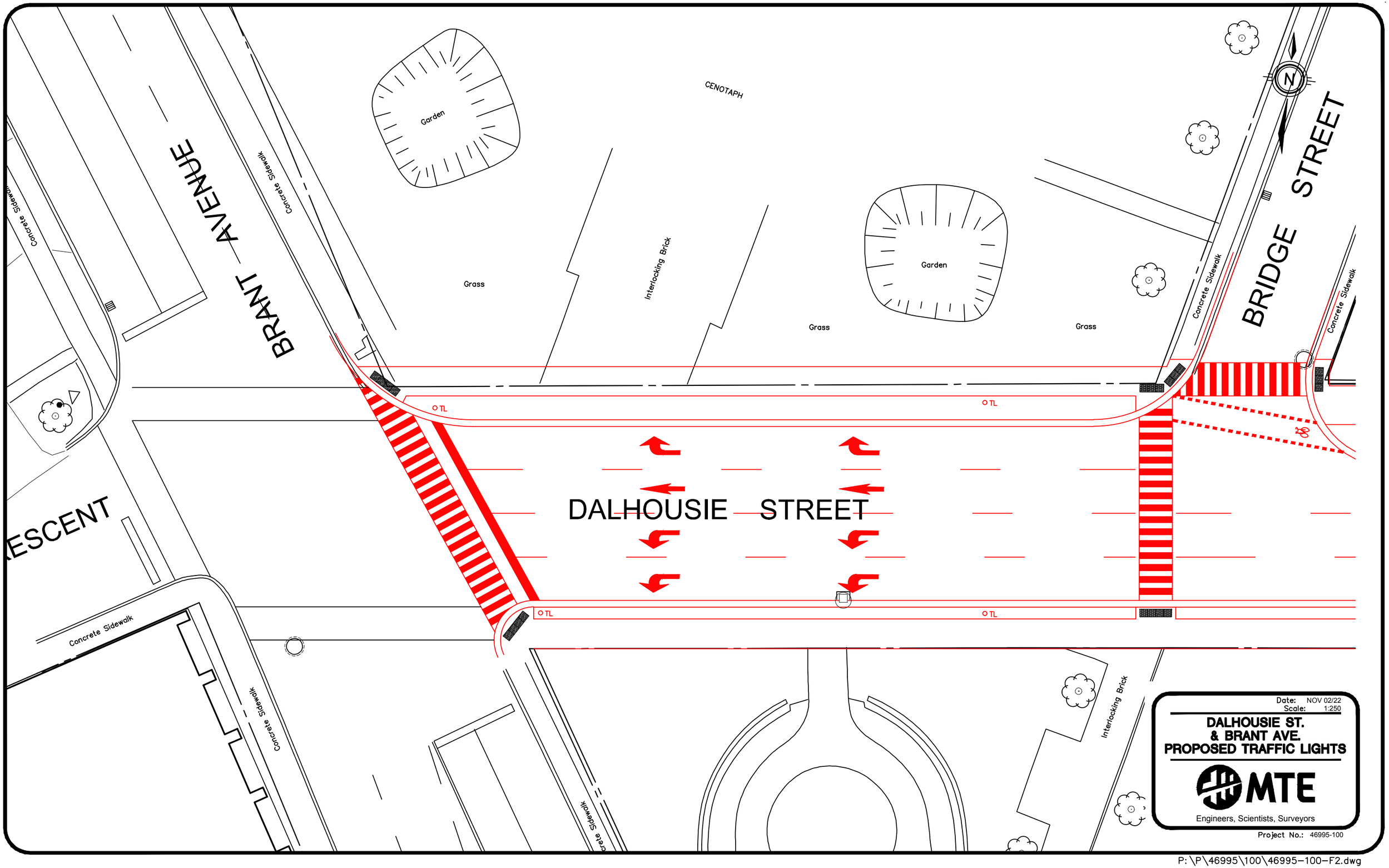
| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 014644 | 2017-Apr-24, Mon,16:27 | Clear | SMV other | Non-fatal injury | West | Dry | Turning left | Pick-up truck | Pedestrian | Improper turn | |
| **Comments:** | | | | | | Dry | | | | | |
| 018303 | 2017-May-20, Sat,15:10 | Clear | Rear end | P.D. only | West | Dry | Going ahead | Pick-up truck | Other motor vehicle | Following too close | |
| **Comments:** | | | | | West | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 022423 | 2017-Jun-16, Fri,15:30 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | | | | | | |
| 17-002987 | 2017-Jan-25, Wed,17:44 | Clear | Rear end | P.D. only | South | Dry | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Following too close | |
| **Comments:** | | | | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-005744 | 2017-Feb-16, Thu,10:40 | Clear | Sideswipe | P.D. only | West | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | West | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly | |
| 17-026429 | 2017-Jul-14, Fri,11:29 | Clear | Rear end | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Other | |
| **Comments:** | | | | | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-030619 | 2017-Aug-10, Thu,16:50 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | | | | | | |
| 17-035928 | 2017-Sep-17, Sun,10:15 | Clear | Rear end | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close | |
| **Comments:** | | | | | North | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-39556 | 2017-Oct-13, Fri,17:00 | Rain | Sideswipe | P.D. only | West | Wet | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper passing | |
| **Comments:** | | | | | West | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 18003969 | 2018-Jan-30, Tue,09:19 | Clear | Rear end | Non-fatal injury | South | Ice | Going ahead | Passenger van | | Speed too fast for condition |
| **Comments:** | | | | | South | Ice | | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-023358 | 2018-Jun-15, Fri,23:00 | Clear | Rear end | | South | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | South | | | | | |
| 18-023394 | 2018-Jun-17, Sun,18:45 | Clear | Turning movement | | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | | | Going ahead | | | |
| 18-025033 | 2018-Jun-29, Fri,15:14 | Clear | Rear end | P.D. only | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-027135 | 2018-Jul-13, Fri,16:38 | Clear | Turning movement | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-036635 | 2018-Sep-15, Sat,17:35 | Rain | Turning movement | | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Following too close |
| **Comments:** | | | | | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-037801 | 2018-Sep-25, Tue,00:24 | Rain | Angle | Non-fatal injury | North | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-045909 | 2018-Nov-19, Mon,09:30 | Clear | Turning movement | | North | Dry | Going ahead | Automobile, station wagon | Skidding/sliding | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |
| 18-04792 | 2018-Feb-05, Mon,08:45 | Clear | Rear end | | South | Ice | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Speed too fast for condition |
| **Comments:** | | | | | South | | | | | |
| 18-06864 | 2018-Feb-20, Tue,13:15 | Rain | Rear end | | West | Wet | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| **Comments:** | | | | | West | | | | | |
| 18-3969 | 2018-Jan-30, Tue,09:19 | Clear | Rear end | Non-fatal injury | South | Ice | Going ahead | Passenger van | Other motor vehicle | Speed too fast for condition |
| **Comments:** | | | | | South | Ice | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-09893 | 2019-Mar-18, Mon,21:50 | Clear | SMV other | Non-reportable | West | Dry | Turning right | Automobile, station wagon | Pedestrian | |
| **Comments:** | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-11223 | 2019-Mar-29, Fri,09:11 | Clear | SMV other | P.D. only | West | Dry | Turning left | Motorcycle | Pole (utility, power) | Exceeding speed limit |
| **Comments:** | | | | | | | | | | |
| 19-20213 | 2019-Jun-01, Sat,12:30 | Clear | Sideswipe | P.D. only | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | Hit Median | | | | South | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |
| 19-22827 | 2019-Jun-19, Wed,11:50 | Clear | Angle | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Driving properly |

Figure 2

# Proposed Traffic Lights – Dalhousie at Brant

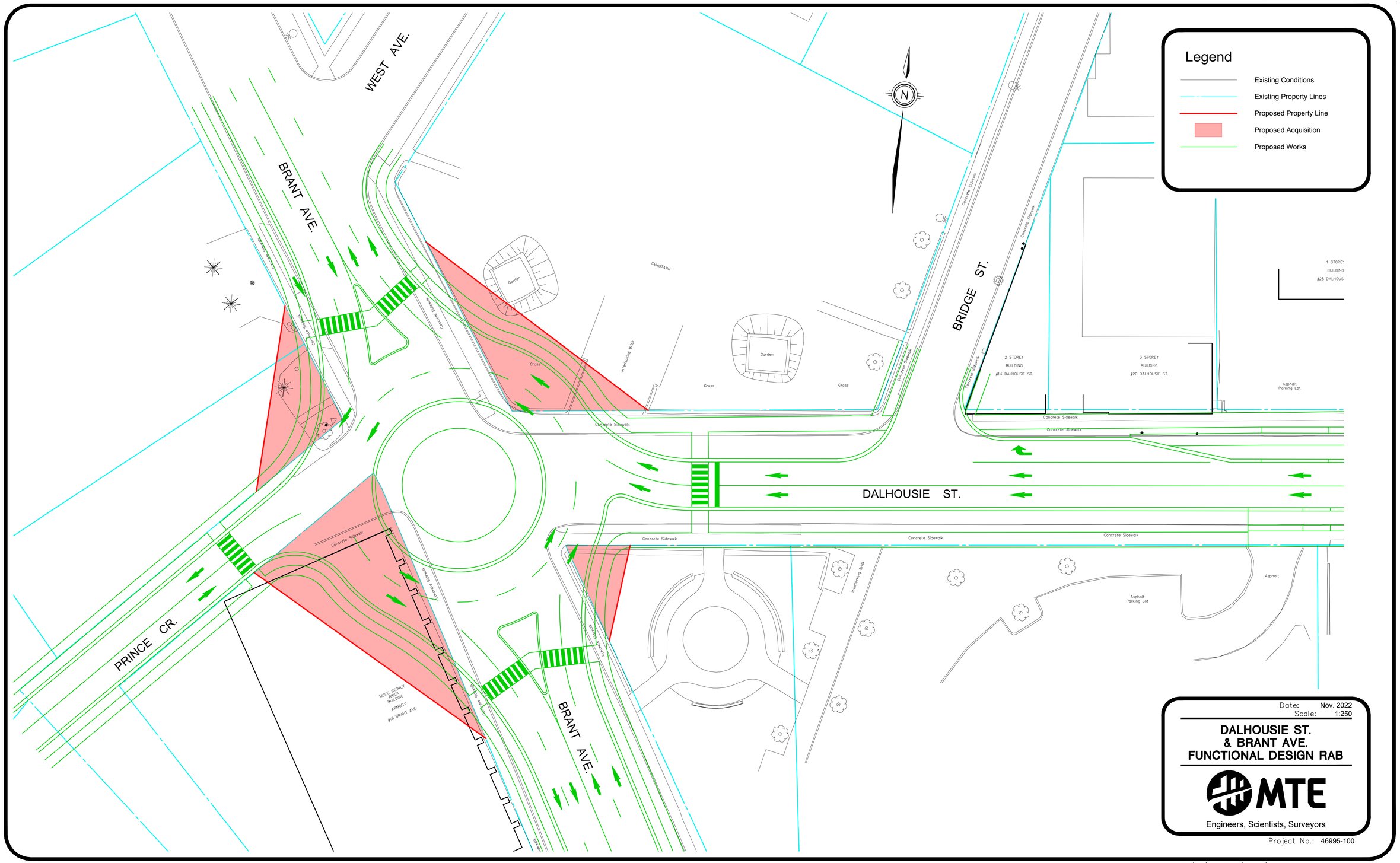



P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Dalhousie at Brant




Date: Nov. 2022
Scale: 1:250

**DALHOUSIE ST. & BRANT AVE. FUNCTIONAL DESIGN RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

November 4, 2022 — 9:59 a.m. — Plotted By: EMcDonald

P:\P\46995\100\46995-100-FD4.dwg

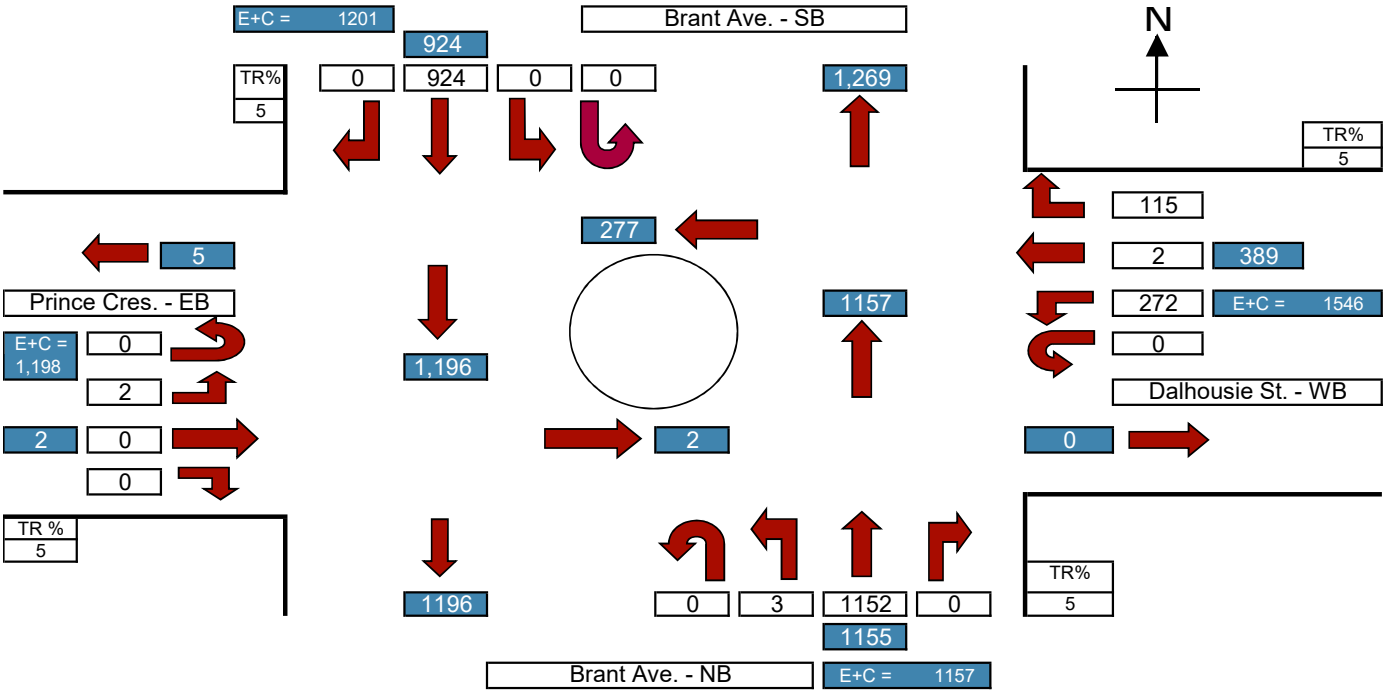
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie St. & Brant Ave.
**Time Period:** **AM PEAK 2021**

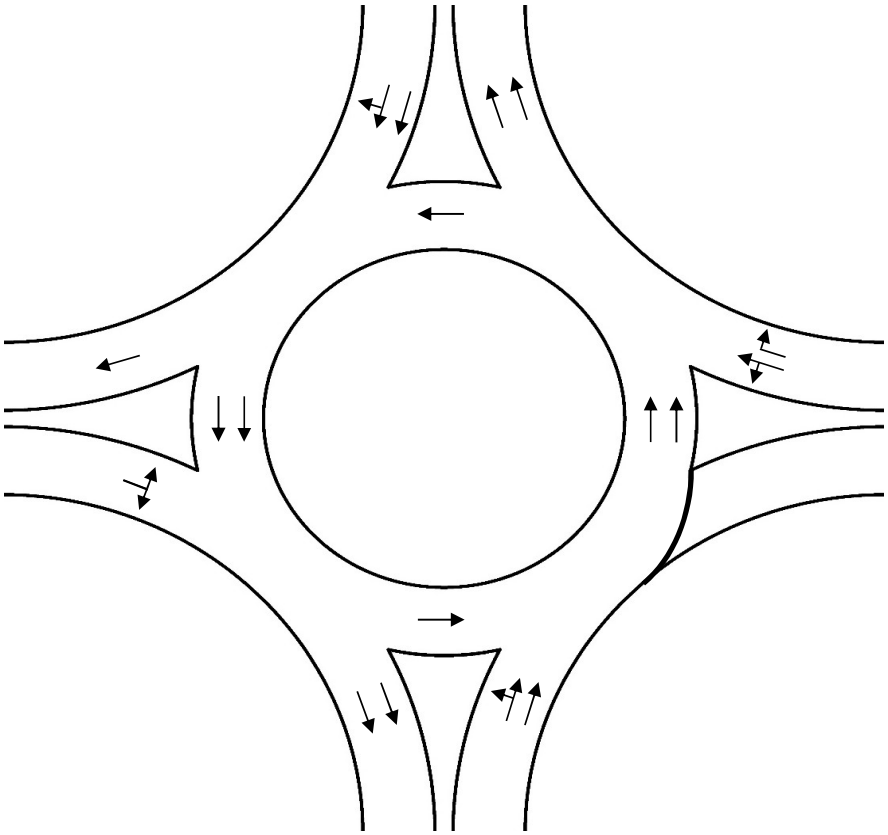
**Prepared By:** NPD
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

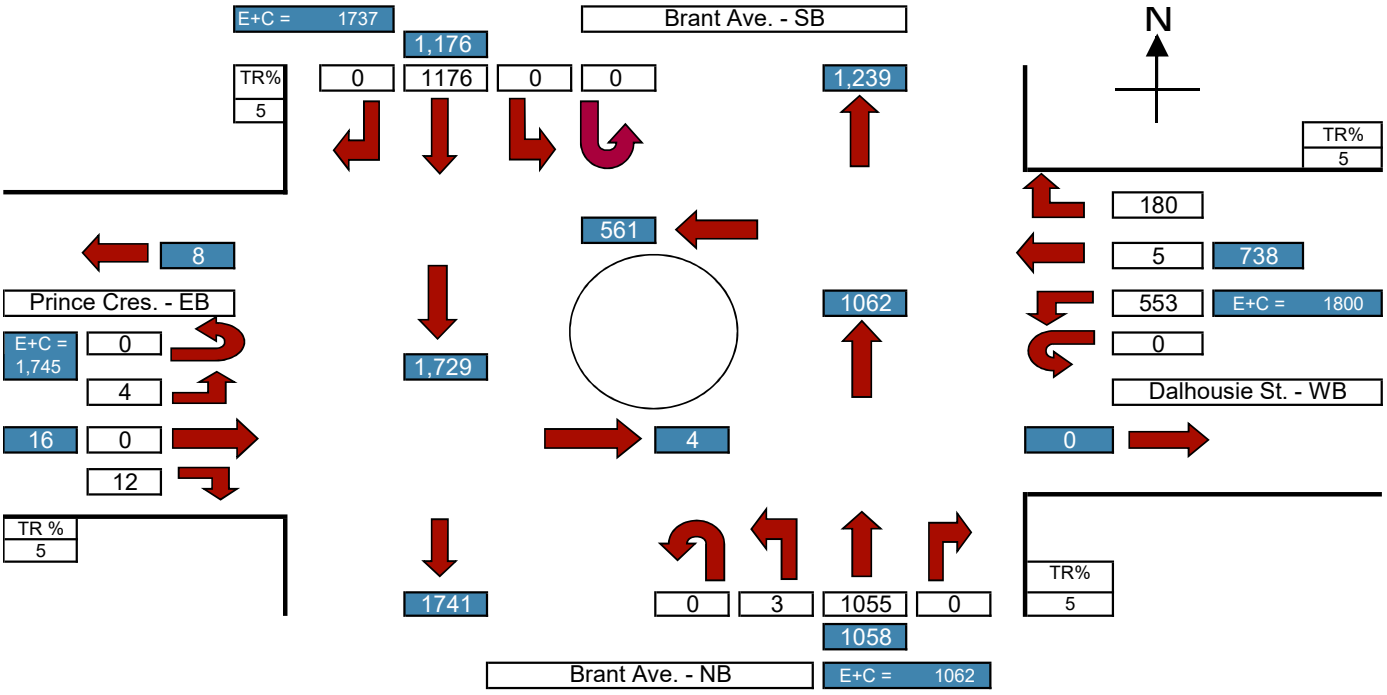
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 0 | 924 | 0 | 0 |
| Prince Cres. - EB | 1.05 | 0 | 0 | 2 | 0 |
| Brant Ave. - NB | 1.05 | 0 | 1152 | 3 | 0 |
| Dalhousie St. - WB | 1.05 | 115 | 2 | 272 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie St. & Brant Ave.
**Time Period:** **PM PEAK 2021**

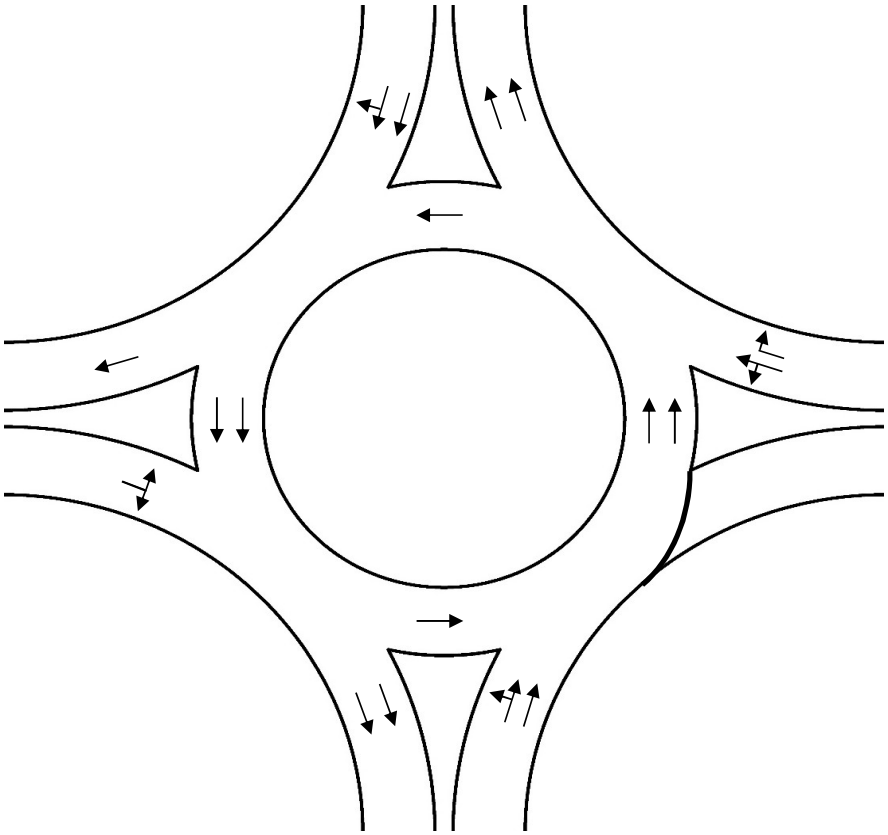
**Prepared By:** NPD
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

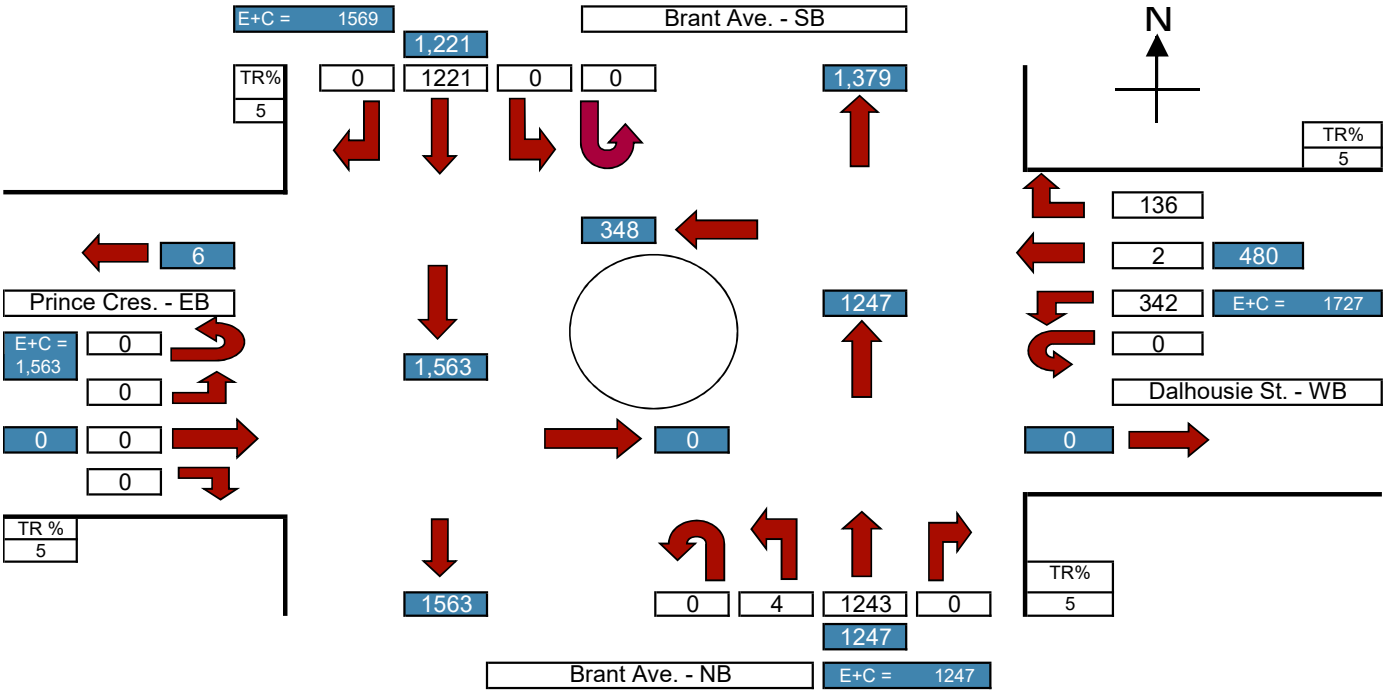
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 0 | 1176 | 0 | 0 |
| Prince Cres. - EB | 1.05 | 12 | 0 | 4 | 0 |
| Brant Ave. - NB | 1.05 | 0 | 1055 | 3 | 0 |
| Dalhousie St. - WB | 1.05 | 180 | 5 | 553 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie St. & Brant Ave.
**Time Period:** **AM PEAK 2040**

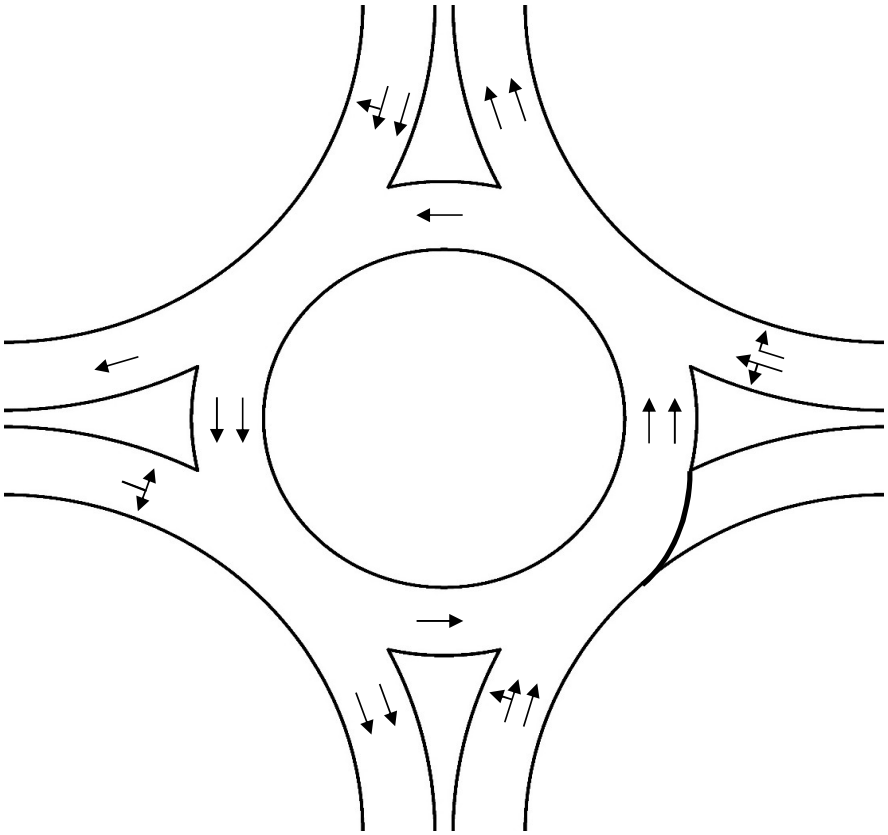
**Prepared By:** NPD
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

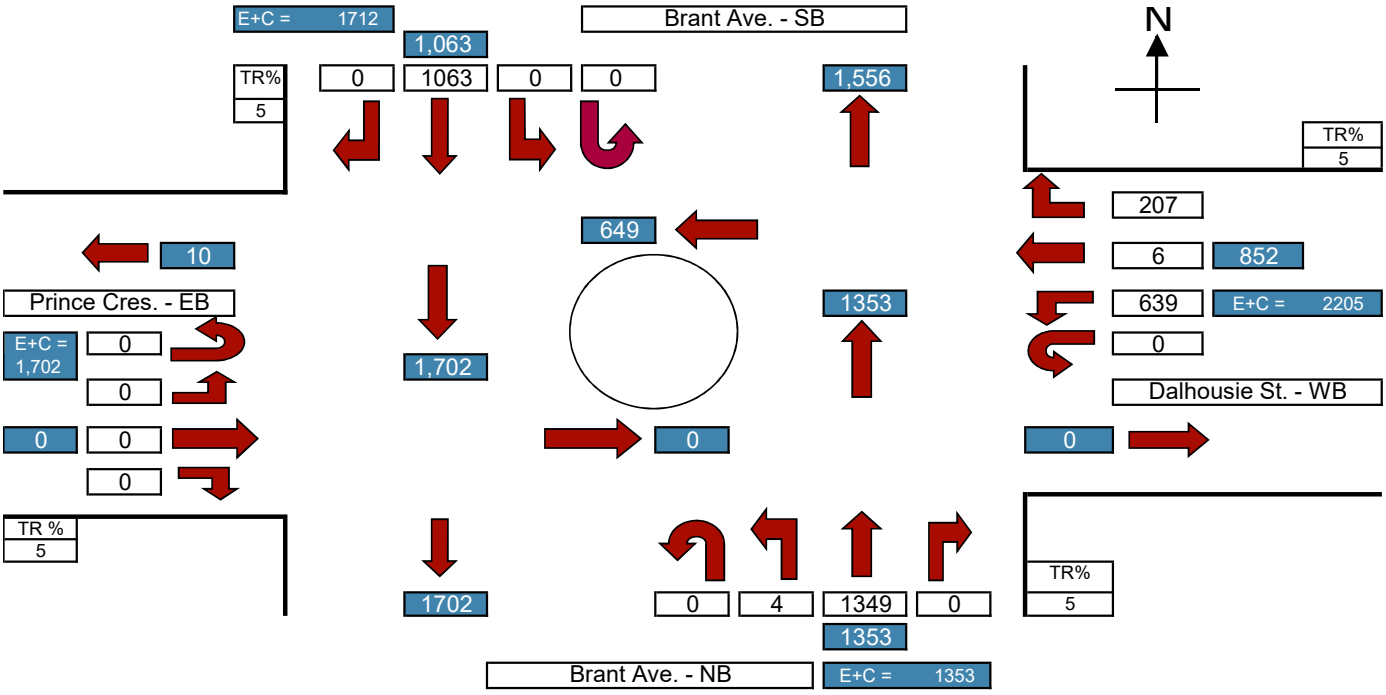
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 0 | 1221 | 0 | 0 |
| Prince Cres. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Brant Ave. - NB | 1.05 | 0 | 1243 | 4 | 0 |
| Dalhousie St. - WB | 1.05 | 136 | 2 | 342 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie St. & Brant Ave.
**Time Period:** **PM PEAK 2040**

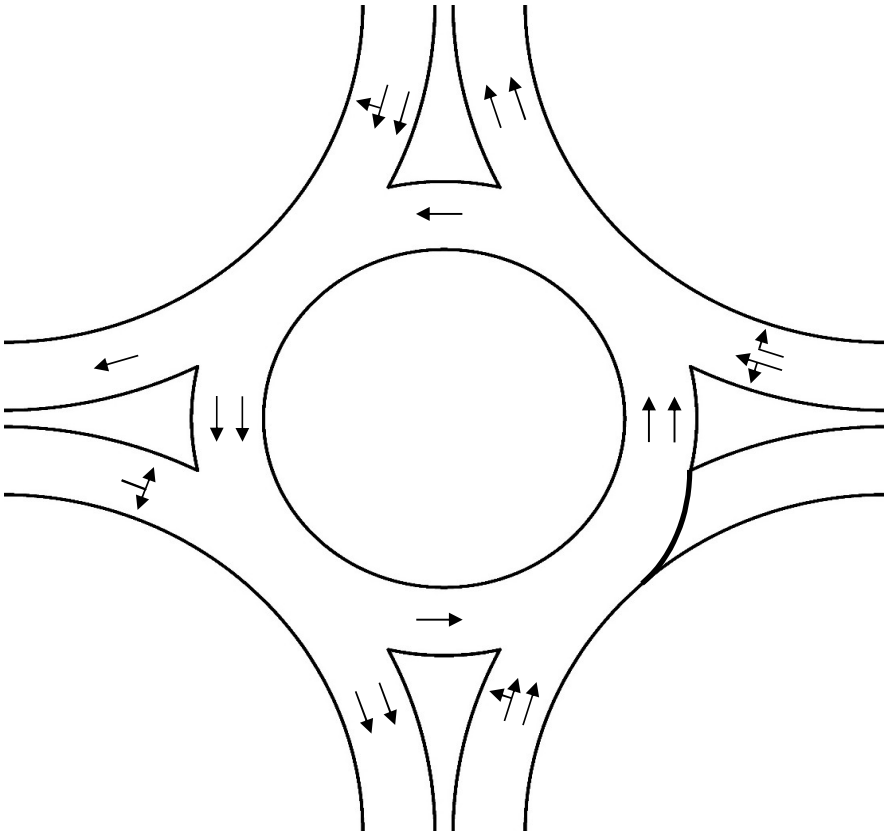
**Prepared By:** NPD
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Brant Ave. - SB | 1.05 | 0 | 1063 | 0 | 0 |
| Prince Cres. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Brant Ave. - NB | 1.05 | 0 | 1349 | 4 | 0 |
| Dalhousie St. - WB | 1.05 | 207 | 6 | 639 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Dalhousie St. & Brant Ave. ICS

**Major Road:** Dalhousie Street

**Minor Road:** Brant Avenue

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Signalized |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | NO |
| **Will the proposed intersection have illumination:** | YES |

**5-Year Total Collisions:** 24

**5-Year PDO Collisions:** 10

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 9,000

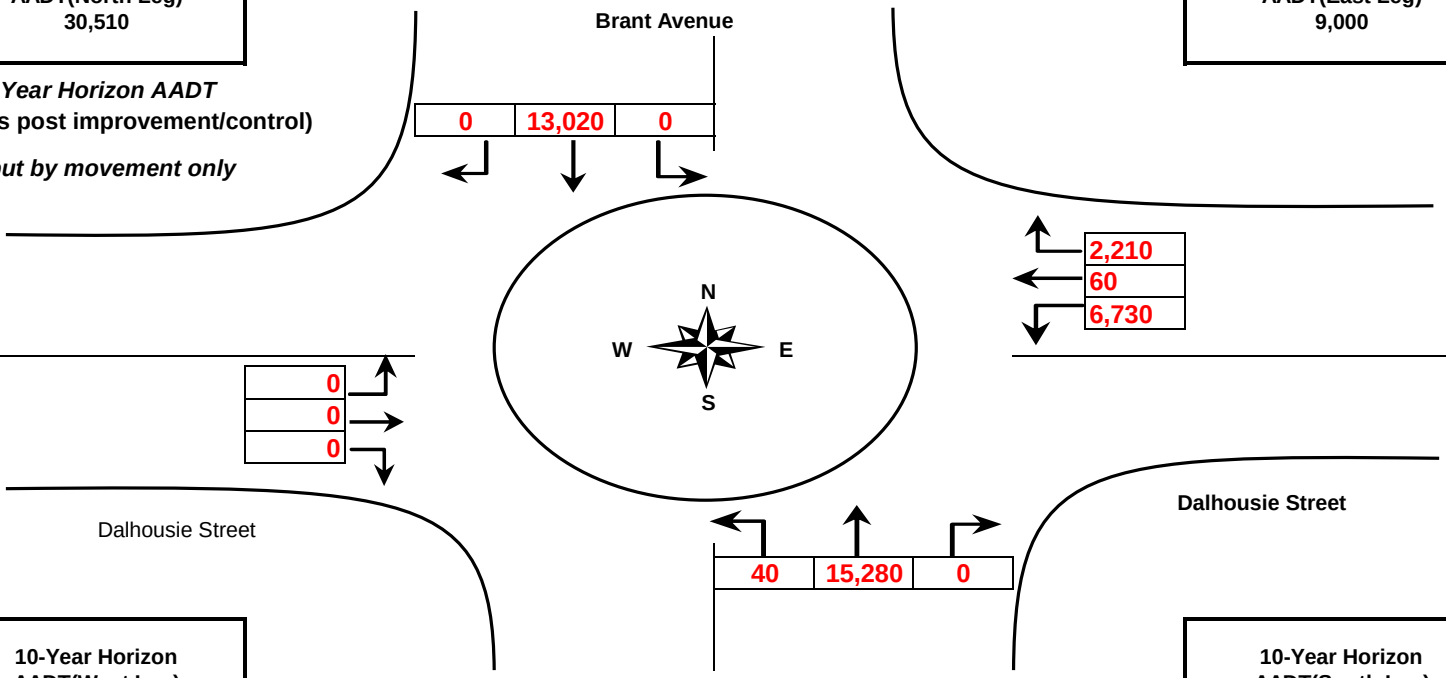
**Minor Road (mid-block) 10-Year Horizon AADT:** 35,070

**10-Year Horizon AADT(North Leg) 30,510**

**10-Year Horizon AADT(East Leg) 9,000**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 100**

**10-Year Horizon AADT(South Leg) 35,070**

**Direct Capital Costs**

Fatal = $1,656,500
Injury = $60,500
PDOSIG = $5,000
PDORA = $4,500

Discount Rate = 0.06

## 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Signalized | **$1,653,859.41** | **$238,574.36** | **$1,339,285.35** | **$75,999.70** |
| Roundabout | **$2,558,888.12** | **$1,026,088.80** | **$1,532,799.32** | **$0.00** |

* Roundabout calibration Factor - 1.5

Region of Waterloo

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

*Last Rev JAN 2021*

**Scenario:** **Dalhousie St. & Brant Ave. ICS**

**Major Road:** **Dalhousie Street**
**Minor Road:** **Brant Avenue**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Signalized

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **31780**

**5-Year Total Collisions:** **24**

**5-Year PDO Collisions:** **10**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **6.09** | **4.16** | **1.93** | **0.00** |
| Roundabout | **22.09** | **19.88** | **2.21** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-10.99** | **1.07** | **0.23** | **N/A** | **0.002** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-11.02** | **1.02** | **0.24** | **N/A** | **0.002** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **2.1** | Total | PDO |
| | | | | **N/A** | **N/A** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

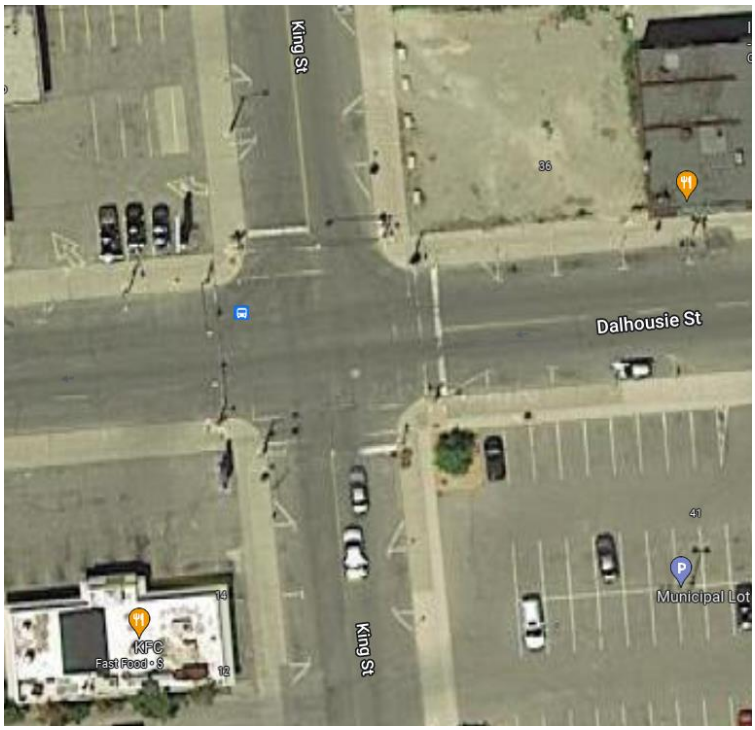
# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie Street, Brant Avenue and Icomm Drive Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **2500** | $16,250.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **785** | $8,635.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **325** | $2,600.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **1362** | $54,480.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **8** | $9,600.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$254,565.00** | **$254,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,320.00 | $18,480.00 | |
| A2.2 | Roadway Paving | | | **2,200** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 2,475 | $37,125.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 825 | $16,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 550 | $68,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 275 | $50,875.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **1,109** | $66,540.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **36** | $10,800.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$276,330.00** | **$276,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Reloaction | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $40,000.00 | 1 | $40,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $106,179.00 | 1 | $106,179.00 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$656,179.00** | **$656,000.00** |
| | | | | **Engineering (20%)** | **$188,421.80** | **$188,000.00** |
| | | | | **Contingency (20%)** | **$188,421.80** | **$188,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,563,917.60** | **$1,562,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie , Brant Avenue and Icomm Drive Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $18,000.00 | 1 | $18,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **2500** | $16,250.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **785** | $8,635.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | **325** | $2,600.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **1362** | $54,480.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **8** | $9,600.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$264,565.00** | **$264,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $1,500.00 | $21,000.00 | |
| A2.2 | Roadway Paving | | | **2,500** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 2,813 | $42,187.50 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 938 | $18,750.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 625 | $62,500.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 313 | $46,875.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **276** | $15,180.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **0** | $0.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **726** | $43,560.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$269,972.50** | **$270,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 15% Miscellaneous | lump sum | $80,180.63 | 1 | $80,180.63 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$255,180.63** | **$254,000.00** |
| | | | | **Engineering (20%)** | **$157,943.63** | **$158,000.00** |
| | | | | **Contingency (20%)** | **$157,943.63** | **$158,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,105,605.38** | **$1,104,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | 4C6995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & King Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which King Street is a two-lane north/south arterial, Dalhousie Street is a two lane, one-way arterial approaching from the east. The intersection connects at right angles between Dalhousie Street and King Street. |
| |  |
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | No operational problems have been experienced at this intersection. Intersection is expected to operate with a Level of Service A in the 2051 design horizon. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |

| | |
|---|---|
| | The intersection to the west is Dalhousie Street and Brant Avenue, and is a signalized four leg intersection with signalized pedestrian crossings on each leg. The intersection to the east is Dalhousie Street and Queen Street, which is a signalized four-leg intersection with signalized pedestrian crossings on each leg. The traffic analysis indicates that the adjacent intersections should not experience high queueing. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with reduced lane widths, on street parking on both sides and the introduction of separated cycling facilities. King Street will see no changes as a result of the EA. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 18 collisions were recorded for this intersection. See figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | The southeast, southwest, and northwest corners all have parking lots right to the property line. The northeast corner has a small vacant lot that would likely require a full buyout if any property taking was required. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a four-leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on King Street. Refer Appendix A for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |

| | |
|---|---|
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $986,000 | $1,050,000 |
| **Injury Collision Cost** | $ 765,000 | $ 511,000 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,880,000 | $1,582,000 |

Attach collision cost calculation sheets

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), contingency (20%) and maintenance (5%)

Implementation and NPV cost estimates can be found in Appendix A.

| | |
|---|---|
| **12** | Conclusion and Recommendations: |

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 18 collisions in the past 5 years (11 Property Damage only)
- The signalized intersection is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $298,000.
- Roundabout would require property taking, that will impact parking. The value of the parking spots is factored into the cost estimate.

It is recommended that the intersection remain as a signalized intersection. While in isolation this may be a fair candidate for a roundabout, this intersection is part of the downtown transportation system. All of the intersections have been confirmed that signalized is preferred, and it would be difficult to have one roundabout included as part of the network, specifically given the one way nature of Dalhousie Street.

Figure 1

# Collisions – Dalhousie at King

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** DALHOUSIE ST @ KING ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 18

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17-000567 | 2017-Jan-04, Wed,20:57 | Clear | Rear end | | West | Dry | Slowing or stopping | Automobile, station wagon | Skidding/sliding | Following too close | |
| **Comments:** | | | | | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 17-031195 | 2017-Aug-15, Tue,12:20 | Clear | Turning movement | | West | Dry | Turning left | Pick-up truck | Other motor vehicle | Improper turn | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | | Driving properly | |
| 17-44435 | 2017-Nov-18, Sat,17:38 | Rain | Sideswipe | P.D. only | West | Wet | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | West | Wet | Going ahead | Pick-up truck | Other motor vehicle | Driving properly | |
| 18-013335 | 2018-Apr-05, Thu,16:00 | Clear | Other | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | West | Dry | Stopped | Pick-up truck | Other motor vehicle | Driving properly | |
| 18-022501 | 2018-Jun-12, Tue,15:15 | Clear | SMV unattended vehicle | | West | Dry | Unknown | Motor home | Unattended vehicle | Driving properly | |
| **Comments:** | | | | | West | Dry | Parked | Passenger van | Other | | |
| 18-11940 | 2018-Mar-31, Sat,12:30 | Clear | Sideswipe | | West | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-12208 | 2018-Apr-02, Mon,12:50 | Clear | Turning movement | | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | | | Turning left | | | | |
| 18-13335 | 2018-Apr-05, Thu,16:00 | Clear | Rear end | | West | Dry | Stopped | Pick-up truck | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | West | | | | | | |
| 19-07153 | 2019-Feb-25, Mon,15:15 | Clear | Turning movement | P.D. only | West | Dry | Turning left | Passenger van | Other motor vehicle | Improper turn | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 19-10114 | 2019-Mar-21, Thu,01:30 | Rain | Angle | P.D. only | South | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | | | | | West | Wet | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-10394 | 2019-Mar-22, Fri,20:10 | Clear | Turning movement | P.D. only | West | Dry | Turning left | Automobile, station wagon | Other motor vehicle | Improper turn |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | |
| 19-11277 | 2019-Mar-29, Fri,15:45 | Clear | Rear end | P.D. only | West | Dry | Slowing or stopping | Pick-up truck | Other motor vehicle | Following too close |
| **Comments:** | | | | | West | Dry | Stopped | Pick-up truck | Other motor vehicle | Driving properly |
| 19-18011 | 2019-May-17, Fri,14:10 | Clear | Sideswipe | P.D. only | West | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-25475 | 2019-Jul-06, Sat,13:27 | Clear | Rear end | P.D. only | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Disobeyed traffic control |
| **Comments:** | D1 CAI 2(1)(A) TC1166160, D1 HTA 130(1) TC1166161 | | | | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-28518 | 2019-Jul-27, Sat,07:30 | Clear | Angle | P.D. only | West | Dry | Going ahead | Passenger van | Other motor vehicle | Failed to yield right-of-way |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-38676 | 2019-Oct-04, Fri,11:15 | Clear | SMV unattended vehicle | P.D. only | South | Dry | Parked | Automobile, station wagon | Other motor vehicle | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Unattended vehicle | Driving properly |
| 19-42740 | 2019-Nov-04, Mon,15:00 | Clear | Sideswipe | P.D. only | West | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly |
| 19-49473 | 2019-Dec-25, Wed,17:20 | Clear | Sideswipe | P.D. only | West | Dry | Changing lanes | Automobile, station wagon | Other motor vehicle | Improper lane change |
| **Comments:** | | | | | West | Dry | Going ahead | Pick-up truck | Other motor vehicle | Driving properly |

Figure 2

# Proposed Traffic Lights – Dalhousie at King

KING STREET

DALHOUSIE STREET

Asphalt

Concrete Sidewalk

Concrete Sidewalk

Concrete Sidewalk

Gravel
Parking Lot

2 STOREY
BUILDING
#40–42 DALHOUSIE ST.

N

TL

TL

TL

TL

TL

TL

Asphalt

Concrete Sidewalk

Concrete Sidewalk

Concrete Sidewalk

Concrete Sidewalk

Garden

Asphalt
Parking Lot

Asphalt
Parking Lot

Asphalt
Parking Lot

1 STOREY

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST.
& KING ST.
PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

P:\P\46995\100\46995–100–F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Dalhousie at King

2m CONCRETE SIDEWALK. MATCH INTO EXIST. TYP.

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.25m CONCRETE CURB AND NARROW GUTTER AS PER OPSD 600.080

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

KING ST

N

Direction of Traffic

DALHOUSIE ST

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

0.7m CONCRETE SEMI-MOUNTABLE CURB AND WIDE GUTTER AS PER OPSD 600.020

0.5m CONCRETE CURB AND GUTTER AS PER OPSD 600.040

FD3.1

Date: Oct.21/22

Scale: 1:250

**Example RAB**

MTE

Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

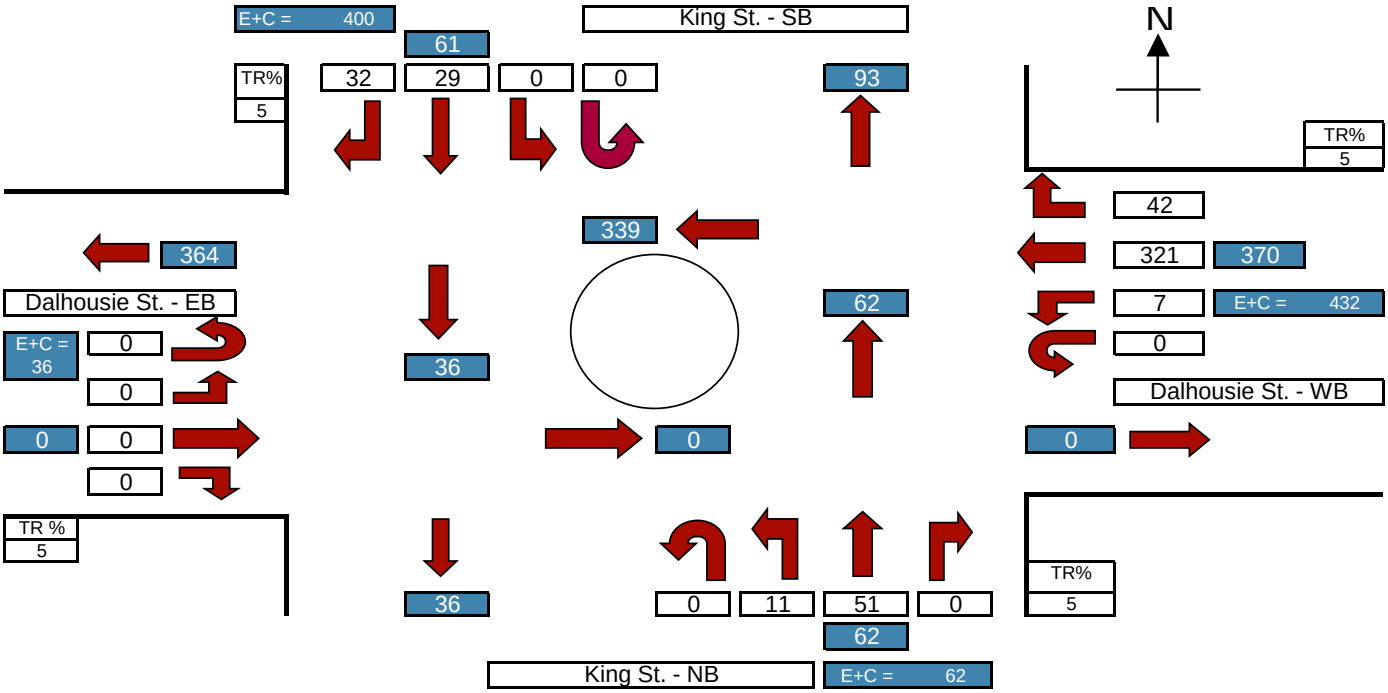
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & King Street
**Time Period:** **AM PEAK 2021**

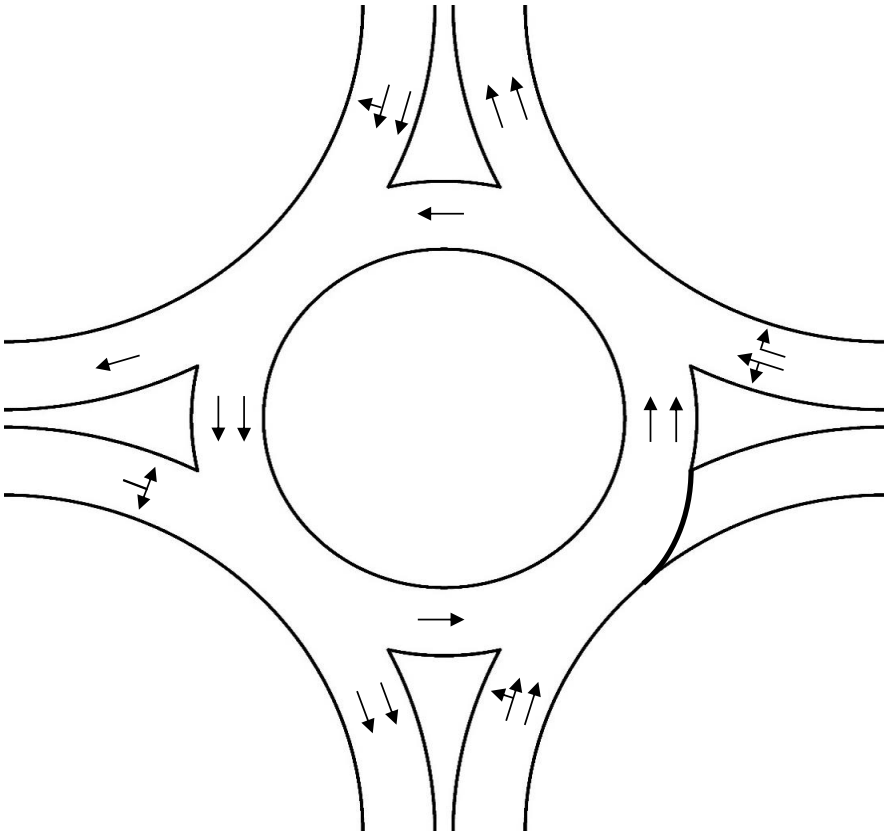
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

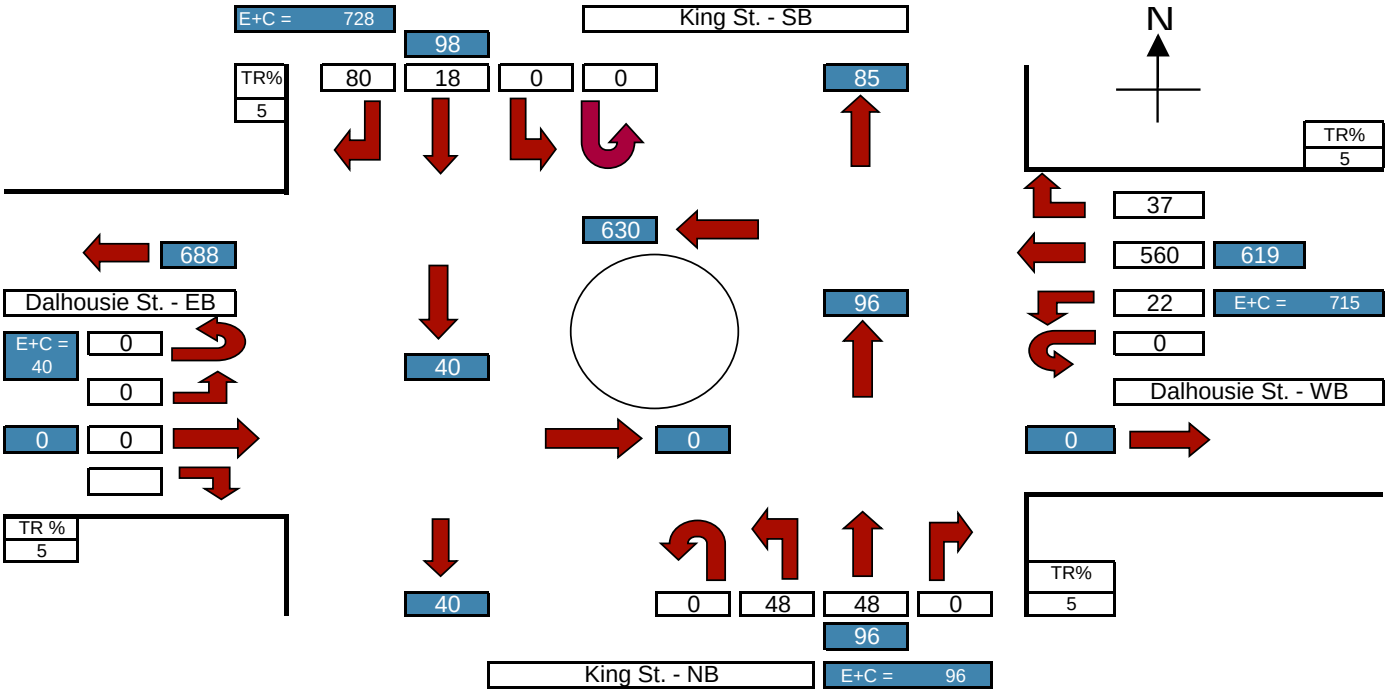
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| King St. - SB | 1.05 | 32 | 29 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| King St. - NB | 1.05 | 0 | 51 | 11 | 0 |
| Dalhousie St. - WB | 1.05 | 42 | 321 | 7 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & King Street
**Time Period:** **PM PEAK 2021**

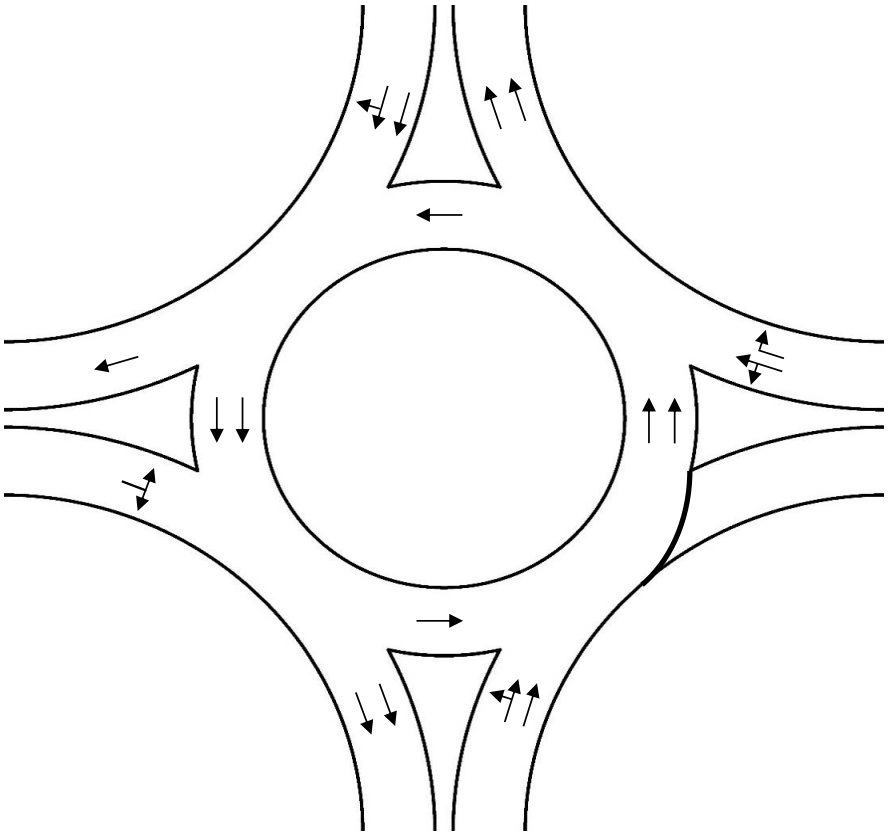
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

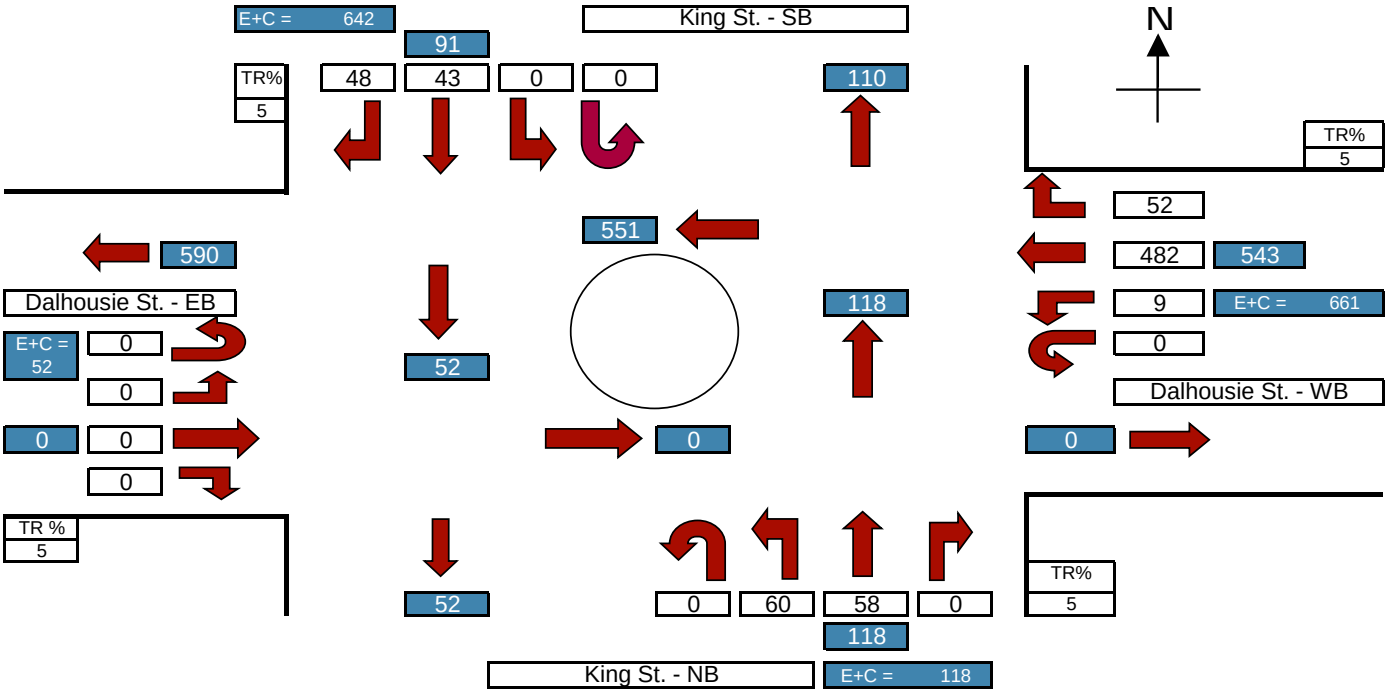
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| King St. - SB | 1.05 | 80 | 18 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| King St. - NB | 1.05 | 0 | 48 | 48 | 0 |
| Dalhousie St. - WB | 1.05 | 37 | 560 | 22 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & King Street
**Time Period:** **AM PEAK 2051**

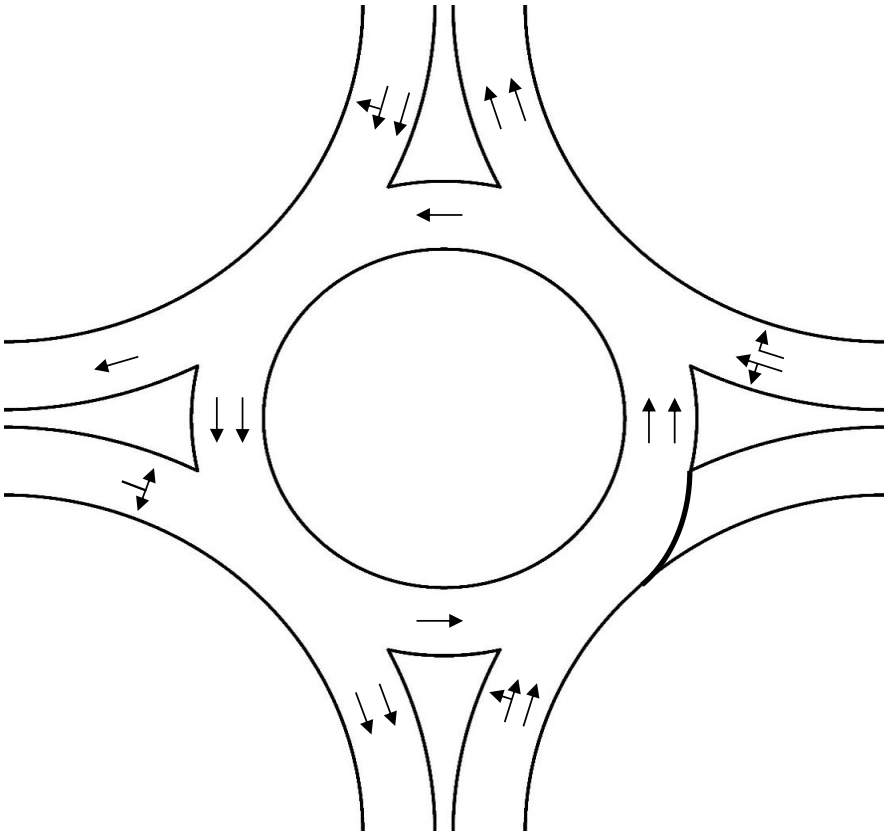
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

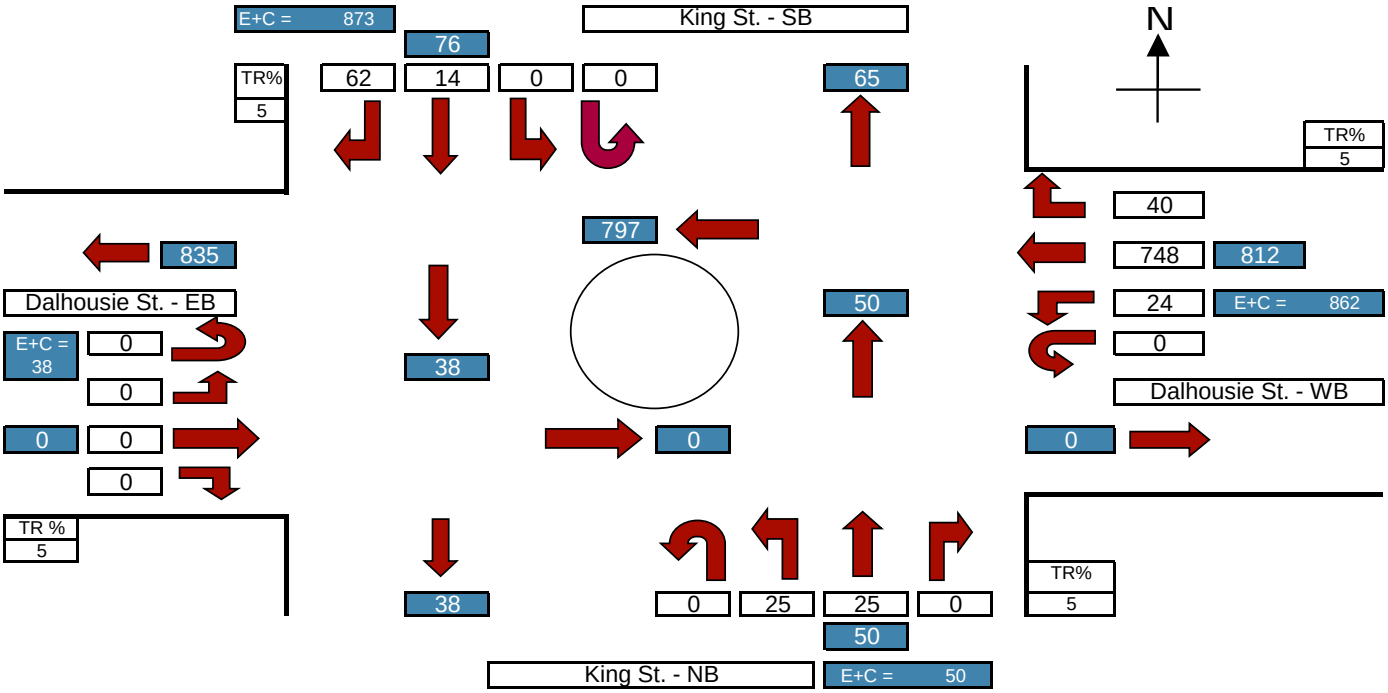
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| King St. - SB | 1.05 | 48 | 43 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| King St. - NB | 1.05 | 0 | 58 | 60 | 0 |
| Dalhousie St. - WB | 1.05 | 52 | 482 | 9 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & King Street
**Time Period:** **PM PEAK 2051**

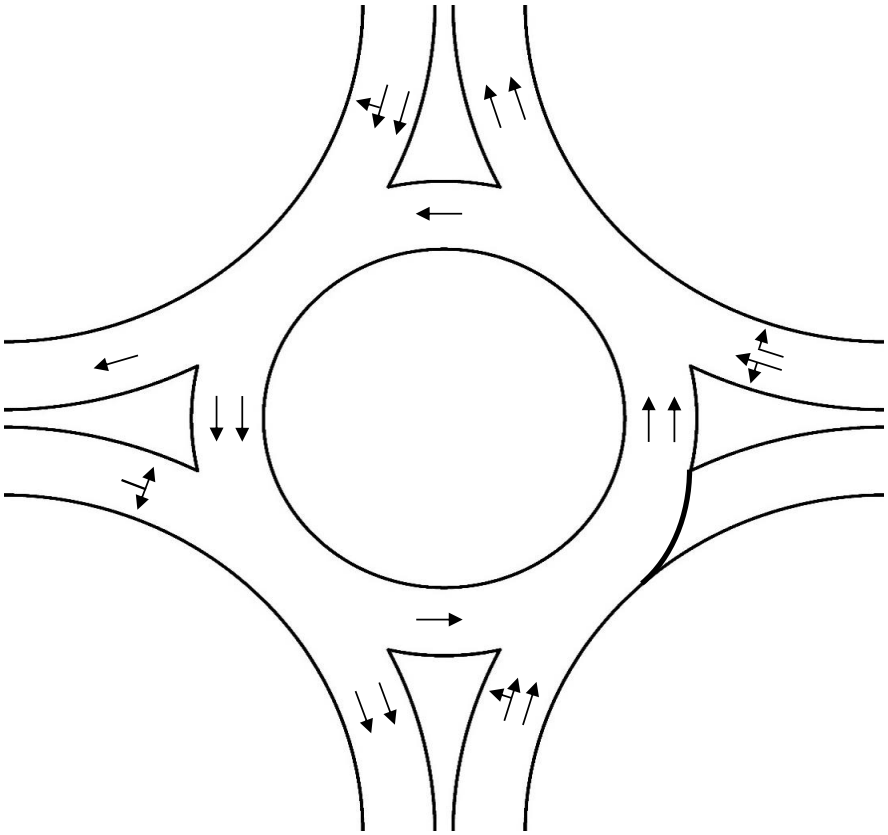
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| King St. - SB | 1.05 | 62 | 14 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| King St. - NB | 1.05 | 0 | 25 | 25 | 0 |
| Dalhousie St. - WB | 1.05 | 40 | 748 | 24 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Dalhousie St. & King St. ICS

**Major Road:** Dalhousie St.

**Minor Road:** King St.

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Signalized |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | NO |
| **Will the proposed intersection have illumination:** | YES |

**5-Year Total Collisions:** 18

**5-Year PDO Collisions:** 11

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 8,350

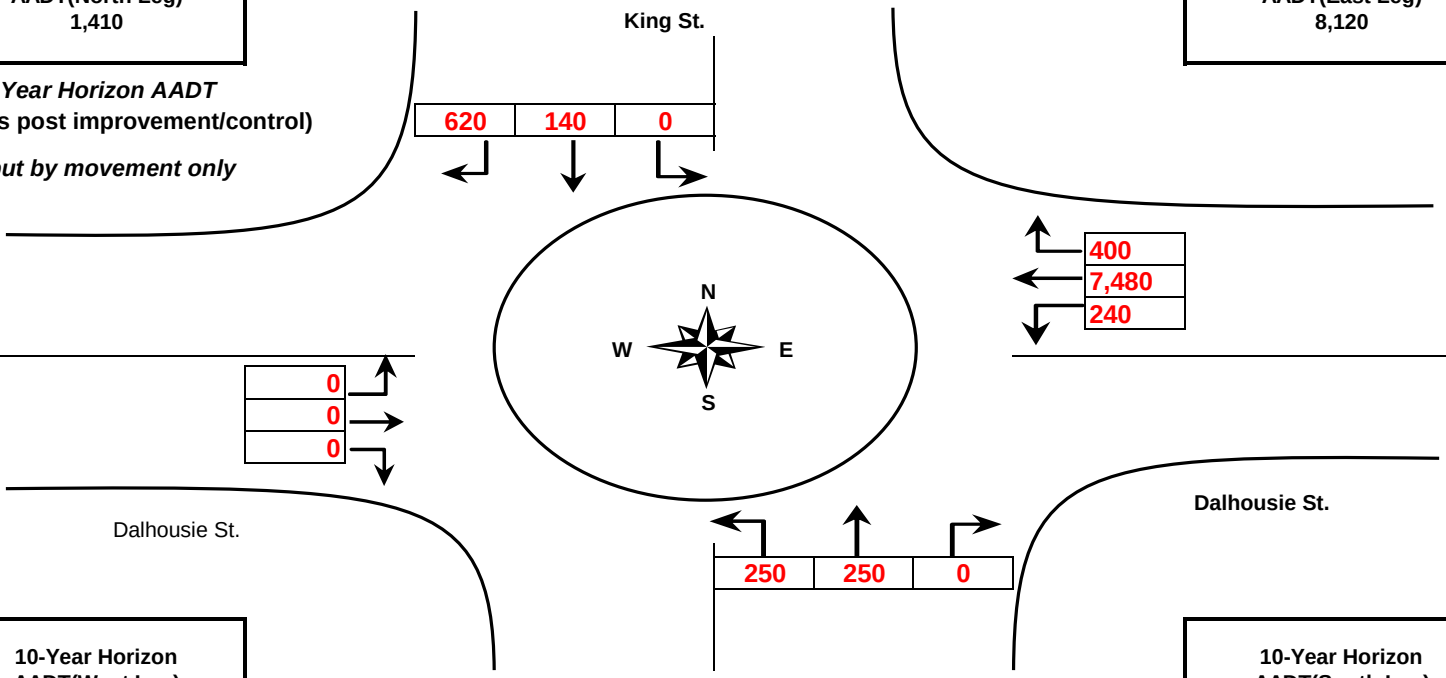
**Minor Road (mid-block) 10-Year Horizon AADT:** 1,410

**10-Year Horizon AADT(North Leg) 1,410**

**10-Year Horizon AADT(East Leg) 8,120**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 8,350**

**10-Year Horizon AADT(South Leg) 880**

**Direct Capital Costs**

| | |
|---|---|
| Fatal = | $1,656,500 |
| Injury = | $60,500 |
| $PDO_{SIG}$ = | $5,000 |
| $PDO_{RA}$ = | $4,500 |
| Discount Rate = | 0.06 |

**20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)**

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Signalized | $764,619.36 | $102,082.30 | $624,537.21 | $37,999.85 |
| Roundabout | $510,953.70 | $204,887.37 | $306,066.32 | $0.00 |

* Roundabout calibration Factor - 1.5

Region of Waterloo

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

*Last Rev JAN 2021*

**Scenario:** **Dalhousie St. & King St. ICS**

**Major Road:** **Dalhousie St.**
**Minor Road:** **King St.**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Signalized

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **4400**

**5-Year Total Collisions:** **18**

**5-Year PDO Collisions:** **11**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **2.68** | **1.78** | **0.90** | **0.00** |
| Roundabout | **4.41** | **3.97** | **0.44** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-10.99** | **1.07** | **0.23** | **N/A** | **0.002** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-11.02** | **1.02** | **0.24** | **N/A** | **0.002** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **2.1** | Total | PDO |
| | | | | **N/A** | **N/A** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie St. and King St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***August 12, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$220,233.00** | **$220,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$228,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $0.00 | |
| A6.3 | Utility Reloaction | lump sum | $270,000.00 | 1 | $25,000.00 | |
| A6.4 | Property Acquisition | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $85,000.00 | 1 | $40,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $89,424.60 | 1 | $89,424.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$304,424.60** | **$302,000.00** |
| | | | | **Engineering (20%)** | **$150,309.52** | **$150,000.00** |
| | | | | **Contingency (20%)** | **$150,309.52** | **$150,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,052,166.64** | **$1,050,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE
## Dalhousie St. and King St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***August 12, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $8,000.00 | 1 | $8,000.00 | |
| A1.4 | Site Office | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.5 | Traffic control | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A1.6 | Construction layout | lump sum | $18,000.00 | 1 | $18,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 0 | $0.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$228,433.00** | **$228,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $720.00 | $10,080.00 | |
| A2.2 | Roadway Paving | | | **1,200** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,350 | $20,250.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 450 | $9,000.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 300 | $30,000.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 150 | $22,500.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$286,722.00** | **$288,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 15% Miscellaneous | lump sum | $77,273.25 | 1 | $77,273.25 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$252,273.25** | **$250,000.00** |
| | | | | **Engineering (20%)** | **$109,815.05** | **$110,000.00** |
| | | | | **Contingency (20%)** | **$109,815.05** | **$110,000.00** |
| | | | | **Total Estimated Construction Cost** | **$987,058.35** | **$986,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Market Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of three-legs in which Market Street is a two-lane north/south collector, Dalhousie is a four lane, one-way arterial approaching from the east. |


| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | The intersection experiences high volumes of traffic at peak periods but has a Level of Service B and A indicating that there may be no operational issues. Intersection is expected to operate with a Level of Service B in the 2051 design horizon. |
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Dalhousie Street and Queen Street, which is a signalized four leg intersection with signalized pedestrian crossings on each leg. The intersection to the east is |

| | |
|---|---|
| | Dalhousie Street and George Street, which is a three-leg intersection with one way stop on George Street entering Dalhousie Street. There are pedestrian crossings on each leg but are not signalized. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with on-street parking on both sides. A recommendation in the EA is that Market Street be converted to more pedestrian friendly roadway. All traffic on Market Street will be share use, where no priority is given to any mode of transportation. Market Street will remain open to necessary traffic for parking and deliveries but cut through traffic will be discouraged. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 7 collisions were recorded for this intersection. See Figure 1 for detailed breakdown of collision history. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Each of the corners of the intersection has commercial buildings adjacent to the right of way. There are physical constraints on each corner that will constrain any significant design changes. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2, which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a three-leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on Market Street. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $938,000 | $1,432,000 |
| **Injury Collision Cost (20 Year NPV)** | $ 311,958.92 | $ 187,087.03 |
| **NPV Maintenance** | $129,000 | $21,000 |
| **TOTAL** | $1,378,958.92 | $1,640,087.03 |

Attach collision cost calculation sheets

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

See Appendix B for 20 Year NPV and Implementation cost estimates

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 7 collisions in the past 5 years (2 Property Damage only)
- The roundabout is the higher cost alternative over the 20-Year life cycle cost, when the social impacts of the intersection are included. The capital cost of the roundabout is approximately $494,000.
- Roundabout would require property taking. While estimates are included for property taking, buildings that extend to property line may require full buyouts. The property taking costs could be substantially higher.

The recommendation for the Dalhousie Street at Market Street intersection is that the City proceed with a signalized intersection. The signalized intersection functions very well in the 2051 planning horizon, and requires no property taking.

Figure 1

# Collisions – Dalhousie at Market

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** DALHOUSIE ST @ MARKET ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 7

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 008950 | 2017-Mar-10, Fri,17:45 | Snow | | | West | Ice | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | | | | | | | |
| 009684 | 2017-Mar-19, Sun,02:19 | Clear | Angle | P.D. only | East | Wet | Going ahead | Truck - dump | Other | Other | |
| **Comments:** | | | | | South | Wet | Slowing or stopping | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 020992 | 2017-Jun-07, Wed,17:07 | Clear | SMV unattended vehicle | P.D. only | West | Dry | Slowing or stopping | Pick-up truck | Unattended vehicle | Driving properly | |
| **Comments:** | | | | | West | Dry | Parked | Automobile, station wagon | Other motor vehicle | | |
| 17-48894 | 2017-Dec-22, Fri,17:03 | Clear | Turning movement | | West | Dry | Turning right | Pick-up truck | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | | | Going ahead | | | | |
| 18-035924 | 2018-Sep-10, Mon,10:25 | Clear | | | West | Dry | Turning right | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | | | | | | | |
| 19-27808 | 2019-Jul-22, Mon,18:15 | Clear | SMV other | Non-fatal injury | North | Dry | Turning right | Automobile, station wagon | Pole (sign, parking meter) | Improper turn | |
| **Comments:** | | | | | | | | | | | |
| 19-41009 | 2019-Oct-22, Tue,09:28 | Rain | SMV other | Non-fatal injury | West | Wet | Going ahead | Automobile, station wagon | Pedestrian | Lost control | |
| **Comments:** | | | | | | | | | | | |

Figure 2

# Proposed Traffic Lights – Dalhousie at Market

MARKET STREET

DALHOUSIE STREET

2 STOREY
STONE
BUILDING

#102 DALHOUSIE ST.

Interlocking Brick

Interlocking Brick

3 STOREY
COMMERCIAL
BUILDING

#112–116 DALHOUSIE ST.

3 STOREY
COMMERCIAL
BUILDING

#122–134 DALHOUSIE ST.

TL

TL

TL

TL

TL

TL

1 STOREY
COMMERCIAL
BUILDING

#32 MARKET ST.

Interlocking Brick

Interlocking Brick

2 STOREY
COMMERCIAL
BUILDING

#1 MARKET ST.

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST.
& MARKET ST.
PROPOSED TRAFFIC LIGHTS**

MTE

Engineers, Scientists, Surveyors

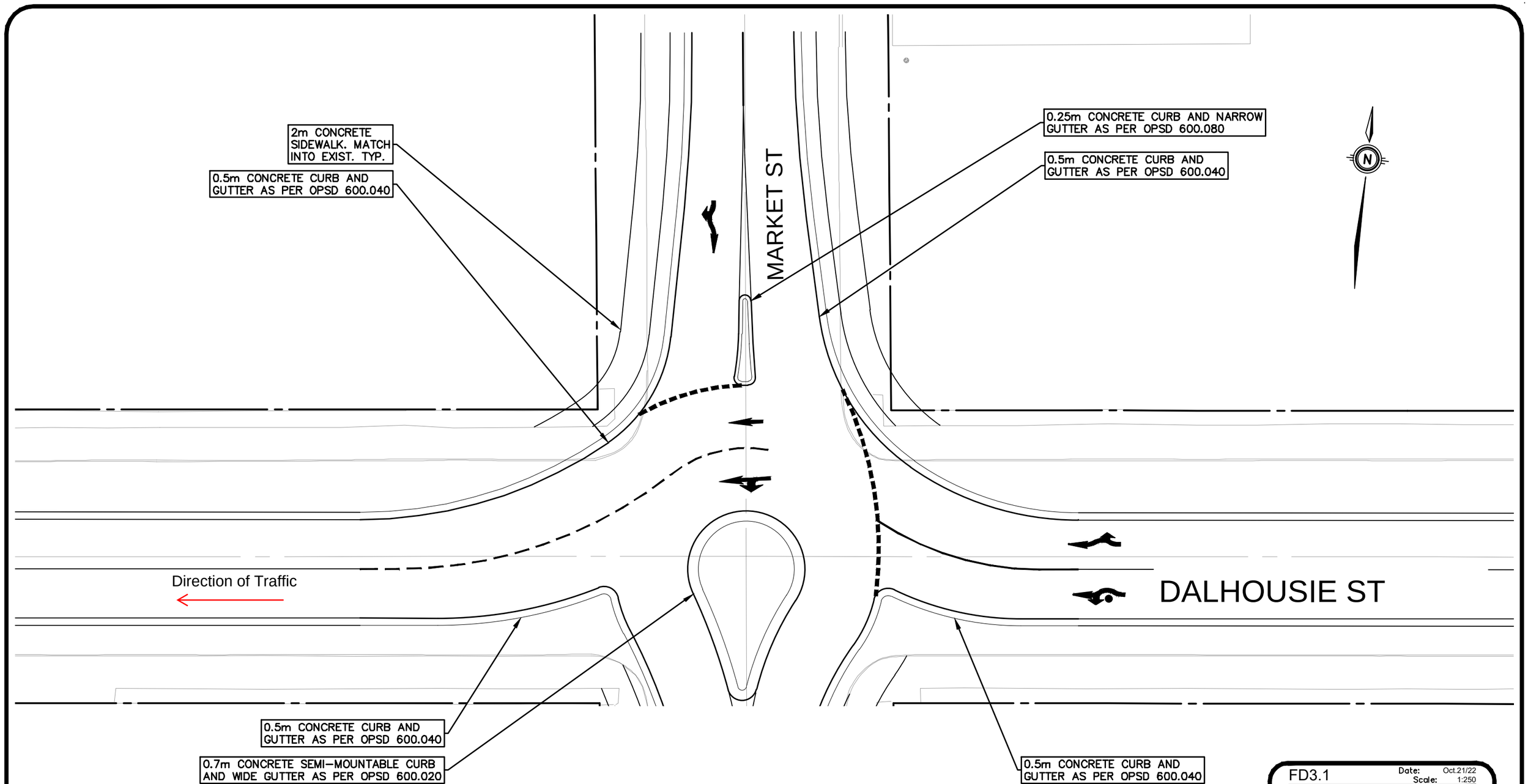
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Dalhousie at Market




FD3.1

Date: Oct.21/22
Scale: 1:250

**Example RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

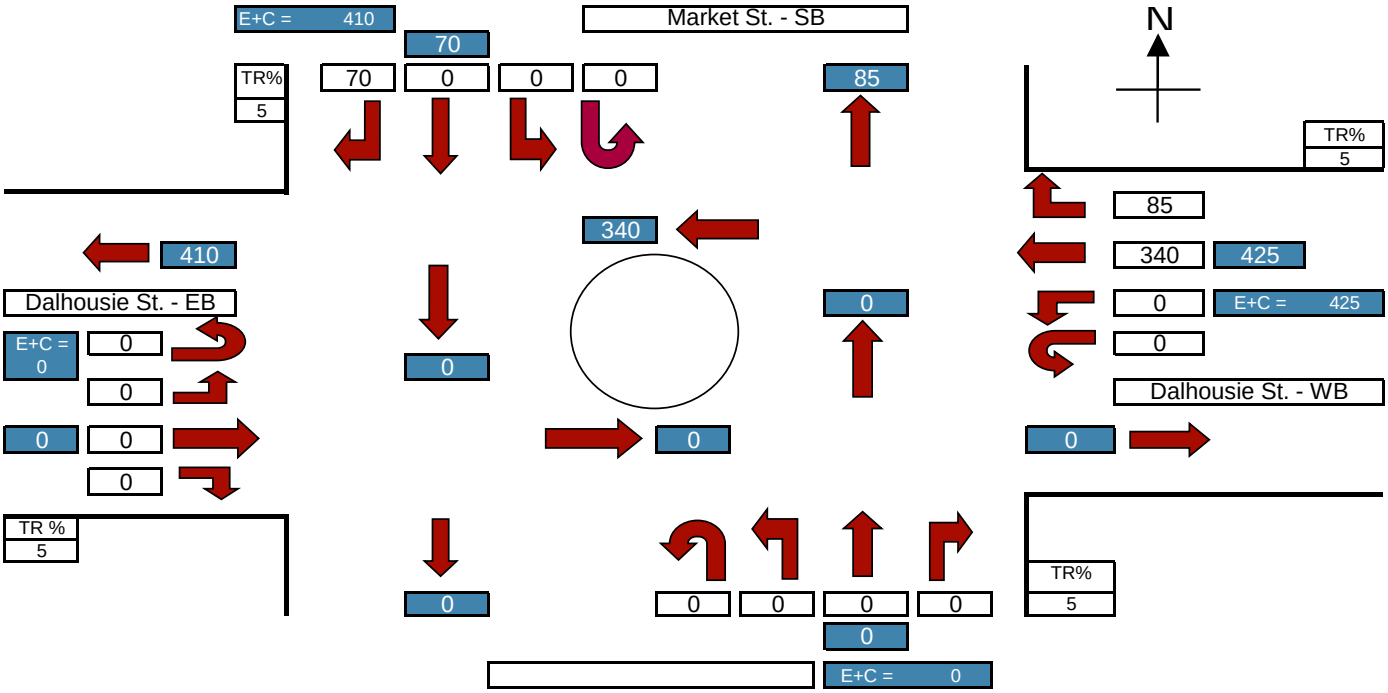
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Market Street
**Time Period:** **AM PEAK 2021**

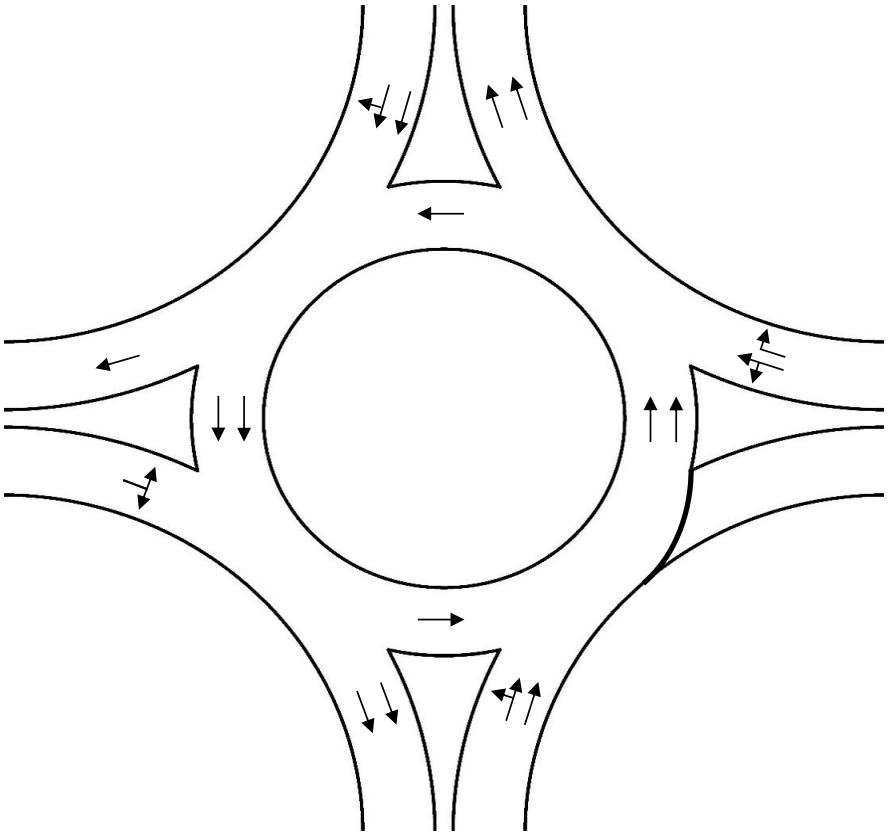
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

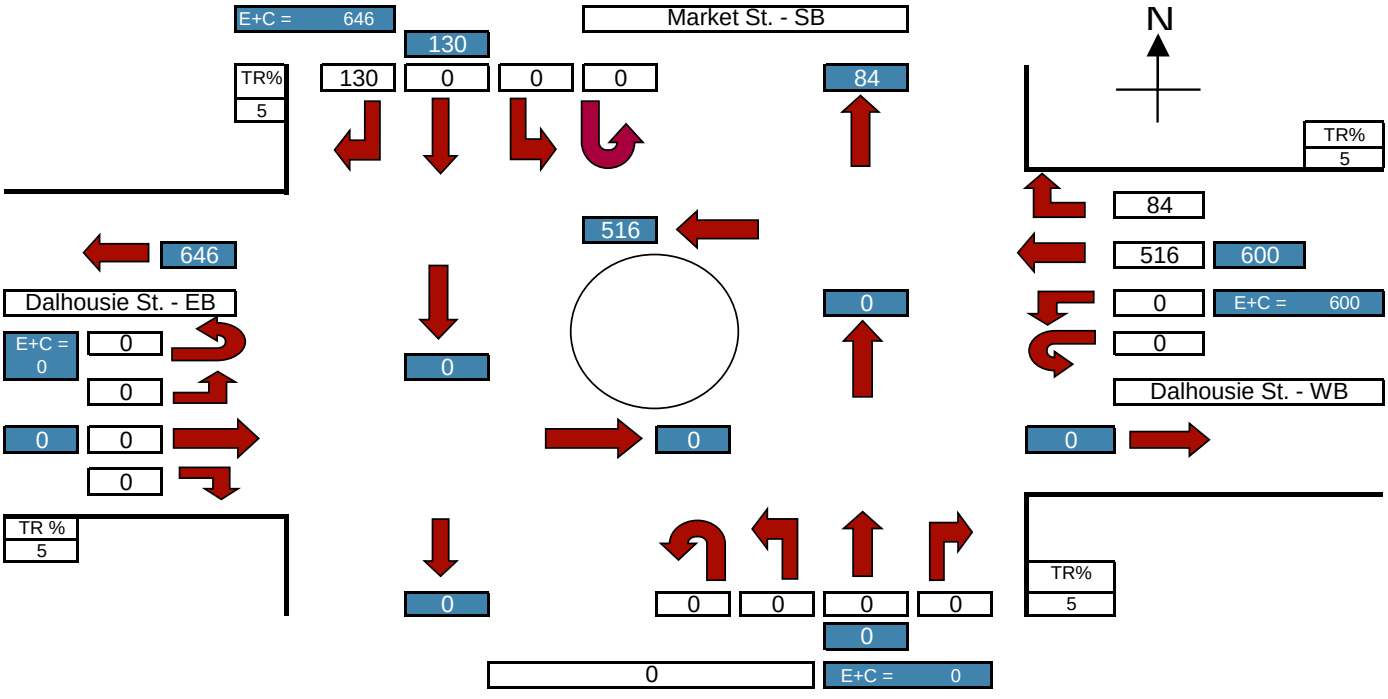
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Market St. - SB | 1.05 | 70 | 0 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Dalhousie St. - WB | 1.05 | 85 | 340 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Market Street
**Time Period:** **PM PEAK 2021**

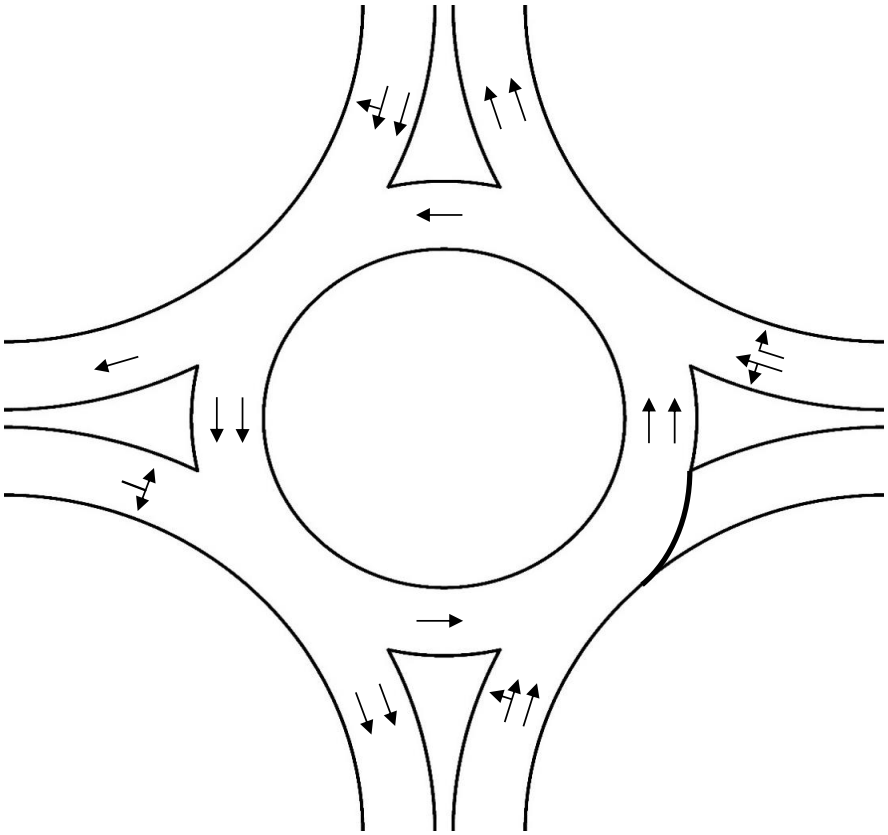
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

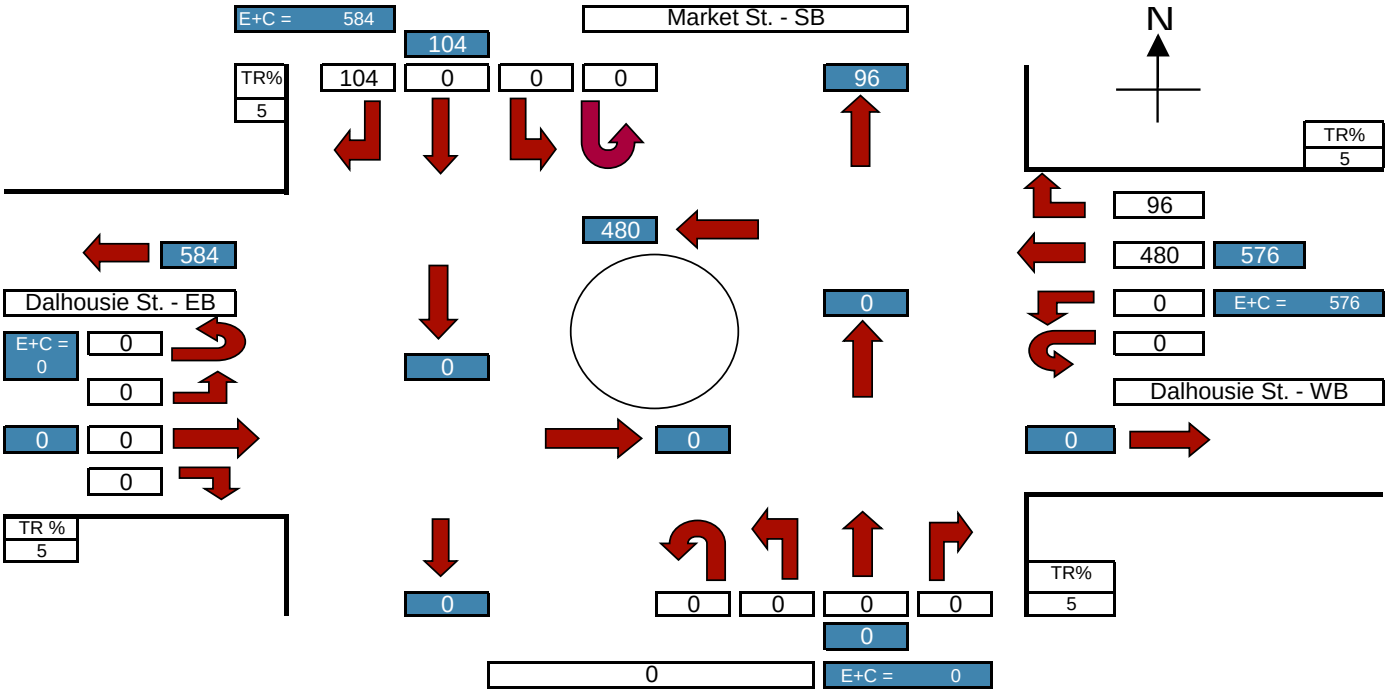
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Market St. - SB | 1.05 | 130 | 0 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Dalhousie St. - WB | 1.05 | 84 | 516 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Market Street
**Time Period:** **AM PEAK 2051**

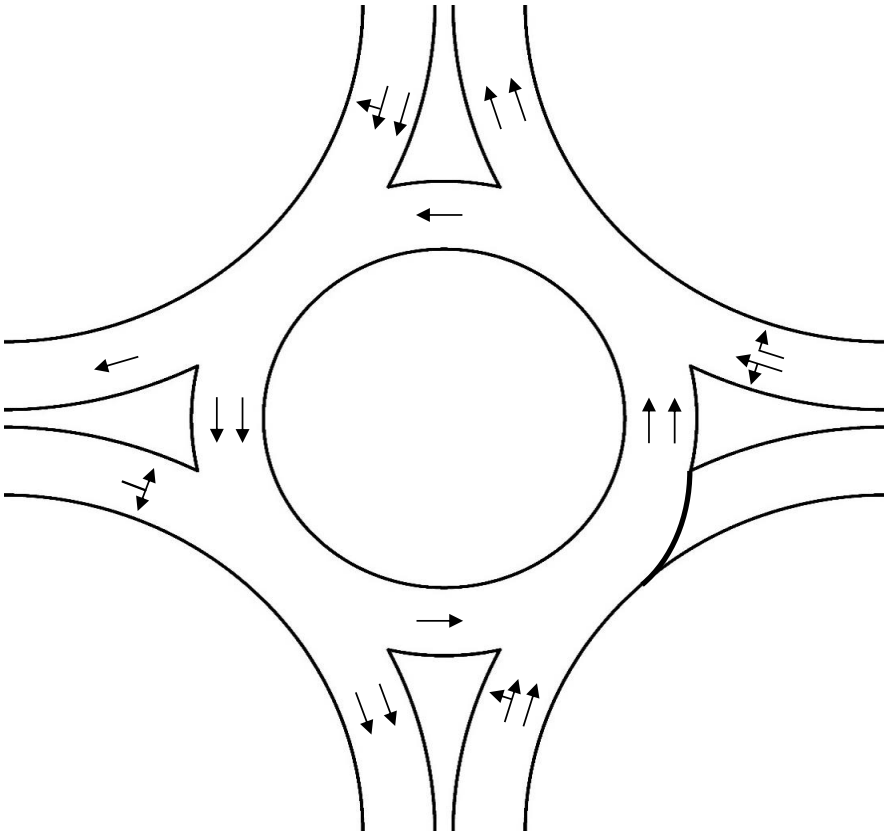
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

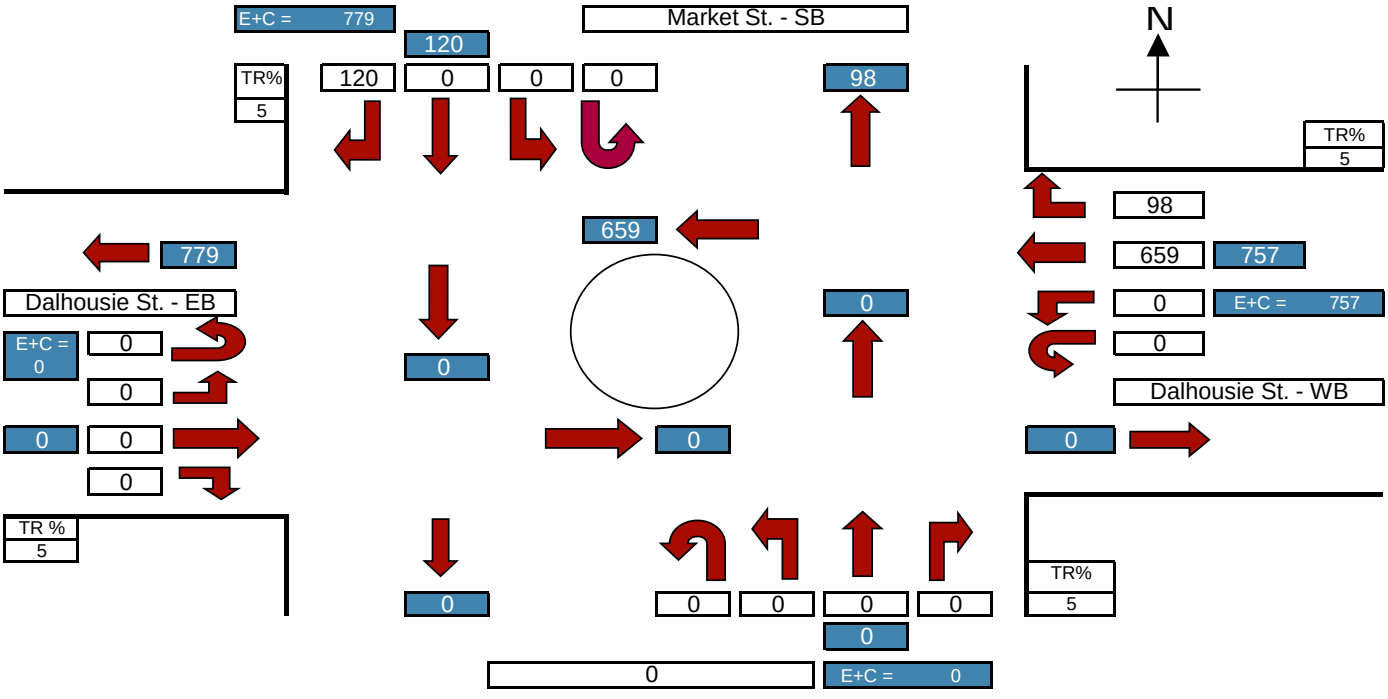
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Market St. - SB | 1.05 | 104 | 0 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Dalhousie St. - WB | 1.05 | 96 | 480 | 0 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Market Street
**Time Period:** **PM PEAK 2051**

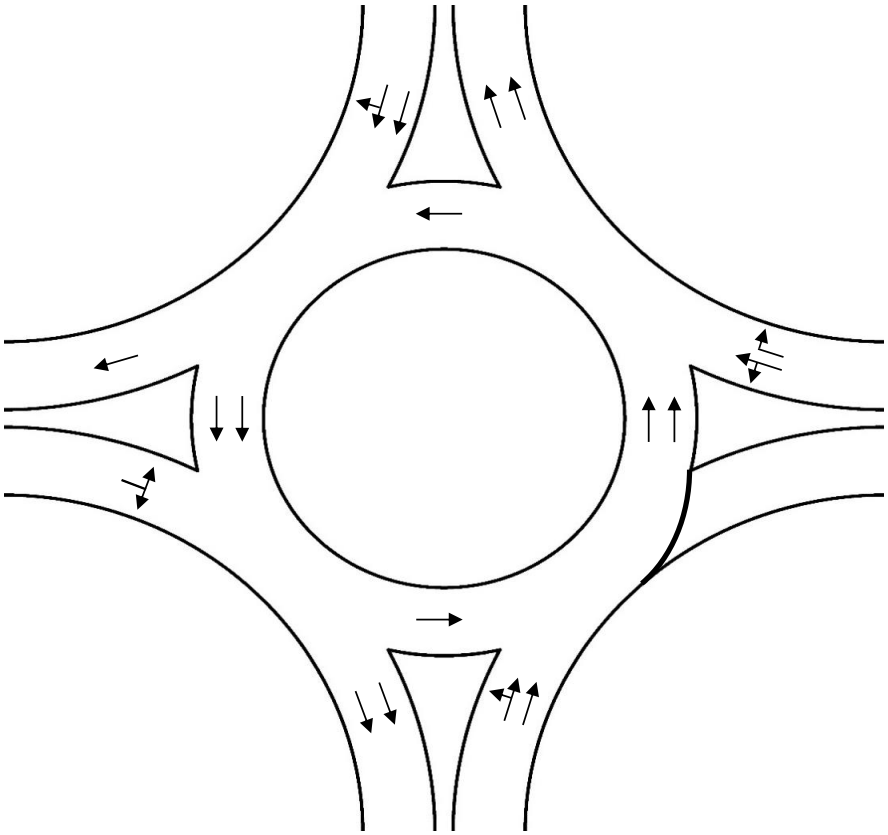
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Market St. - SB | 1.05 | 120 | 0 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| 0 | 1.05 | 0 | 0 | 0 | 0 |
| Dalhousie St. - WB | 1.05 | 98 | 659 | 0 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Dalhousie St. & Market St. ICS

**Major Road:** Dalhousie Street

**Minor Road:** Market Street

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Stop Control |
| **Proposed Config.** | 3-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

| | |
|---|---|
| **Is there going to be any fully protected left-turn phasing?** | YES |
| **Number of approaches with FPLTP:** | N/A |
| **Is the proposed intersection "new" or is it existing:** | EXISTING |
| **Does control and number of approaches remain the same:** | YES |
| **Will the proposed intersection have illumination:** | YES |

**5-Year Total Collisions:** 7

**5-Year PDO Collisions:** 2

**Proposed RA Configuration?** MULTI - 3 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 7,790

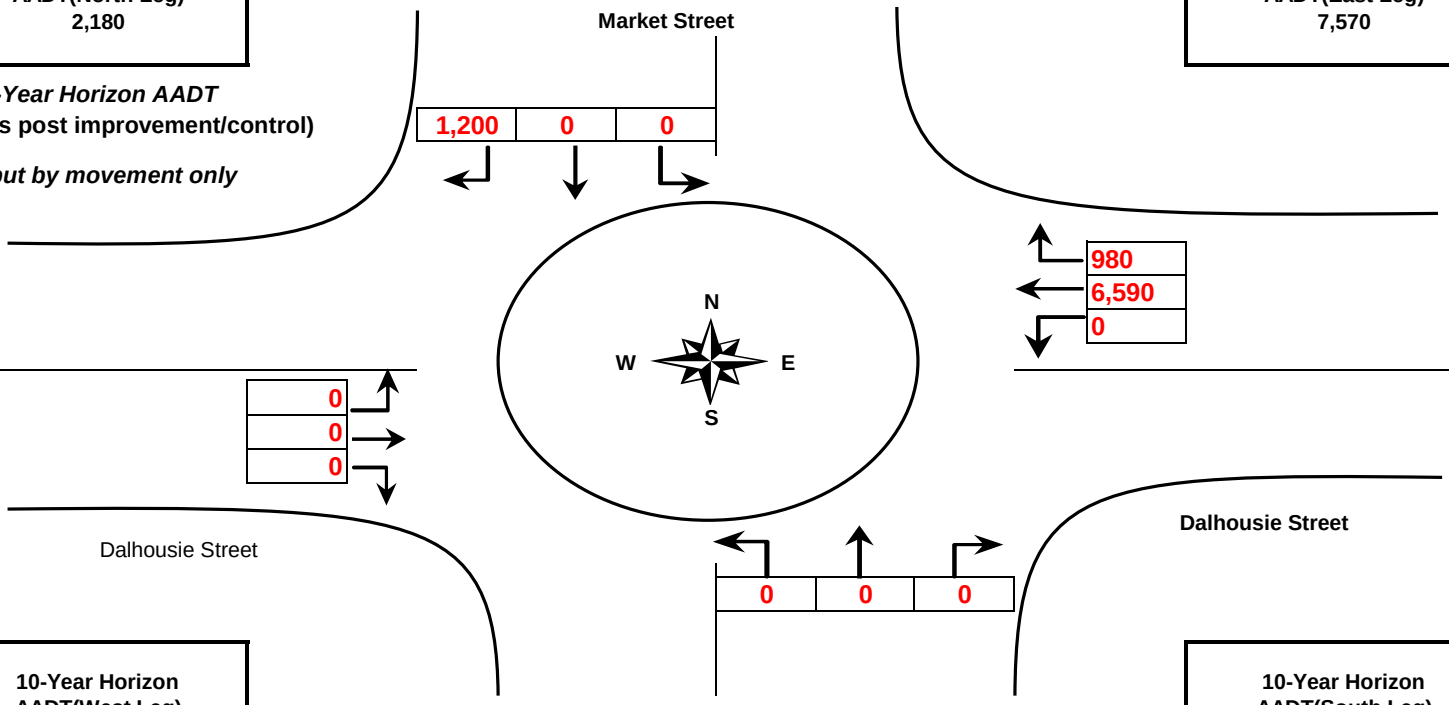
**Minor Road (mid-block) 10-Year Horizon AADT:** 2,180

**10-Year Horizon AADT(North Leg) 2,180**

**10-Year Horizon AADT(East Leg) 7,570**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 7,790**

**10-Year Horizon AADT(South Leg) 0**

**Direct Capital Costs**

| | |
|---|---|
| Fatal = | $1,656,500 |
| Injury = | $60,500 |
| $PDO_{SIG}$ = | $5,000 |
| $PDO_{RA}$ = | $4,500 |
| Discount Rate = | 0.06 |

## 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Stop Control | $311,958.92 | $17,204.88 | $256,754.19 | $37,999.85 |
| Roundabout | $187,087.03 | $75,020.05 | $112,066.98 | $0.00 |

* Roundabout calibration Factor - 0.9

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** **Dalhousie St. & Market St. ICS**

**Major Road:** **Dalhousie Street**
**Minor Road:** **Market Street**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Stop Control

**Proposed Config.** 3-Leg Intersection

**Roundabout Conflicts:** **2400**

**5-Year Total Collisions:** **7**

**5-Year PDO Collisions:** **2**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Stop Control | **0.67** | **0.30** | **0.37** | **0.00** |
| Roundabout | **1.61** | **1.45** | **0.16** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 3-Leg Intersection | **-13.36** | **1.11** | **0.41** | **0.8** | **0.006** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Stop Control | 3-Leg Intersection | **-15.38** | **1.2** | **0.51** | **0.77** | **0.006** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **0.61** | Total | PDO |
| | | | | **1.563701491** | **1.080277513** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)
## Dalhousie St. and Market St. Intersection
## Intersection Improvements EA
## Project No. 46995-100
***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $300,000.00 | 1 | $300,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$620,824.60** | **$620,000.00** |
| | | | | **Engineering (20%)** | **$204,989.52** | **$205,000.00** |
| | | | | **Contingency (20%)** | **$204,989.52** | **$205,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,434,926.64** | **$1,432,000.00** |

## TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Market St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $306.00 | $4,284.00 | |
| A2.2 | Roadway Paving | | | **510** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 574 | $8,606.25 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 191 | $3,825.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 128 | $12,750.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 64 | $9,562.50 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$233,919.75** | **$235,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $82,230.55 | 1 | $82,230.55 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$257,230.55** | **$258,000.00** |
| | | | | **Engineering (20%)** | **$133,676.66** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$133,676.66** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$935,736.62** | **$938,000.00** |

| | | | |
|---|---|---|---|
| **Project Name:** | Brantford Streetscaping Class EA | **MTE File No.:** | C46995-100 |
| **Project City:** | Brantford | **Date:** | October 28, 2022 |
| **Intersection:** | Dalhousie Street & Queen Street | **Completed By:** | MTE Consultants Inc. |

| | |
|---|---|
| **1** | Description of the existing intersection: (number of legs, lanes on each leg, skew, offset, etc.) (include a sketch showing existing and horizon year turning movements, if available) |
| | The intersection consists of four legs in which Queen Street is a two-lane north/south arterial, Dalhousie Street is a four lane, one-way arterial approaching from the east. The intersection connects at right angles between Queen Street and Dalhousie Street. |


| | |
|---|---|
| **2** | Is this a new or existing Intersection? If existing, what is the current traffic control? |
| | This intersection is currently signal controlled with full pedestrian signals. |
| **3** | Are there any operational problems experienced at this intersection? If so explain: |
| | No operational problems have been experienced at this intersection. Intersection is expected to operate with a Level of Service A in the 2051 design horizon. |

| | |
|---|---|
| **4** | Describe adjacent intersections, pedestrian crossings, railroad crossings, driveways, etc. Are adjacent ques a potential problem? |
| | The intersection to the west is Dalhousie Street and King Street, and is a signalized four leg intersection with signalized pedestrian crossings on each leg. The intersection to the east is Dalhousie Street and Market Street, which is a signalized three-leg intersection with signalized pedestrian crossings on each leg. The traffic analysis indicates that the adjacent intersections should not experience high queueing. |
| **5** | Is the intersection located within a coordinated signal system? |
| | It is assumed that the one-way traffic along Dalhousie is controlled by a coordinated signal system. To be confirmed by City staff. |
| **6** | Is the intersection located within a corridor scheduled for improvements within the next 10 years? If so, what is the ultimate cross section of the approaching streets? |
| | Yes, this roundabout screening is being completed as part of the Downtown Brantford Streetscape EA, which has determined that the one-way traffic along Dalhousie Street will remain. The street will remain two lanes of traffic on Dalhousie Street, with reduced lane widths, parking on both sides, and the introduction of separated cycling facilities. Queen Street is expected to be converted to a one-way street with southbound traffic only. |
| **7** | What is the collision history over the past five years? Are there collision problems that need to be addressed? |
| | Between the year 2017 & 2019, 7 collisions were recorded for this intersection. Please refer to Figure 1 for collision history data. |
| **8** | Describe the neighbouring land use and physical constraints such as buildings or steep grades which may provide technical constraints, such as sight distance requirements. |
| | Each corner of the intersection has buildings immediately adjacent to the right of way. Brantford's City Hall is located on the northeast corner. Any property taking would result in impact to the buildings, resulting in complete buy outs for property. There are physical constraints on each corner. |
| **9** | What traditional intersection improvement is warranted/planned for this intersection? Provide a sketch. |
| | A traditional improvement would consist of the same lane configuration and updated signal system. Refer to Figure 2 which shows the proposed signalized design option. |
| **10** | What size of roundabout is being considered for this intersection? Provide a Traffic Flowsheet c/w lane configuration diagram, as well as a sketch showing how a roundabout would 'fit' at this intersection. Highlight any potential right-of-way requirements. |
| | For this intersection a four-leg roundabout would be considered with two lanes in each direction east/west on Dalhousie Street, with a single lane north/south on Queen Street. Refer Appendix |

| | |
|---|---|
| | A for adjusted base year and future projected traffic flowsheets. Figure 3 provides a sketch of a potential roundabout configuration for the intersection. |
| **11** | Provide a 20 year life cycle cost estimate comparison of a traditional vs roundabout traffic control. |

| 20 Year Life Cycle Cost Comparison | | |
|---|---|---|
| **Cost Item** | **Stop/Signal Control** | **Roundabout** |
| **Implementation Cost** | $950,000 | $1,712,000 |
| **Injury Collision Cost** | $742,654.46 | $593,701.28 |
| **Total Life Cycle Cost** | $129,000 | $21,000 |
| **Total** | $1,821,654.46 | $2,326,701.28 |

Implementation costs include construction, property, utility relocations, illumination, engineering (20%), and contingency (20%).

Implementation and NPV cost estimates can be found in Appendix A.

**12** Conclusion and Recommendations:

Conclusions are based on the results of the roundabout screening:

- This intersection has seen 7 collisions in the past 5 years (3 Property Damage only)
- The roundabout is the higher cost alternative over the 20-Year life cycle cost. The difference in capital cost of the roundabout is approximately $762,000.
- Roundabout would require property taking that would directly impact buildings. While estimates are included for property taking, the affected properties would likely require full buyouts.

The recommendation for the Queen Street intersection is that the City proceed with a signalized intersection. There are no indications of congestion at this intersection, and the cost of implementing a roundabout would be substantially greater than maintaining signalization.

Figure 1

# Collisions – Dalhousie at Queen

# Collision Details Report

**From:** January 1, 2017 **To:** December 31, 2019

**Location .....** DALHOUSIE ST @ QUEEN ST **Municipality.....** BRANTFORD

**Traffic Control....** Traffic signal **Total Collisions....** 7

| Collision ID | Date/Day/Time | Environment | Impact Type | Classification | Direction | Surface Cond'n | Vehicle Manoeuver | Vehicle type | First Event | Driver Action | No. Ped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18-024183 | 2018-Jun-24, Sun,15:00 | Clear | Sideswipe | P.D. only | North | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | North | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-027688 | 2018-Jul-17, Tue,11:30 | Clear | Turning movement | | South | Dry | Turning right | Automobile, station wagon | Other motor vehicle | Driving properly | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-028514 | 2018-Jul-23, Mon,09:00 | Clear | SMV unattended vehicle | | West | Dry | Parked | Automobile, station wagon | Other motor vehicle | | |
| **Comments:** | | | | | | | | | | | |
| 18-038571 | 2018-Sep-30, Sun,12:50 | Clear | Sideswipe | | West | Dry | Changing lanes | Passenger van | Other motor vehicle | Improper lane change | |
| **Comments:** | | | | | West | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 18-09688 | 2018-Mar-15, Thu,12:28 | Clear | Sideswipe | | South | Dry | Pulling away from shoulder or curb | Automobile, station wagon | Other motor vehicle | Failed to yield right-of-way | |
| **Comments:** | | | | | South | Dry | Going ahead | Automobile, station wagon | Other motor vehicle | Driving properly | |
| 19-09855 | 2019-Mar-19, Tue,06:50 | Clear | Turning movement | P.D. only | South | Dry | Turning right | Pick-up truck | Other motor vehicle | Improper turn | |
| **Comments:** | | | | | South | Dry | Turning right | | Other motor vehicle | Driving properly | |
| 19-20773 | 2019-Jun-04, Tue,17:30 | Clear | Rear end | P.D. only | West | Dry | Slowing or stopping | Passenger van | Other motor vehicle | Following too close | |
| **Comments:** | | | | | West | Dry | Stopped | Automobile, station wagon | Other motor vehicle | Driving properly | |

Figure 2

# Proposed Traffic Lights – Dalhousie at Queen

QUEEN STREET

DALHOUSIE STREET

2 STOREY
BUILDING
#50–54 DALHOUSIE ST.

3 STOREY
STONE
BUILDING
#60 DALHOUSIE ST.

2 STOREY
COMMERCIAL
BUILDING
#57–59 DALHOUSIE ST.

4 STOREY
COMMERCIAL
BUILDING

STOREY
UILDING
SITOR PLACE

ALHOUSIE ST.

Concrete Sidewalk

Concrete Sidewalk

Concrete Ramp

Concrete Sidewalk

Concrete Sid

Interlocking Brick

Interlocking Brick

TL

N

Date: NOV 02/22
Scale: 1:250

**DALHOUSIE ST.
& QUEEN ST.
PROPOSED TRAFFIC LIGHTS**

MTE
Engineers, Scientists, Surveyors

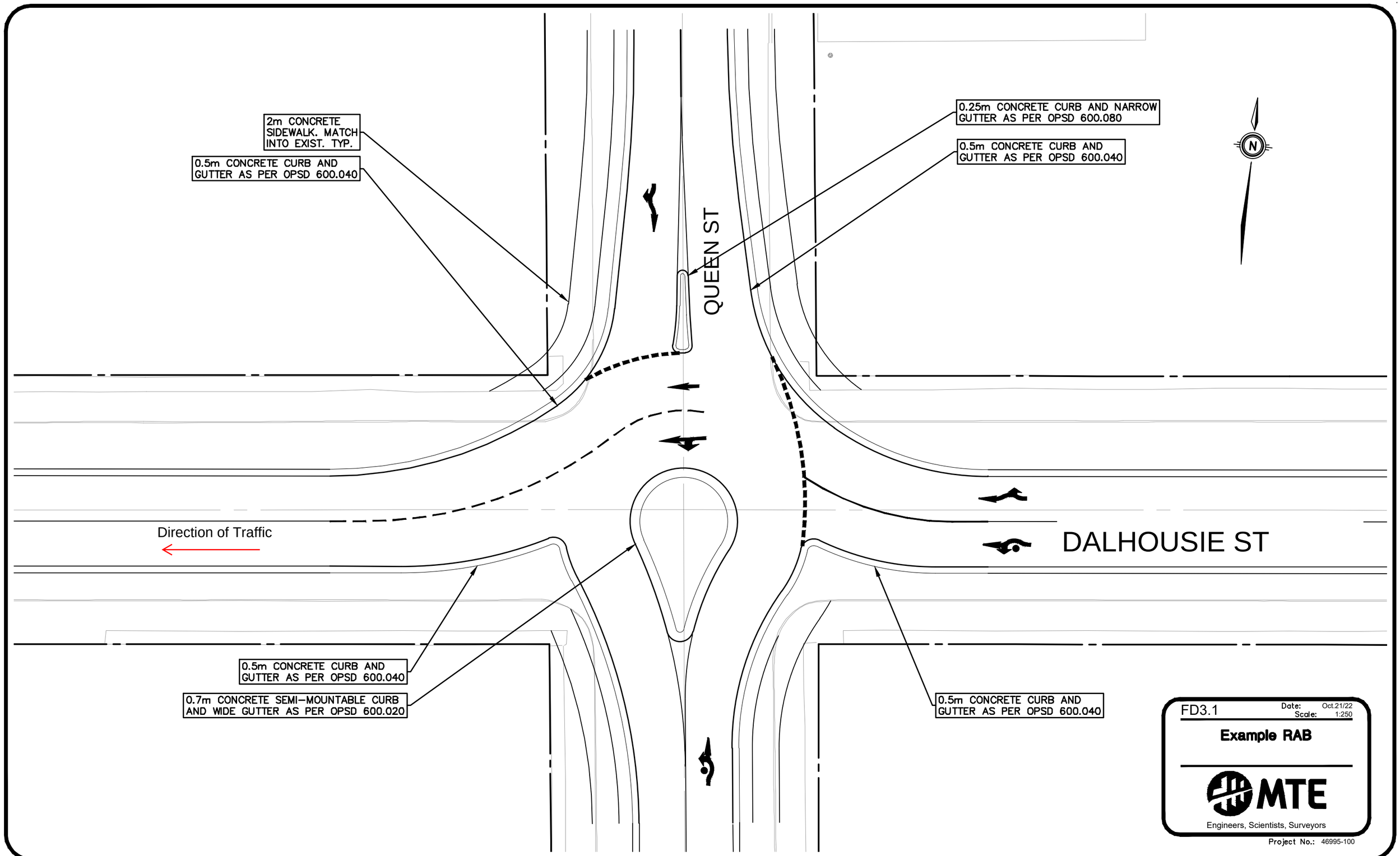
Project No.: 46995-100

P:\P\46995\100\46995-100-F2.dwg

November 2, 2022 — 2:02 p.m. — Plotted By: EMcDonald

Figure 3

# RAB Example – Dalhousie at Queen




FD3.1

Date: Oct.21/22
Scale: 1:250

**Example RAB**

MTE
Engineers, Scientists, Surveyors

Project No.: 46995-100

October 21, 2022 — 11:08 a.m. — Plotted By: AHegarty

P:\P\46995\100\46995-100-FD3.dwg

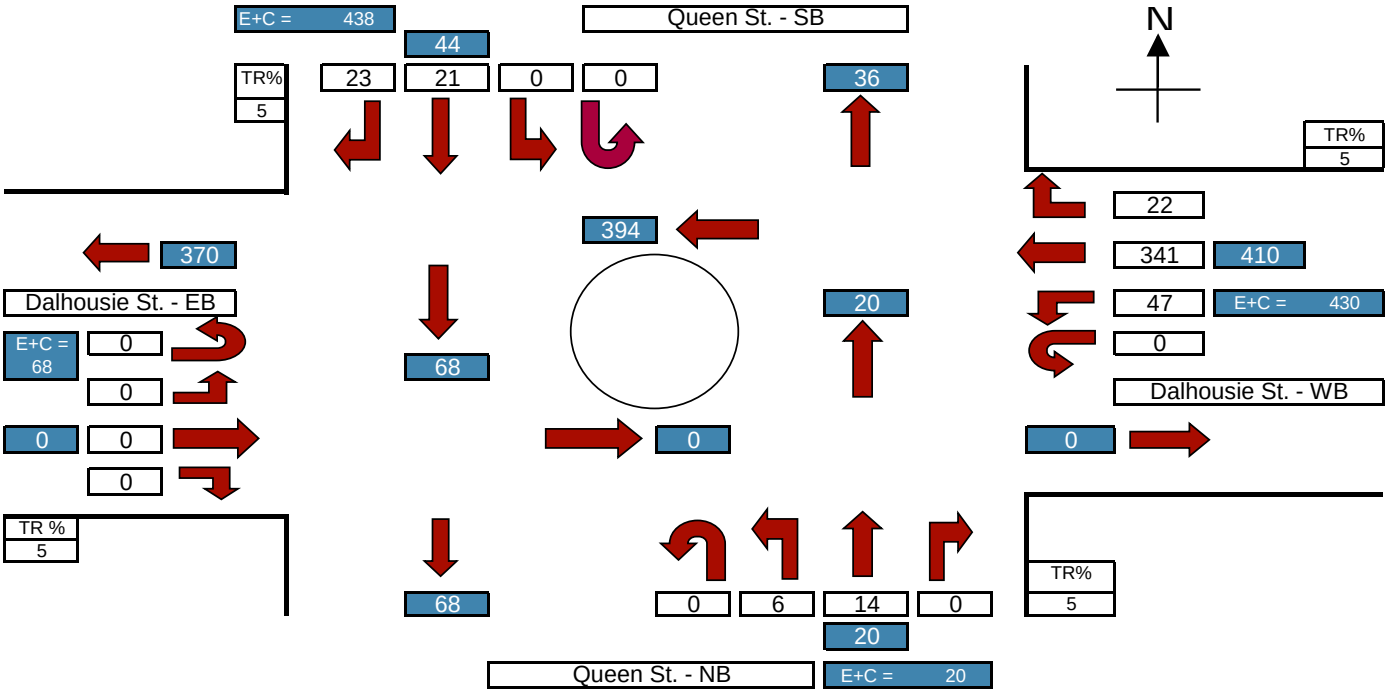
# Appendix A

# Base Year and Traffic Projections

# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Queen Street
**Time Period:** **AM PEAK 2021**

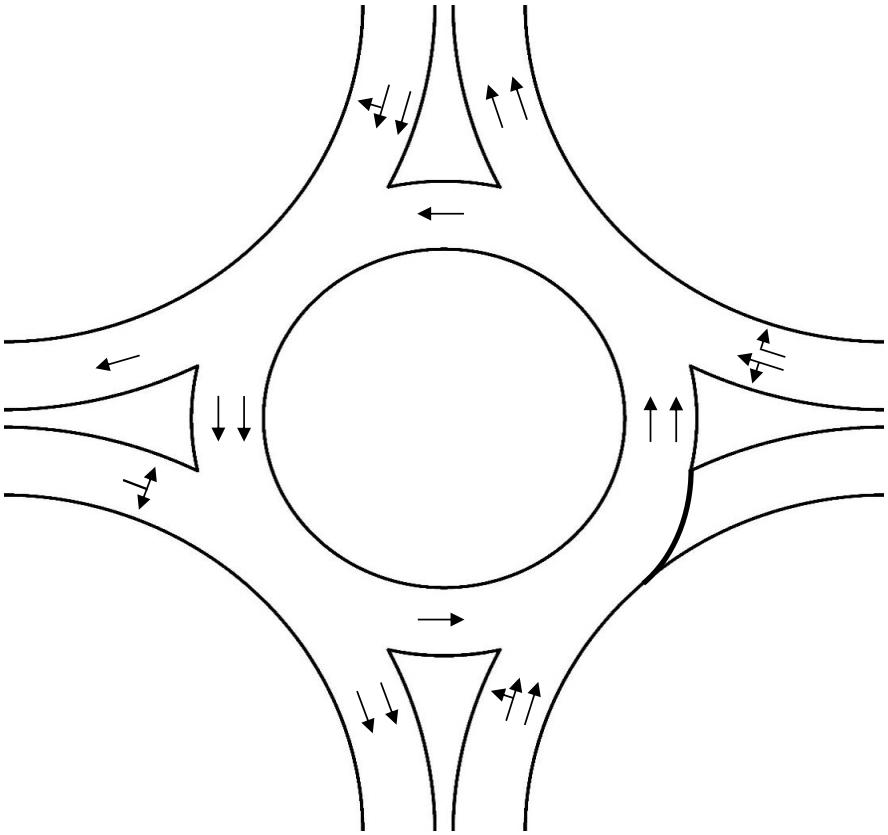
**Prepared By:** EVM
**Sheet:** **1 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

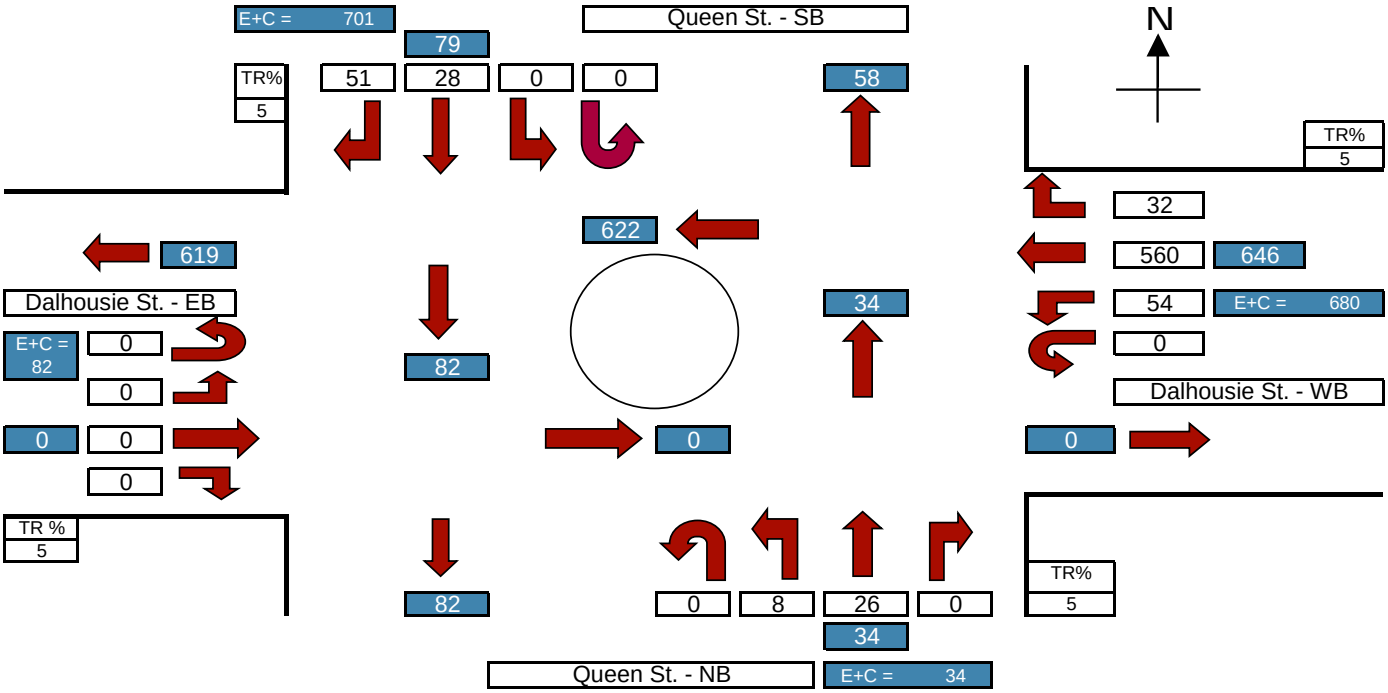
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 23 | 21 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Queen St. - NB | 1.05 | 0 | 14 | 6 | 0 |
| Dalhousie St. - WB | 1.05 | 22 | 341 | 47 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Queen Street
**Time Period:** **PM PEAK 2021**

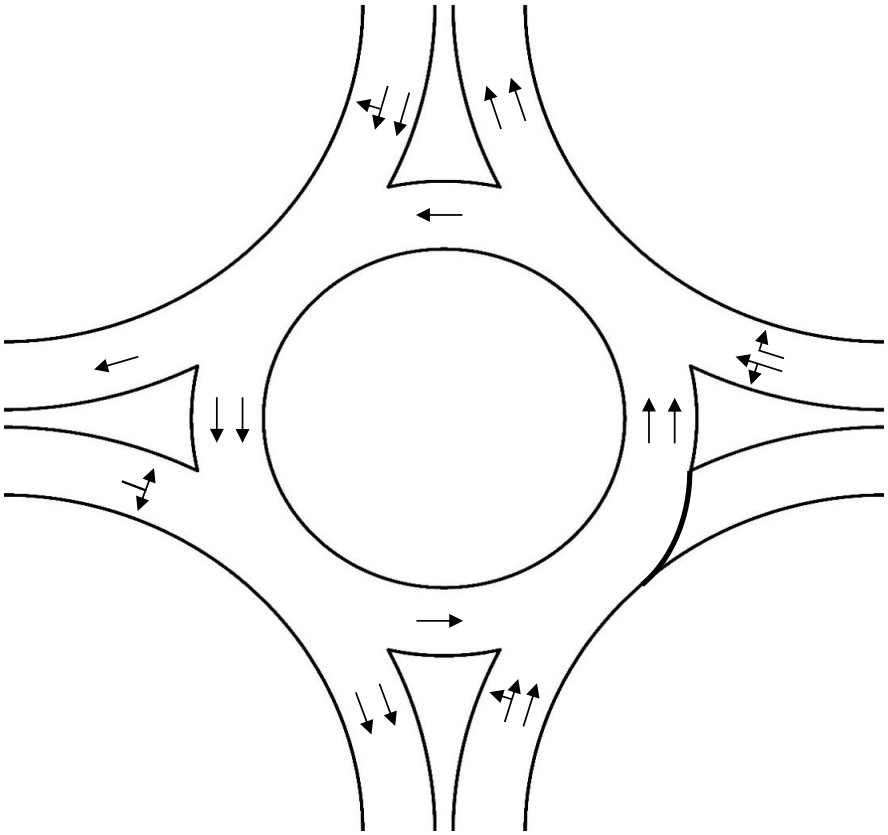
**Prepared By:** EVM
**Sheet:** **2 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

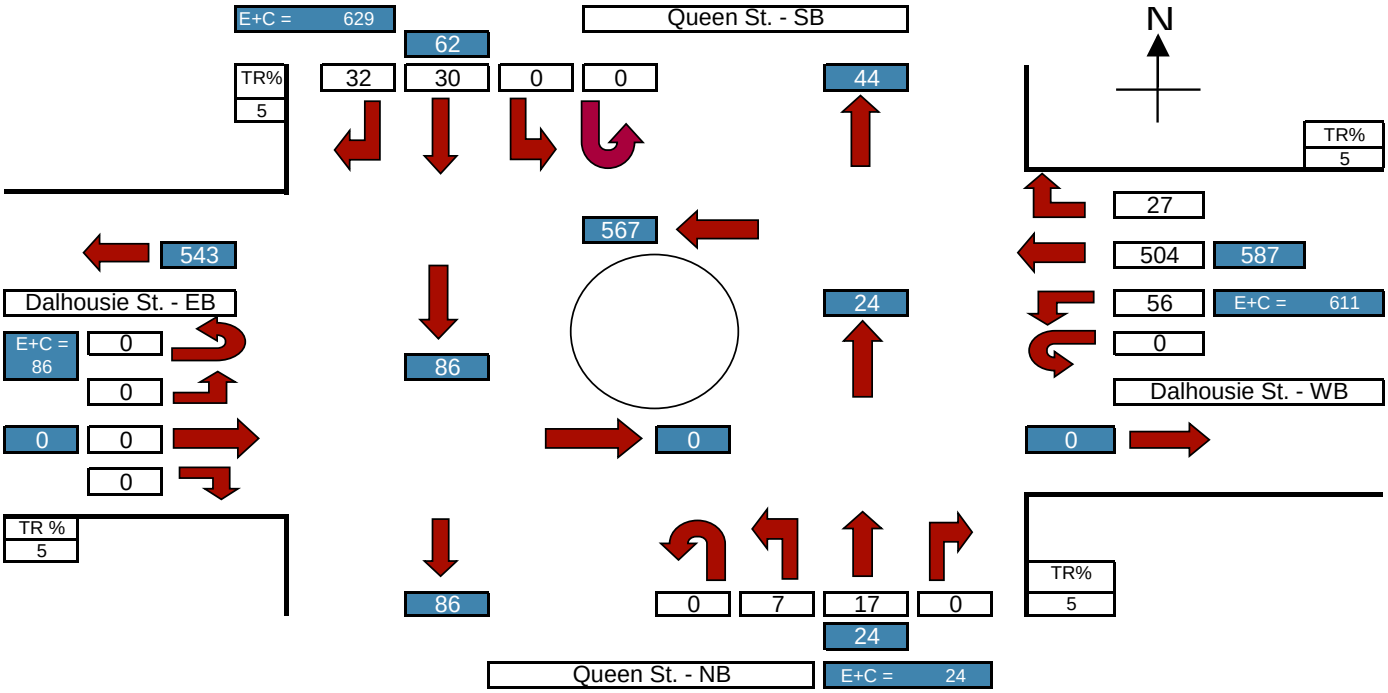
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 51 | 28 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Queen St. - NB | 1.05 | 0 | 26 | 8 | 0 |
| Dalhousie St. - WB | 1.05 | 32 | 560 | 54 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Queen Street
**Time Period:** **AM PEAK 2051**

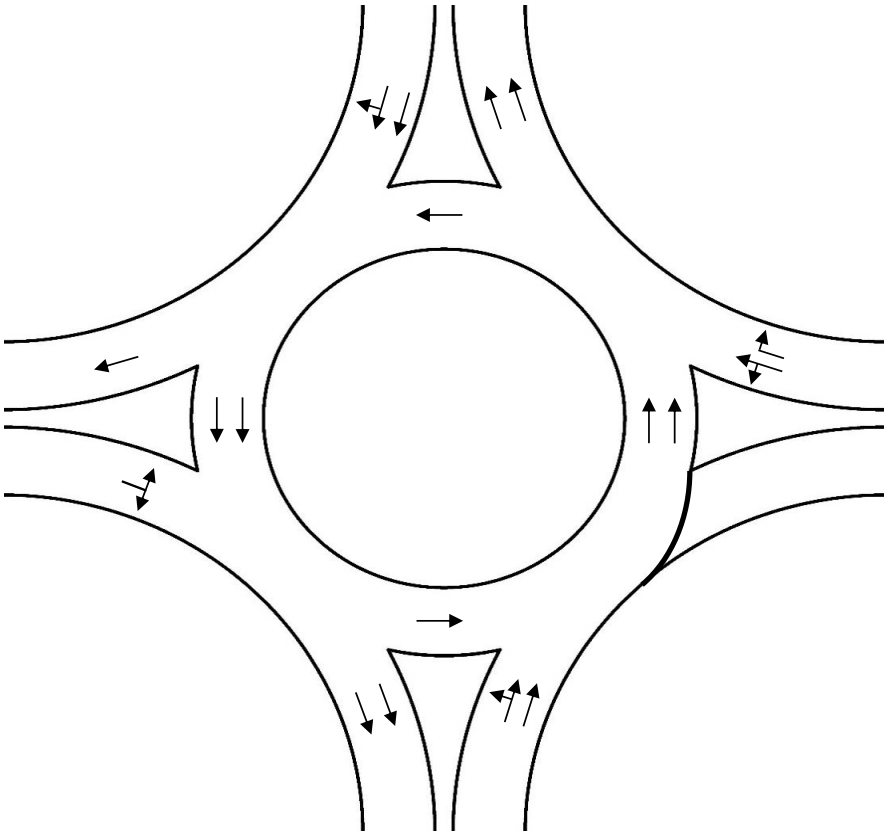
**Prepared By:** EVM
**Sheet:** **3 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

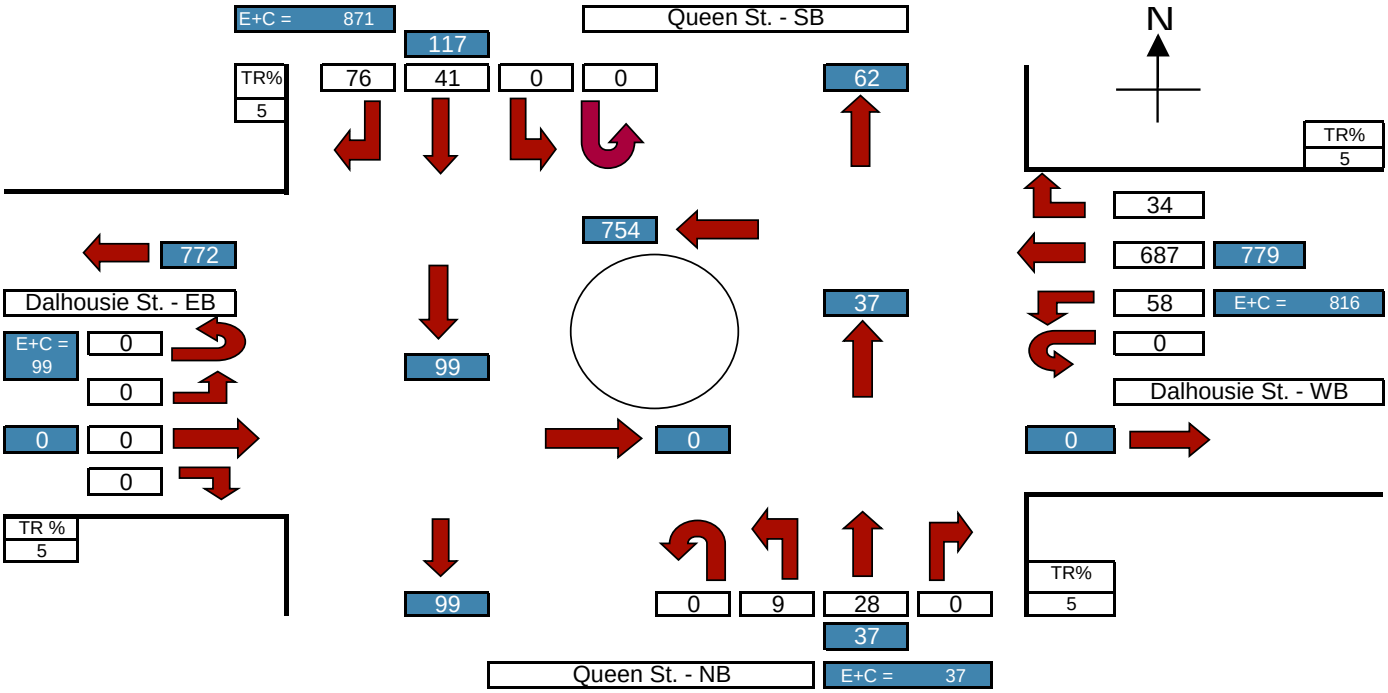
| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 32 | 30 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Queen St. - NB | 1.05 | 0 | 17 | 7 | 0 |
| Dalhousie St. - WB | 1.05 | 27 | 504 | 56 | 0 |



# ROUNDABOUT TRAFFIC FLOW SHEET

**Project:** Brantford Streetscaping EA
**Project No.:** 46995-100
**Intersection:** Dalhousie Street & Queen Street
**Time Period:** **PM PEAK 2051**

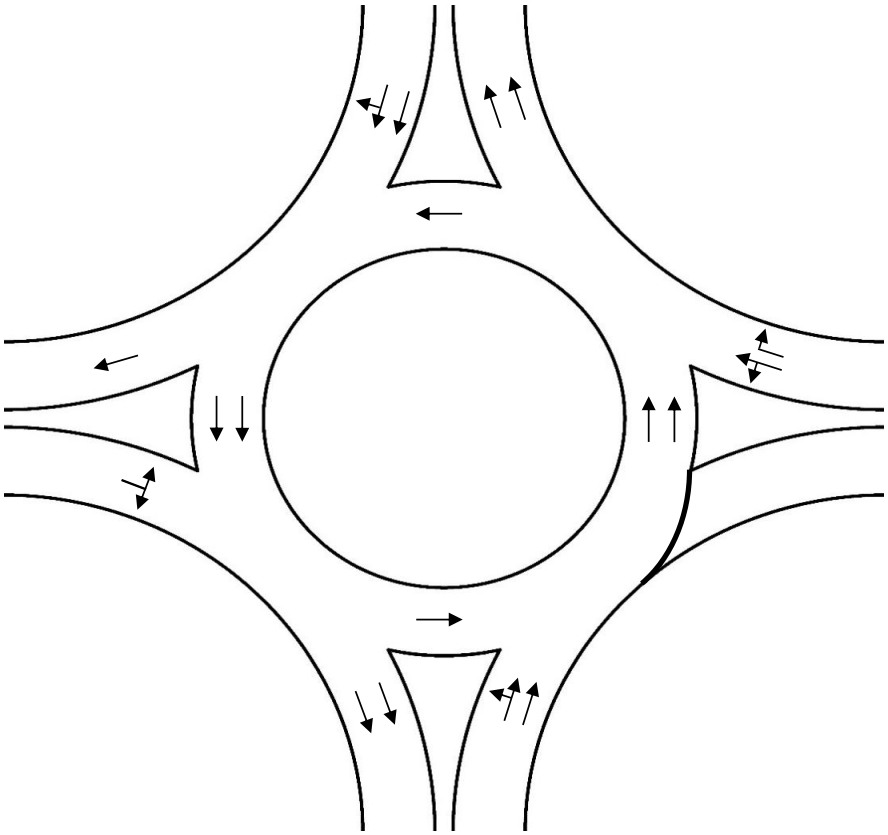
**Prepared By:** EVM
**Sheet:** **4 of 4**




Capacity Guidelines

1. Single Lane service volumes < 900vph - 1200 vph
2. Exit flow < 900vph - 1200 vph for single lane exit
3. Entry flow + circulating flow < 1400vph use single lane entry
4. 1400 vph < Entry + Circ. flow < 2200vph use two-lane entry
3. Entry flow + circulating flow > 2200vph use three-lane entry

| | | Model Inputs | | | |
|---|---|---|---|---|---|
| Leg | PCU | 1st Exit | 2nd Exit | 3rd Exit | U-turn |
| Queen St. - SB | 1.05 | 76 | 41 | 0 | 0 |
| Dalhousie St. - EB | 1.05 | 0 | 0 | 0 | 0 |
| Queen St. - NB | 1.05 | 0 | 28 | 9 | 0 |
| Dalhousie St. - WB | 1.05 | 34 | 687 | 58 | 0 |



# Appendix B

# Cost Estimates

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

Region of Waterloo

*Last Rev JAN 2021*

**Scenario:** Dalhousie St. & Queen St. ICS

**Major Road:** Dalhousie Street

**Minor Road:** Queen Street

| | |
|---|---|
| **Major Road Direction:** | East / West |
| **Urban or Rural:** | Urban |
| **Proposed Control:** | Signalized |
| **Proposed Config.** | 4-Leg Intersection |

| LT Lanes Proposed (non roundabout): | | RT Lanes Proposed (non roundabout): | |
|---|---|---|---|
| **Major** | No LT Lanes | **Major** | No RT Lanes |
| **Minor** | No LT Lanes | **Minor** | No RT Lanes |

**Is there going to be any fully protected left-turn phasing?** YES

**Number of approaches with FPLTP:** N/A

**Is the proposed intersection "new" or is it existing:** EXISTING

**Does control and number of approaches remain the same:** NO

**Will the proposed intersection have illumination:** YES

**5-Year Total Collisions:** 7

**5-Year PDO Collisions:** 3

**Proposed RA Configuration?** MULTI - 4 x 2

** Proposed RA config. - 1st number represents approaches while 2nd represents lanes*

**Major Road (mid-block) 10-Year Horizon AADT:** 7,790

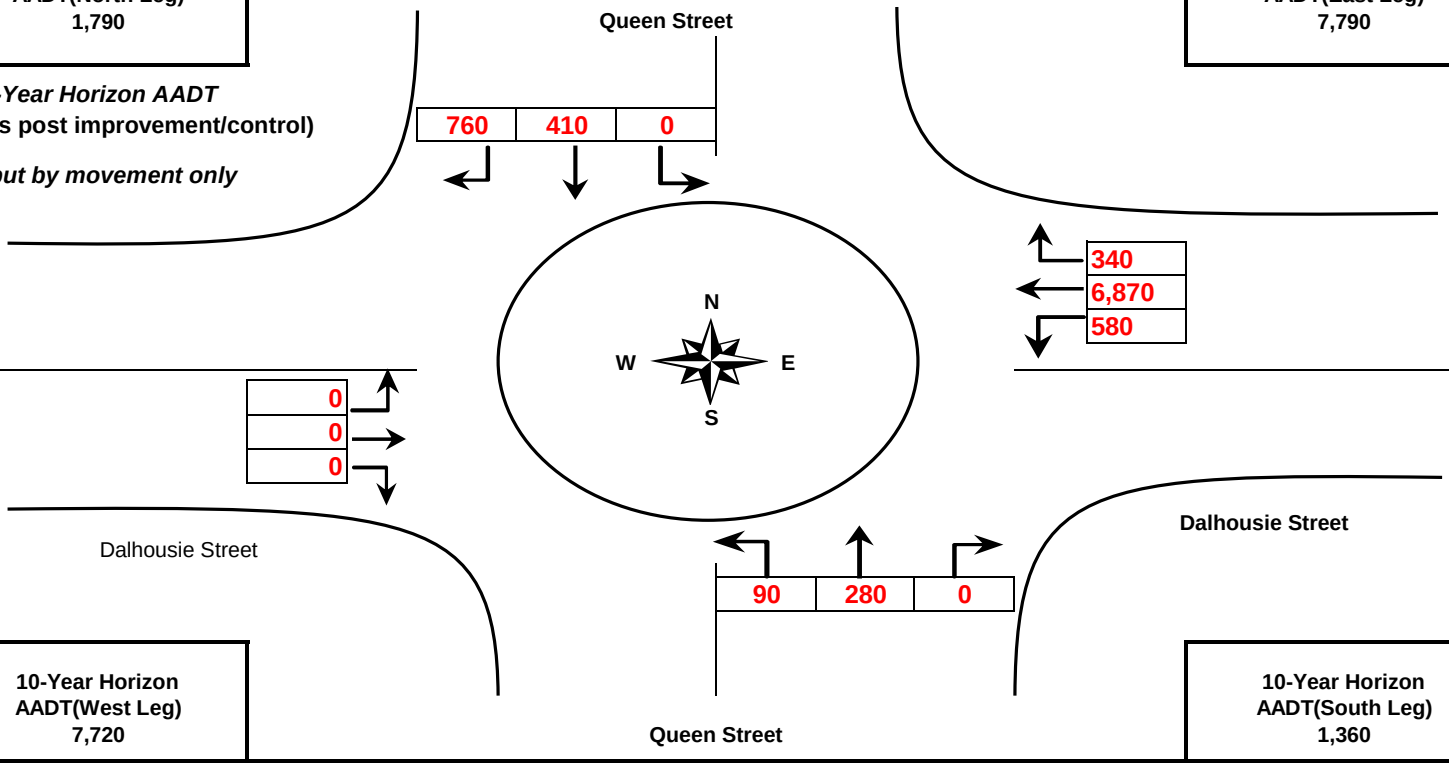
**Minor Road (mid-block) 10-Year Horizon AADT:** 1,790

**10-Year Horizon AADT(North Leg) 1,790**

**10-Year Horizon AADT(East Leg) 7,790**

**** 10-Year Horizon AADT***
**(10ys post improvement/control)**

**** Input by movement only***




**10-Year Horizon AADT(West Leg) 7,720**

**10-Year Horizon AADT(South Leg) 1,360**

**Direct Capital Costs**

Fatal = $1,656,500
Injury = $60,500
PDO$_{SIG}$ = $5,000
PDO$_{RA}$ = $4,500

Discount Rate = 0.06

## 20-Year Present Value Collision Costs (DIRECT CAPITAL COSTS)

| Collisions by Severity | Total | PDO | Injury | Fatal |
|---|---|---|---|---|
| Signalized | **$742,654.46** | **$100,935.31** | **$603,719.30** | **$37,999.85** |
| Roundabout | **$593,701.28** | **$238,068.34** | **$355,632.95** | **$0.00** |

* Roundabout calibration Factor - 1.5

# INTERSECTION CONTROL STUDIES
# SAFETY ASSESSMENT METHODOLOGY (HSM)

*Last Rev JAN 2021*

Region of Waterloo

**Scenario:** **Dalhousie St. & Queen St. ICS**

**Major Road:** **Dalhousie Street**
**Minor Road:** **Queen Street**

**Major Road Direction:** East / West

**Urban or Rural:** Urban

**Proposed Control:** Signalized

**Proposed Config.** 4-Leg Intersection

**Roundabout Conflicts:** **5290**

**5-Year Total Collisions:** **7**

**5-Year PDO Collisions:** **3**

| Estimated **ANNUAL (1-YEAR ONLY)** Collisions | | | | |
|---|---|---|---|---|
| Future Expected Collisions by Severity | **Total** | **PDO** | **Injury** | **Fatal** |
| Signalized | **2.63** | **1.76** | **0.87** | **0.00** |
| Roundabout | **5.12** | **4.61** | **0.51** | **0.00** |

| **TOTAL CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-10.99** | **1.07** | **0.23** | **N/A** | **0.002** | **n/a** |

| **PDO CRASH COEFFICIENTS USED IN CALCULATION** | | | | | | Fatal/Inj. Ratio | Collision Factor |
|---|---|---|---|---|---|---|---|
| Control | Intersection Config | Intercept | AADTmaj | AADTmin | Overdispersion | | |
| Signalized | 4-Leg Intersection | **-11.02** | **1.02** | **0.24** | **N/A** | **0.002** | **n/a** |

| Collision Modification Factors (cmf's) | Left Turn Lane | Right Turn Lane | Calibration Factor | Empirical Bays Weighting | |
|---|---|---|---|---|---|
| | | | **2.1** | Total | PDO |
| | | | | **N/A** | **N/A** |
| | Illumination | Protected LT Phasing | | | |
| | **0.91** | **1.00** | | | |

**Comments**:

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (ROUNDABOUT)

## Dalhousie St. and Queen St. Intersection

## Intersection Improvements EA

## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $600.00 | $8,400.00 | |
| A2.2 | Roadway Paving | | | **1,000** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 1,125 | $16,875.00 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 375 | $7,500.00 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $125.00 | 250 | $31,250.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $185.00 | 125 | $23,125.00 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.5 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,048** | $122,880.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$226,890.00** | **$227,000.00** |
| **A6 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A6.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A6.2 | Allowance for contaminated material remediation | lump sum | $85,000.00 | 1 | $85,000.00 | |
| A6.3 | Utility Relocation | lump sum | $100,000.00 | 1 | $100,000.00 | |
| A6.4 | Property Acquisition | lump sum | $500,000.00 | 1 | $500,000.00 | |
| A6.5 | Streetlighting and Traffic Signal Allowance | lump sum | $30,000.00 | 1 | $30,000.00 | |
| A6.6 | 20% Miscellaneous | lump sum | $80,824.60 | 1 | $80,824.60 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$820,824.60** | **$820,000.00** |
| | | | | **Engineering (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Contingency (20%)** | **$244,989.52** | **$245,000.00** |
| | | | | **Total Estimated Construction Cost** | **$1,714,926.64** | **$1,712,000.00** |

# TABLE 1 - PRELIMINARY CONSTRUCTION COST ESTIMATE (SIGNALIZED)

## Dalhousie St. and Queen St. Intersection
## Intersection Improvements EA
## Project No. 46995-100

***October 24, 2022***

| Item No. | Description | Unit | Unit Price | Estimated Quantity | Total Cost | Approx |
|---|---|---|---|---|---|---|
| **A1 - Site Preparation & Removals** | | | | | | |
| A1.1 | Bonding, Insurance, Etc. | lump sum | $45,000.00 | 1 | $45,000.00 | |
| A1.2 | Mobilization/Demobilization | lump sum | $20,000.00 | 1 | $20,000.00 | |
| A1.3 | Pre-condition Survey | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.4 | Site Office | lump sum | $5,000.00 | 1 | $5,000.00 | |
| A1.5 | Traffic control | lump sum | $10,000.00 | 1 | $10,000.00 | |
| A1.6 | Construction layout | lump sum | $4,000.00 | 1 | $4,000.00 | |
| A1.7 | Remove & dispose of existing asphalt | $m^2$ | $6.50 | **1200** | $7,800.00 | |
| A1.8 | Remove & dispose of existing sidewalk | $m^2$ | $11.00 | **403** | $4,433.00 | |
| A1.9 | Remove & dispose of existing curb & gutter | m | $8.00 | 225 | $1,800.00 | |
| A1.10 | Remove & dispose of existing storm sewers | | | | | |
| A1.11 | Pipes & leads | m | $40.00 | **720** | $28,800.00 | |
| A1.12 | Manholes and catchbasins | each | $1,200.00 | **12** | $14,400.00 | |
| A1.13 | Tree removals, protection, maintain & relocate as required | lump sum | $12,000.00 | 1 | $12,000.00 | |
| A1.14 | Miscellaneous removals ( pillars, signs etc.) | lump sum | $20,000.00 | 1 | $20,000.00 | |
| | | | | **Subtotal Section A1 - Site Preparation & Removals** | **$177,233.00** | **$175,000.00** |
| **A2 - Road Works** | | | | | | |
| A2.1 | Excavate to subgrade | m3 | $14.00 | $405.00 | $5,670.00 | |
| A2.2 | Roadway Paving | | | **675** | | |
| A2.2.1 | Granular 'B' (450mm) | tonnes | $15.00 | 759 | $11,390.63 | |
| A2.2.2 | Granular 'A' (150mm) | tonnes | $20.00 | 253 | $5,062.50 | |
| A2.2.3 | HL8 binder asphalt for road construction | tonnes | $100.00 | 169 | $16,875.00 | |
| A2.2.4 | HL3 surface asphalt for road restoration | tonnes | $150.00 | 84 | $12,656.25 | |
| A2.3 | Concrete Curb & Gutter (OPSD 600.040) | m | $55.00 | **132** | $7,260.00 | |
| A2.4 | Concrete Curb & Gutter (OPSD 600.080) | m | $45.00 | 0 | $0.00 | |
| A2.5 | Asphalt Multi-Use Trail | $m^2$ | $58.00 | **384** | $22,272.00 | |
| A2.6 | Concrete sidewalk and island infil | $m^2$ | $60.00 | **2,424** | $145,440.00 | |
| A2.7 | Boulevard restoration - topsoil & sod | $m^3$ | $16.00 | **645** | $10,320.00 | |
| A2.8 | Truncated Dome Plates | each | $300.00 | **32** | $9,600.00 | |
| | | | | **Subtotal Section A2 - Road Works** | **$246,546.38** | **$245,000.00** |
| **A7 - Miscellaneous/Provisional Items - Design** | | | | | | |
| A7.1 | Linepainting Allowance | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.2 | Allowance for contaminated material remediation | lump sum | $0.00 | 1 | $0.00 | |
| A7.3 | Utility Relocation | lump sum | $25,000.00 | 1 | $25,000.00 | |
| A7.4 | Property Acquisition | lump sum | $0.00 | 1 | $0.00 | |
| A7.5 | Streetlighting and Traffic Signal Allowance | lump sum | $125,000.00 | 1 | $125,000.00 | |
| A7.6 | 20% Miscellaneous | lump sum | $84,755.88 | 1 | $84,755.88 | |
| | | | | **Subtotal Section A6 - Miscellaneous/Provisional Items** | **$259,755.88** | **$260,000.00** |
| | | | | **Engineering (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Contingency (20%)** | **$136,707.05** | **$135,000.00** |
| | | | | **Total Estimated Construction Cost** | **$956,949.35** | **$950,000.00** |