Mayfield Road Improvements

Appendix ESR 1

Municipal Class
Environmental Assessment
Chinguacousy Road to
Winston Churchill Boulevard

June 2016

List of Appendices – Volume 1

A NOTIFICATIONS AND CONTACTS

NOTICE OF COMMENCEMENT

- Newspaper advertisement
- Mailing lists – residents and agencies
- Letter templates – residents and agencies

Region of Peel
Working for you

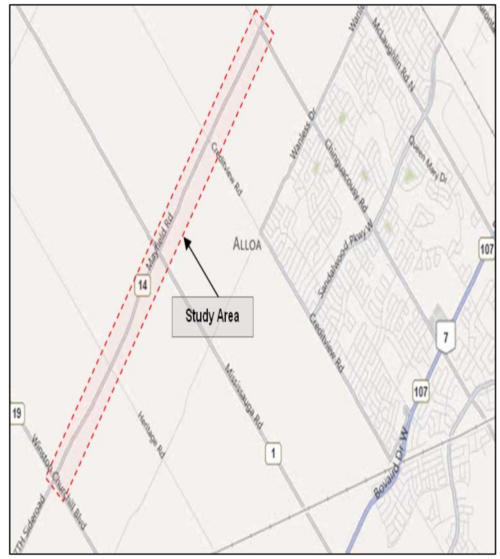
Public Notice

Environmental Assessment Study

NOTICE OF STUDY COMMENCEMENT

The Study

The Region of Peel has initiated a Schedule ‘C’ Municipal Class Environmental Assessment (EA) in accordance with the Municipal Engineers Association’s Municipal Class EA process for the widening of Mayfield Road to six lanes from Chinguacousy Road to Winston Churchill Boulevard (see map).



Mayfield Road is an east-west arterial road and forms the boundary between the City of Brampton and the Town of Caledon. Winston Churchill Boulevard forms the boundary between the Region of Peel and Region of Halton.

The study will examine alternatives for widening and intersection improvements to Mayfield Road to address short and long term issues related to planned future growth up to 2031. The study will review opportunities to facilitate the movement of vehicles, transit, goods movement, walking and cycling.

The Process

The Class EA process will include:

- public and agency consultation
- an evaluation of road improvement alternatives
- an assessment of the possible environmental effects of the improvements, and,
- the identification of reasonable means to mitigate any adverse impacts

Public Consultation

Public consultation is important to the success of this study. We plan to hold two Public Information Centres (PICs) during the study. The first PIC will provide stakeholders with an opportunity to meet the project team, and:

- obtain background information on the study and review the study scope
- discuss issues related to the project, including alternative solutions, environmental considerations and an evaluation criteria

Notification of the PICs will be provided at the appropriate time by means of a similar advertisement and study newsletters. Upon completion of the study, an Environmental Study Report will be submitted to the Ministry of the Environment and other key agencies and made available for public review for a period of 30 days.

Comments and Information

Your participation is important and your comments are valued. Please visit our website at www.peelregion.ca/pw/roads/environ-assess for updates on this project. To provide comments or request additional information about this project please contact Neal Smith, Project Manager.

Neal Smith, C.E.T.
Project Manager
Region of Peel
10 Peel Centre Drive
Suite B, 4th Floor
Brampton, ON L6T 4B9
Tel: 905.791.7800 ext. 7866
Toll Free: 1.888.919.7800
Fax: 905.791.1442
neal.smith@peelregion.ca

Agency Mailing List for Mayfield Road

Title	First Name	Last Name	Position	Agency	Address	City/Prov/PC	email
Ms.	Sheryl	Bennett	Senior Officer	Accommodation Services Section Ontario Provincial Police	777 Memorial Avenue, 1st Floor	Orillia, ON L3V 7V3	
Mr.	Allan	Dokis	Intergovernmental Affairs Director	Anishinabek Nation/Union of Ontario Indians, Nipissing First Nation	P.O. Box 711	North Bay, ON P1B 8J8	
Ms.	Rolanda	Elijah	Director of Intergovernmental Affairs	Association of Iroquois and Allied Indians	387 Princess Avenue	London, ON N6B 2A7	
Ms.	Janice	Young	Manager - Right of Way	Bell Canada	F3 Section Green 100 Borough Drive	Scarborough, ON M1P 4W2	
Mr.	Scott	Moon		Bell Canada	5115 Creekbank Road, Floor 3 West Tower	Mississauga, ON L4W 5R1	
Ms.	Lynn	Chaput		Bell Canada Municipal Operations Centre	100 Borough Drive, Floor 5 Blue	Scarborough, ON M1P 4W2	
Ms.	Elaine	Oakley		Bell Canada, Municipal Operations Centre c/o Plantec Consulting Engineers	200 Town Centre Blvd., Suite 300	Markham, ON L3R 8G5	
Chief	Andy	MacDonald	Fire Chief	Brampton Fire and Emergency Services	8 Rutherford Road South	Brampton, ON L6W 3J1	
Mr.	Tony	Mason	Director, Brampton Flying Club	Brampton Flight Centre	13691 McLaughlin Road PO Box 27, Stn. Cheltenham	Caledon, ON L7C 3L7	tonymason@globalserve.net
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Ms.	Karen	Hutchinson	Executive Director	Caledon Countryside Alliance	PO Box 69, Stn Inglewood	Caledon, ON L7C 3L6	
Chief	David	Forfar	Chief, Caledon Fire	Caledon Fire and Emergency Services	6097 Old Church Road	Caledon East, ON L7C 1G6	
Staff Sargeant	Greg	Sweeney	Operations Manager	Caledon Ontario Provincial Police Detachment	6211 Old Church Road	Caledon East, ON L7C 1J7	
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Mr.	Liam	Marray	Senior Planner / Ecologist	Credit Valley Conservation Authority	1225 Old Derry Road	Mississauga, ON L5N 6R4	
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Mr.	Anthony	Segreto	Access Planning Manager	TELUS Central Region	5 2700 Matheson Boulevard East	Mississauga, ON L4W 4V9	
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Mr.	Tim	Manley		Town of Caledon	6311 Old Church Road	Caledon East, ON L7C 1J6	kant.chawla@caledon.ca

Letter to Agencies Notice of Commencement

Date

Name
Title
Ministry/Department
Address 1
Town/Province/Postal Code

Re: Notice of Study Commencement, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard, City of Brampton, Town of Caledon, Town of Halton Hills

The Region of Peel is initiating a Municipal Class Environmental Assessment (Class EA) Study for improvements to Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard. The purpose of this letter is to inform you of the study and to invite your input. A copy of the notice is attached.

The study is being conducted in accordance with the approved requirements for a Schedule "C" project as described in the Municipal Engineers Association's Municipal Class Environmental Assessment (EA) document (October 2000, as amended in 2007 and 2011).

The study will evaluate:

- capacity deficiencies (existing and future),
- structural condition and deficiencies,
- identified safety issues,
- approved and proposed land use changes,
- natural heritage and fisheries requirements and other aspects of the environment,
- surrounding road network improvements, and
- property requirements

A key component of the study will be consultation with interested stakeholders (public and regulatory agencies) including two Public Information Centres (PICs). Details regarding the PICs will be advertised as the study progresses.

Over the next few weeks, the Region's project team, including a number of environmental sub-consultants, may contact your office directly for information or mapping related to environmental conditions for the study area. Your assistance with our study is greatly appreciated.

Yours truly,

Neal Smith

Neal Smith, C.E.T.
Project Manager | Transportation Program Planning
Transportation Division
Phone: 905.791.7800 ext. 7866
Fax: 905.791.1442
Email: neal.smith@peelregion.ca
Encl.: Notice of Study Commencement

Date

Letter to Residents PIC#1

Name
Address
Town/Province
Postal Code

Dear Property/Business Owner:

Re: Notice of Study Commencement, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard, City of Brampton, Town of Caledon, Town of Halton Hills

The Regional Municipality of Peel is initiating a Schedule 'C' Class Environmental Assessment Study to investigate improvements to Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard. A copy of the Notice of Study Commencement is enclosed.

The study will evaluate:

- capacity deficiencies (existing and future),
- structural condition and deficiencies,
- identified safety issues,
- approved and proposed land use changes,
- natural heritage and fisheries requirements and other aspects of the environment,
- surrounding road network improvements, and
- property requirements

A key component of the study will be consultation with interested stakeholders (public and regulatory agencies) including two Public Information Centres (PICs). Details regarding the forthcoming PICs will be advertised as the study progresses.

Through the next few months, a topographic survey will be conducted along Mayfield Road. Please note:

- A topographic survey identifies and records the existing physical and natural features on the ground such as driveways, trees, signs, etc.;
- the Region of Peel will be conducting actual field measurements for topographic survey;

- measurements may be taken slightly beyond the road allowance, on your property;
- this fieldwork will not involve any heavy equipment; and
- will only involve people walking on the property for short periods of time for measurement purposes.

If there is any concern with the survey fieldwork being conducted on your property, please contact us immediately.

In addition to the field survey, sub-consultants working for the Region will be in the area to perform various forms of fieldwork including a natural features survey, archeological assessment, surface water and groundwater surveys and a geotechnical borehole investigation. This work will be completed from spring 2013 to summer 2013.

You may use the enclosed comment form to request additional information or provide comments about the study.

Thank you for your assisting us in the identification of pertinent issues affecting this project and your attention to this matter.

Yours truly,

Neal Smith, C.E.T.
Project Manager | Transportation Program Planning
Transportation Division
Phone: 905.791.7800 ext. 7866
Fax: 905.791.1442
Email: neal.smith@peelregion.ca

Encl.: 1. Notice of Study Commencement
2. Comment Form

COMMENT FORM

Class Environmental Assessment Study for

MAYFIELD ROAD IMPROVEMENTS FROM
CHINGUACOUSY ROAD TO WINSTON CHURCHILL BOULEVARD
CITY OF BRAMPTON, TOWN OF CALEDON, TOWN OF HALTON HILLS

Please provide your comments or ask any questions that you may have with respect to the study.

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Thank you for providing your comments. **Please, write, fax or email your comments to:**

Neal Smith, C.E.T.
Project Manager
The Regional Municipality of Peel
10 Peel Centre Drive, Suite B
Brampton, ON L6T 3B9
Tel: 905.791.7800 x7866
Fax: 905.791.1442
neal.smith@peelregion.ca

Completed by:

Name ____

Email Address ____

Address ____

Phone ____

NOTICE OF COMMENCEMENT RESIDENT ADDRESS LIST

FIRST_NAME	PROPERTY LOCATION	MAILING1	C/O	CITY_PROVINCE	POSTAL_CODE
2107999 ONTARIO INC	[redacted]	[redacted]		[redacted]	[redacted]
MONKMAN KEITH MAXWELL	[redacted]	[redacted]		[redacted]	[redacted]
CREDITVIEW MAYFIELD CORPORAT	[redacted]	[redacted]		[redacted]	[redacted]
PARADISE HOMES NORTH WEST IN	[redacted]	[redacted]		[redacted]	[redacted]
PARADISE HOMES NORTH WEST IN	[redacted]	[redacted]		[redacted]	[redacted]
PARADISE HOMES NW INC	[redacted]	[redacted]		[redacted]	[redacted]
584572 ONTARIO LIMITED	[redacted]	[redacted]		[redacted]	[redacted]
SAHOTA AJIT SINGH	[redacted]	[redacted]		[redacted]	[redacted]
SMITH PETER BRYDON	[redacted]	[redacted]		[redacted]	[redacted]
BAUMANN HEINZ	[redacted]	[redacted]		[redacted]	[redacted]
1231058 ONTARIO INC	[redacted]	[redacted]		[redacted]	[redacted]
MCN (MAYFIELD) INC	[redacted]	[redacted]		[redacted]	[redacted]
TIBER BRAMPTON HOLDINGS INC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MISTRY DINESH HARIBHAI	[redacted]	[redacted]		[redacted]	[redacted]
MCN (MAYFIELD) INC	[redacted]	[redacted]		[redacted]	[redacted]
CRAWFORD LLOYD H	[redacted]	[redacted]		[redacted]	[redacted]
VAN TENT JOHN WILLIAM GERALD	[redacted]	[redacted]		[redacted]	[redacted]
KUMAR KIRAN	[redacted]	[redacted]		[redacted]	[redacted]
HUI COLLEEN SHUK LAN	[redacted]	[redacted]		[redacted]	[redacted]
BRAR JASVIR	[redacted]	[redacted]		[redacted]	[redacted]
CREDITVIEW MAYFIELD CORPORAT	[redacted]	[redacted]		[redacted]	[redacted]
FINELLI FAUSTO	[redacted]	[redacted]		[redacted]	[redacted]
WALNESS DEVELOPMENTS INC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1367933 ONTARIO INC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1367933 ONTARIO INC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
MONKMAN LORI ANNE	[redacted]	[redacted]		[redacted]	[redacted]
MONKMAN CATHERINE A	[redacted]	[redacted]		[redacted]	[redacted]
MCCLURE GORDON DOUGLAS	[redacted]	[redacted]		[redacted]	[redacted]
856063 ONTARIO INC	[redacted]	[redacted]		[redacted]	[redacted]
FRADOL FARMS LIMITED	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1867847 ONTARIO LIMITED	[redacted]	[redacted]		[redacted]	[redacted]
PEEL REGION	[redacted]	[redacted]		[redacted]	[redacted]
PIONEER HI-BRED PRODUCTION L	[redacted]	[redacted]		[redacted]	[redacted]
1143922 ONTARIO LIMITED	[redacted]	[redacted]		[redacted]	[redacted]
MAYFIELD STATION DEVELOPMENT	[redacted]	[redacted]		[redacted]	[redacted]
IABONI GIACINTO	[redacted]	[redacted]		[redacted]	[redacted]
SPRICKERHOFF ANNIE	[redacted]	[redacted]		[redacted]	[redacted]
1223513 ONTARIO INC	[redacted]	[redacted]		[redacted]	[redacted]
VANAIK ROMESH	[redacted]	[redacted]		[redacted]	[redacted]
VAN GOOL FAMILY HOLDINGS INC	[redacted]	[redacted]		[redacted]	[redacted]
DIAS MARIO	[redacted]	[redacted]		[redacted]	[redacted]
LONJAK REZA	[redacted]	[redacted]		[redacted]	[redacted]
HOME UNITED CHURCH	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
PEEL DISTRICT SCHOOL BOARD	[redacted]	[redacted]		[redacted]	[redacted]
1096281 ONTARIO LIMITED	[redacted]	[redacted]		[redacted]	[redacted]
1096281 ONTARIO LIMITED	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
GARBUTT DONALD KEITH	[redacted]	[redacted]		[redacted]	[redacted]
MOORE BETTY JANE	[redacted]	[redacted]		[redacted]	[redacted]
DENHART MARVARIE	[redacted]	[redacted]		[redacted]	[redacted]
LORWOOD HOLDINGS INCORPORATE	[redacted]	[redacted]		[redacted]	[redacted]
LESLIE TERRENCE GEORGE	[redacted]	[redacted]		[redacted]	[redacted]
HYDRO ONE NETWORKS INC	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

PUBLIC INFORMATION CENTRE NO. 1

- Newspaper advertisement
- Mailing lists – residents and agencies
- Letter templates – residents and agencies

Region of Peel
Working for you

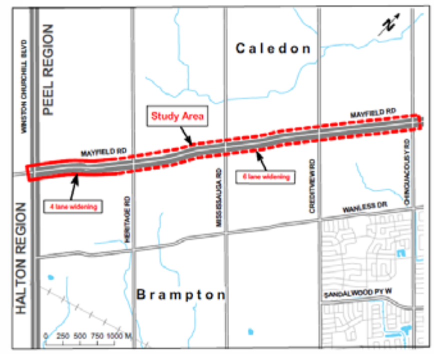
Public Notice

Environmental Assessment Study

Notice of Public Information Centre #1
Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard

The Study

The Region of Peel has initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) in accordance with the Municipal Engineers Association's Municipal Class EA process for the widening of Mayfield Road to six lanes from Chinguacousy Road to Winston Churchill Boulevard (see map). The approximate limits of the project area are illustrated on the map.



Mayfield Road is an east-west arterial road and forms the boundary between the City of Brampton and the Town of Caledon. Winston Churchill Boulevard forms the boundary between the Region of Peel and Region of Halton.

The study will examine the need and feasibility for improvements to Mayfield Road to address the short and long term issues related to planned future growth, road design and function up to 2031. The study will review opportunities to facilitate the movement of vehicles, transit, goods movement, walking and cycling.

The Process

The Class EA process includes:

- public and agency consultation;
- an evaluation of road improvement alternatives;
- an assessment of the possible environmental effects of the improvements; and,
- the identification of reasonable means to mitigate any adverse impacts.

Public Information Centre

Two Public Information Centres (PICs) are planned for this study. The first PIC will use an informal drop-in centre format with display boards to present the study background information including:

- a problem statement;
- an evaluation of planning alternatives; and,
- a recommended planning alternative.

The Project Team members will be present to answer questions and discuss the next steps in the study. The first PIC is scheduled for:

Date: **Tuesday, November 27, 2013**
Time: **6:30 p.m. - 8:30 p.m.**
Location: **Police Association Building, 10675 Mississauga Road, Brampton**

Comments and Information

Please visit our website: http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm for updates on this project. Comments and information regarding the study are being collected to assist the Region of Peel in meeting the requirements of the EA Act. This material will be maintained on file for use during the project and may be included in project documentation.

To provide comments or request additional information about this project, please contact:

Neal Smith, C.E.T.
Project Manager, Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton, ON L6T 4B9
Telephone: 905-791-7800 ext. 7866
Toll Free: 1-888-919-7800
Fax: 905-791-1442
Email: neal.smith@peelregion.ca

The Region of Peel is committed to ensure that all Regional services, programs and facilities are inclusive and accessible for persons with disabilities. Please contact the Project Manager if you need any disability accommodations to participate in the PIC.

This notice was first issued on November 14, 2013

With the exception of personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the Municipal Class Environmental Assessment, which is a planning process approved under Ontario's *Environmental Assessment Act*.

Date

PIC#1 Letter to Agencies

Name
Title
Ministry/Department
Address 1
Town/Province/Postal Code

Re: Notice of Public Information Centre #1, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard City of Brampton, Town of Caledon and Town of Halton Hills

The Region of Peel has initiated a Municipal Class Environmental Assessment Study for the above study area to support planned growth and to address operational, servicing and capacity deficiencies. Opportunities will be examined to facilitate transit and enhance pedestrian movements. The purpose of this letter is to inform you of the first Public Information Centre (PIC). A copy of the notice is attached with details of the PIC.

The study is being undertaken as a Schedule 'C' project in accordance with the requirements of the Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011).

The first PIC will be an informal drop-in centre with display information on the study findings to date including the existing conditions, the problem and opportunity statement, the evaluation of alternative solutions and the preliminary recommended solution. The PIC provides stakeholders with the opportunity to ask questions, review project information, consider the preliminary recommended solution and provide input on the project. The first PIC is scheduled on:

Wednesday, November 27, 2013
Peel Regional Police Association Banquet Hall
10675 Mississauga Road, Brampton, Ontario L7A 0B6
6:30 p.m. – 8:30 p.m.

You are welcome to attend the first PIC to review the study findings to date and provide additional comments. If you are unable to attend but wish to forward comments or request additional information, please contact me. The information boards will be posted on the Region of Peel's website following the PIC.

Yours truly,

Neal Smith

Neal Smith, C.E.T.
Project Manager | Transportation Program Planning
Transportation Division
Phone: 905-791-7800 ext. 7866
Toll Free 1-888-919-7800
Fax: 905-791-1442
Email: neal.smith@peelregion.ca

Encl.: 1. PIC Notice
2. Comment Form

AGENCY ADDRESS LIST PIC#1

AGENCY	CONTACT FIRST NAME	CONTACT SECOND NAME	MAILING	CITY_PROVINCE	POSTAL_CODE
Alderville First Nation	James	Marsden	P.O. Box 46/11696 2nd Line Rd	Alderville, ON	K0K 2X0
Association of Iroquois and Allied Indians	Gord	Peters	387 Princess Avenue	London, ON	N6B 2A7
Beausoleil First Nation	Roland	Monague	11 Ogemaa Miikaan	Christian Island, ON	L9M 0A9
Chippewas of Georgina Island	Donna	Big Canoe	R.R.#2 Box N-13	Sutton West, ON	L0E 1R0
Chippewas of Mnjikaning	Sharon	Stinson Henry	5884 Rama Road, Suite 200	Rama, ON	L3V 6H6
Chippewas of Saugeen (Ojibwe)	Randall	Kahgee	6493 Highway 21/R.R # 1	Southampton, ON	N0H 2L0
Credit River Métis Council	Steven	Sarrazin	160 Main St, Suite 561	Brampton, ON	L6W 4R1
Curve Lake First Nation	Phyllis	Williams	Curve Lake Post Office	Curve Lake, ON	K0L 1R0
Haudenosaunee Confederacy Development Institute	Hazel	Hill	16 Sunrise Court, Suite 407/P.O.	Ohsweken, ON	N0A 1M0
Haundenosaunee Confederacy Chiesfs Council	Allen	MacNaughton	2634 6th Line Rd, RR 2	Ohsweken, ON	N0A 1N0
Hiawatha First Nation	Sandra	Moore	123 Paudash Street	Keene, ON	K0L 2G0
Mississaugas of New Credit First Nation	Bryan	LaForme	2789 Mississauga Road/RR 6	Hagersville, ON	N0A 1H0
Mississaugas of Scugog Island First Nation	Tracy	Gauthier	22521 Island Road	Port Perry, ON	L9L 1B6
Six Nations of the Grand River Territory	William	Montour	1695 Chiefswood Rd./P. O. Box	Ohsweken, ON	N0A 1M0
The Chiefs of Ontario	Kathleen	Padulo	111 Peter Street, Suite 804	Toronto, ON	M5V 2H1
The Metis Nation of Ontario	Doug	Wilson	500 Old St. Patrick St, Unit 3	Ottawa, ON	K1N 9G4
Union of Ontario Indians (Anishinabek)	Jason	Laronde	1 Miigizi Mikan	North Bay, ON	P1B 8J8
City of Brampton	Bob	Callahan	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Susan	Fennell	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Chris	Duyvestyn	8850 McLaughlin Road	Brampton, ON	L6Y 5T1
City of Brampton	John	Hutton	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Paul	Palleschi	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	John	Sanderson	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Antonietta	Minichillo	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Ricardo	Scattolon	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 5T1
City of Brampton	Kyla	Devin	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 4R2
City of Brampton	John	Allison	2 Wellington St W, Brampton	Brampton, ON	L6Y 4R2
City of Brampton	Susan	Evans	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 4R2
Region of Peel	Wendy	Jawdek	10 Peel Centre Dr, Suite B, 4th Floor	Brampton, ON	L6T 4B9
Town of Caledon	Sally	Drummond	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Tim	Manley	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Marolyn	Morrison	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Jeremy	Schembri	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Craig	Campbell	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Mary	Hall	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Danita	Taccogna	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Todd	Salter	6311 Old Church Road	Caledon, ON	L7C 1J6
City of Mississauga	Jadie	Adams-Thompson	3185 Mavis Road, Ground Floor	Mississauga, ON	L5C 1T7
City of Mississauga	Mike	Maloney	3185 Mavis Road, Ground Floor	Mississauga, ON	L5C 1T7
Aboriginal Affairs and Rural Development Canada	Sean	Darcy	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Janet	Townson	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Don	Boswell	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Josee	Beauregard	25 Eddy St, 14th Floor	Gatineau, QC	K1A 0H4
Brampton Fire and Emergency Services	Andy	MacDonald	8 Rutherford Road South	Brampton, Ontario	L6W 3J1
Brampton Transit	Craig	Sherwood	185 Clark Boulevard	Brampton, Ontario	L6T 4G6
Caledon Countryside Aliiance	Karen	Hutchinson	PO Box 69/Station Inglewood	Caledon, ON	L7C 3L6
Caledon Ontario Provincial Police Detachment	Brian	Knowler	6211 Old Church Road	Caledon East, ON	L7C 1J7
Canadian Transport Agency	Jeannette	Anderson	15 Eddy St	Gatineau, QC	K1A 0N9
CVCA	Liam	Marray	1225 Old Derry Road	Mississauga, ON	L5N 6R4
Environment Canada	Rob	Dobos	PO Box 5050, 867 Lakeshore Rd	Burlington, ON	L7T 3M3

Fisheries and Oceans Canada	Cindy	Latendresse	3027 Harvester Road Unit 304	Burlington, ON	L7R 4K3
GO Transit	Michael	Wolczyk	20 Bay St	Toronto, ON	M5J 2W3
GO Transit	Elise	Croll	20 Bay St	Toronto, ON	M5J 2W3
Health Canada	John	Fischer	867 Lakeshore Road	Burlington, ON	L7R 4A6
Ministry of Aboriginal Affairs	Lorena	Weesit	Suite 400, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Aboriginal Affairs	Alan	Kary	4th Flr, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Aboriginal Affairs	Ashley	Johnson	9th Flr, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Agriculture, Food and Rural Affairs	Carol	Neumann	Unit 10, 6484 Wellington Rd 7	Elora ON	N0B1S0
Metrolinx	Daniel	Haufschild	20 Bay St	Toronto, ON	M5J 2W3
Ministry of Community Safety and Correctional Services	Sheryl	Bennett	777 Memorial Ave	Orillia ON	L3V7V3
Ministry of Culture	Winston	Wong	Bldg D, 3rd Flr, 1201 Wilson Ave	Downsview ON	M3M1J8
Ministry of Culture	Michael	Johnson	3rd Flr N, 300 Water St	Peterborough ON	K9J8M5
Ministry of Municipal Affairs and Housing	Timothy	Haldenby	2nd Flr, 777 Bay St	Toronto ON	M5G2E5
Ministry of Municipal Affairs and Housing	Bruce	Singbush	4th Flr, 777 Bay St	Toronto, ON	M5G2E5
Ministry of Public Infrastructure Renewal	Tija	Dirks	4th Flr Suite 425, 777 Bay St	Toronto, ON	M5G2E5
Ministry of Natural Resources	Debbie	Pella Keen	50 Bloomington Rd	Aurora ON	L4G0L8
Ministry of Natural Resources	Bohdan	Kowalyk	50 Bloomington Rd W	Aurora ON	L4G0L8
Ministry of Natural Resources	Mark	Heaton	50 Bloomington Rd	Aurora ON	L4G0L8
Ministry of Natural Resources	Theresa	Fancy	5th Flr N, 300 Water St	Peterborough ON	K9J8M5
Ministry of Environment	Dan	Panko	9th Flr, 5775 Yonge St	Toronto ON	M2M4J1
Ministry of Environment	Chunmei	Liu	9th Flr, 5775 Yonge St	Toronto ON	M2M4J1
Ministry of Transportation Ontario	Alice	Kam	Bldg D, 4th Flr, 1201 Wilson Ave	Downsview ON	M3M1J8
Ministry of Transportation Ontario	Ted	Lagakos	2nd Flr, 301 St Paul St	St Catharines ON	L2R7R4
Ministry of Transportation Ontario	Johnathan	Boone	Bldg D, 6th Flr, 1201 Wilson Ave	Toronto, ON	M3M1J8
Orangeville-Brampton Railway	Steve	Gallagher	75 1st Street	Orangeville, ON	L9W 5B6
Parks Canada, Historic Site & Monument Board	Alexandre	Ferland	25 Rue Eddy	Gatineau, QC	K1A 1K5
Peel Regional Police	Jennifer	Evans	7750 Hurontario Street	Brampton, ON	L6V 3W6
Region of Peel Ambulance Service	Peter	Dundas	5299 Maingate Drive	Mississauga, ON	L4W 1G6
Transport Canada	Laura	Verwey	330 Sparks Street	Ottawa, ON	K1A 0N5
TRCA	Ben	Krul	5 Shoreham Dr	Downsview, ON	M3N 1S4
TRCA	Sharon	Lingertat	5 Shoreham Dr	Downsview, ON	M3N 1S4
Bell Canada Municipal Operations Centre	Diana	Velez	200 Town Centre Boulevard, Suite	Markham, ON	L3R 8G5
Enbridge Gas Distribution Inc	Diana	Beaulne	500 Consumers Road, 4th Floor	North York, ON	M2J 1P8
Hydro One Brampton	Linda	Morson	175 Sandalwood Parkway West	Brampton, ON	L7A 1E8
Hydro One Telecom	Ian	Mitchell	65 Kelfield Street	Rexdale, ON	M9W 5A3
MTS Allstream	Ian	Fleming	50 Worcester Road	Toronto, ON	M9W 5X2
Rogers Cable	Edgar	Henriquez	3573 Wolfedale Road	Mississauga, ON	L5C 3T6
Telus Network	Steve	Hoy	25 York St, 22nd Floor	Toronto, ON	M5J 2V5

Date

Letter to Residents PIC#1

Name
Address
Town/Province
Postal Code

Dear Property/Business Owner:

Re: Notice of Study Commencement, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard, City of Brampton, Town of Caledon, Town of Halton Hills

The Regional Municipality of Peel is initiating a Schedule 'C' Class Environmental Assessment Study to investigate improvements to Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard. A copy of the Notice of Study Commencement is enclosed.

The study will evaluate:

- capacity deficiencies (existing and future),
- structural condition and deficiencies,
- identified safety issues,
- approved and proposed land use changes,
- natural heritage and fisheries requirements and other aspects of the environment,
- surrounding road network improvements, and
- property requirements

A key component of the study will be consultation with interested stakeholders (public and regulatory agencies) including two Public Information Centres (PICs). Details regarding the forthcoming PICs will be advertised as the study progresses.

Through the next few months, a topographic survey will be conducted along Mayfield Road. Please note:

- A topographic survey identifies and records the existing physical and natural features on the ground such as driveways, trees, signs, etc.;
- the Region of Peel will be conducting actual field measurements for topographic survey;

- measurements may be taken slightly beyond the road allowance, on your property;
- this fieldwork will not involve any heavy equipment; and
- will only involve people walking on the property for short periods of time for measurement purposes.

If there is any concern with the survey fieldwork being conducted on your property, please contact us immediately.

In addition to the field survey, sub-consultants working for the Region will be in the area to perform various forms of fieldwork including a natural features survey, archeological assessment, surface water and groundwater surveys and a geotechnical borehole investigation. This work will be completed from spring 2013 to summer 2013.

You may use the enclosed comment form to request additional information or provide comments about the study.

Thank you for your assisting us in the identification of pertinent issues affecting this project and your attention to this matter.

Yours truly,

Neal Smith, C.E.T.
Project Manager | Transportation Program Planning
Transportation Division
Phone: 905.791.7800 ext. 7866
Fax: 905.791.1442
Email: neal.smith@peelregion.ca

Encl.: 1. Notice of Study Commencement
2. Comment Form

COMMENT FORM

Class Environmental Assessment Study for

MAYFIELD ROAD IMPROVEMENTS FROM CHINGUACOUSY ROAD TO WINSTON CHURCHILL BOULEVARD CITY OF BRAMPTON, TOWN OF CALEDON, TOWN OF HALTON HILLS

Please provide your comments or ask any questions that you may have with respect to the study.

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Thank you for providing your comments. **Please, write, fax or email your comments to:**

Neal Smith, C.E.T.
Project Manager
The Regional Municipality of Peel
10 Peel Centre Drive, Suite B
Brampton, ON L6T 3B9
Tel: 905.791.7800 x7866
Fax: 905.791.1442
neal.smith@peelregion.ca

Completed by:

Name ____

Email Address _______________________________________

Address ____

Phone ____

Mailing List to the Public - Commencement and PIC#1

FIRST_NAME	PROPERTY LOCATION	MAILING1	C/O	CITY_PROVINCE	POSTAL_CODE
2107999 ONTARIO INC	11687 CHINGUACOUSY RD	40 KING ST W SUITE 3100		TORONTO ON	M5H 3Y2
MONKMAN KEITH MAXWELL	11690 CHINGUACOUSY RD	11690 CHINGUACOUSY RD		BRAMPTON ON	L7A 0G7
CREDITVIEW MAYFIELD CORPORAT	11953 CREDITVIEW RD	85 HANNA AVE SUITE 400		TORONTO ON	M6K 3S3
PARADISE HOMES NORTH WEST IN	11630 CREDITVIEW RD W/S	625 COCHRANE DR SUITE 801		MARKHAM ON	L3R 9R9
PARADISE HOMES NORTH WEST IN	1333 MAYFIELD RD	625 COCHRANE DR SUITE 801		MARKHAM ON	L3R 9R9
PARADISE HOMES NW INC	11719-11827 MISSISSAUGA RD	625 COCHRANE DR SUITE 801		MARKHAM ON	L3R 9R9
584572 ONTARIO LIMITED	11722 MISSISSAUGA RD	34 RAVINDER CRT		BRAMPTON ON	L6Z 3M8
SAHOTA AJIT SINGH	781 MAYFIELD RD	781 MAYFIELD RD		BRAMPTON ON	L7A 0C5
BAUMANN HEINZ	HERITAGE RD	6160 WINSTON CHURCHILL BLVD		ALTON ON	L0N 1A0
1231058 ONTARIO INC	11968 HERITAGE RD	160 CIDERMILL AVE UNIT 7		CONCORD ON	L4K 4K5
MCN (MAYFIELD) INC	111 MAYFIELD RD	2800 HWY NO 7		VAUGHAN ON	L4K 1W8
TIBER BRAMPTON HOLDINGS INC	MAYFIELD RD	111 CREDITSTONE RD	C/O GALLIANO TIBERINI	CONCORD ON	L4K 1N3
MISTRY DINESH HARIBHAI	MAYFIELD RD	259 MOSSBROOK SQ		PICKERING ON	L1V 6P9
MCN (MAYFIELD) INC	419 MAYFIELD RD	2800 HIGHWAY 7		CONCORD ON	L4K 1W8
CRAWFORD LLOYD H	709 MAYFIELD RD	PO BOX 151 STN MAIN		GEORGETOWN ON	L7G 4T1
VAN TENT JOHN WILLIAM GERALD	1209 MAYFIELD RD	1209 MAYFIELD RD		BRAMPTON ON	L7A 0C4
KUMAR KIRAN	1235 MAYFIELD RD	1235 MAYFIELD RD		BRAMPTON ON	L7A 0C4
HUI COLLEEN SHUK LAN	1255 MAYFIELD RD	1255 MAYFIELD RD		BRAMPTON ON	L7A 0C4
BRAR JASVIR	1285 MAYFIELD RD	1285 MAYFIELD RD		BRAMPTON ON	L7A 0C4
CREDITVIEW MAYFIELD CORPORATION	1577 MAYFIELD RD	85 HANNA AVE SUITE 400		TORONTO ON	M6K 3S3
FINELLI FAUSTO	1637 MAYFIELD RD	5 REDTHORN CRT		ETOBICOKE ON	M9C 3K1
WALNESS DEVELOPMENTS INC	MAYFIELD RD	145 REYNOLDS ST SUITE 400	C/O MELROSE INVESTMENTS IN	OAKVILLE ON	L6J 3K8
1367933 ONTARIO INC	MAYFIELD RD	145 REYNOLDS ST SUITE 400	C/O MELROSE INVESTMENTS IN	OAKVILLE ON	L6J 3K8
1367933 ONTARIO INC	1635 MAYFIELD RD	145 REYNOLDS ST SUITE 400	C/O MELROSE INVESTMENTS IN	OAKVILLE ON	L6J 3K8
MONKMAN LORI ANNE	MAYFIELD RD	11690 CHINGUACOUSY RD		BRAMPTON ON	L7A 0G7
MONKMAN CATHERINE A	MAYFIELD RD	11690 CHINGUACOUSY RD		BRAMPTON ON	L7A 0G7
MCCLURE GORDON DOUGLAS	12016 CHINGUACOUSY RD	12872 CREDITVIEW RD		CALEDON ON	L7C 1Y1
856063 ONTARIO INC	12017-12101 CREDITVIEW RD	12101 CREDITVIEW RD		CALEDON ON	L7C 1Y6
FRADOL FARMS LIMITED	CREDITVIEW RD	12205 CREDITVIEW RD	C/O M G DOLSON	CALEDON ON	L7C 1Y6
1867847 ONTARIO LIMITED	12100 CREDITVIEW DR	24 QUEEN ST E SUITE 600		BRAMPTON ON	L6V 1A3
PIONEER HI-BRED PRODUCTION L	12111 MISSISSAUGA RD	12111 MISSISSAUGA RD		CALEDON ON	L7C 1X1
1143922 ONTARIO LIMITED	12134 MISSISSAUGA RD	506 CONSERVATION DR		BRAMPTON ON	L6Z 0B8
MAYFIELD STATION DEVELOPMENT	2068 MAYFIELD RD	150 CONNIE CRES UNIT 1		CONCORD ON	L4K 1L9
IABONI GIACINTO	MAYFIELD RD N/S	29 FRITH RD		NORTH YORK ON	M3N 1E9
SPRICKERHOFF ANNIE	1890 MAYFIELD RD	1890 MAYFIELD RD		CALEDON ON	L7C 0Y8
1223513 ONTARIO INC	MAYFIELD RD	1350 SHAWSON DR		MISSISSAUGA ON	L4W 1C5
VANAIK ROMESH	1770 MAYFIELD RD	1770 MAYFIELD RD		CALEDON ON	L7C 0Y8
VAN GOOL FAMILY HOLDINGS INC	1760 MAYFIELD RD	1760 MAYFIELD RD		CALEDON ON	L7C 0Y8
DIAS MARIO	1704 MAYFIELD RD	1704 MAYFIELD RD		CALEDON ON	L7C 0Y8
LONJAK REZA	1680 MAYFIELD RD	1680 MAYFIELD RD		CALEDON ON	L7C 0Y8
PEEL DISTRICT SCHOOL BOARD	1248 MAYFIELD RD	5650 HURONTARIO ST		MISSISSAUGA ON	L5R 1C6
1096281 ONTARIO LIMITED	816 MAYFIELD RD	12231 SECOND LINE	RR 1	CAMPBELLVILLE ON	L0P 1B0
GARBUTT DONALD KEITH	624 MAYFIELD RD	624 MAYFIELD RD		CALEDON ON	L7C 0Y6
MOORE BETTY JANE	486 MAYFIELD RD	486 MAYFIELD RD		CALEDON ON	L7C 0Y5
DENHART MARVARIE	468 MAYFIELD RD	468 MAYFIELD RD		CALEDON ON	L7C 0Y5
LORWOOD HOLDINGS INCORPORATE	400 MAYFIELD RD	86 MOYAL CRT SUITE 201		CONCORD ON	L4K 4R8
LESLIE TERRENCE GEORGE	84 MAYFIELD RD	84 MAYFIELD RD		CALEDON ON	L7C 0Y5
2201411 ONTARIO INC.	12016 Chinguacousy Road	114 Regent Road	c/o Ahmed Topyurek,	Toronto ON	M3K 1H4
Hydro One Networks	North side of Mayfield Road, west of Chinguacousy Road, Caledon	PO Box 4300		Markham, ON	L3R 5Z5
The Trustees of the Alloa Home United Church	1500 Mayfield Road	12466 Mississauga Rd	c/o Bill Frazer	Caledon, ON	L7C 1W2
Bimani Developments Inc.	11953 Creditview Road and 1577 Mayfield Road	8600 Dufferin Street		Vaughan, ON	L4K 5P5
Peter and Sheila Smith	767 Mayfield Road	767 Mayfield Road		Brampton, ON	L7A 0C5
Vinfab Investments Inc.	11968 Heritage Road, Brampton	25 High Meadow Place		Toronto, ON	M9L 0A3
PL Ventures Limited	11687 Chinguacousy Road	10 Dundas Street East, Suite 1002		Toronto, ON	M5B 2G9
No. 3 Hunglin Development Corporation	11694 Winston Churchill Blvd	40 Colonel Danforth Trail		Scarborough, ON	M1C 1R1
Treeola Farms	11324 Winston Churchill Blvd	12700 McLaughlin Road		Caledon, ON	L7C 2A9
Domingos and Fatima Da Cruz	12157 Chinguacousy Road	12157 Chinguacousy Road		Caledon, ON	L7C 3H1
Sharon Bonello	12116 Chinguacousy Road	12116 Chinguacousy Road		Caledon, ON	L7C 1Y9
Domenico and Concetta Polsinelli	12140 Chinguacousy Road	12140 Chinguacousy Road		Caledon, ON	L7C 1Y9
Moises and Maria Cordeira	12156 Chinguacousy Road	2907 Saint Malo Circle		Mississauga, ON	L5N 1S8
2308645 Ontario Inc. and 1839234 Ontario Limited	East side of Creditview Road, south of Mayfield Road	3601 Highway 7 East, Suite 309		Markham, ON	L3R 0M3
Gold Park Rowntree Developers Inc.	East side of Creditview Road, south of Mayfield Road	55 Silton Road, Unit 2		Woodbridge, ON	L4L 7Z8
Francis and Joan Pelly and Ann McCartney	12158 Creditview Road	12158 Creditview Road		Caledon, ON	L7C 1X9
John and Grinoalda Martins	12139 Mississauga Road	12139 Mississauga Road		Caledon, ON	L7C 1X1
Aleksander and Joanna Trochanowski	12153 Mississauga Road	12153 Mississauga Road		Caledon, ON	L7C 1X1
James and Joan Scott	12165 Mississauga Road	12165 Mississauga Road		Caledon, ON	L7C 1X1
Rosie O'Donnell	12150 Mississauga Road	12150 Mississauga Road		Caledon, ON	L7C 1W1
Robert Leslie	12038 Heritage Road	12038 Heritage Road		Caledon, ON	L7C 1T2
Springbrook North Developments Inc.	East side of Heritage Road, south of Mayfield Road	5622 McAdam Road		Mississauga, ON	L4Z 1P1
Jack Bottner	West side of Heritage Road, south of Mayfield Road	3330 Cambourne Crescent	c/o S. Bottner	Mississauga, ON	L5N 5P6
Alosia Asbeck and Roland Vollert	11354 Winston Churchill Boulevard	11354 Winston Churchill Boulevard		Halton Hills, ON	L7A 0A3

Brampton Brick Limited
- Brad Cobbledick bcobbledick@bramptonbrick.com
- Lauren Mulkerns lmulkerns@bramptonbrick.com

Long Environmental Consultants
- Bob Long Bob_long@longenv.com
- Todd Lawr todd_lawr@longenv.com

PUBLIC INFORMATION CENTRE NO. 2

- Newspaper advertisement
- Mailing lists – residents and agencies
- Letter templates – residents and agencies

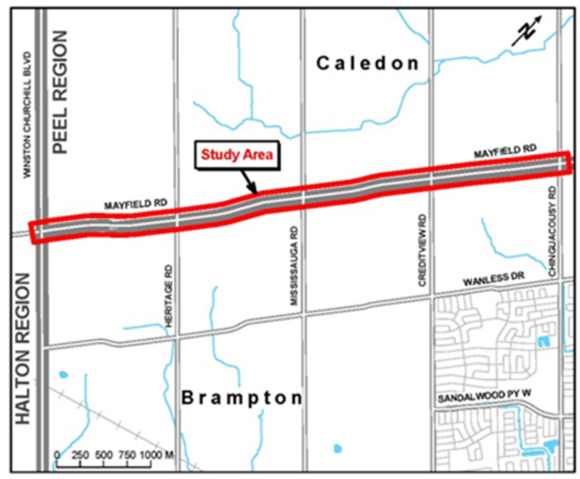
Region of Peel
Working for you

Public Notice

MAYFIELD ROAD

Municipal Class Environmental Assessment
from Chinguacousy Road to Winston Churchill Blvd

This is the **second Public Information Centre** for proposed improvements to Mayfield Road. It will build on previous study recommendations and present a preliminary road design.



Please join us at the second

Public Information Centre

Thursday, October 8, 2015

The Peel Police Association Banquet Hall
10675 Mississauga Road
Brampton, Ontario L7A 0B6
6:30 pm to 8:30 pm

Your opinion matters and we welcome your participation!

For study background details visit us on-line at:
peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea.htm
or call ***Neal Smith*** at ***905-791-7800*** extension ***7866***

The Region of Peel is committed to ensure that all Regional services, programs and facilities are inclusive and accessible for persons with disabilities. Please contact the project manager if you need any disability accommodations to participate in the public meeting.

This notice was first issued on September 24, 2015

With the exception of personal information, all comments will become part of the public record of the study. The study is being conducted according to the requirements of the Municipal Class Environmental Assessment, which is a planning process approved under Ontario's *Environmental Assessment Act*.

Region of Peel
Working for you

September 22, 2015

LETTER SENT TO AGENCIES FOR PIC NO. 2

Re: Notice of Public Information Centre No. 2
Municipal Class Environmental Assessment Study for Improvements to Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard

The Region of Peel commenced a Municipal Class Environmental Assessment Schedule 'C' Study in March 2013 to study improvements to Mayfield within the above study limits. The purpose of this letter is to invite you to the ***second*** and ***final*** Public Information Centre (PIC) on ***October 8, 2015*** at the Peel Regional Police Association Banquet Hall in Caledon. Details of the PIC are on the reverse side of this letter.

This final PIC will be presented as an informal drop-in centre with display information on the study findings to date including the **preliminary recommended alternative design** and **proposed property impacts.**

If you cannot attend the PIC and wish to provide comment, please visit our website and use our interactive comment box or, send comments using the attached comment sheet by letter, fax or e-mail. The information boards will be posted on the Region's website following the PIC at: www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm

Sincerely,

Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Phone No.: 905-791-7800 ext. 7866
Fax No.: 905-791-1442
Email: neal.smith@peelregion.ca

Attachment

AGENCY	CONTACT FIRST NAME	CONTACT SECOND NAME	MAILING	CITY_PROVINCE	POSTAL_CODE
First Nations					
Alderville First Nation	James	Marsden	P.O. Box 46/11696 2nd Line Rd	Alderville, ON	K0K 2X0
Association of Iroquois and Allied Indians	Gord	Peters	387 Princess Avenue	London, ON	N6B 2A7
Beausoleil First Nation	Roland	Monague	11 Ogemaa Miikaan	Christian Island, ON	L9M 0A9
Chippewas of Georgina Island	Donna	Big Canoe	R.R.#2 Box N-13	Sutton West, ON	L0E 1R0
Chippewas of Saugeen (Ojibwe)	Randall	Kahgee	6493 Highway 21/R.R # 1	Southampton, ON	N0H 2L0
Chippewas of Rama	Sharon	Stinson Henry	5884 Rama Road, Suite 200	Rama, ON	L3V 6H6
Credit River Métis Council	Steven	Sarrazin	160 Main St, Suite 561	Brampton, ON	L6W 4R1
Curve Lake First Nation	Phyllis	Williams	Curve Lake Post Office	Curve Lake, ON	K0L 1R0
Haudenosaunee Confederacy Development Institute	Hazel	Hill	16 Sunrise Court, Suite 407/P.O.	Ohsweken, ON	N0A 1M0
Haundenosaunee Confederacy Chiesfs Council	Allen	MacNaughton	2634 6th Line Rd, RR 2	Ohsweken, ON	N0A 1N0
Hiawatha First Nation	Sandra	Moore	123 Paudash Street	Keene, ON	K0L 2G0
Mississaugas of New Credit First Nation	Bryan	LaForme	2789 Mississauga Road/RR 6	Hagersville, ON	N0A 1H0
Mississaugas of Scugog Island First Nation	Tracy	Gauthier	22521 Island Road	Port Perry, ON	L9L 1B6
Six Nations of the Grand River Territory	William	Montour	1695 Chiefswood Rd./P. O. Box	Ohsweken, ON	N0A 1M0
The Chiefs of Ontario	Kathleen	Padulo	111 Peter Street, Suite 804	Toronto, ON	M5V 2H1
The Metis Nation of Ontario	Doug	Wilson	500 Old St. Patrick St, Unit 3	Ottawa, ON	K1N 9G4
Union of Ontario Indians (Anishinabek)	Jason	Laronde	1 Miigizi Mikan	North Bay, ON	P1B 8J8
City of Brampton	Bob	Callahan	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Linda	Jeffrey	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Chris	Duyvestyn	8850 McLaughlin Road	Brampton, ON	L6Y 5T1
City of Brampton	John	Hutton	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Michael	Palleschi	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	John	Sanderson	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Antonietta	Minichillo	2 Wellington Street West	Brampton, ON	L6Y 4R2
City of Brampton	Ricardo	Scattolon	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 5T1
City of Brampton	Kyla	Devin	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 4R2
City of Brampton	John	Allison	2 Wellington St W, Brampton	Brampton, ON	L6Y 4R2
City of Brampton	Susan	Evans	8850 McLaughlin Rd S, Unit 2	Brampton, ON	L6Y 4R2
Town of Caledon	Sally	Drummond	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Tim	Manley	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Allan	Thompson	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Jeremy	Schembri	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	David	Loveridge	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Mary	Hall	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Danita	Taccogna	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Todd	Salter	6311 Old Church Road	Caledon, ON	L7C 1J6
Town of Caledon	Johanna	Downey	6312 Old Church Road	Caledon, ON	L7C 1J7
Aboriginal Affairs and Rural Development Canada	Sean	Darcy	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Janet	Townson	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Don	Boswell	10 Wellington St	Gatineau, QC	K1A 0H4
Aboriginal Affairs and Rural Development Canada	Josee	Beauregard	25 Eddy St, 14th Floor	Gatineau, QC	K1A 0H4
Brampton Fire and Emergency Services	Andy	MacDonald	8 Rutherford Road South	Brampton, Ontario	L6W 3J1
Brampton Transit	Craig	Sherwood	185 Clark Boulevard	Brampton, Ontario	L6T 4G6
Brampton Transit	David	Stowe	185 Clark Boulevard	Brampton, ON	L6T 4G6
Caledon Countryside Aliiance	Karen	Hutchinson	PO Box 69/Station Inglewood	Caledon, ON	L7C 3L6
Caledon Ontario Provincial Police Detachment	Brian	Knowler	6211 Old Church Road	Caledon East, ON	L7C 1J7
Canadian Transport Agency	Jeannette	Anderson	15 Eddy St	Gatineau, QC	K1A 0N9
CVCA	Jakub	Kilis	1225 Old Derry Road	Mississauga, ON	L5N 6R4
Environment Canada	Rob	Dobos	PO Box 5050, 867 Lakeshore Rd	Burlington, ON	L7T 3M3
Fisheries and Oceans Canada	Cindy	Latendresse	3027 Harvester Road Unit 304	Burlington, ON	L7R 4K3
GO Transit	Michael	Wolczyk	20 Bay St	Toronto, ON	M5J 2W3

GO Transit	Elise	Croll	20 Bay St	Toronto, ON	M5J 2W3
Health Canada	John	Fischer	867 Lakeshore Road	Burlington, ON	L7R 4A6
Ministry of Aboriginal Affairs	Lorena	Weesit	Suite 400, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Aboriginal Affairs	Alan	Kary	4th Flr, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Aboriginal Affairs	Ashley	Johnson	9th Flr, 160 Bloor St E	Toronto, ON	M7A2E6
Ministry of Agriculture, Food and Rural Affairs	Carol	Neumann	Unit 10, 6484 Wellington Rd 7	Elora ON	N0B1S0
Ministry of Community Safety and Correctional Services	Sheryl	Bennett	777 Memorial Ave	Orillia ON	L3V7V3
Ministry of Tourism, Culture and Sport, Culture Services	Rosi	Zirger	401 Bay Street, Suite 1700	Toronto, ON	M7A 0A7
Ministry of Tourism, Culture and Sport, Culture Services	Dan	Minkin	401 Bay Street, Suite 1700	Toronto, ON	M7A 0A7
Ministry of Municipal Affairs and Housing	Timothy	Haldenby	2nd Flr, 777 Bay St	Toronto ON	M5G2E5
Ministry of Municipal Affairs and Housing	Bruce	Singbush	4th Flr, 777 Bay St	Toronto, ON	M5G2E5
Ministry of Public Infrastructure Renewal	Tija	Dirks	4th Flr Suite 425, 777 Bay St	Toronto, ON	M5G2E5
Ministry of Natural Resources and Forestry	Debbie	Pella Keen	50 Bloomington Rd	Aurora ON	L4G0L8
Ministry of Natural Resources and Forestry	Bohdan	Kowalyk	50 Bloomington Rd W	Aurora ON	L4G0L8
Ministry of Natural Resources and Forestry	Mark	Heaton	50 Bloomington Rd	Aurora ON	L4G0L8
Ministry of Natural Resources and Forestry	Theresa	Fancy	5th Flr N, 300 Water St	Peterborough ON	K9J8M5
Ministry of the Environment and Climate Change	Amanda	Graham	9th Flr, 5775 Yonge St	Toronto ON	M2M4J1
Ministry of Transportation Ontario	Alice	Kam	Bldg D, 4th Flr, 1201 Wilson Ave	Downsview ON	M3M1J8
Ministry of Transportation Ontario	Lou	Politano	Bldg D, 2nd Flr, 1201 Wilson Ave	Downsview ON	M3M1J8
Ministry of Transportation Ontario	Ted	Lagakos	2nd Flr, 301 St Paul St	St Catharines ON	L2R7R4
Ministry of Transportation Ontario	Johnathan	Boone	Bldg D, 6th Flr, 1201 Wilson Ave	Toronto, ON	M3M1J8
Orangeville-Brampton Railway	Steve	Gallagher	75 1st Street	Orangeville, ON	L9W 5B6
Parks Canada, Historic Site & Monument Board	Alexandre	Ferland	25 Rue Eddy	Gatineau, QC	K1A 1K5
Peel Regional Police	Jennifer	Evans	7750 Hurontario Street	Brampton, ON	L6V 3W6
Region of Peel Ambulance Service	Peter	Dundas	5299 Maingate Drive	Mississauga, ON	L4W 1G6
Transport Canada	Laura	Verwey	330 Sparks Street	Ottawa, ON	K1A 0N5
Bell Canada Municipal Operations Centre	Diana	Velez	200 Town Centre Boulevard, Suite	Markham, ON	L3R 8G5
Enbridge Gas Distribution Inc	Diana	Beaulne	500 Consumers Road, 4th Floor	North York, ON	M2J 1P8
Hydro One Brampton	Linda	Morson	175 Sandalwood Parkway West	Brampton, ON	L7A 1E8
Hydro One Telecom	Ian	Mitchell	65 Kelfield Street	Rexdale, ON	M9W 5A3
MTS Allstream	Ian	Fleming	50 Worcester Road	Toronto, ON	M9W 5X2
Rogers Cable	Edgar	Henriquez	3573 Wolfedale Road	Mississauga, ON	L5C 3T6
Telus Network	Steve	Hoy	25 York St, 22nd Floor	Toronto, ON	M5J 2V5
Hydro One Networks Orangeville	Steve	Davey	40 Olympic Drive	Dundas, ON	L9H 7P5
Fire & Emergency Services	Dave	Forfar	6097 Old Church Road	Caledon, ON	L7C 1G6
Hydro One Brampton	Rob	Evangelista	175 Sandalwood Parkway West	Brampton, ON	L7A 1E8

Region of Peel
Working for you

September 22, 2015

Letters to Residents

Property Location:

Re: Notice of Public Information Centre No. 2
Municipal Class Environmental Assessment Study for Improvements to Mayfield Road
from Chinguacousy Road to Winston Churchill Boulevard 12-4390

The Region of Peel commenced a Municipal Class Environmental Assessment in March 2013 to study improvements to Mayfield within the above study limits. The purpose of this letter is to invite you to the ***second*** and ***final*** Public Information Centre (PIC) on ***October 8, 2015*** at the Peel Regional Police Association Banquet Hall in Caledon. Details of the PIC are on the reverse side of this letter.

This final PIC will be presented as an informal drop-in centre with display information on the study findings to date including the **preliminary recommended alternative design** and proposed **property impacts.**

This is a great opportunity to be heard, to ask questions, review project information, talk with our project team and provide input on the project. Your participation is important and I look forward to meeting you.

If you cannot attend the PIC and wish to provide comment, please visit our website and use our interactive comment box or, send comments using the attached comment sheet by letter, fax or e-mail. The information boards will be posted on the Region's website following the PIC at:

www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm

Sincerely,

Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Transportation Division
Phone No.: 905-791-7800 ext. 7866
Fax No.: 905-791-1442
Email: neal.smith@peelregion.ca

Attachment

Region of Peel
Working for you

September 22, 2015

Gurdeep Gakhal and Gurpirit Gakhal
[redacted]

Dear Property Owner,

Re: Notice of Public Information Centre No. 2
Municipal Class Environmental Assessment Study for Improvements to Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard

The Region of Peel commenced a Municipal Class Environmental Assessment in March 2013 to study improvements to Mayfield within the above study limits. The purpose of this letter is to invite you to the ***second*** and ***final*** Public Information Centre (PIC) on ***October 8, 2015*** at the Peel Regional Police Association Banquet Hall in Caledon. Details of the PIC are on the reverse side of this letter.

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Sincerely,

Neal Smith

Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Transportation Division
Phone No.: 905-791-7800 ext. 7866
Fax No.: 905-791-1442
Email: neal.smith@peelregion.ca

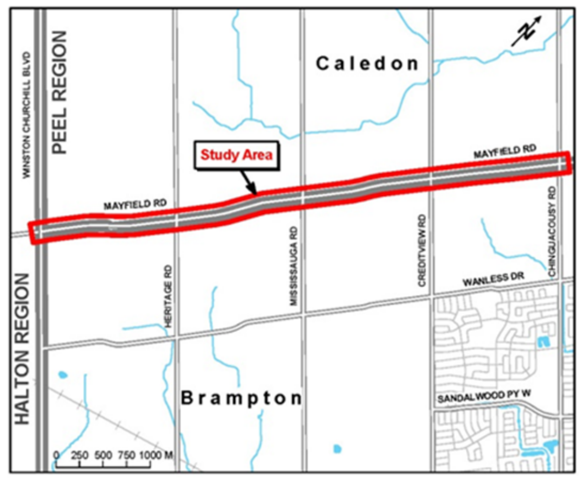
Attachment

Region of Peel
Working for you

Public Notice

MAYFIELD ROAD

Municipal Class Environmental Assessment from Chinguacousy Rd to Winston Churchill Blvd



This is the **second Public Information Centre** for proposed improvements to Mayfield Road. It will build on previous study recommendations and present a preliminary road design.

Please join us at the

Second Public Information Centre

Thursday, October 8, 2015

The Peel Police Association Banquet Hall
10675 Mississauga Road
Brampton, Ontario L7A 0B6

6:30 p.m. to 8:30 p.m.

Your opinion matters and we welcome your participation!

For study background details visit us on-line at:
peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm
or call ***Neal Smith, Project Manager*** at ***905-791-7800*** extension ***7866***

The Region of Peel is committed to ensure that all Regional services, programs and facilities are inclusive and accessible for persons with disabilities. Please contact the project manager if you need any disability accommodations to participate in the public meeting.
This notice was first issued on September 24, 2015

Public Works
10 Peel Centre Dr., Suite B, Brampton, ON L6T 4B9
Tel: 905-791-7800 www.peelregion.ca

Comment Sheet for the **MAYFIELD ROAD** Environmental Assessment
from Chinguacousy Road to Winston Churchill Boulevard

Public Information Centre No. 2

Thursday, October 8, 2015

Where do you live? □ Town of Caledon □ City of Brampton □ Halton Region
□ Other ____________________

1. My interest is? (check all applicable)
   - □ Direct access onto Mayfield Road
   - □ Residential property
   - □ Business/commercial
   - □ Industrial
   - □ Other (specify)
2. Do you have any questions or comments on the study information presented or the preliminary recommended design?

____
____
____
____
____
____
____
____
____

3. If you would like us to contact you, please give us your details.

Name: ____
Address: ____
Telephone/Email: _____________________________________

Thank you for participating in this study. For more information please visit our website. You can also provide comments on-line at:
http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm
Comment sheets may be placed in the comment box at the PIC or sent to Neal Smith, Project Manager, by ***Friday, October 23, 2015***.

Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, ON L6T 4B9
Tel: 905-791-7800 x7866 / Fax 905-791-1442
Email: neal.smith@peelregion.ca

Note: Comments and information regarding this project are being collected in accordance with the *Municipal Freedom of Information & Protection of Privacy Act* for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become a part of the public record.

PROPERTY OWNER MAILING LIST
FOR PIC#2

Property Owner	Mailing Address	Property Address / Location
2201411 Ontario Inc.	c/o Ahmed Topyurek, 114 Regent Road, North York (Toronto), ON M3K 1H4	12016 Chinguacousy Road, Caledon
Hydro One Networks Inc.	PO Box 4300, Markham, ON L3R 5Z5	North side of Mayfield Road, west of Chinguacousy Road, Caledon
Giacinto Iaboni, Elisa Iaboni Bianca Iaboni, Gina Iaboni, Cerelli Armando and Nick Gouliaras	29 Frith Road, North York, ON M3N 1E9	North side of Mayfield Road, west of Chinguacousy Road, Caledon
Kenneth Robert Sprickerhoff and Annie Sprickerhoff	1890 Mayfield Road, Caledon, ON L7C 0Y8	1890 Mayfield Road, Caledon
1223513 Ontario Inc.	c/o Antun Deltin, 1350 Shawson Drive, Mississauga, ON L4W 1C5	North side of Mayfield Road, west of Chinguacousy Road, Caledon
Romesh Vanaik, Rajan Vanaik and Rahul Vanaik	1770 Mayfield Road, Caledon, ON L7C 0Y8; and, 12 Kelways Circle, Brampton, Ontario, L6T 0G6	1770 Mayfield Road, Caledon
Van Gool Family Holdings Inc.	1760 Mayfield Road, Caledon, ON L7C 0Y8	1760 Mayfield Road, Caledon
Stephen James Dolson, Mary Jean Dolson, Thomas Edward Dolson, Fradol Farms Limited and Fradol Family Farm GP.	c/o Tom Dolson, 12205 Creditview Road, Caledon, ON L7C 1Y6	12205 Creditview Road, Caledon
Emilia Dias and Mario Dias	1704 Mayfield Road, Caledon, ON L7C 0Y8	1704 Mayfield Road, Caledon
Reza Lonjak	1680 Mayfield Road, Caledon, ON L7C 0Y8	1680 Mayfield Road, Caledon

856063 Ontario Inc.	c/o Tom Dolson, 12101 Creditview Road, Caledon, ON L7C 1Y6	12017-12101 Creditview Road, Caledon
The Trustees of the Home Congregation of the United Church of Canada	c/o Bill Frazer, 12466 Mississauga Rd., Caledon, ON L7C 1W2	1500 Mayfield Road, Caledon
1867847 Ontario Limited	24 Queen Street East, Suite 600, Brampton, ON L6V 1A3; and, c/o Norman McClure, 12458 Creditview Road, Caledon, Ontario L7C 1X1	12100 Creditview Road, Caledon
The Regional Municipality of Peel	c/o Jaime Acoste, 10 Peel Centre Drive, Suite B, 4th Floor, Brampton, ON L6T 4B9	1278 Mayfield Road, Caledon
Peel District School Board	5650 Hurontario Street, Mississauga, ON L5R 1C6	1248 Mayfield Road, Caledon
Pioneer Hi-Bred Production Ltd.	c/o Willem Nieuwenkamp, 12111 Mississauga Road, Caledon, ON L7C 1X1	12111 Mississauga Road, Caledon
1143922 Ontario Limited; Kavar Jewellers Inc.	c/o Harry Peddle, 506 Conservation Drive, Brampton, ON L6Z 0B8; and, c/o Raffi Konialian, 25 Peel Centre Drive Suite 257 Brampton, ON L6T 3R5	12134 Mississauga Road, Caledon
1096281 Ontario Limited	c/o W. McKague, 12231 Second Line, RR 1 Campbellville, ON L0P 1B0	North side of Mayfield Road, west of Mississauga Road, Caledon
		816 Mayfield Road, Caledon
Donald Keith Garbutt and Lisa Garbutt	624 Mayfield Road, Caledon, ON L7C 0Y6	624 Mayfield Road, Caledon
Betty Jane Moore	486 Mayfield Road, Caledon, ON L7C 0Y5	486 Mayfield Road, Caledon
Marvarie Denhart and Michael Raghunath	468 Mayfield Road, Caledon, ON L7C 0Y5	468 Mayfield Road, Caledon
Lorwood Holdings Incorporated	c/o Mr. Guglietti, 86 Moyal Court, Suite 201, Concord, ON L4K 4R8	400 Mayfield Road, Caledon

George Terrence Leslie and Lora Lee Leslie	84 Mayfield Road, Caledon, ON L7C 0Y5	84 Mayfield Road, Caledon
Catherine Ann Monkman, Neil Clayton Monkman, Lori Anne Monkman and Estate of Keith Maxwell Monkman	1958 Station Road, Caledon, ON L7C 3L1	11690 Chinguacousy Road, Brampton
Neil Clayton Monkman, Catherine Anne Monkman and Kristen Annie Stephens		South side of Mayfield Road, west of Chinguacousy Road, Brampton
Neil Clayton Monkman, Lori Anne Monkman and Holly Katherine Monkman		South side of Mayfield Road, west of Chinguacousy Road, Brampton
1367933 Ontario Inc.	c/o Melrose Investments Inc., 145 Reynolds Street, Suite 400, Oakville, ON L6J 3K8	1635 Mayfield Road, Brampton
Walness Developments Inc.		South side of Mayfield Road, east of Creditview Road, Brampton
Fausto Finelli	5 Redthorn Court, Etobicoke, ON M9C 3K1	1637 Mayfield Road, Brampton
Bimani Develpments Inc.	c/o Trinistar Corporation, 8600 Dufferin Street, Vaughan, ON L4K 5P5	11953 Creditview Road, Brampton
		1577 Mayfield Road, Brampton
Paradise Homes North West Inc.	625 Cochrane Drive, Suite 801, Markham, ON L3R 9R9	11630 Creditview Road, Brampton
		1333 Mayfield Road, Brampton
Paradise Homes NW Inc.		11719 Mississauga Road, Brampton
Jasvir Brar and Narinder Brar	40 Woodvalley Drive, Brampton, L7A 1Z3	1285 Mayfield Road, Brampton
Colleen Shuk Lan Hui	1255 Mayfield Road, Brampton, ON L7A 0C4	1255 Mayfield Road, Brampton
Kiran Kumar and Angela Isaacs	1235 Mayfield Road, Brampton, ON L7A 0C4	1235 Mayfield Road, Brampton

John William Gerald Van Tent and Brenda Christine Bernice Van Tent	1209 Mayfield Road, Brampton, ON L7A 0C4	1209 Mayfield Road, Brampton
584572 Ontario Limited	c/o Ms. Ghinis, 34 Ravinder Court, Brampton, ON L6Z 3M8	11722 Mississauga Road, Brampton
Ajit Sahota, Surinder Sahota and Balbir Sahota	781 Mayfield Road, Brampton, ON L7A 0C5	781 Mayfield Road, Brampton
Peter Brydon Smith and Sheila Julia Smith	767 Mayfield Road, Brampton, ON L7A 0C5	767 Mayfield Road, Brampton
Lloyd Harland Crawford	PO Box 151 Main, Georgetown, ON L7G 4T1	709 Mayfield Road, Brampton
Heinz Baumann	6160 Winston Churchill Boulevard, Alton, ON L0N 1A0	Southeast corner of Mayfield Road and Heritage Road, Brampton
Vinfab Investments Inc.	25 High Meadow Place, Toronto, ON M9L 0A3	11968 Heritage Road, Brampton
MCN (Mayfield) Inc.	c/o Mr. Cortellucci, 2800 Highway No. 7, Vaughan, ON L4K 1W8	419 Mayfield Road, Brampton
		111 Mayfield Road, Brampton
Dinesh Haribhai Mistry, Pushpa Mistry, Bachubhai Jhinabhai Patel and Gitaben Patel	259 Mossbrook Square, Pickering, ON L1V 6P9	South side of Mayfield Road, east of Winston Churchill Boulevard, Brampton
Tiber Brampton Holdings Inc.	c/o Galliano Tiberini, 11 Creditstone Road, Concord, ON L4K 1N3	South side of Mayfield Road, east of Winston Churchill Boulevard, Brampton
Mayfield Station Developments Inc.	150 Connie Crescent, Unit 4, Concord, ON L4K 1L9	2068 Mayfield Road, Caledon
PL Ventures Limited	10 Dundas Street East, Suit 1002, Toronto, ON M5B 2G9	11687 Chinguacousy Road, Brampton
No. 3 Hunglin Development Corporation	40 Colonel Danforth Trail, Scarborough, ON M1C 1R1	11694 Winston Churchill Blvd., Halton
Treeola Farms Limited	12700 McLaughlin Road, Caledon, ON L7C 2A9	11324 Winston Churchill Blvd., Halton

Domingos Da Cruz ad Fatima Maria Da Cruz	12157 Chinguacousy Road, Caledon, ON L7C 3H1	12157 Chinguacousy Road, Caledon
Sharon Bonello	12116 Chinguacousy Road, Caledon, ON L7C 1Y9	12116 Chinguacousy Road, Caledon
Domenico Polsinelli and Concetta Polsinelli	12140 Chinguacousy Road, Caledon, ON L7C 1Y9	12140 Chinguacousy Road, Caledon
Moises Cordeiro and Maria A. Cordeiro	2907 Saint Malo Circle, Mississauga, ON L5N 1S8	12156 Chinguacousy Road, Caledon
2308645 Ontario Inc.	3601 Highway 7 East, Suite 309, Markham, ON L3R 0M3	East side of Creditview Road, south of Mayfield Road, Brampton
1839234 Ontario Limited		
Gold Park Rowntree Developers Inc.	55 Silton Road, Unit 2, Woodbridge, ON L4L 7Z8	East side of Creditview Road, south of Mayfield Road, Brampton
Francis Pelly, Joan Pelly and An McCartney	12158 Creditview Road, Caledon, ON L7C 1X9	12158 Creditview Road, Caldeon
John Martins and Grinoalda Martins	12139 Mississauga Road, Caledon, ON L7C 1X1	12139 Mississauga Road, Caledon
Aleksander Trochanowski and Joanna Trochanowski	12153 Mississauga Road, Caledon, ON L7C 1X1	12153 Mississauga Road, Caledon
James Richard Scott and Joan Mary Scott	12165 Mississauga Road, Caledon, ON L7C 1X1	12165 Mississauga Road, Caledon
Rosemary O'Donnell	12150 Mississauga Road, Caledon, ON L7C 1W1	12150 Mississauga Road, Caledon
Mary Agnes Lavina Garbutt and Donald Keith Garbutt	12171 Heritage Road, Caledon, ON L7C 1T8	12171 Heritage Road, Caledon
Robert James Leslie	12038 Heritage Road, Caledon, ON L7C 1T2	12038 Heritage Road, Caledon

Springbrook North Developments Inc.	5622 McAdam Road, Mississauga, ON L4Z 1P1	East side of Heritage Road, south of Mayfield Road, Brampton
Jack Bottner	c/o S. Bottner, 3330 Cambourne Crescent, Mississauga, ON L5N 5P6	West side of Heritage Road, south of Mayfield Road, Brampton
Aloisia Asbeck and Roland Vollert	11354 Winston Churchill Boulevard, Halton Hills, ON L7A 0A3	11354 Winston Churchill Boulevard, Halton Hills

B

COMMENTS

COMMENTS

- COMMENCEMENT
- PIC#1
- PIC#2
- COMPLETION

COMMENCEMENT COMMENTS

From:	Beirnes, Shane
To:	Evans, Susan; Smith, Neal
Subject:	RE: EA Mayfield - Chinguacousy to Winston Churchill
Date:	March 25, 2013 10:09:48 AM

Hi Neal.

Please include me on all future emails regarding this project.

Thanks.

Shane Beirnes, CTech.
Traffic Street Light Coordinator
Works & Transportation
City of Brampton
905-874-2553
Mobile: 416-801-8424
shane.beirnes@brampton.ca

8850 McLaughlin Road South
Brampton, Ontario L6Y 5T1

From: Evans, Susan
Sent: 2013/03/22 4:52 PM
To: Neal.Smith@peelregion.ca
Cc: Beirnes, Shane
Subject: EA Mayfield - Chinguacousy to Winston Churchill

Hello Neal,

Thank you for the notice.

I'm assuming this area will be upgraded as a urban cross section. Based on this assumption, street lighting will be required as part of the review.

Regards,

Flower City
brampton.ca
Susan Evans
City of Brampton
Street Light Supervisor

(905) 874-2592 Work
susan.evans@brampton.ca
8850 McLaughlin Road, Unit 2
Brampton ON L6Y 5T1
www.brampton.ca

Working Together To Keep Brampton Moving

From:	Pendlebury, Martin
To:	Smith, Neal
Cc:	Motala, Imran
Subject:	RE: Mayfield Road EA Chinguacousy to WCB
Date:	December 7, 2012 4:04:39 PM
Attachments:	PEEL_2012DC_WATER_2012-2031.pdf

Hi Neal,

The Water Program has the following future capital projects on Mayfield Road between Winston Churchill Boulevard and Chinguacousy Road:

Project No.	Project Name	Project Limits	Proposed Construction Year	Project Manager	Project Status
10-1215	Alloa Transmission Main (Phase 2)	Alloa Reservoir to Mississauga Road and south on Mississauga Road to Bovaird Drive (Pressure Zone 5)	2013-2015	Jaime Acosta	Detailed Design
10-1139	900mm Feedermain – Mayfield Road	Alloa Pumping Station to Mississauga Road (Pressure Zone 7)	2013-2014	Jaime Acosta	Detailed Design
12-1185	600mm Feedermain – Mayfield Road	Alloa Pumping Station to Creditview Road (Pressure Zone 7)	2013	Jaime Acosta	Detailed Design
12-1186	600mm Feedermain – Mayfield Road	Creditview Road to Hurontario Street (Pressure Zone 7)	2013	Jaime Acosta	Detailed Design
12-1260	Mayfield Road Sub-Transmission Main	Alloa Pumping Station to Creditview Road (Pressure Zone 6)	2013	Jaime Acosta	Detailed Design
12-1261	Mayfield Road Sub-Transmission Main	Creditview Road to Van Kirk Drive (Pressure Zone 6)	2013	Jaime Acosta	Detailed Design
13-1134	600mm Feedermain – Mayfield Road	Alloa Pumping Station to Mississauga Road (Pressure Zone 7)	2014	Jaime Acosta	Detailed Design
18-1199	750mm Feedermain – Mayfield Road	Mississauga Road to Heritage Road (Pressure Zone 6)	2024	Anthony Parente	Master Planning
18-1199	400mm Feedermain – Mayfield Road	Mississauga Road to Heritage Road (Pressure Zone 7)	2024	Anthony Parente	Master Planning

The Alloa Reservoir and Pumping Station will be constructed on the north side of Mayfield Road about half way between Mississauga Road and Creditview Road. The construction timing for the last two water mains will be modified based on the recommendations of the Heritage Heights Secondary Plan.

Attached is our 2012 DC Water Map for your reference. Let me know if you have any further questions.

Cheers,

Martin

Martin Pendlebury, P.Eng. | Project Manager
Program Planning & Compliance | Water | Public Works
Region of Peel | 10 Peel Centre Dr., 4th Fl. Suite A, Brampton, ON L6T 4B9
Tel. 905-791-7800 ext. 4548

From: Motala, Imran
Sent: December 7, 2012 2:50 PM
To: Pendlebury, Martin
Subject: FW: Mayfield Road EA Chinguacousy to WCB

Hi Martin;

Can you please respond to Neal.

Thanks;

Imran

From: Rose, Jennifer
Sent: December 6, 2012 3:42 PM
To: Smith, Neal; Motala, Imran
Subject: FW: Mayfield Road EA Chinguacousy to WCB

Hi Neal

Please see Wastewater comments below

Jennifer

From: Motamedi, Kolsoom
Sent: December 6, 2012 1:54 PM
To: Rose, Jennifer
Cc: Nemeth, John
Subject: RE: Mayfield Road EA Chinguacousy to WCB

Hi Jenifer,

We have 675mm sanitary trunk sewer, west of Chinguacousy Road between Wanless Drive and Mayfield Road, which is scheduled for 2014. This trunk will cross the Mayfield toward the North.
We have 900mm trunk sewer, west of Mississauga Road, which will cross the Mayfield Road toward the North. This project is scheduled for 2020.

Thanks and Regards,

Kolsoom Motamedi, P.Eng.
Project Manager
Wastewater Program Planning
Public Works, Region of Peel
Tel. (905) 791-7800, ext. 4196
Kolsoom.Motamedi@peelregion.ca

From: Rose, Jennifer
Sent: December 6, 2012 1:00 PM
To: Motamedi, Kolsoom
Cc: Nemeth, John
Subject: FW: Mayfield Road EA Chinguacousy to WCB

Hi Kolsoom

Any future work on Mayfield? We don't have any sanitary at all along this stretch.

Jennifer

From: Smith, Neal
Sent: December 6, 2012 11:39 AM
To: Rose, Jennifer; Motala, Imran
Subject: Mayfield Road EA Chinguacousy to WCB

Hi Jennifer and Imran

We will be awarding the Mayfield Road EA (Chinguacousy to WCB) project shortly and in doing so, I am putting and information package together for the consultant. Can you please provide me with a list of ongoing or future projects you may have within the limits of this EA?

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation Program Planning
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From:	Rose, Jennifer
To:	Smith, Neal; Motala, Imran
Subject:	FW: Mayfield Road EA Chinguacousy to WCB
Date:	December 6, 2012 3:42:21 PM

Hi Neal

Please see Wastewater comments below

Jennifer

From: Motamedi, Kolsoom
Sent: December 6, 2012 1:54 PM
To: Rose, Jennifer
Cc: Nemeth, John
Subject: RE: Mayfield Road EA Chinguacousy to WCB

Hi Jenifer,

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We have 900mm trunk sewer, west of Mississauga Road, which will cross the Mayfield Road toward the North. This project is scheduled for 2020.

Thanks and Regards,

Kolsoom Motamedi, P.Eng.
Project Manager
Wastewater Program Planning
Public Works, Region of Peel
Tel. (905) 791-7800, ext. 4196
Kolsoom.Motamedi@peelregion.ca

From: Rose, Jennifer
Sent: December 6, 2012 1:00 PM
To: Motamedi, Kolsoom
Cc: Nemeth, John
Subject: FW: Mayfield Road EA Chinguacousy to WCB

Hi Kolsoom

Any future work on Mayfield? We don't have any sanitary at all along this stretch.

Jennifer

From: Smith, Neal
Sent: December 6, 2012 11:39 AM
To: Rose, Jennifer; Motala, Imran
Subject: Mayfield Road EA Chinguacousy to WCB

Hi Jennifer and Imran

We will be awarding the Mayfield Road EA (Chinguacousy to WCB) project shortly and in doing so, I am putting and information package together for the consultant. Can you please provide me with a list of ongoing or future projects you may have within the limits of this EA?

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation Program Planning
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
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Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From:	Gutmann, Christine
To:	Smith, Neal
Cc:	Williams, Sharon
Subject:	RE: Mayfield Road EA - Chinguacousy Road to WCB
Date:	August 14, 2012 12:40:54 PM

Hi Neal,

Thanks for including us. It is always easier to be in at the start of a project.

Mayfield Road presents a unique challenge because of the development to the south and the agricultural land use to the north. From the Chronic Disease side, the focus is about walkability and opportunities for active transportation. While the active transportation plan would cover the requirements for cycle lanes or multi-use paths as appropriate, I think there are some opportunities in this area that could be focused on to improve opportunities for pedestrians/walking. This might include the Alloa school area and at intersections (considering the proposed future development in the south). It would be beneficial from a chronic disease perspective for the alternatives to be measured against an element which considers pedestrians as a priority. Further, the Healthy Development Index and Health Background Study Framework provide some guidance for tree spacing, lighting and sidewalks that may be beneficial for the consultant to consider. To start, please include me and Sharon Williams (I have copied her on this e-mail). We will split the duties. But, if it is easier for you to have one contact, please use my name and Sharon and I will work together at our end.

Many of our elements are being included in the Characterization Study, however, due to the timing of your EA, I am not sure how the EA will work with the Characterization Study. Could you let me know?

I will also forward this to Environmental Health as well to see if they have an interest in participating (I will copy you on the email to them). Their interest would be from an air quality perspective.

Christine Gutmann, MCIP, RPP
Health Planning Facilitator
Public Health, Region of Peel
Phone: (905) 791-7800 extension 2120

From: Smith, Neal
Sent: August 14, 2012 11:57 AM
To: Gutmann, Christine
Subject: Mayfield Road EA - Chinguacousy Road to WCB

Hi Christine

I will be starting the above mentioned EA in September and as part of the process, I would like to include Health Services. Who will be my contact and what information would your group like to see? This project is being conducted in-house with only the technical studies being farmed out to a consultant. The RFP went out last week, and we will be reviewing the proposals in 4 weeks.

Please let me know what involvement your group (Health Services) would like to take in this process and I will be more then happy to assist you.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation Program Planning
Public Works

Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From:	Kilis, Jakub
To:	Smith, Neal
Subject:	FW: Mayfield Rd EA wildlife road ecology
Date:	March 18, 2014 11:46:41 AM

Neal,

Please see the memo from CVC ecology staff below related to your EA along Mayfield between Winston Churchill and Chinguacousy. Please share this with your EA consulting team for their consideration in the design.

Please let me know if you have any questions,
Jakub

Jakub Kilis, MCIP, RPP | Planner, Environmental Assessment
Credit Valley Conservation
jkilis@creditvalleyca.ca | 905.670.1615 ext 287
1255 Old Derry Rd, Mississauga, ON L5N 6R4
www.creditvalleyca.ca

From: Elliott, Jason
Sent: March 17, 2014 11:12 AM
To: Kilis, Jakub
Cc: Marray, Liam; DiBerto, Dorothy; 'Heaton, Mark (MNR)'
Subject: Mayfield Rd EA wildlife road ecology

Jakub,

Further to our conversation a few weeks ago I am emailing you to inform you of the direction the City of Brampton and Block 51-1 Landowners Group is headed with respect to wildlife fencing in their NHS. After much discussion, the city has agreed to wildlife fencing at each of the internal road crossings (including Wanless Rd) within the block and along the Sandalwood Wetland. This is relevant to the Mayfield Rd EA as they have deferred this area to that project. They deferred Mayfield Rd as it was felt that there was no point in implementing anything when the road would be widened a few years later. We agreed to this approach.

The Huttonville-Fletchers Subwatershed Study for the area and the Mount Pleasant Secondary Plan NHS identified the Mayfield Rd crossing of the 51-1 NHS as a linkage to the north as per the LSA. Due to the alignment of East Huttonville Creek post-development, the NHS along Mayfield road at this location will encompass both the new channel corridor at the crossing and along the road approximately 120m to the east. Given the envisioned linkage to the north for this area it is recommended that the EA assess the need for wildlife fencing along the full length of the NHS at this location. Of note, Mayfield Woodland A, a relatively large woodland that contains wetland forms part of the NHS in the vicinity. Mapping of the post-development scenario is available.

You indicated that you would pass this along to the EA project manager.

Thanks,

Jason

Jason Elliott │ Planning Ecologist
Credit Valley Conservation

1255 Old Derry Road Mississauga ON L5N 6R4
(905) 670 – 1615 x230

BRAMPTON Flower City brampton.ca

Works and Transportation
Brampton Transit

Date: **May 13, 2013**

File: **Mayfield Road Environmental Assessment from Chinguacousy Road to Winston Churchill Boulevard.**

To: **Compton Bobb.**

Subject: **Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard.**
Environmental Assessment.
Brampton Transit Comments.

Brampton Transit has reviewed the design criteria for the referenced Environmental Assessment road widening and has the following comments from a transit planning perspective:

- At intersections where there are dedicated right turn lanes, Brampton Transit will require farside bus bays with passenger amenities (landing pads and shelter pads).

- At intersections where there is no dedicated right turn lane, Brampton Transit will require nearside bus stops with passenger amenities (landing pads and shelter pads).

The exact location of the stops and pads will be determined through the detail design process.

For bus landing and shelter pads design, please refer to Brampton Standard 260 and for bus bay details see Standard 261 and 266.

We trust this information is satisfactory; should you require further assistance, please contact the undersigned.

Tahar Singh

Tahar Singh
Planning Co-Ordinator
Brampton Transit
phone: (905) 874-2750 Xt 62397, fax: (905) 874-2799
e-mail: tahar.singh@brampton.ca

Copy: Alex Milojevic
Doug Rieger
David Stowe
Craig Sherwood

Ministry of the Environment

Central Region
Technical Support Section

5775 Yonge Street, 8th Floor
North York, OntarioM2M 4J1

Tel.: (416) 326-6700
Fax: (416) 325-6347

Ministère de l'Environnement

Région du Centre
Section d'appui technique

5775, rue Yonge, 8ème étage
North York, Ontario M2M 4J1

Tél. : (416) 326-6700
Téléc. : (416) 325-6347

Ontario

March 28, 2013

File: EA01-06-05

Neal Smith, C.E.T.
Project Manager, Transportation Program Planning
Transportation Division
Region of Peel
10 Peel Centre Drive, Suite B
Brampton ON L6T 4B9

RE: Mayfield Road from Chinguacousy Road to Winston ChurchillBoulevard
Peel Region
Class Environmental Assessment
Response to Notice of Commencement

Dear Mr. Smith,

This letter is our response to the Notice of Study Commencement for the above noted project. This response acknowledges that the Region of Peel has indicated that its study is following the approved environmental planning process for a Schedule "C" project under the *Municipal Engineers Association Municipal Class Environmental Assessment* (Class EA).

Based on the information submitted, we have identified the following areas of interest with respect to the proposed undertaking:

- Ecosystem Protection and Restoration
- Surface Water
- Groundwater
- Air Quality, Dust and Noise
- Contaminated Soils
- Mitigation and Monitoring
- Planning and Policy
- Class EA Process
- Aboriginal Consultation

We are providing the following general comments to assist you and your project team members in effectively addressing these areas of interest:

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The Environmental Study Report (ESR) should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- All natural heritage features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. Our records confirm that the following sensitive environmental features are located within or adjacent to theStudy Area:

    - Watercourses
    - Woodlots

Air Quality, Dust and Noise

- Any potential air quality impacts should be assessed and used in the evaluation of alternatives for the proposed project. Appropriate mitigation measures of any potential effects should be identified.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the Study Area are not adversely affected during construction activities.

- The ESR should consider the potential impacts of increased noise levels during the operation of the undertaking due to potentially higher traffic volumes resulting from this project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Contaminated Soils

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act (EPA)* and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. We recommend contacting the ministry's Halton Peel District Office in Burlington for further consultation if contaminated sites are present.

- The location of any underground storage tanks should be investigated in the ESR. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Any current or historical waste disposal sites should be identified in the ESR. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the *Environmental Protection Act* may be required for land uses on former disposal sites.

- The ESR should identify any underground transmission lines in the Study Area. The owners should be consulted to avoid impacts to this infrastructure, including potential spills.

Mitigation and Monitoring

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- All waste generated during construction must be disposed of in accordance with ministry requirements.

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the ESR and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly. The

Yours sincerely,

Dorothy Moszynski
Environmental Resource Planner and EA Coordinator
Air, Pesticides and Environmental Planning

c. T. Dufresne, Manager, Halton Peel District Office, MOE
Central Region EA File
A & P File

Delegation of Procedural Aspects of Consultation

Proponents, by virtue of their knowledge and participation in project activities, have an important and direct role in the consultation process to ensure both success and certainty. Where the Crown's duty to consult is triggered, Ontario is delegating these procedural aspects of this rights-based consultation to you as the proponent of the project.

Ontario will have an oversight role as the consultation process unfolds but will be relying on the steps undertaken and information you obtain to ensure adequate consultation has taken place. To ensure that First Nation and Métis communities have the ability to assess a project for its potential to impact on an Aboriginal or treaty right, there are certain procedural aspects of consultation that Ontario requires proponents to undertake.

The responsibilities of the proponent for procedural aspects of consultation include:

- Providing notice to the elected leadership of the First Nation and/or Métis communities (e.g., First Nation Chief) as early as possible regarding the project;
- Providing First Nation and/or Métis communities with information about the proposed project including anticipated impacts, information on timelines and your environmental assessment process;
- Following up with First Nation and/or Métis communities to ensure they received project information and that they are aware of the opportunity to express comments and concerns about the project; **if you are unable to make the appropriate contacts (e.g. are unable to contact the Chief) please contact the Ministry of the Environment for further direction.**
- Providing First Nation and/or Métis communities with opportunities to meet with appropriate representatives to discuss the project;
- Gathering information about how the project may adversely impact the Aboriginal and/or Treaty rights (for example, hunting, fishing) or sites of cultural significance (for example, burial grounds, archaeological sites);
- Considering the comments and concerns provided by First Nation and/or Métis communities and providing responses;
- Where appropriate, discussing potential mitigation strategies with First Nation and/or Métis communities;
- Bearing the reasonable costs associated with these procedural aspects of consultation.
- Maintaining a Consultation Record and upon request, providing copies of the Consultation Record to Ontario. The Consultation Record should:
    - summarize the nature of any comments and questions received from First Nation and/or Métis communities
    - describe the response to comments and how concerns were considered
    - include a communications log indicating the dates and times of all communications; and
    - document activities in relation to consultation.

Successful consultation depends, in part, on early engagement by proponents with First Nation and Métis communities. Information shared with communities must be clear, accurate and complete, and in plain language where possible. The consultation process must maintain sufficient flexibility to respond to new information, and we trust you will make all reasonable efforts to build positive relationships with all First Nation and Métis communities contacted.

BRAMPTON
Flower City
brampton.ca

Works and Transportation
Brampton Transit

Date: May 13, 2013

File: Mayfield Road Environmental Assessment from Chinguacousy Road to Winston Churchill Boulevard.

To: Compton Bobb.

Subject: Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard.
Environmental Assessment.
Brampton Transit Comments.

Brampton Transit has reviewed the design criteria for the referenced Environmental Assessment road widening and has the following comments from a transit planning perspective:

- At intersections where there are dedicated right turn lanes, Brampton Transit will require farside bus bays with passenger amenities (landing pads and shelter pads).

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The exact location of the stops and pads will be determined through the detail design process.

For bus landing and shelter pads design, please refer to Brampton Standard 260 and for bus bay details see Standard 261 and 266.

We trust this information is satisfactory; should you require further assistance, please contact the undersigned.

Tahar Singh

Tahar Singh
Planning Co-Ordinator
Brampton Transit
phone: (905) 874-2750 Xt 62397, fax: (905) 874-2799
e-mail: tahar.singh@brampton.ca

Copy: Alex Milojevic
Doug Rieger
David Stowe
Craig Sherwood

Smith, Neal

From: Smith, Neal
Sent: December 2, 2013 8:34 AM
To: 'David Laing'
Cc: Hutton, John; Palleschi, Paul; Duque, Erica; Carolyn Clubine; 'Dayle Laing'; George Shepperdley; Gerald Pyjor; Hrushikesh Gandhi; John Van West; Kevin Montgomery; Leo O'Brien; Osmani Perez-Rojas; pauline.thornham@rogers.com; Stephen Laidlaw; Tricia Prato; Chung, Margie
Subject: RE:
Attachments: 2013-11-28 115931.pdf

Thank you David for your comments, I have forwarded you comments to Margie Chung, she is a principal planner with the Region and is working on the Region's Active Transportation Plan.

As we move forward with the environmental assessments for Mayfield Road we will be looking at ways to promote cycling as well as other modes within the Mayfield Road corridor.

Feel free to contact me any time, if you have any questions

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: David Laing [redacted]
Sent: November 29, 2013 11:22 AM
To: Smith, Neal
[redacted]
Subject:

Hello Mr. Smith,
My name is David Laing and I chair the Brampton Bicycle Advisory Committee, a volunteer based advocacy group that promotes active transportation in Brampton and Peel Region. We are interested in seeing the development of appropriate bicycle facilities in our community. As such and, on behalf of the committee, I am sending you the attached comments on the proposed roadway development along Mayfield Rd.

The bicycle facilities that are currently available on regional roads in Brampton are both limited and lack the necessary level of continuity and safety elements. Only the diehard cyclists feel safe riding on the regional roads in Brampton. Mayfield has the potential to be a significant east-west cycling commuter route as additional residential and commercial development continues along Brampton's northern boundary and in Caledon South. I applaud the region's foresight in incorporating multi-use pathways and bike detection systems in the current Mayfield preferred plan. That said, given our member's experiences cycling the Region's current pathways, our comment is that the Mayfield implementation will need to be an improvement from the current standard.

I want to emphasize that other communities in Ontario have seen reduced traffic congestion and achieved substantial road development and maintenance cost savings, (both current and future), by building effective bicycle infrastructure; one that encourages even a relatively modest modal shift from cars to active transportation. I see no reason why the same opportunity should not be made available to residents of Peel.

Smith, Neal

From: Stowe, David <David.Stowe@brampton.ca>
Sent: November 26, 2013 10:39 AM
To: Smith, Neal
Subject: Mayfield Road PIC

Hi Neal:

Could you please change our contact information from Lisa Clark to myself, at the same address, for all correspondence related to this project, and other similar programs (Ms. Clark has not been with the City for some time, and I'm concerned some of this correspondence may get re-directed....).

Thanks,

- Dave

David Stowe
Supervisor of Planning
Brampton Transit
david.stowe@brampton.ca
905-874-2750 ext. 62378
Cell: 416-919-7255

PIC1 COMMENTS

MAYFIELD ROAD CLASS EA
Public Information Centre No. 2 SIGN-IN

Region of Peel
Working for you

GENIVAR

Name	Address	E-mail	Phone No.	
1. John Smith	123 Main Street Anytown, Ontario, A1B 2C3	john.smith@sample.com	555-555-5555	
2. PETER&SHEILA SMITH	[redacted]			— PIC#1
3. Gerald Pyjor	[redacted]			— PIC# 1&2
4. Allan Thompson	[redacted]			
5. HAROLD PEDDLE	[redacted]		[redacted]	— PIC 1&2
6. LORI KIDD	[redacted]		[redacted]	— PIC 1&2
7. Leslie McMichael	[redacted]	[redacted]		— "
8. Tai Tang	[redacted]	[redacted]		
9. KEITH GARBUTT	[redacted]	[redacted]		
10. Betty Moore	[redacted]		[redacted]	
11. Steve Cimes				
12. Yvette Pimentel	[redacted]			
13. John Pimentel	[redacted]			PIC#1
14. Lora Leslie	[redacted]			#1
15. Terry Leslie	[redacted]			#1
16. RICK BARKER	[redacted]			
17. John VanTent	[redacted]		[redacted]	
18. Scott Gibbons	[redacted]			#1&2
19. HAFIZ AHMED	[redacted]			
20. KATHY CHIWA	[redacted]			#1
21. Jamie Perras	[redacted]			
22. Brian Perras	[redacted]			
23. Neil & Lori Monkman	[redacted]			
24. Bill McKague	[redacted]			
25. Karen MacGougan	[redacted]			
26. Bill & Lois Frazer	[redacted]			
27.				
28.				

MAYFIELD ROAD CLASS EA
Public Information Centre No. 2 SIGN-IN

Region of Peel
Working for you
GENIVAR

Name	Address	E-mail	Phone No.	
1. John Smith	123 Main Street Anytown, Ontario, A1B 2C3	john.smith@sample.com	555-555-5555	
2. PETER & SHEILA SMITH	[redacted]			— PIC#1
3. Gerald Pyjor	[redacted]			— PIC # 1 & 2
4. Allan Thompson	[redacted]			
5. HAROLD PEDDLE	[redacted]		[redacted]	— PIC 1 & 2
6. LORI KIDD	[redacted]		[redacted]	— PIC 1 & 2
7. Leslie McMichael	[redacted]	[redacted]		— "
8. Tai Tang	[redacted]	[redacted]		
9. KEITH GARBUTT	[redacted]	[redacted]		
10. Betty Moore	[redacted]		[redacted]	
11. Steve Cimms				
12. Yvette Pimentel	[redacted]			
13. John Pimentel	[redacted]			PIC#1
14. Lora Leslie	[redacted]			#1
15. Terry Leslie	[redacted]			#1
16. RICK BARBER	[redacted]			
17. John VanTent	[redacted]		[redacted]	
18. Scott Gibbons	[redacted]			#1 & 2
19. HAFIZ AHMED	[redacted]			
20. KATHY CHIN	[redacted]			#1
21. Jamie Perras	[redacted]			
22. Brian Perras	[redacted]			
23. Neil & Lori Monkman	[redacted]			
24. Bill McKague	[redacted]			
25. Karen MacGougan	[redacted]			
26. Bill & Lois Frazer	[redacted]			
27.				
28.				

Smith, Neal

From:	Detaramani, Tina
Sent:	December 6, 2013 1:44 PM
To:	'smithsheila@live.com'
Cc:	Smith, Neal
Subject:	Mayfield Road EA - Response to Your Comments

Hello Ms. Smith,

Thank you for submitting comments during the Mayfield Road Environmental Assessment Public Information Centre held on November 27, 2013. Neal Smith forwarded your comments regarding the GTA West Study to me, and I am pleased to provide a response.

Please note that the GTA West Environmental Assessment study is being conducted by the Ontario Ministry of Transportation. For information on the study, please refer to this website: http://www.gta-west.com/

Should you wish to receive notices related to the GTA West study, please complete the form in the "contact us" link.

Thank you,

Tina Detaramani, MCIP, RPP
Principal Planner
Transportation Division
Public Works, Region of Peel

tel: 905-791-7800 ext. 4554
toll free: 1-888-919-7800

Smith, Neal

From: Jane Deighton [redacted]
Sent: November 25, 2013 11:32 AM
To: Smith, Neal
Subject: RE: Mayfield Rd Improvements

Thank you Neil.

From: Smith, Neal [mailto:Neal.Smith@peelregion.ca]
Sent: Monday, November 25, 2013 10:43 AM
To: 'Jane Deighton'
Cc: Zois, Anthony; Saddi, Asha
Subject: RE: Mayfield Rd Improvements

Good morning Jane

Thank you for your email and voice message. We will be uploading the PIC #2 material on to the Regions website on Wednesday so you will be able to view it there. If you have any questions please let me know.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Jane Deighton [mailto:jdeighton@sympatico.ca]
Sent: November 25, 2013 10:06 AM
To: Smith, Neal
Subject: Mayfield Rd Improvements

Hello Neil,

This is further to my voice mail message to you of November 21, 2013 wherein I inquired about the implications and proposed impact of the proposed Mayfield Rd Widening on my properties, the one being on the SW corner of Kennedy/Mayfield Rd in Brampton and the other being on the NW corner of Heart Lake Rd in Caledon.

I am unable to attend the Public Information Centre #2 on November27,2013. I would like to remain on the mailing list for all communications with regard to this matter. I look forward to your response to my inquiry.

Thank you very much for your attention to this matter.

Jane Deighton, President
[redacted]

Smith, Neal

From: Smith, Neal
Sent: December 2, 2013 8:34 AM
To: 'David Laing'
Cc: Hutton, John; Palleschi, Paul; Duque, Erica; Carolyn Clubine; 'Dayle Laing'; George Shepperdley; Gerald Pyjor; Hrushikesh Gandhi; John Van West; Kevin Montgomery; Leo O'Brien; Osmani Perez-Rojas; pauline.thornham@rogers.com; Stephen Laidlaw; Tricia Prato; Chung, Margie
Subject: RE:
Attachments: 2013-11-28 115931.pdf

Thank you David for your comments, I have forwarded you comments to Margie Chung, she is a principal planner with the Region and is working on the Region's Active Transportation Plan.

As we move forward with the environmental assessments for Mayfield Road we will be looking at ways to promote cycling as well as other modes within the Mayfield Road corridor.

Feel free to contact me any time, if you have any questions

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: David Laing [redacted]
Sent: November 29, 2013 11:22 AM
To: Smith, Neal
[redacted]
Subject:

Hello Mr. Smith,
My name is David Laing and I chair the Brampton Bicycle Advisory Committee, a volunteer based advocacy group that promotes active transportation in Brampton and Peel Region. We are interested in seeing the development of appropriate bicycle facilities in our community. As such and, on behalf of the committee, I am sending you the attached comments on the proposed roadway development along Mayfield Rd.

The bicycle facilities that are currently available on regional roads in Brampton are both limited and lack the necessary level of continuity and safety elements. Only the diehard cyclists feel safe riding on the regional roads in Brampton. Mayfield has the potential to be a significant east-west cycling commuter route as additional residential and commercial development continues along Brampton's northern boundary and in Caledon South. I applaud the region's foresight in incorporating multi-use pathways and bike detection systems in the current Mayfield preferred plan. That said, given our member's experiences cycling the Region's current pathways, our comment is that the Mayfield implementation will need to be an improvement from the current standard.

I want to emphasize that other communities in Ontario have seen reduced traffic congestion and achieved substantial road development and maintenance cost savings, (both current and future), by building effective bicycle infrastructure; one that encourages even a relatively modest modal shift from cars to active transportation. I see no reason why the same opportunity should not be made available to residents of Peel.

Smith, Neal

From: Nancy Frieday <nancy@wellingsplanning.ca>
Sent: November 25, 2013 3:10 PM
To: Smith, Neal
Subject: Public Information Centre - Mayfield Road EA

Hello Neal: I understand there is a PIC on Wednesday November 27th for the Winston Churchill to Chingacousy Road section of Mayfield Road.

If we are not able to attend the PIC, will the display boards/information be available on line to review? If so when?

Regards,

Nancy Frieday, MCIP, RPP
Wellings Planning Consultants Inc.
564 Emerald Street
Burlington, ON L7R 2N8
Phone: 905-681-1769
Fax: 905-681-8741
Cell: 905-483-0796

Please note that effective immediately my new email addresss is nancy@wellingsplanning.ca. Please update your records accordingly. Thanks

Smith, Neal

From: Detaramani, Tina
Sent: December 6, 2013 1:44 PM
To: 'smithsheila@live.com'
Cc: Smith, Neal
Subject: Mayfield Road EA - Response to Your Comments

Hello Ms. Smith,

Thank you for submitting comments during the Mayfield Road Environmental Assessment Public Information Centre held on November 27, 2013. Neal Smith forwarded your comments regarding the GTA West Study to me, and I am pleased to provide a response.

Please note that the GTA West Environmental Assessment study is being conducted by the Ontario Ministry of Transportation. For information on the study, please refer to this website: http://www.gta-west.com/

Should you wish to receive notices related to the GTA West study, please complete the form in the “contact us” link.

Thank you,

Tina Detaramani, MCIP, RPP
Principal Planner
Transportation Division
Public Works, Region of Peel

tel: 905-791-7800 ext. 4554
toll free: 1-888-919-7800

Smith, Neal

From: Saddi, Asha
Sent: December 2, 2013 11:08 AM
To: 'nancy@wellingsplanning.ca'
Cc: Smith, Neal
Subject: FW: Public Information Centre - Mayfield Road EA

Good Morning Nancy,

I'm attaching the link to our study website where you will be able to find the PIC #1 materials:
http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm

If you have any problems with access please don't hesitate to contact me.

Thanks,

Asha Saddi
Technical Analyst, Infrastructure Programming & Studies
Transportation Division
Public Works, Region of Peel
Tel: 905-791-7800 x7794
Fax:905-791-1442
asha.saddi@peelregion.ca

From: Smith, Neal
Sent: November 25, 2013 3:20 PM
To: 'Nancy Frieday'
Cc: Saddi, Asha
Subject: RE: Public Information Centre - Mayfield Road EA

Hi Nancy, thank you for your inquiry.

We will be making the display boards available online (Region of Peel website). I expect them to be uploaded some time Wednesday or Thursday. Once they are there I can let you know and provide you the link.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

Please consider the environment before printing this e-mail

From: Nancy Frieday [mailto:nancy@wellingsplanning.ca]
Sent: November 25, 2013 3:10 PM
To: Smith, Neal
Subject: Public Information Centre - Mayfield Road EA

Hello Neal: I understand there is a PIC on Wednesday November 27th for the Winston Churchill to Chingacousy Road section of Mayfield Road.

If we are not able to attend the PIC, will the display boards/information be available on line to review? If so when?

Regards,

Nancy Frieday, MCIP, RPP
Wellings Planning Consultants Inc.
564 Emerald Street
Burlington, ON L7R 2N8
Phone: 905-681-1769
Fax: 905-681-8741
Cell: 905-483-0796

Please note that effective immediately my new email address is nancy@wellingsplanning.ca. Please update your records accordingly. Thanks

PIC2 COMMENTS

3

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
19	Art Rice	[redacted]		[redacted]
20	Harold Van Gool	[redacted]	[redacted]	[redacted]
21	Jose Montouto	Region of Peel	jose.montouto@peelregion.ca	905-791-7800 Ext. 7813.
22	KEITH GARBUTT	[redacted]	[redacted]	[redacted]
23	SCOTT GIBBONS	[redacted]	[redacted]	
24				
25				
26				
27				

1

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
1	Charles Hui	[redacted]	[redacted]	Send Mayfield Rd Post Dev Mngr Drainage Plan
2	LOUIS GHING	[redacted]	[redacted]	
3	KATHY GHING	[redacted]		
4	DAYLE LAING	[redacted]	[redacted]	
5	David Laing	[redacted]	[redacted]	[redacted]
6	Daniel Ridgway	[redacted]	[redacted]	
7	Tom Pettingill	[redacted]	[redacted]	[redacted]
8	George Shepperdley	[redacted]	[redacted]	[redacted]
9	MARY CHURCHILL	[redacted]	[redacted]	[redacted]

2

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
10	Connie McCracken	[redacted]	[redacted]	[redacted]
11	Kelley + John Terry	[redacted]	[redacted]	[redacted]
12	Patrick Monaghan	[redacted]	[redacted]	
13	Heinz Baumann	[redacted]	[redacted]	[redacted]
14	MARVIN LENSTRA	[redacted]	[redacted]	
15	HAROLD PEDDLE	[redacted]	[redacted]	[redacted]
16	RITA LESLIE.	[redacted]	[redacted]	[redacted]
17	TOM DOLSON	[redacted]	[redacted]	[redacted]
18	BILL + LOIS FRAZER	[redacted]	[redacted]	[redacted]

3

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
19	Art Rice	[redacted]		[redacted]
20	Harold Van Gool	[redacted]	[redacted]	
21	Jose Montouto	Region of Peel	jose.montouto@peelregion.ca	905-791-7800 Ext. 7813.
22	KEITH GARBUTT	[redacted]	[redacted]	[redacted]
23	SCOTT GIBBONS	[redacted]	[redacted]	
24				
25				
26				
27				

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
1	Charles Hui	[redacted]		Send Mayfield Rd Post Dev Mngy Drainage Plan
2	Louis Ghing	[redacted]		
3	Kathy Ghing	[redacted]		
4	Dayle Laing	[redacted]		
5	David Laing	[redacted]		
6	Daniel Ridgway	[redacted]		
7	Tom Pettingill	[redacted]		
8	George Shepperdley	[redacted]		
9	Mary Churchill	[redacted]		

②

Region of Peel
Working for you

MAYFIELD ROAD ENVIRONMENTAL ASSESSMENT - Chinguacousy Rd to WCB - PIC#2 SIGN-IN SHEET

08-Oct-15

	Name	Address	Email	Telephone
10	Connie McCracken	[redacted]		
11	Kelley + John Terry	[redacted]		
12	Patrick Monaghan	[redacted]		
13	Heinz Baumann	[redacted]		
14	MARVIN LENSTRA	[redacted]		
15	HAROLD PEDDLE	[redacted]		
16	RITA LESHE.	[redacted]		
17	TOM DOLSON	[redacted]		
18	BILL + LOIS FRAZER	[redacted]		

Brock, Liz

From: Smith, Neal
Sent: December 8, 2015 11:00 AM
To: Brock, Liz
Subject: FW: PF-12056.00 - Mr. Kumar's phone message

fyi

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Lee, Thomas
Sent: December 8, 2015 10:58 AM
To: Smith, Neal
Cc: Thomsen, Lori-Ann; Lovisotto, Sandy
Subject: RE: PF-12056.00 - Mr. Kumar's phone message

PF-12056.00 – Mayfield Road Widening EA
Project No.: 15-4070

Hi Neal,

For your records, Mr. Kumar returned my call.

He had accessed the website already, but he was looking at the wrong file and so couldn't see the actual potential impacts to his property – so I directed him to the correct file.

He had spoken to his neighbour, and the neighbour had told him that the Region would be expropriating from his property, so I told him that that was not strictly true, and told him about the process that the Region follows when property is required:

- Detail Design finalizes the design and identifies the property requirements.
- When the property requirements are finalized, the Region has an independent appraisal report done for each property by an accredited appraiser to determine the fair market value for the requirements.
- Only then would the Region approach the individual property owners to commence negotiations for the acquisition of those property requirements. The aim is to negotiate with the owners to actually acquire the lands.

We also spoke about timing, so I mentioned that the EA should be completed in February 2016, at which point the Detailed Design phase of the project would commence. DD would potentially be completed by 2018/19. It would only be then, that the Region would commence the negotiation process with the property owners.

He said he would call if he had any further questions.

Regards,

Tom

Thomas Lee, AACI, P.App.
Capital Acquisition Agent, Real Estate Section
The Regional Municipality of Peel
10 Peel Centre Drive, Suite B, 6th Floor
Brampton, ON L6T 4B9
Phone: 905-791-7800 ext. 5787
Fax: 905-791-3645 Toll Free: 1-888-919-7800
Email: thomas.lee@peelregion.ca

From: Smith, Neal
Sent: December 8, 2015 9:57 AM
To: Lee, Thomas
Cc: Thomsen, Lori-Ann
Subject: RE: PF-12056.00 - Mr. Kumar's phone message

Thanks Tom.

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Lee, Thomas
Sent: December 8, 2015 9:49 AM
To: Smith, Neal
Cc: Thomsen, Lori-Ann
Subject: PF-12056.00 - Mr. Kumar's phone message

PF-12056.00 Mayfield Road Widening EA
Project No.: 15-4070

Hi Neal,

I got your message about Mr. Kumar's phone call. I have returned his call, but unfortunately he did not pick up. I directed him to the Region's website, so that he could access the PIC#2 boards and preliminary design. I also told him to contact me if he needs any further information or wishes to discuss the project and its potential impact to his property.

I will let you know if and when he contacts me.

Regards,

Tom

Thomas Lee, AACI, P.App.
Capital Acquisition Agent, Real Estate Section
The Regional Municipality of Peel
10 Peel Centre Drive, Suite B, 6th Floor
Brampton, ON L6T 4B9
Phone: 905-791-7800 ext. 5787
Fax: 905-791-3645 Toll Free: 1-888-919-7800
Email: thomas.lee@peelregion.ca

Brock, Liz

From: Smith, Neal
Sent: January 6, 2016 8:34 AM
To: Brock, Liz
Subject: FW: Area between Lagerfeld Dr. and Mississauga Rd

FYI

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
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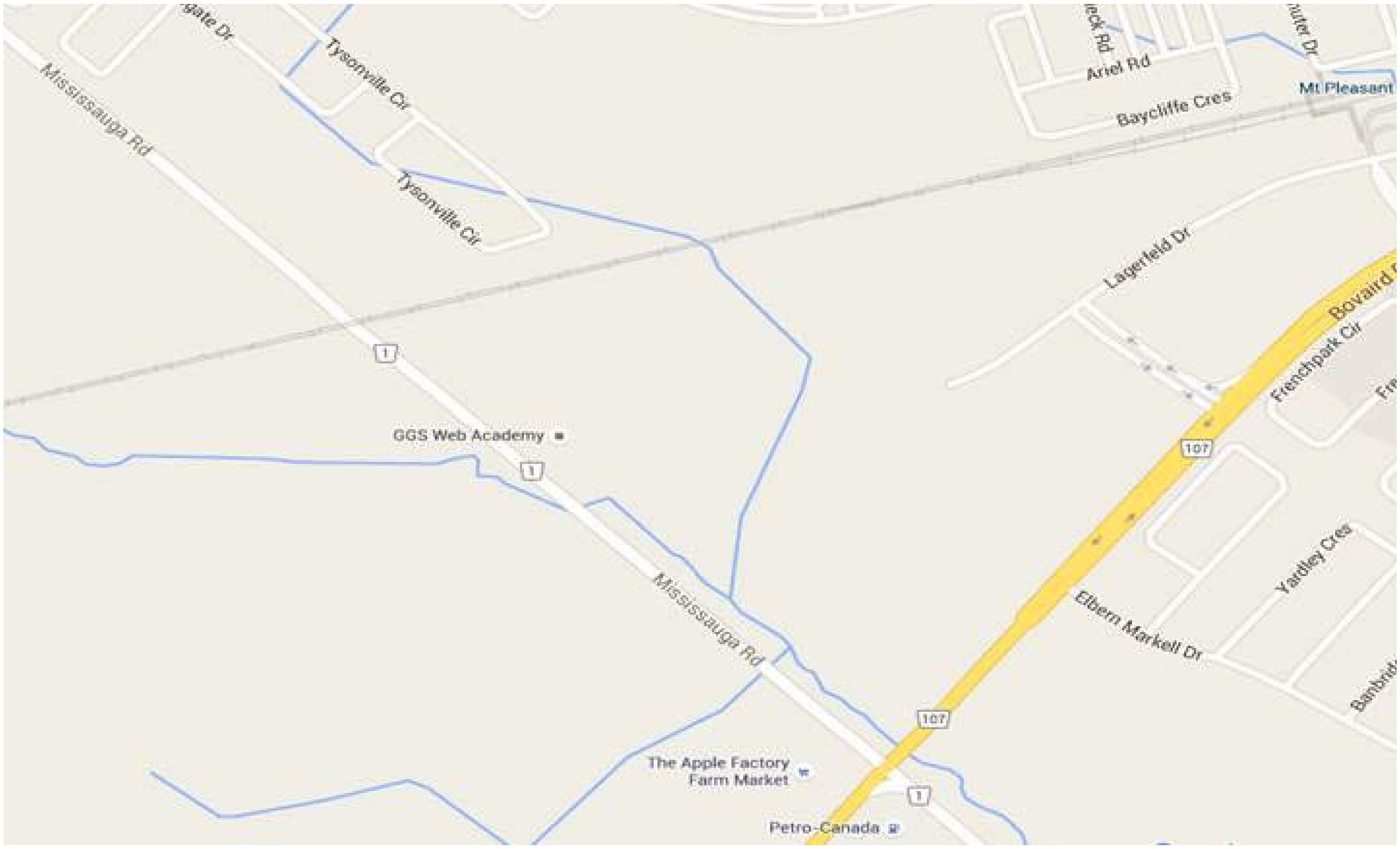
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Smith, Neal
Sent: January 5, 2016 3:28 PM
To: 'Emily Galloway'
Cc: 'Oliveira, Andria'
Subject: RE: Area between Lagerfeld Dr. and Mississauga Rd

Hi Emily, thank you for your email.

The Region of Peel did not expanded the Mayfield Road EA to consider the Lagerfeld extension to Mississauga Road as The City of Brampton is currently completing their own EA for the Lagerfeld Drive extension. The Project Manager from the City of Brampton completing this project is Andria Oliveira, I copied her on the response.

Thank you.



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Email: neal.smith@peelregion.ca
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-----Original Message-----
From: Emily Galloway [[redacted]]
Sent: January 5, 2016 3:06 PM
To: Smith, Neal
Subject: Area between Lagerfeld Dr. and Mississauga Rd

This email was sent by the following person. Please reply to them:

Sender's Name: Emily Galloway
Sender's Email: e[redacted]

The message was submitted through an Automated Email Service on Peel's Website Tue Jan 5 15:09:10 2016:

To whom it may concern,

I am writing to inquire whether the Region of Peal has expanded the Mayfield Road environmental assessment to consider an alternate route expansion between Lagerfeld Dr. and Mississauga Rd.

Thank you for your time,

Emily Galloway

It is the Region of Peel's policy to reply to e-mails within two working days.

For assistance, please contact the webmaster@peelregion.ca

:: NOTE ABOUT CONTACT INFORMATION ::
Contact information can be forged. There is no way to accurately verify a person's name and email address on the Internet.

Brock, Liz

From: Smith, Neal
Sent: January 6, 2016 8:34 AM
To: Brock, Liz
Subject: FW: Area between Lagerfeld Dr. and Mississauga Rd

FYI

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

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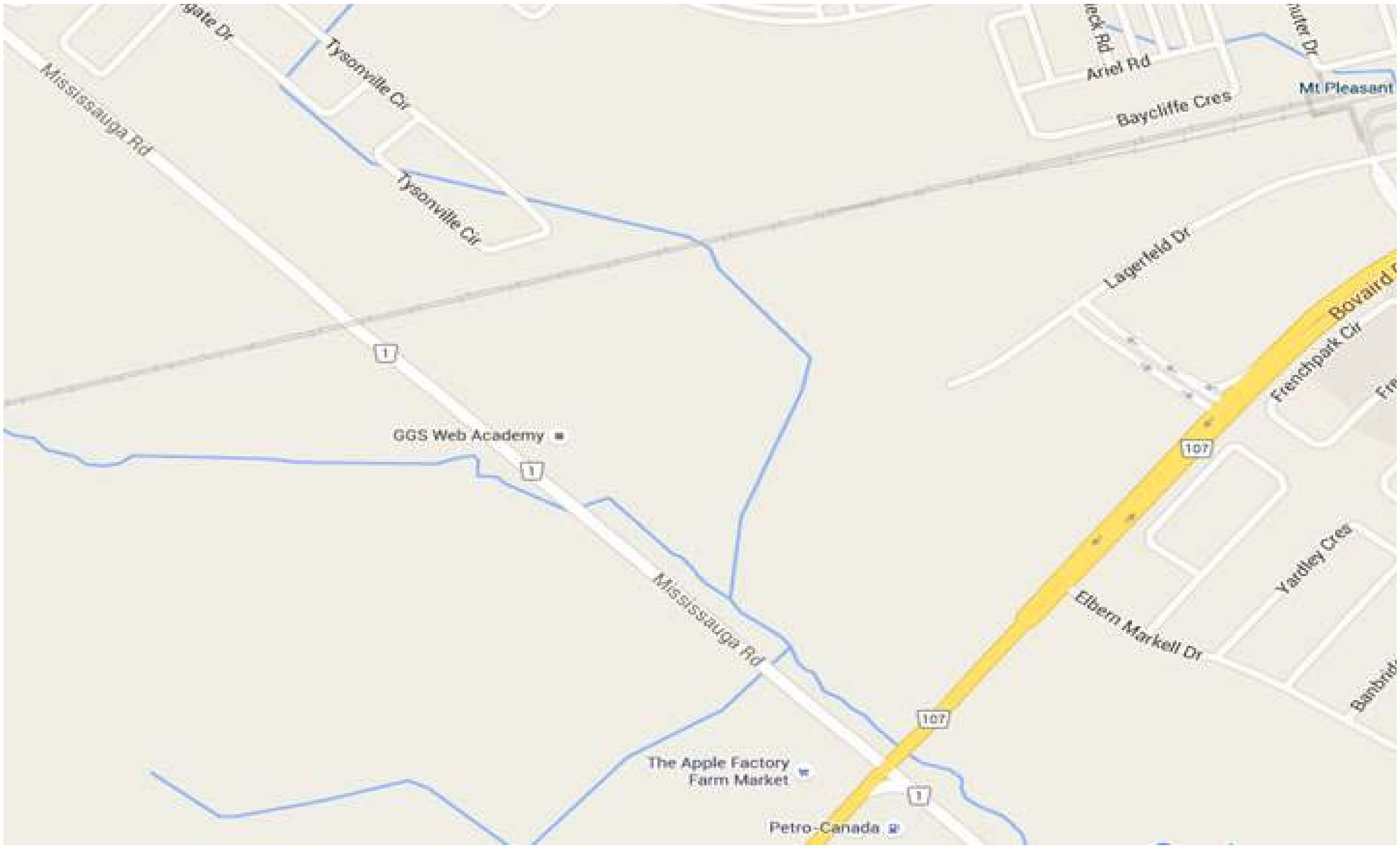
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Smith, Neal
Sent: January 5, 2016 3:28 PM
To: 'Emily Galloway'
Cc: 'Oliveira, Andria'
Subject: RE: Area between Lagerfeld Dr. and Mississauga Rd

Hi Emily, thank you for your email.

The Region of Peel did not expanded the Mayfield Road EA to consider the Lagerfeld extension to Mississauga Road as The City of Brampton is currently completing their own EA for the Lagerfeld Drive extension. The Project Manager from the City of Brampton completing this project is Andria Oliveira, I copied her on the response.

Thank you.



Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
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Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca
 Please consider the environment before printing this e-mail

-----Original Message-----
From: Emily Galloway [mailto:[redacted]]
Sent: January 5, 2016 3:06 PM
To: Smith, Neal
Subject: Area between Lagerfeld Dr. and Mississauga Rd

This email was sent by the following person. Please reply to them:

Sender's Name: Emily Galloway
Sender's Email: e[redacted]

The message was submitted through an Automated Email Service on Peel's Website Tue Jan 5 15:09:10 2016:

To whom it may concern,

I am writing to inquire whether the Region of Peal has expanded the Mayfield Road environmental assessment to consider an alternate route expansion between Lagerfeld Dr. and Mississauga Rd.

Thank you for your time,

Emily Galloway

Brock, Liz

Subject: FW: Bike Lanes

From: Smith, Neal
Sent: September 10, 2014 1:34 PM
To: 'Doug Foster'
Cc: Brock, Liz
Subject: RE: Bike Lanes

Hi Doug

I am following up on the email I sent to you back on August 18th. I would like to address this issue, but need the background information to move forward and provide you with a proper response.

Please feel free to call my anytime.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies Public Works Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

-----Original Message-----
From: Smith, Neal
Sent: August 18, 2014 10:41 AM
To: 'Doug Foster'
Subject: RE: Bike Lanes

Good morning Doug

Thank you for your comments. We have reviewed our records for this project and cannot find the comments you referred to in your email. Do you recall who the person was you wrote to? Please feel to give me a call, my contact information is below.

Thank you.

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies Public Works Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca
P Please consider the environment before printing this e-mail

-----Original Message-----
From: Doug Foster [redacted]
Sent: July 31, 2014 7:10 PM
To: Smith, Neal
Subject: Bike Lanes

This email was sent by the following person. Please reply to them:

Sender's Name: Doug Foster
Sender's Email: [redacted]

The message was submitted through an Automated Email Service on Peel's Website Thu Jul 31 19:16:04 2014:

I am disappointed (again on road work)that there is no consideration for a bicycle lane. A multi use path is NOT suitable for road cyclists.

I made these comments (written) at a previous open house last all in the Mt. Pleasant area, but never got any feedback.

It is the Region of Peel's policy to reply to e-mails within two working days.

For assistance, please contact the webmaster@peelregion.ca

:: NOTE ABOUT CONTACT INFORMATION ::
Contact information can be forged. There is no way to accurately verify a person's name and email address on the Internet.

Region of Peel
Working for you

Comment Sheet for the **MAYFIELD ROAD** Environmental Assessment
from Chinguacousy Road to Winston Churchill Boulevard
Public Information Centre No. 2
Thursday, October 8, 2015

Where do you live? ☐ Town of Caledon ☑ City of Brampton ☐ Halton Region
☐ Other ________________

1. My interest is? (check all applicable)
   - ☐ direct access onto Mayfield Road
   - ☑ residential property
   - ☐ business/commercial
   - ☐ industrial
   - ☐ other (specify)
2. Do you have any questions or comments on the study information presented or the preliminary recommended design?

Board #4 HAS NO MENTION OF MULTIUSE PATH/BIKE LANE FOR MAYFIELD INDUSTRIAL CONNECTOR & GOODS MOV'T
TECHNICAL BOARD #1 — I FAVOUR ROUNDABOUTS AT IDM INITIATIVES - BICYCLE DETECTION & CROSS RIDES SHOULD BE EVALUATED IN THE CONTEXT OF THIS OR A BETTER DESIGN. VERY IMPORTANT TO USE BIKE LANES/PATHS TO PROVIDE CONNECTIVITY FOR SCHOOL → LIBRARIES & COMMUNTER CYCLING. MAYFIELD IS AN IMPORTANT EAST/WEST CORRIDOR AS A ROAD THAT CROSSES #410.

3. If you would like to be contacted, please give us your information.

Name: DAYLE LAING
Address: [redacted]
Telephone/Email:

Thank you for participating in this study. For more information please visit our website. You can also provide comments on-line at:
http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm
Comment sheets may be placed in the comment box at the PIC or sent to Neal Smith, Project Manager,
by ***Friday, October 23, 2015***.

Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, ON L6T 4B9
Tel: 905-791-7800 x7866 / Fax 905-791-1442
Email: neal.smith@peelregion.ca

Region of Peel
Working for you

Comment Sheet for the **MAYFIELD ROAD** Environmental Assessment
from Chinguacousy Road to Winston Churchill Boulevard

Public Information Centre No. 2

Thursday, October 8, 2015

Where do you live? ☐ Town of Caledon ☑ City of Brampton ☐ Halton Region
☐ Other ____________

1. My interest is? (check all applicable)
   - ☐ direct access onto Mayfield Road
   - ☐ residential property
   - ☐ business/commercial
   - ☐ industrial
   - ☑ other (specify) Active Transportation Advocacy.
2. Do you have any questions or comments on the study information presented or the preliminary recommended design?

Industrial Connector & Goods Movement Corridor Road X-section does not give an indication of facility support for cyclists. along a separated lane.

Bicycle facilities including: X-Rides and detection systems should be included as part of the design

The proposed round a bouts are great!!

3. If you would like to be contacted, please give us your information.

Name: David Lewis [redacted]
Address: [redacted]
Telephone/E[redacted]

Thank you for participating in this study. For more information please visit our website. You can also provide comments on-line at:
http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm
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Neal Smith, C.E.T.
Project Manager, Infrastructure Programming & Studies
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, ON L6T 4B9
Tel: 905-791-7800 x7866 / Fax 905-791-1442
Email: neal.smith@peelregion.ca

From: [redacted].
To: Smith, Neal; [redacted].
Cc: Chung, Margie; Lo, Arthur; Brock, Liz
Subject: RE: Public Information Center #2 comments
Date: October 19, 2015 5:53:34 PM

Thanks for keeping us in the loop Neal!

David

David Laing - Chair, BikeBrampton
[redacted]

BikeBrampton.ca
Biking in Brampton Builds our Community

www.bikebrampton.ca
BIKING IN BRAMPTON BUILDS OUR COMMUNITY!

From: Smith, Neal [mailto:Neal.Smith@peelregion.ca]
Sent: October-19-15 9:21 AM
To: 'david@bikebrampton.ca'; [redacted]
Cc: Chung, Margie; Lo, Arthur; Brock, Liz
Subject: Public Information Center #2 comments

Good morning David and Dayle

It was a pleasure to speak with you both at the public information center held on October 8, 2015 and thank you for providing your comments (attached). As I mentioned Thursday night, as part of the EA we plan to design infrastructure that supports active transportation (pedestrians and cyclists) as well as vehicular traffic.

One of our key objectives when it comes to active transportation needs is to design for connectivity to other infrastructure. You mentioned some areas of concern where connectivity (small sections) have not been completed and Arthur was going to look in to those areas for you, thank you for bringing them to our attention.

As we move forward into the next phase, detailed design, Margie's team will be working closely with the capital project manager to review, comment and evaluate cycling infrastructure (i.e. cross rides, detection systems, etc.) that may fit into the overall design.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

Region of Peel
Working for you

Comment Sheet for the **MAYFIELD ROAD** Environmental Assessment
from Chinguacousy Road to Winston Churchill Boulevard
Public Information Centre No. 2
Thursday, October 8, 2015

Where do you live? ☐ Town of Caledon ☑ City of Brampton ☐ Halton Region
☐ Other ______________

1. My interest is? (check all applicable)
   - ☐ direct access onto Mayfield Road
   - ☐ residential property
   - ☐ business/commercial
   - ☐ industrial
   - ☑ other (specify) BICYCLE FACILITIES
2. Do you have any questions or comments on the study information presented or the preliminary recommended design?

FOR BICYCLE FACILITIES I PREFER THE 5 LANE DESIGN WITH PAVED SHOULDERS FOR CYCLING.

I AM ALSO IN FAVOUR OF ROUND-A-BOUTS AT ALL INTERSECTIONS. THIS WOULD ENHANCE EAST-WEST TRAFFIC FLOW

3. If you would like to be contacted, please give us your information.

Name: GEORGE SHEPPERDLEY
Address: [redacted]
Telephone/Email: [redacted]

Thank you for participating in this study. For more information please visit our website. You can also provide comments on-line at:
http://www.peelregion.ca/pw/transportation/environ-assess/mayfield-road-ea-2.htm
Comment sheets may be placed in the comment box at the PIC or sent to Neal Smith, Project Manager,
by ***Friday, October 23, 2015***.

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Project Manager, Infrastructure Programming & Studies
Public Works, Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, ON L6T 4B9
Tel: 905-791-7800 x7866 / Fax 905-791-1442
Email: neal.smith@peelregion.ca

DRAFT ESR AND COMPLETION COMMENTS

Brock, Liz

Subject: FW: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Attachments: Mayfield Road EA - MOECC Comments 2016.docx; RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

From: Smith, Neal
Sent: July 13, 2016 9:18 AM
To: 'Bell, Trevor (MOECC)'
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Trevor

Further to me phone message, I reviewed your comments and received a message from Melissa that the updated stormwater report (to include your comments) were not clearing revised in the ESR document. I have attached the comments we received from Hatch. If the changes are acceptable, we will add them to the section in the ESR so the match what's in the report (Appendix F).

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Bell, Trevor (MOECC) [mailto:Trevor.Bell@ontario.ca]
Sent: July 12, 2016 3:14 PM
To: Smith, Neal
Cc: Brock, Liz; Alexander, Melissa (melissa.alexander@hatch.com); Martin, Paul (MOECC); Dufresne, Tina (MOECC)
Subject: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Good afternoon,

Please find attached a letter from the Ministry of the Environment and Climate Change, Central Region Technical Support Section regarding the above noted project. Feel free to contact me directly with any questions or concerns you may have.

Sincerely,

Trevor Bell
Environmental Resource Planner and EA Coordinator
Technical Support Section | Central Region
Ministry of the Environment and Climate Change
5775 Yonge St., 8th Floor
Toronto, ON M2M 4J1
T: 416-326-3577
E: trevor.bell@ontario.ca

Mayfield Road EA – MOECC Comments – April 28, 2016

Comments – SWM – April 28, 2016	Response (Hatch) May 3, 2016
1. The report does not clearly indicate the kind of stormwater management (SWM) (quality/quantity) controls that currently exist (if any). The report is also not clear on the water quality control that would apply for the widened road. We recommend the ESR be revised to include a clear commitment to achieve enhanced level of treatment, as a minimum for an area equivalent to the additional impervious area created by the road widening. We also encourage the Region to explore the feasibility of providing enhanced level of treatment for runoff from the existing road surface area.	Page 15 of the SWM report states that there are presently no SWM control measures to manage runoff from the Mayfield Road study area. The existing study area is serviced by road side ditches that convey runoff to culvert outfall locations. Table 4-6 Proposed Drainage Plan for Road ROW (page 25 of the SWM Report) and Section 4.6.2 Proposed SWM/LID Strategy (page 29 of the SWM report) has illustrated the proposed water quality control strategies for the Mayfield Roadway corridor. It can be summarized as follows:

Location	Proposed Cross-sections	Proposed Water Quality Control Measures
Winston Churchill Blvd to Heritage Rd	4-lane rural	Enhanced Grass Swale
Heritage Rd to Mississauga Rd	4-lane rural	Enhanced Grass Swale
Mississauga Rd to Creditview Rd	*Interim* – 5-lane mixed rural/urban	*North Side: Enhanced Grass Swale on the. South Side: Subsurface Infiltration Chamber + OGS Unit*
	Ultimate – 6-lane Urban	*Subsurface Infiltration Chamber + OGS Unit*
Creditview Rd to Chinguacousy Rd	*Interim – 5-lane mixed rural/urban*	*North Side: Enhanced Grass Swale on the. South Side: Subsurface Infiltration Chamber + OGS Unit*
	Ultimate - 6-lane	*Subsurface Infiltration Chamber +*

Comments – SWM – April 28, 2016	Response (Hatch) May 3, 2016
	<table><tr><td></td><td>urban</td><td>*OGS Unit*</td></tr></table> **Action:** Revise the SWM report to clearly indicate the proposed SWM controls that would apply for the widened road. The Appendix will include OGS unit sizing details and projected pollutant removal efficiency.
2. The report indicates that water quality treatment will be through the use of swales and (yet unspecified) low impact development (LID) measures. We disagree that enhanced level of treatment can be achieved through the use of the swales alone. Whether LID measures are feasible or how a treatment train approach will be used to achieve the desired level of treatment is not described. We recommend the final design include a treatment train approach to satisfy the requirement to achieve the "enhanced" level of treatment.	A treatment train approach has been developed for <u>urban cross-sections</u> (between <u>Mississauga Rd. to Chinguacousy Rd,)</u> • **<u>Conveyance Controls:</u>** The Proposed subsurface infiltration chamber has been integrated into the proposed storm sewer system to collect, retain and infiltrate all rainfall events up to 10 year design storm for the entire ROW area. Under this design, the main-line storm sewer will be functioned as an overflow pipe to convey runoff volumes that is greater than the 10 year event (as shown in attached). • **<u>End-of-Pipe Controls:</u>** Oil-Grit-Separation unit is designed to treat the runoff prior to the release. For rural cross-section (between Winston Churchill Blvd. to Mississauga Rd.), the proposed SWM plan have only recommended enhanced grass swale as a primary water quality treatment measures. We agree that the use of swales along cannot achieve enhanced level of treatment as required by the MOECC. However, due to the proposed roadway configuration (i.e. rural cross-sections , no STM Sewers), poor native soil drainage condition and large storage volume requirement, a similar treatment train approach seems to be not feasible nor practical at this segment. By considering possibility of future subdivisions development (i.e. potential future development adjacent to Mayfield Road in the next few years) and cost-effectiveness, **<u>SWM pond</u>** is the most feasible water quality and quantity control measures to be implemented within this area. On page 32 of the SWM Report,

Comments – SWM – April 28, 2016	Response (Hatch) May 3, 2016
	Table 4-9 illustrated the storage volume required to detain 25 mm, 10 year and 100 year stormwater runoffs for sizing linear LID features purposes. In the revised report submission, Hatch will recommend future adjacent subdivision development plan to accommodate the calculated 100 year storage volume requirement as shown in Table 4-9. In the meantime, Hatch will update the SWM report to recommend the use of check dam and or low Grade Weir across the enhanced grassed swales between Winston Churchill Blvd. and Mississauga Rd. Such structures will promote pollutant settlements and reducing flow velocity, which ultimately improve the effectiveness of water quality treatment. **Action:** Revise the SWM report to include SWM ponds recommendations and design check dam as a temporary water quality treatment measures.
3. We understand the SWM system for the widened road will need to be approved through the Environmental Compliance Approval process and it may be prudent to hold early consultation with the Ministry's Environmental Approvals Branch (EAB) on whether the SWM design meets the criteria or not. Our recommendation to EAB will be to review the SWM proposal to ensure it meets the enhanced level of treatment.	Acknowledged – no action required.

Brock, Liz

From: Bell, Trevor (MOECC) <Trevor.Bell@ontario.ca>
Sent: July 13, 2016 4:24 PM
To: Smith, Neal
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Neal,

Our Water Unit is satisfied with the responses provided by your consultant. We are comfortable signing off on the Class EA now that our concerns have been adequately addressed.

Thanks,
Trevor

From: Bell, Trevor (MOECC)
Sent: July-13-16 9:34 AM
To: 'Smith, Neal'
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Neal, I got your voice mail and the email below. Thanks that is much appreciated – it's very helpful to have the changes identified in a table like that. I'll have one of our water specialists review the changes and get back to you ASAP.

-Trevor

From: Smith, Neal [mailto:neal.smith@peelregion.ca]
Sent: July-13-16 9:18 AM
To: Bell, Trevor (MOECC)
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Trevor

Further to me phone message, I reviewed your comments and received a message from Melissa that the updated stormwater report (to include your comments) were not clearing revised in the ESR document. I have attached the comments we received from Hatch. If the changes are acceptable, we will add them to the section in the ESR so the match what's in the report (Appendix F).

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866

Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Bell, Trevor (MOECC) [mailto:Trevor.Bell@ontario.ca]
Sent: July 12, 2016 3:14 PM
To: Smith, Neal
Cc: Brock, Liz; Alexander, Melissa (melissa.alexander@hatch.com); Martin, Paul (MOECC); Dufresne, Tina (MOECC)
Subject: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Good afternoon,

Please find attached a letter from the Ministry of the Environment and Climate Change, Central Region Technical Support Section regarding the above noted project. Feel free to contact me directly with any questions or concerns you may have.

Sincerely,

Trevor Bell
Environmental Resource Planner and EA Coordinator
Technical Support Section | Central Region
Ministry of the Environment and Climate Change
5775 Yonge St., 8th Floor
Toronto, ON M2M 4J1
T: 416-326-3577
E: trevor.bell@ontario.ca

Ministry of the Environment and Climate Change

Central Region
Technical Support Section

5775 Yonge Street, 8th Floor
North York, Ontario M2M 4J1

Tel.: (416) 326-6700
Fax: (416) 325-6345

Ministère de l'Environnment et de l'Action en matière de changement climatique

Région du Centre
Section d'appui technique

5775, rue Yonge, 8ième étage
North York, Ontario M2M 4J1

Tél. : (416) 326-6700
Téléc. : (416) 325-6347

Ontario

April 28, 2016

File No.: EA 01-06-05

Mr. Neal Smith
Project Manager
Region of Peel
10 Peel Centre Drive, 4th Floor, Suite B
Brampton, Ontario L6T 4B9

RE: Mayfield Road Improvements from Chinguacousy Road to Winston Churchill Boulevard
City of Brampton and Town of Caledon
Schedule C Municipal Class Environmental Assessment
Response to Draft Environmental Study Report, April 2016

Dear Mr. Smith,

We have reviewed the Draft Environmental Study Report (ESR) for the above noted project, and understand the preferred design concept for Mayfield Road Improvements is Alternative 4 (Hybrid widening about the centre line, to the North, and to the South). The following comments are offered for your consideration.

General Comments

1. Please note the following change in Ministry of the Environment and Climate Change contacts and update the Agency Mailing List accordingly: Trevor Bell, EA Coordinator, Technical Support Section, Central Region. Email: trevor.bell@ontario.ca (replaces Amanda Graham).

2. Section 1.9 of the Draft ESR indicates that the record of Aboriginal engagement is provided in Appendix O, whereas it is actually provided in Appendix C. Additionally, the Table of Contents in Appendix Volumes 1 and 2 give incorrect page numbers for some of the Appendices. Please ensure that the final ESR references Appendices and page numbers correctly.

3. Please include in section 1.9 of the ESR a summary table of Aboriginal consultation for ease of reference, which should indicate project notices that were sent, the dates they were sent, the method of contact, and any responses received from Aboriginal communities.

Planning and Policy Comments

1. The study area is subject to the Provincial Policy Statement (2014) and the Growth Plan for the Greater Golden Horseshoe. The ESR should reference the relevant policies in these plans and demonstrate how the proposed project is consistent with these policies.

Air Quality Comments

1. Please clarify why the "Future No Build" scenario was not assessed.

2. Please note that the ministry no longer uses the term "smog days" and the Air Quality Health Index replaced the Air Quality Index on June 24, 2015. Please see the link below for additional information.

   http://www.airqualityontario.com/science/aqhi_description.php

3. The proposed widening will bring the road closer to certain residential developments and other sensitive receptors. We recommend planting coniferous vegetation adjacent to the areas that are most impacted by particulate levels to act as a year round barrier.

4. During construction, please apply best management practices to mitigate any air quality impacts caused by construction dust. Please note that the ministry recommends that non-chloride dust suppressants be applied.

   For a comprehensive list of fugitive dust prevention and control measures, please refer to Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities. Report prepared for Environment Canada. March 2005.

Surface Water Comments

1. The report does not clearly indicate the kind of stormwater management (SWM) (quality/quantity) controls that currently exist (if any). The report is also not clear on the water quality control that would apply for the widened road. We recommend the ESR be revised to include a clear commitment to achieve enhanced level of treatment, as a minimum for an area equivalent to the additional impervious area created by the road widening. We also encourage the Region to explore the feasibility of providing enhanced level of treatment for runoff from the existing road surface area.

2. The report indicates that water quality treatment will be through the use of swales and (yet unspecified) low impact development (LID) measures. We disagree that enhanced level of treatment can be achieved through the use of the swales alone. Whether LID measures are feasible or how a treatment train approach will be used to achieve the desired level of treatment is not described. We recommend the final design include a treatment train approach to satisfy the

requirement to achieve the "enhanced" level of treatment.

3. We understand the SWM system for the widened road will need to be approved through the Environmental Compliance Approval process and it may be prudent to hold early consultation with the Ministry's Environmental Approvals Branch (EAB) on whether the SWM design meets the criteria or not. Our recommendation to EAB will be to review the SWM proposal to ensure it meets the enhanced level of treatment.

Thank you for the opportunity to comment on this Draft ESR. Should you or any member of your project team have any questions or concerns, feel free to contact me directly by phone at 416-326-3577 or by email at trevor.bell@ontario.ca.

Sincerely,

Trevor Bell
Environmental Resource Planner and EA Coordinator
Air, Pesticides, and Environmental Planning

c: Liz Brock, Technical Analyst, Peel Region
Melissa Alexander, Environmental Planner, Hatch Mott MacDonald
Paul Martin, APEP Supervisor, MOECC
Tina Dufresne, Manager, Halton Peel District, MOECC
A&P File

Brock, Liz

From: Waters, Daniel <DANIEL.WATERS@brampton.ca>
Sent: May 12, 2016 1:18 PM
To: Brock, Liz; Bobb, Compton
Cc: Smith, Neal; Sifo, Sargon
Subject: RE: Mayfield EA City of Brampton comments

Hello Liz,

Sorry for this delayed response. The changes to the alignment of pathways are much improved. It is too bad that there is not enough room given constraints on the Eastern corner of Robert Parkinson Drive.

Regards,

Daniel

From: Brock, Liz [mailto:liz.brock@peelregion.ca]
Sent: 2016/05/06 11:34 AM
To: Bobb, Compton; Waters, Daniel
Cc: Smith, Neal; Sifo, Sargon
Subject: FW: Mayfield EA City of Brampton comments

Hi Compton and Daniel – please see our project designer's response (in red) to the comments you provided.

ESR indicates the MUT narrows to 1.8m at Robert Parkinson Drive. The trails should maintain 3.0m width consistently

- The MUT has to be 1.8m at the location because of property constraints.

It is also noted that the MUT does not align across this intersection, the pathway should be designed to allow direct crossing.

- The crossing has been realigned with pedestrian pavement markings added.

I have attached two drawings indicating proposed connections to Truro Circle and Exhibition Crescent, please let me know if you require any further plans.

- The MUT now connects to the trail connections.

Please see attached drawings showing the trail connections and the realigned crossing at Robert Parkinson Drive.

The Streetscaping design will be prepared in detailed design. At the EA stage we only speak of landscape requirements in generalities; however I will mention in the ESR to consult with the City on plant choices in detailed design and to use native plants next to NHS.

Regards,

Liz Brock
Technical Analyst
Infrastructure Programming and Studies
10 Peel Centre Drive, Suite B
Brampton, ON
905-791-7800 x7902
liz.brock@peelregion.ca

Brock, Liz

Subject: FW: Mayfield Road EA - MOECC Comments

From: Alexander, Melissa [mailto:melissa.alexander@hatch.ca]
Sent: May 11, 2016 9:18 AM
To: Brock, Liz
Cc: Smith, Neal
Subject: Mayfield Road EA - MOECC Comments

Please see our response to the MOECC comments below.

Comment 1

Page 15 of the SWM report states that there are presently no SWM control measures to manage runoff from the Mayfield Road study area. The existing study area is serviced by road side ditches that convey runoff to culvert outfall locations.

Table 4-6 Proposed Drainage Plan for Road ROW (page 25 of the SWM Report) and Section 4.6.2 Proposed SWM/LID Strategy (page 29 of the SWM report) has illustrated the proposed water quality control strategies for the Mayfield Roadway corridor. It can be summarized as follows:

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	Ultimate – 6-lane Urban	*Subsurface Infiltration Chamber + OGS Unit*
Creditview Rd to Chinguacousy Rd	*Interim – 5-lane mixed rural/urban*	*North Side: Enhanced Grass Swale on the. South Side: Subsurface Infiltration Chamber + OGS Unit*
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Action: Revise the SWM report to clearly indicate the proposed SWM controls that would apply for the widened road.

Comment 2

A treatment train approach has been developed for urban cross-sections (between Mississauga Rd. to Chinguacousy Rd,)

- **Conveyance Controls:** The Proposed subsurface infiltration chamber has been integrated into the proposed storm sewer system to collect, retain and infiltrate all rainfall events up to 10 year design storm for the entire ROW area. Under this design, the main-line storm sewer will be functioned as an overflow pipe to convey runoff volumes greater than the 10 year event (as shown in attached).
- **End-of-Pipe Controls:** Oil-Grit-Separation unit is designed to treat the runoff prior to the release.

For rural cross-section (between Winston Churchill Blvd. to Mississauga Rd.), the proposed SWM plan have only recommended enhanced grass swale as a primary water quality treatment measures. We agree that the use of swales alone cannot achieve enhanced level of treatment as required by the MOECC. However, due to the proposed roadway configuration (i.e. rural cross-sections , no STM Sewers), poor native soil drainage condition and large storage volume requirement, a similar treatment train approach seems to be not feasible nor practical at this segment.

By considering possibility of future subdivisions development (i.e. potential future development adjacent to Mayfield Road in the next few years) and cost-effectiveness, **SWM pond** is the most feasible water quality and quantity control measure to be implemented within this area. At page 32 of the SWM Report, Table 4-9 illustrated the storage volume required to detain 25 mm, 10 year and 100 year stormwater runoffs for sizing linear LID features purposes. In the revised report submission, Hatch will recommend future adjacent subdivision development plan to accommodate the calculated 100 year storage volume requirement as shown in Table 4-9.

In the meantime, Hatch will update the SWM report to recommend the use of check dam and or low Grade Weir across the enhanced grassed swales between Winston Churchill Blvd. and Mississauga Rd. Such structures will promote pollutant settlements and reducing flow velocity, which ultimately improve the effectiveness of water quality treatment.

Action: Revise the SWM report to include SWM ponds recommendations and design check dam as a temporary water quality treatment measures.

Comment 3

Acknowledged. No Action Required.

Melissa Alexander, B.Sc., MCIP, RPP
Environmental Planner / Hatch Infrastructure

Tel: +1 519 489 4109
5035 South Service Road, Sixth Floor, Burlington
Ontario Canada L7L 6M9

HATCH

CANADA'S SAFEST EMPLOYERS 2015 GOLD WINNER

Brock, Liz

Subject: FW: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works
905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world….Thich Nhat Hanh

Studies show trees live longer when they're not cut down.
Please do not print this email unless you really need to.

From: Brock, Liz
Sent: May 3, 2016 10:47 AM
To: Smith, Neal
Subject: FW: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard

fyi

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works
905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world….Thich Nhat Hanh

Studies show trees live longer when they're not cut down.
Please do not print this email unless you really need to.

From: Motamedi, Kolsoom
Sent: May 3, 2016 10:31 AM
To: Motala, Imran; Pendlebury, Martin; Gill, Nimarta
Cc: Stockman, Angela; Brock, Liz
Subject: RE: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard

Hi,

We do not have any future planned sewer project along Mayfield Road between Chinguacousy Road and Winston Churchill Boulevard. However there are two future growth-related sewermains which will cross the Mayfield Road from south to north as follow:
1-900 mm trunk sewer along future north-south Street, east of Mississauga Road, which it is planned for construction in 2028 under project number 21-2299

2- 450 mm sewer along the future north-south Street, west of Heritage Road, which it is planned for construction in 2031 under project number 21-2199

These two projects are required to be mentioned in table 6(Utilities Consulted) of ESR.

Two different construction years are addressed in the report for Mayfield Road between Mississauga Road and Winston Churchill Blvd.
Could you please clarify which one is correct?

- At page VII of the ESR, Highlights of Recommendation Design, it is mentioned 2031
- At page XVI of the ESR, Description of recommendation design, it is mentioned 2021

Thanks and Regards,

Kolsoom Motamedi, M.Eng., P.Eng., PMP

Project Manager
Water and Wastewater Program Planning
Public Works, Region of Peel
Tel. (905) 791-7800, ext. 4196
Kolsoom.Motamedi@peelregion.ca

From: Motala, Imran
Sent: May 2, 2016 2:46 PM
To: Pendlebury, Martin; Motamedi, Kolsoom; Gill, Nimarta
Cc: Stockman, Angela
Subject: FW: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard
Importance: High

Please ensure all our infrastructure is listed on the EA document.

Thanks

From: Brock, Liz
Sent: May 2, 2016 11:31 AM
To: Compton Bobb; Chan, Eric; Montouto, Jose; Nemeth, John; Saiyed, Sabbir; Gardiner, Len; Crawford, Mark; Mele, Lorenzo; Sikand, Meenu; Stockman, Angela; Motala, Imran; Carrick, Sean; Caughey, Rebecca; Kilis, Jakub; Marray, Liam; Chan, Wayne; Lo, Arthur; kant.chawla@caledon.ca; Alexander, Melissa
Cc: Nieuwenhuysen, Bob; Rook, Sally; Ganesh, Steve; Smith, Neal
Subject: FW: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard
Importance: High

Good morning – we are finishing off the ESR and are hoping to complete the final document and publish the Notice of Completion starting next week in the local newspapers. If you have not provided comments and still wish to do so, please forward to me by **Wednesday May 4, 2016**. Otherwise I will assume you have none.

Thank you,

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works
905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world….Thich Nhat Hanh

Studies show trees live longer when they're not cut down.
Please do not print this email unless you really need to.

From: Brock, Liz
Sent: April 1, 2016 10:18 AM
To: Compton Bobb; 'patrick.monaghan@halton.ca'; 'Trevor.Bell@ontario.ca'; 'DanielR@haltonhills.ca'; Kant Chawla; 'Heaton, Mark (MNRF)'; Chan, Eric; Montouto, Jose; Nemeth, John (John.Nemeth@peelregion.ca); Sinka, Nathan; Sabbir Saiyed; Gardiner, Len; Crawford, Mark (Mark.Crawford@peelregion.ca); Mele, Lorenzo; Lee, Thomas; Gorman, Gayle; Vandenburg, Ryan; Sikand, Meenu; Stockman, Angela; Motala, Imran; Reaume, Melodie; Abalos, Federico (Federico.Abalos@peelregion.ca); Zare, Mina; Carrick, Sean; Caughey, Rebecca; 'Alexander, Melissa'; Kilis, Jakub; Marray, Liam; Chan, Wayne; Lo, Arthur
Cc: Nieuwenhuysen, Bob; Rook, Sally; Ganesh, Steve; Neal Smith
Subject: Draft ESR Review for the Mayfield Road Widening, Chinguacousy Rd to Winston Churchill Boulevard
Importance: High

Good morning,

The draft ESR for the Mayfield Road widening, Chinguacousy Rd to Winston Churchill Boulevard, is now available for your download and review. The electronic copy has been placed on our ftp site:

https://efts.peelregion.ca/OpenKM/login.jsp

User: PeelEA
Password: environment

A hard copy for those that requested will be sent out early next week. Please review and provide your comments back by **Friday April 15, 2016.**

Thank you,

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works

905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world….Thich Nhat Hanh

Studies show trees live longer when they're not cut down.
Please do not print this email unless you really need to.

Brock, Liz

Subject: FW: CVC Comments - Mayfield Rd Draft ESR (CVC file no EA 12/006)

Hi Neal – I have added my comments/response in red. Can you address the rest as per our meeting yesterday? Also – have they provided you any feedback on the hydrogeology report?

Here is the link to the Final ESR

[Final ESR]

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works
905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world....Thich Nhat Hanh

From: Kilis, Jakub
Sent: May 6, 2016 12:51 PM
To: Brock, Liz
Cc: Marray, Liam; Stewart, Rebecca
Subject: CVC Comments - Mayfield Rd Draft ESR (CVC file no EA 12/006)

Hi Liz,

Please find CVC's comment on the Draft ESR below:

1. As discussed throughout this process this EA is at least partially dependent on a number of external factors related to the future development on lands both south and north of Mayfield. This is not really discussed in the EA. It was our understanding during the study period that this EA would be positioned to recognize some of the uncertainty of future land uses and as such highlight the flexibility that may be required during the detailed design phase.
   See Executive Summary and Section 1.3 Background. Added some additional wording in Section 1.3.

2. Section 3.6.1 Aquatic Habitat (pg 19) and Section 3.13 Fluvial Geomorphological and Meander Belt Width Assessment (pg 29) both refer to watercourses along Mayfield Road and Section 3.13 refers to 14 watercourses specifically. During the EA study CVC identified which of the features were considered watercourses. The water's edge report refers to ephemeral features and their form and function, however, terminology differentiating them from watercourses should be used in the ESR. Drainage information should come from the subwatershed studies for the area. If all the features are called/considered watercourses then the report must address all associated hazards beyond geomorphology to include flooding and erosion. Most of the features should be classified as Headwater Drainage Features not watercourses.
   Wording has been changed to reflect your direction.

3. Section 3.13 – 3rd paragraph. The unnamed tributary of the Credit River is called Credit River Tributary 2. Renamed as requested.

4. Section 4.4 – Stormwater Drainage section (pg 37) – Stormwater and Drainage section refers to numbers of potential culverts as well as opportunity to upsize future culverts to allow animal passage. Planning decision around future drainage and natural heritage corridors including animal passage are being considered through the Heritage Heights Subwatershed Study and were considered during design of Blocks 51-1 and 51-2 in Mount Pleasant Secondary Plan Area. Specific crossing locations and types should be at least partially informed using the future land use proposed within these development areas.

   The intention of the Region's drainage plan is to match the location and type of conveyance infrastructure to what has been already approved for development in the Heritage Heights Subwatershed Study and the Mount Pleasant Secondary Plan Area.

5. Section 5.2.4 – During detailed design CVC will be looking for opportunities to reduce any culvert lengths at watercourse crossings. Opportunities such as changes to grading, reductions in boulevard widths, centre medians etc should be left for consideration at detailed design. This statement has been added to the ESR.

6. Section 6.10 – Environmental Impacts and Recommended Mitigation - Although Credit River Fish Management Plan identifies these as warm water features with the presence of Redside Dace (RSD) the streams should be classified as coolwater. MNRF should be also circulated for confirmation regarding SAR. CVC has a record of bobolink (2011) that does not appear to be picked up in Beacon's review. MNRF should confirm that none of these crossings are RSD. Wording changed as follows:

   Species at Risk

   The Headwater Drainage Features within the study area do not provide suitable conditions for Redside Dace but provide contributing habitat. The new Natural Heritage Systems constructed as part of the Mount Pleasant Development lands along Mayfield Road will also become contributing habitat for Redside Dace.

   The CVC identified one Bobolink in 2011 within the study area, a bird species protected under the Endangered Species Act. However, there is no suitable habitat to support the 3 most common birds protected under the Act; Bobolink, Eastern Meadowlark, and Barn Swallow and no mitigation is required.

7. Section 6.10 – Environmental Impacts and Recommended Mitigation – this section only lists RSD and birds. CVC expected that broad overall environmental mitigation would be covered in this section, or at least reference would be made to sections in the report which discuss proposed environmental mitigation measures. Reference added to review Section 3.6 Natural Environment for details on mitigation measures.

8. Section 7.3 – Proposed Construction Monitoring – Comments regarding Permits to Take Water should be updated with new information as per recent changes, as required.

   The Region will consult with the Ministry of the Environment and Climate Change (MOECC) Central Region Permit to Take Water (PTTW) Coordinator prior to detailed design to confirm the most up-to-date approval requirements for water takings during construction or operation, as regulated under the Ontario Water Resources Act (OWRA) and the Water Taking Regulation (O. Reg. 387/04).

9. Wildlife passage - The report indicates that the culverts will be sized for small mammals. The culverts should be similarly sized as the downstream crossings through the development lands – this can be further addressed at detailed design. Note that new CVC crossing guidelines will be available shortly.

Storm Water Management specific comments

10. The Mount Pleasant Sub-Area 51-1 EIR and Mount Pleasant Sub-Area 51-2 EIR have completed a geomorphic assessment to determine the erosion thresholds of the two regulated watercourses (at locations C11 and C18). Confirm that the stormwater management strategy respects these threshold targets. Where the targets cannot be achieved, a risk assessment must be completed to determine the impact this may have on the system. See Section 3.14 - Stormwater Management and Drainage

11. At the two locations of interest, meander belt widths have been established through the EIR's for Mount Pleasant. The crossings must be sized appropriately based on the results of the EIR. Confirmation of this within the EA is required.

12. The watercourses located at crossings C11 and C18 are regulated by CVC. CVC requires that the culverts be sized based on the Regulatory storm event which is the greater of the 100yr and Regional storm event. Additional hydraulic information through subwatershed studies may be available from the City of Brampton. CVC expects no flooding or erosion impacts upstream of the proposed crossings.

13. Provide proposed drainage plans for both the minor and major systems that include the runoff coefficient for each drainage area.

14. It is preferred that the flows being used to size Culverts C11 and C18 correspond with the flows as established through the EIR for the blocks south of Mayfield Rd. The HSPF hydrologic model has been previously approved through the submission of the EIR in 2010. This model is currently in the process of being revised. The hydraulic assessment for Culverts C11 and C18 must be coordinated with this updated model at the detailed design stage. Refer to Tables 4.3.4.7 and 4.3.4.8 in the EIR to obtain the flows from the 2010 approved HSPF model.

Table 1: Frequency Flows (m^3/s) for Baseline Land Use
(Subwatershed Management Strategy and Implementation plan, AMEC, Dec 2010)

Node	Drainage Area (ha)	Frequency (years)						
		2	5	10	20	50	100	Regional
7.35	20.89	0.18	0.38	0.57	0.82	1.20	1.73	2.71
5.550	64.25	0.57	1.17	1.78	2.57	3.99	5.43	8.65

Stormwater Management Strategy – Winston Churchill Blvd to Mississauga Rd:

15. The ROW drainage area will achieve the water quantity, water quality and water balance criteria through the use of enhanced grass swales. Infiltration rates should be determined based on the geotechnical and hydrogeological studies in order to appropriately size and design these swales.

16. The ultimate SWM strategy will require coordination with the City of Brampton in order to utilize the future SWM ponds within the blocks south of Mayfield Rd.

Stormwater Management Strategy – Mississauga Rd to Chinguacousy Rd:

17. The minor system (less than 10yr flow) will achieve the water quantity and quality criteria through the use of underground detention chambers and catch basin inserts. The major system (greater than 10yr flow) will achieve the water quantity and quality control criteria through the use of storm sewers with OGS units. Please clarify how the water balance target will be achieved.

18. Flood control must be provided for all flows discharging into the regulated watercourses as per the CVC's Stormwater Management Criteria Document. This will require the control of post-development to pre-development flows for the 2-year to 100-yr and the regional storm events.

We are still completing our review of the hydrogeology report and will provide any comments when our review is complete.

Please let me know if you have any questions,
Jakub

Jakub Kilis, RPP, Can-CISEC
Planner, Environmental Assessment | Credit Valley Conservation
905.670.1615 ext 287 | C: 647.212.6554 | 1.800.668.5557
jkilis@creditvalleyca.ca | creditvalleyca.ca

C

ABORIGINAL AND FIRST NATIONS ENGAGEMENT

ALDERVILLE FIRST NATION
11696 Second Line
P.O. Box 46
Roseneath, Ontario K0K 2X0
Phone: (905) 352-2011
Fax: (905) 352-3242

November 26, 2013

Region of Peel, Public Works
10 Peel Centre Dr., Suite B
Brampton, ON L6T 4B9

Att: Neal Smith, Project Manager

Re: Notice of Public Information Centre, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard City of Brampton, Town of Caledon and Town of Halton Hills

Dear Neal Smith,

Thank you for your consultation request to Alderville First Nation regarding the Class Environmental Assessment for Mayfield Road which is being proposed within our Traditional and Treaty Territory. We appreciate the fact that the Region of Peel recognizes the importance of First Nations Consultation and that your office is conforming to the requirements within the Duty to Consult Process.

As per the Alderville First Nation Consultation Protocol, your proposed project is deemed a level 3, having minimal potential to impact our First Nations' rights, therefore, please keep Alderville apprised of any changes to your project. I can be contacted at the mailing address above or electronically via email, at the email address below.

In good faith and respect,

Dave Simpson
Lands and Resources
Communications Officer
Alderville First Nation

dsimpson@aldervillefirstnation.ca

Tele: (905) 352-2662
Fax: (905) 352-3242

Chippewas of RAMA
First Nation

A Proud Progressive First Nation Community

5884 Rama Road, Suite 200
Rama, Ontario L3V 6H6
T 705.325.3611 F 705.325.0879

OFFICE OF THE CHIEF

March 22, 2013

Region of Peel
10 Peel Centre Drive
Suite A
Brampton, ON L6T 4B9

Attention: Neal Smith, C.E.T., Project Manager

Re: Notice of Study Commencement, Class Environmental Assessment for Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard, City of Brampton, Town of Caledon and Town of Halton Hills

Dear Mr. Smith:

As a member of the Williams Treaties First Nations, Rama First Nation acknowledges receipt of your letter of March 13, 2013, which was received on March 18, 2013.

A copy of your letter has been forwarded to Karry Sandy-McKenzie, Barrister & Solicitor, Coordinator for Williams Treaties First Nations for further review and response directly to you. Please direct all future correspondence and inquires, with a copy to Rama First Nation, to Ms. Sandy-McKenzie at 8 Creswick Court, Barrie, ON L4M 2J7 or her email address at k.a.sandy-mckenzie@rogers.com. Her telephone number is (705) 792-5087.

We appreciate your taking the time to share this important information with us.

Sincerely,

Sharon Stinson Henry

Chief Sharon Stinson Henry

c: Council, Rama First Nation
Jeff Hewitt, General Counsel
Karry Sandy-McKenzie, Coordinator for Williams Treaties First Nations
Chief Roland Monague, Portfolio Chief for Williams Treaties First Nations

GEORGINA ISLAND

CHIPPEWAS OF GEORGINA ISLAND
R.R#2 P.O. BOX N-13 SUTTON WEST
ONTARIO L0E 1R0

Phone: (705) 437-1337
Fax: (705) 437-4597

December 12, 2013

Re: Notice of PIC, Class Environmental Assessment for Mayfield Road, from Chinguacousy Road to Winston Churchill Boulevard City of Brampton, Town of Caledon and Town of Halton Hills

To whom it may Concern;

This letter is to thank you and to acknowledge the information sent. We wish to be kept informed regarding the project and would like to remain on the study contact list. If any other First Nation has any concerns we stand behind them fully.

Sincerely,

Sheri Taylor

Sheri Taylor
Community Consultation Worker
Chippewas of Georgina Island First Nation
sheri.taylor@georginaisland.com

Brock, Liz

From: Brock, Liz
Sent: September 25, 2015 11:54 AM
To: 'sheri.taylor@georginaisland.com'
Subject: FW: Notice of Public Information No. 2 - Environmental Assessment for Mayfield Rd from Chinguacousy Rd to Winston Churchill Boulevard
Attachments: Notice of PIC #2_Mayfield Rd EA updatedKC.pdf

Hi Sheri,

This is to inform you of the second PIC to be held October 8th at the Peel Regional Police Association Banquet Hall. Details are given in the attached notice.

Sincerely,

Liz Brock
Technical Analyst, Infrastructure Programming & Studies
Transportation
Public Works
905-791-7800 x7902
liz.brock@peelregion.ca

Peace in oneself, peace in the world....Thich Nhat Hanh

D

TRAFFIC STUDY

Class Environmental Assessment Study for Mayfield Road From Chinguacousy Road to Winston Churchill Boulevard

Transportation and Traffic Study Report

FINAL

March, 2016

Hatch Mott MacDonald
5035 South Service Road
Burlington, ON L7L 6M9
T 905.315.3500

Revision and Version Tracking

Report Title: Mayfield Road Municipal Class Environmental Assessment (EA) – Chinguacousy Road to Winston Churchill Boulevard – Transportation and Traffic Report

Submission Date: March, 2016

Version #	Filename and Description	Author	Checker	Approver	Date
V080	Mayfield Transportation DRAFT REPORT v080.docx	J. Perez, R. Rifaat	G. Chartier, M. Parkhill, M. MacDonald	G. Chartier	February 2014
V090	Mayfield Transportation DRAFT FINAL REPORT v090.docx	J. Perez	G. Chartier, M. Parkhill, M. MacDonald	G. Chartier	May 2014
V100	Mayfield Transportation FINAL DRAFT REPORT v100 - Text TRACK CHANGES	J. Perez	G. Chartier, M. Parkhill, M. MacDonald	G. Chartier	June 2014
V110	Mayfield Transportation FINAL DRAFT REPORT v110 – With Heritage Heights	J. Perez	J. Hemingway M. Parkhill,	J. Hemingway	November 2014
V120	Mayfield Transportation FINAL DRAFT REPORT v120 – With Heritage Heights	B.Hashemloo	J. Hemingway	M. Alexander	February 2015
V130	Mayfield Transportation FINAL DRAFT REPORT v130 – With Heritage Heights	B.Hashemloo	J. Hemingway	M. Alexander	April 2015
V140	Mayfield Road Transportation and Traffic Study Report v140 August 10, 2015.docx	B.Hashemloo	J. Hemingway	M. Alexander	August, 2015
V150	Mayfield Road Transportation and Traffic Study Report v150 Sept 2015.docx	B.Hashemloo	J. Hemingway	M. Alexander	January 21, 2015
V160	Mayfield Road Transportation and Traffic Study Report v160 Sept 2015.docs	B.Hashemloo	J. Hemingway	M. Alexander	March, 2016

This document has been formatted for double side printing.

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Appendices

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Executive Summary

Study Overview

The Region of Peel has initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) in accordance with the Municipal Engineers Association's Municipal Class EA process for the widening of Mayfield Road (Regional Road 14) from Chinguacousy Road to Winston Churchill Boulevard (Regional Road 19). This study will examine alternatives for widening and intersection improvements along Mayfield Road to address short and long term transportation needs related to planned growth to the year 2031. Opportunities to better facilitate the movement of vehicles, transit, goods movement, walking and cycling within the Study Area illustrated in **Figure ES-1** are also being examined.

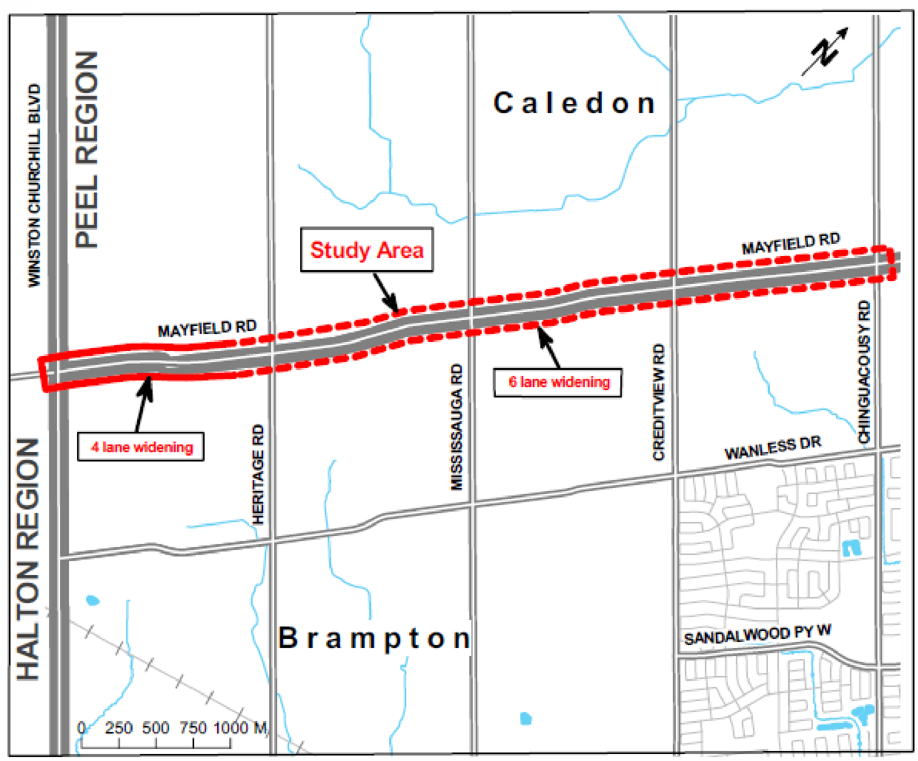


Figure ES-1 – Study Area for Mayfield Road Class EA – Chinguacousy Road to Winston Churchill Boulevard

Mayfield Road forms the boundary between City of Brampton and Town of Caledon within the Region of Peel. The Study Area abuts the Region of Halton and Town of Halton Hills. The length of Mayfield Road within the Study Area is approximately 5.6 km.

Planning Context

Numerous studies, projects and initiatives previously completed or currently underway by the Region and other public agencies provide the planning context for the Mayfield Road Class EA. In particular, the 2012 Peel Region Long Range Transportation Plan (LRTP) establishes the need and justification for the widening of Mayfield Road through the Study Area and served as the foundation for the Problem and Opportunity Statement for this Class EA study. Other notable documents include:

- Provincial Growth Plan for the Greater Golden Horseshoe (Places to Grow);
- Metrolinx Regional Transportation Plan (The Big Move);
- GTA West Corridor Planning and Environmental Assessment Study;
- Halton-Peel Boundary Area Transportation Study (HPBATS);
- Official Plans and Transportation Plans for the Region of Peel, Region of Halton, City of Brampton, Town of Caledon and Town of Halton Hills;
- Region of Peel Road Characterization Study, Strategic Goods Movement Network Study and Active Transportation Plan; and
- Other on-going Class EA studies in the vicinity of the Study Area.

Existing Transportation Conditions

The existing transportation system serving the Study Area includes Mayfield Road in the east-west direction and five arterial roads in the north-south orientation – Chinguacousy Road, Creditview Road, Mississauga Road, Heritage Road and Winston Churchill Boulevard. The intersections of Mayfield Road with Chinguacousy Road, Mississauga Road and Winston Churchill Boulevard are signalized. The Creditview Road and Heritage Road intersections with Mayfield Road are both two-way stop controlled with right-of-way given to Mayfield Road. There is currently no transit service provided or Active Transportation facilities located within the Study Area.

According to Region of Peel traffic counts, existing two-way traffic volumes along Mayfield Road within the Study Area range from 700 to 1,100 vehicles per hour in the AM and PM peak hours. Midday peak hour traffic is significantly lighter than AM and PM peak hour volumes along the corridor and has not been analyzed. The traffic operations analysis shows that under existing conditions, all signalized and unsignalized intersections along Mayfield Road have good operational characteristics with low delays, reserve capacity and only two critical movements. The corridor is also performing relatively well from a safety perspective with a low, or low to moderate potential for collision reduction.

Future Transportation Conditions

The subject section of Mayfield Road is located in an area where a number of road improvements by different agencies (Region of Peel, City of Brampton and Region of Halton) are included in capital programs or are anticipated to be completed by the 2021 and/or 2031 horizon years. Although the GTA West Corridor Planning and EA Study is still in progress and implementation timing is uncertain, a sensitivity analysis was performed comparing the 2031volumes in the study area with and without the GTA West corridor to capture the volume variation and its effect on the performance of Mayfield Road within the study area.

The traffic operations analysis of future conditions indicates the need to widen Mayfield Road to 4 lanes from Chinguacousy Road to Winston Churchill Boulevard by 2021. Traffic volume projections to year 2031 with new developments west of Mississauga Road (Heritage Heights and Mount Pleasant West) and the GTA West Transportation Corridor indicate the need to widen Mayfield Road to 6 lanes from Chinguacousy Road to the future location of GTA West freeway west of Mississauga Road. Post 2031, a further widening of Mayfield Road to 6 through lanes from the GTA West corridor interchange to Winston Churchill Boulevard may be required.

Two-lane roundabouts at Heritage Road and Winston Churchill Boulevard, as well as at a future arterial road connection between these two roads will operate at acceptable levels of service under projected 2021 AM peak hour traffic volumes (the critical period for analysis purposes). However, under projected 2031 AM peak hour traffic conditions, roundabouts require additional improvements to be able to accommodate 2031 projected volumes. At a minimum, design of right-turn by-pass lanes need to be incorporated for the west to south and south to east corners at Heritage Road and Winston Churchill Boulevard.

It is recommended that after 2021 horizon year, the operation of the roundabouts to be monitored until more is known on the location and design of the GTA West corridor and interchange with Mayfield Road. Then final decision can be made as to whether to expand the roundabouts to three circulating lanes, or to convert them to conventional signalized intersections.

1 Introduction

1.1 Overview

The Region of Peel has initiated a Schedule 'C' Municipal Class Environmental Assessment (EA) in accordance with the Municipal Engineers Association's Municipal Class EA process for the widening of Mayfield Road (Regional Road 14) from Chinguacousy Road to Winston Churchill Boulevard (Regional Road 19). This study will examine alternatives for widening and intersection improvements along Mayfield Road to address short and long term transportation needs related to planned growth to the year 2031. Opportunities to better facilitate the movement of vehicles, transit, goods movement, walking and cycling within the Study Area illustrated in **Figure 1** will also be reviewed.

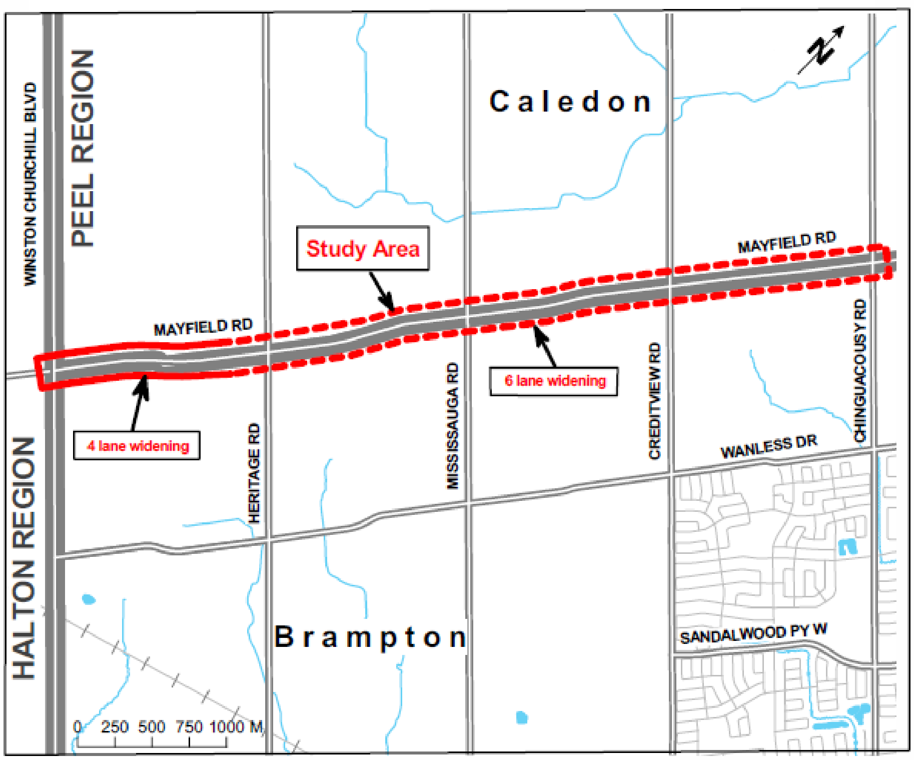


Figure 1 – Study Area for Mayfield Road Class EA – Chinguacousy Road to Winston Churchill Boulevard

This report documents the transportation need and justification for the widening of Mayfield Road as part of the Municipal Class EA process, and specifically:

- Examines the Region of Peel Long Range Transportation Plan (LRTP) recommendation to widen Mayfield Road and the timing for the improvements;

- Develops a vision for the corridor that supports the creation of a multi-modal network through consideration of the needs for Active Transportation (AT), transit, goods movement and other vehicles;
- Examines the implications of development plans on this section of Mayfield Road; and
- Establishes storage lane requirements for major (arterial to arterial) intersections within the Study Area.

1.2 Relationship to Region of Peel Long Range Transportation Plan

The LRTP provides a policy implementation framework for the Peel Regional Official Plan to address transportation challenges to the year 2031. The plan contains information on the state of the Region's transportation system, future trends and ways of addressing those trends identified through technical analysis and demand forecasting. The LRTP also serves as a Master Plan pursuant to *Approach 1* of the Municipal Class EA master planning process, recommending an implementation strategy to meet future transportation needs, including roadway expansion requirements. Approach 1 involves preparation of the Master Plan document at the conclusion of Phases 1 and 2 of the Municipal Class EA process. Since the LRTP was undertaken at a broad level of assessment, more detailed review is needed at the project-specific level through this study to fulfil the Municipal Class EA documentation requirements.

The work completed in preparing the LRTP has satisfied the first two phases of the Municipal Class EA process for the proposed Mayfield Road widening. This study will evaluate the findings of the LRTP and examine the timing for the Mayfield Road project, relying on the LRTP as the context and basis for the need and justification statement (Phase 1) and assessment of alternative solutions (Phase 2). More detailed investigations and focussed public involvement activities to be completed through this study will fulfil the remaining consultation and documentation requirements for Phases 3 and 4 of the Municipal Class EA process.

The widening of Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard to 4 and 6 lanes is identified in the LRTP. The widening is needed to address projected capacity deficiencies in northwest Brampton/southwest Caledon resulting from planned growth. The improvement will also benefit goods movement and provide opportunities to enhance the AT network.

The LRTP provides the need and justification for the widening of Mayfield Road through the Study Area. This Transportation and Traffic Study intends to confirm the required road expansion and the timing for future improvements.

1.3 Traffic Operations Analysis Approach and Methodology

Sections 3.4 and **4.3** of this report detail the traffic operations analysis conducted for the four midblock sections as well as sections east of Chinguacousy Road and west of Winston Churchill Boulevard, including five major intersections along Mayfield Road within the Study Area. This analysis was completed for both existing (2013) and future (2021 and 2031) conditions during the weekday morning (AM) and afternoon (PM) peak hours to characterize operating conditions and identify locations requiring attention. The methodologies applied for the midblock and intersection traffic operations analyses are described as follows:

1.3.1 Midblock Analysis

For midblock sections, the quality of service was characterized based on the **volume to capacity (v/c) ratio** for the link. The v/c ratio provides a measure of traffic volume demand to available capacity, with an at-capacity condition represented by a **v/c ratio of 1.00** (i.e., volume demand equals theoretical capacity). A **v/c ratio of 0.90 or less** was deemed acceptable operation for midblock locations, as the *Region of Peel Level of Service Policy* considers road segments with v/c ratios exceeding this threshold to be candidates for widening.

The midblock v/c ratios were calculated by dividing the traffic link volume (existing or forecasted) by the theoretical capacity for the subject link (i.e., the maximum hourly rate at which vehicles can be expected reasonably to traverse the section of roadway within a given time period, under prevailing roadway, traffic and control conditions). A theoretical capacity value of **900 vehicles per hour per lane** was used in the analysis. This capacity is intended to account for the type and number of local roads and accesses provided, the presence of pedestrians and crossing locations, driving characteristics for this type of facility and other factors. The value of 900 vehicles per hour per lane is the capacity specified for Mayfield Road in the Peel Transportation Demand Model.

1.3.2 Intersection Analysis

Intersection **Level of Service (LOS)** was assigned based on average delay per vehicle and includes deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS is a qualitative measure that describes the operating conditions within an intersection, and the perception of those conditions by road users. There are six levels of service defined. Each level has a letter identification from A to F with LOS A representing the best operating conditions and LOS F the worst. **Table 1** summarizes the LOS criteria for signalized, two-way STOP-controlled and roundabout intersections according to the 2000 and 2010 Highway Capacity Manual (HCM 2000 and HCM 2010).

The operational analysis for the signalized and two-way STOP-controlled intersections was conducted using Synchro/SimTraffic software, Version 8.0, which implements the methods contained in HCM 2000 and HCM 2010. The Synchro network was developed specifically for this study and further refined through the analysis. The *Peel Region Guidelines for Using Synchro Version 7.73 Rev 8, December 2010* were followed in conducting the traffic analysis.

Table 1 – Intersection Level of Service Criteria for Automobile Mode

Level of Service	Average Control Delay per Vehicle (s/veh)	
	Signalized Intersections[1]	Two-Way STOP-Controlled Intersections[2] and Roundabouts[3]
A	≤10	≤10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

Source: 1. Highway Capacity Manual, 4th Edition (HCM 2000), Transportation Research Board, Chapter 16: Signalized Intersections, Exhibit 16-2
2. HCM 2000, Chapter 17: Unsignalized Intersections, Exhibit 17-2
3. HCM 2010, Chapter 21: Roundabouts, Exhibit 21-1

The operational analysis for the proposed roundabouts was conducted using ARCADY[1] (Junctions 8) software produced by the Transport Research Laboratory of the UK. This software models traffic capacity, queue lengths, delays (both queuing and geometric), and collision risk at roundabouts. The HCM 2010 Roundabout Capacity Model has been included in ARCADY 8 to provide output in LOS format.

The quality of traffic operations at the signalized and two-way STOP-controlled intersections was also assessed based on the v/c ratio. For this study, v/c ratios were calculated at each intersection for individual movements and the entire intersection, with a **v/c ratio of 0.90 or less** considered acceptable operation. According to the Peel Region's Capacity Analysis Policy, exclusive movements with v/c ration exceeding 1 have to be identified. Also, v/c ratios for overall intersection operations, through movements or shared through/turning movements equal to 0.9 or above have to be reported.

1.4 Report Organization

The **Mayfield Road Class EA Transportation and Traffic Report** is organized as follows:

- Chapter 2 provides the **Planning Context** for improvements to Mayfield Road, summarizing the findings of studies, projects and initiatives that impact the proposed undertaking;
- Chapter 3 presents the analysis of **Existing Transportation Conditions** for the 2013 base year;

1 ARCADY is an acronym for Assessment of Roundabout Capacity and Delay

- Chapter 4 summarizes the analysis of **Future Transportation Conditions** for the 2021 and 2031 horizon years;
- Chapter 5 provides the **Recommendations** of this report.

2 Planning Context

The following studies, projects and initiatives provide a planning context for the Mayfield Road Class EA:

2.1 Provincial and Inter-Regional

2.1.1 Provincial Growth Plan for the Greater Golden Horseshoe – "Places to Grow"

The Growth Plan for the Greater Golden Horseshoe – Places to Grow was adopted in June 2006 under the provisions of the *Places to Grow Act*, *2005*. The plan provides the framework for implementing the Provincial government's vision for building stronger, prosperous communities by better managing growth to the year 2041 in the burgeoning Greater Toronto and Hamilton Area (GTHA).

The Growth Plan contains specific policies and directives regarding transportation, infrastructure, land use planning, urban form, natural heritage and resource protection to be considered by municipalities in their planning activities. Of particular interest, the Growth Plan provides direction around where growth can occur, the form of future development, and future population and employment forecasts. The recently updated plan forecasts the population of the Region of Peel to grow to 1.77 million by 2031, 1.87 million by 2036, and 1.97 million by 2041, for an annual average growth rate of 1.1 per cent. For employment, *Places to Grow* forecasts the number of jobs in the Region to reach 880,000 by 2031, 920,000 by 2036, and 970,000 by 2041, for an annual average growth rate of 1.0 per cent.

The plan also offers guidance regarding transportation system development, envisioning an "integrated transportation network that will allow people choices for easy travel both within and between urban centers." While travel by automobile will remain a significant means of transport, other travel mode choices, including efficient, convenient and affordable public transit, and walking and cycling, will become more important elements of the urban transportation system.

2.1.2 Metrolinx "The Big Move" – Regional Transportation Plan for the GTHA

Pursuant to the *Metrolinx Act, 2006*, the Province created Metrolinx to develop, fund, coordinate and promote transportation within the GTHA municipalities. Metrolinx has developed a Regional Transportation Plan (RTP) for the GTHA, entitled "The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area", based on a seamless, integrated transportation network, focussing on public transit. The plan outlines a 25-year vision for sustainable transportation in the GTHA, as well as policies, programs and infrastructure investments required to achieve the vision.

The Big Move is primarily focused on enhancing and expanding public transit. In the vicinity of the Study Area, the RTP identifies a few rapid transit initiatives of relevance, including the expansion of Regional Rail on the

Kitchener GO line to full-day, two-way service and the provision of Light Rail Transit (LRT)/Bus Rapid Transit (BRT) on Hurontario Street to the Mayfield West community. The plan also includes policies related to goods movement, AT and transit to be considered in developing and improving infrastructure.

2.1.3 GTA West Corridor Planning and Environmental Assessment Study

The Ministry of Transportation (MTO) is conducting the GTA West Corridor Planning and Environmental Assessment Study to identify the preferred solution for providing better linkages between Urban Growth Centres in the west part of the GTHA, including Downtown Guelph, Downtown Milton, Brampton City Centre and Vaughan Corporate Centre.

The GTA West Transportation Development Strategy (TDS) released in November 2012 recommends a broad range of measures to address future transportation needs in the northwest part of the GTHA, including building a new transportation (freeway) corridor from Highway 400 westerly to Highway 401 east of the Niagara Escarpment. The corridor is proposed to include 6 lanes along the north-south section near the Region of Peel and Region of Halton municipal boundary (once known as the Halton/Peel Freeway) and 4 lanes for the east-west segment north of Mayfield Road. Interchanges with the corridor are anticipated at major arterial roads including Mayfield Road. The Preliminary Route Planning Study Area for the new corridor, which will be identified through Stage 2 of the MTO EA process, is shown in **Figure 2**. It is noted that the TDS assumed the future widening of this section of Mayfield Road as part of the overall transportation network solution.

2.1.4 Halton-Peel Boundary Area Transportation Study

The Halton-Peel Boundary Area Transportation Study (HPBATS) was initiated in response to commitments made by the Region of Halton for the approval of Halton Regional Official Plan Amendment (ROPA) 25. HPBATS was conducted jointly by Region of Peel, Region of Halton, the City of Brampton, the Town of Caledon and the Town of Halton Hills to identify a long-term (2021-2031) transportation network to serve future demands in the municipal boundary area. Growth projections from the Growth Plan served as the basis for the demand forecasts.

The HPBATS transportation strategy endorsed by Town, City and Regional Councils in May 2012 includes a range of measures designed to promote changes in travel behaviour in addition to essential infrastructure improvements. The strategy features enhancements to the transit, AT and road networks, and the introduction of Transportation Demand Management (TDM) initiatives.

Figure 3 illustrates the recommended transportation network for the Halton/Peel boundary area from HPBATS. It is recognized that many of the recommendations of HPBATS are now captured in the GTA West TDS.

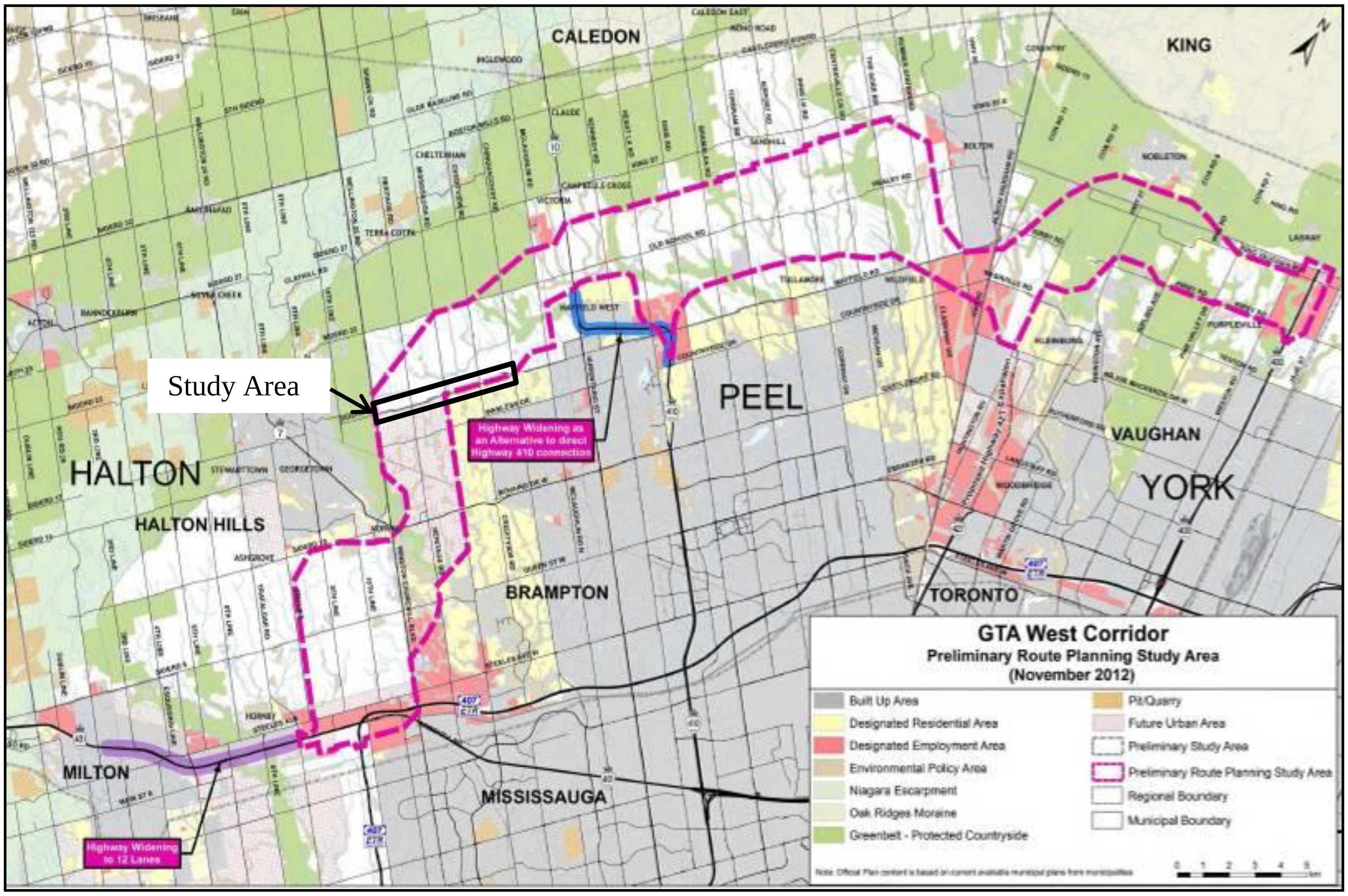


Figure 2 – GTA West Corridor – Preliminary Route Planning Study Area
(Source: GTA West Corridor Planning and EA Study – Transportation Development Strategy Report, November 2012)

The figure illustrates the following improvements in the vicinity of the Mayfield Road EA Study Area:

- New Halton/Peel Freeway at 8 lanes from Highway 401/407 ETR interchanges west of Ninth Line in Halton Region to Bovaird Drive or Mayfield Road, and potential new north-south connection between Halton/Peel Freeway and GTA West Corridor (north of Mayfield Road)[2];
- Widening of Mayfield Road between Chinguacousy Road and Winston Churchill Boulevard to 4 lanes;
- Widening of Mississauga Road between Mayfield Road and Bovaird Drive West (Highway 7) to 4 lanes;
- Park and Ride lot in the vicinity of the Mayfield Road and Winston Churchill Boulevard intersection.

[2] The Halton/Peel Freeway and the north-south connection are now part of the GTA West Transportation Corridor pursuant to the GTA West EA Study TDS released in November 2012.

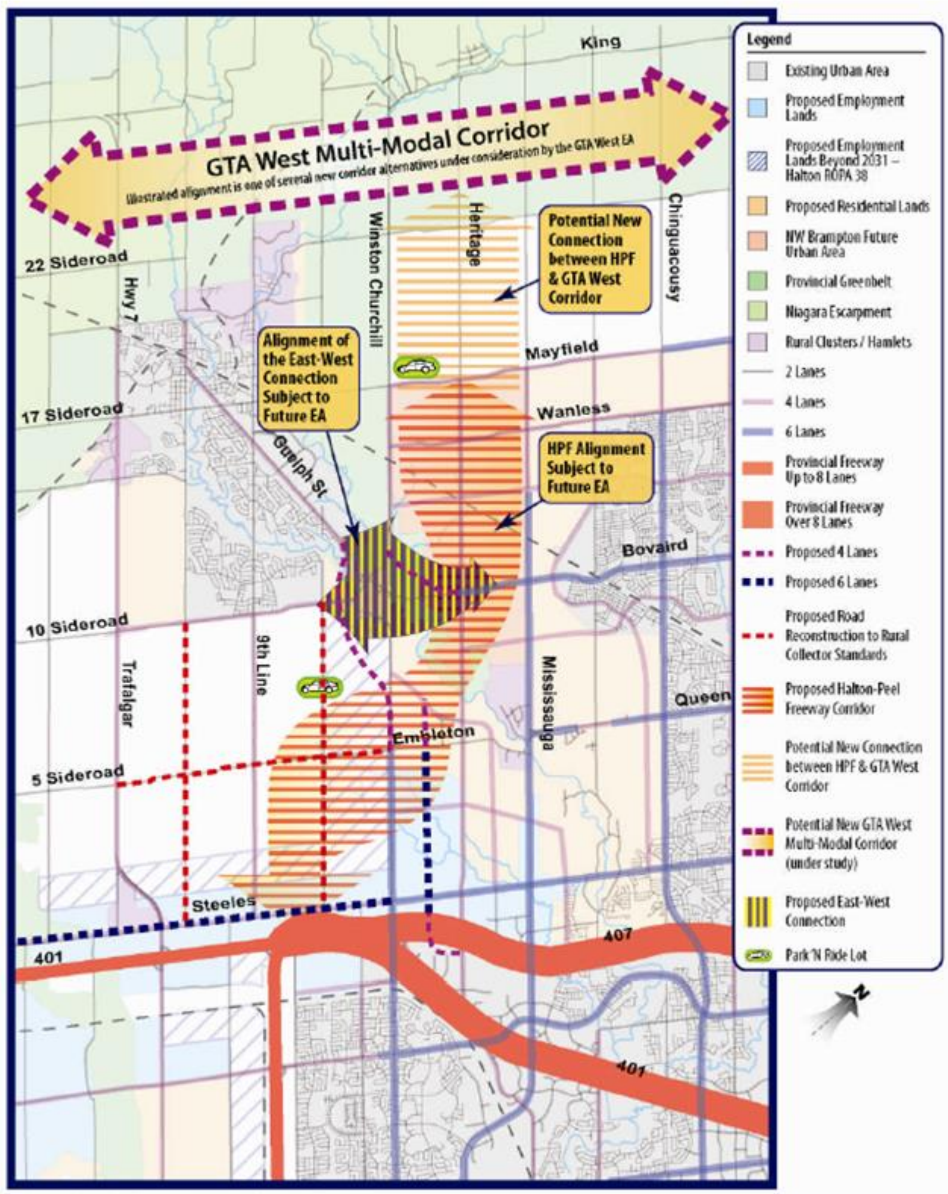


Figure 3 – HPBATS Recommended Road Network, 2031
(Source: Halton-Peel Boundary Area Transportation Study, May 2010)

2.2 Region of Peel

2.2.1 Region of Peel Official Plan and Recent Amendments

The Region of Peel Official Plan (PROP) guides Regional Council in managing growth and development through interpretation of the intent of Provincial legislation and policies, and providing a long term strategic policy framework. The PROP includes a transportation network and related polices to serve planned growth, including TDM policies and programs to foster travel options and reduce traffic congestion in the Region.

ROPA 26, adopted by Regional Council on April 5, 2012, refines policy direction for transportation services and other policies. Relevant schedules and components of ROPA 26 include:

- *Schedule E – Major Road Network:* Added the conceptual GTA West corridor as per the Phase 1 draft TDS (2011), and updated the west Brampton area road network as per HPBATS;
- *Schedule F – Regional Road Right-of-Way Requirements:* Increased the right-of-way from 36m to 38m on Winston Churchill Boulevard from Embleton to the future north-south corridor;
- *Schedule G – Major Transit Network/Rapid Transit Corridors:* Identified corridors for higher-order transit facilities;
- *Policy 5.9.4 – Major Road Network*: Increased intersection right-of-way requirements for turning lanes, subject to confirmation through a traffic impact study and/or functional design; and
- *Policy 5.9.10 – Active Transportation:* Modified AT policies to strengthen and align them with the Region of Peel Active Transportation Plan.

2.2.2 Region of Peel Long Range Transportation Plan

The LRTP provides strategies, policies and plans for roads, transit and TDM to respond to the Region's transportation challenges over the next 20 years. These challenges can be categorized as:

- *Population Growth* – With one of the highest growth rates of all GTHA municipalities, the Region's transportation network needs to be robust and multi-modal to support future demand;
- *Congestion* – The anticipated growth in travel demand and concomitant greenhouse gas emissions present an opportunity to promote the use of transit, AT and other TDM measures;
- *Economic Competitiveness* – The plan focuses on innovative solutions to facilitate the movement of goods; and
- *Sustainability* – The plan recognizes the need to transition from the current culture of auto-dependency and auto-oriented development in the Region of Peel to a pattern of sustainable transit-oriented development served by a multi-modal, balanced and integrated transportation system. The LRTP also calls for a change to the approach in which roads are planned, designed, built and operated. More emphasis is to be placed on modes of travel other than the Single Occupant Vehicle (SOV) in the future.

To address these challenges, the 2012 LRTP Update recommends the broad application of TDM strategies aimed at reducing reliance on SOV travel and sets a goal of 14 per cent reduction in congestion by year 2031 (when compared with the no TDM measures scenario). Strategies outlined in the Region's TDM Plan to reach this target include AT facilities, Smart Commute programs, employer individualized marketing, a high school pilot program, Safe-Active Routes to School initiatives, among others. The LRTP also recommends that public transit be the first priority in transportation infrastructure planning and major investments. Although the plan does not identify higher-order transit improvements for Mayfield Road, some form of transit service will likely be operating in the corridor by 2031 given the scale of planned development in northwest Brampton.

Even with these measures in place, road/highway expansion will be necessary to meet future transportation demands. The LRTP specifies a broad list of Regional Road network improvements, including the following road widenings within the Study Area:

- Widening of Mayfield Road between Chinguacousy Road and Mississauga Road to 4 lanes (2019);
- Widening of Mayfield Road between Mississauga Road and Winston Churchill Boulevard to 4 lanes (2021);
- Widening of Mississauga Road between Mayfield Road and Bovaird Drive West (Highway 7) to 4 lanes (2017);
- Widening of Mississauga Road between Sandalwood Parkway and Bovaird Drive West (Highway 7) to 6 lanes (2028); and
- Widening of Mayfield Road between Chinguacousy Road and a section approximately 1.5 km west of Mississauga Road to 6 lanes (2031).

As noted in Section 1.2, the LRTP provides the need and justification for the widening of Mayfield Road within the Study Area. Section 4 presents an assessment of the Alternative Solutions to address identified transportation problems and the requirements for widening of Mayfield Road.

2.2.3 Region of Peel Road Characterization Study

The Road Characterization Study (RCS) completed in May 2013 provides guidance on how to better reflect the local context and accommodate a broader range of transportation modes and users in the planning and design of Regional Roads. The main objectives of the study were to:

- Improve integration between transportation and land use;
- Support the Region’s multi-modal transportation system; and
- Protect and maximize the current/future functionality and efficiency of the Region’s arterial roads.

The RCS provides a series of illustrative roadway cross sections to be employed when considering changes to a Regional Road right-of-way. The cross sections reflect different road typologies developed through a context-sensitive solutions approach that responds to current and envisioned future land uses. Recognizing the diverse land use contexts within the Region, the RCS includes a Road Character Matrix that correlates land use character with associated right-of-way considerations. Using this matrix, the RCS classifies Mayfield Road as an Industrial Connector that supports both commuter and heavy vehicle/commercial traffic. The illustrative roadway cross section for an Industrial Connector is shown in **Figure 4**.

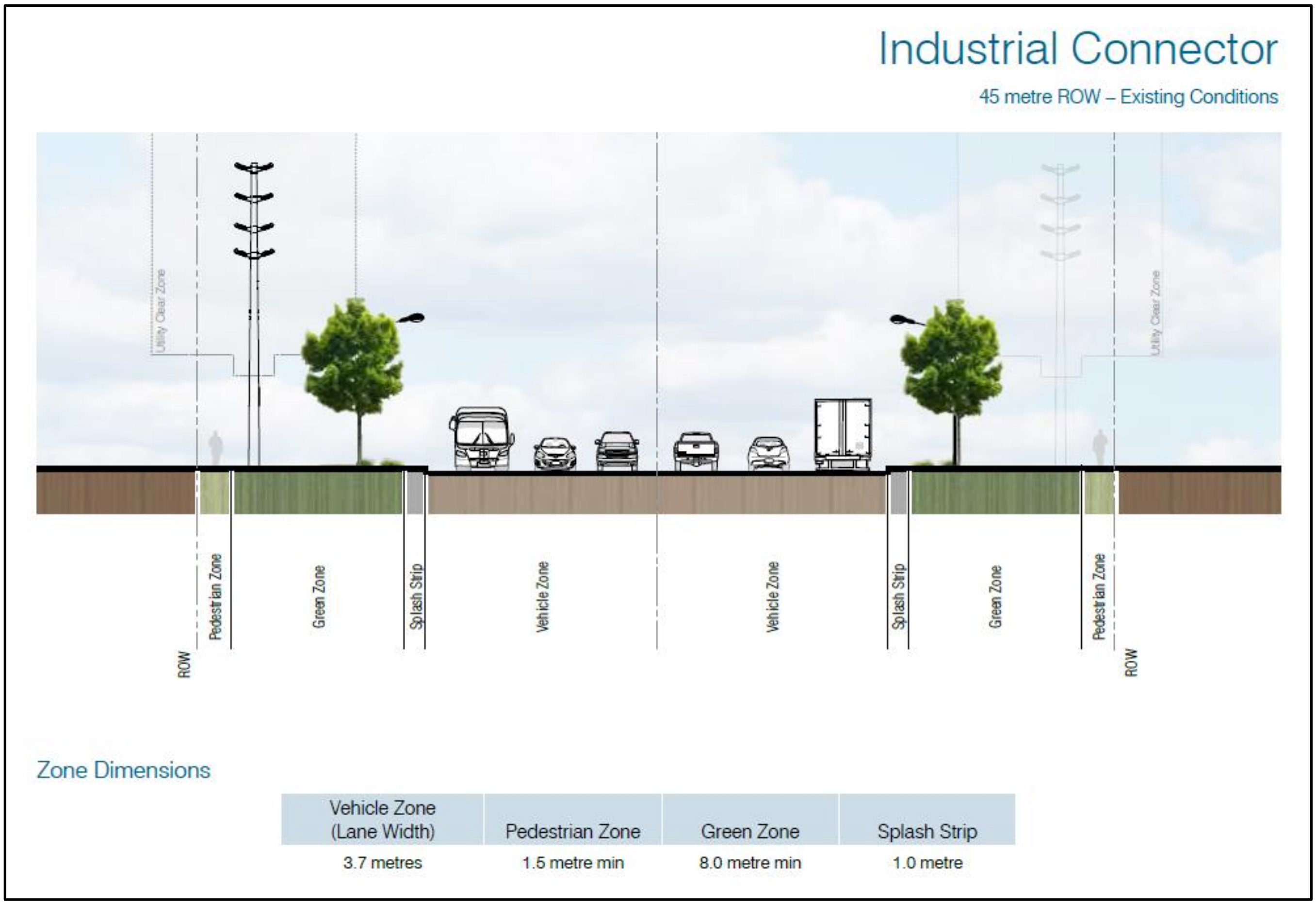


Figure 4 – Illustrative Roadway Cross Section for Industrial Connector
(Source: Region of Peel Road Characterization Study, Section 2: Illustrative Cross Sections, May 2013)

2.2.4 Region of Peel Strategic Goods Movement Network Study

The Strategic Goods Movement Network (SGMN) Study completed in May 2013 developed a systematic, hierarchical truck route network throughout the Region of Peel based on existing truck route networks and volumes, land uses and planning policies, overall network connectivity, trucks origins/destinations, best practices, as well as stakeholder outreach. The study recommends implementing the SGMN through a phased, logical approach that balances the needs of goods movement with local community requirements. This phased strategy includes strengthening the Official Plan to further support goods movement, prioritizing operational management/capital improvements to support the SGMN, implementing the supportive improvements, and assessing SGMN impacts with ongoing improvements as needed.

The study identifies Mayfield Road and Mississauga Road as primary truck routes connecting goods manufacturers with destinations and highways. In the future, it is expected that the GTA West Transportation Corridor will carry some of the goods movement travel demand currently using these two roads.

2.2.5 Region of Peel Active Transportation Plan

The Active Transportation Plan (ATP) completed in November 2011 articulates a vision for AT within the Region of Peel aimed at creating a place where walking, cycling, and rolling are safe, convenient, appealing and accessible for all citizens, especially children, youth, older adults, persons with disabilities and other priority populations. The Plan sets outs policies that direct the practices of the Region to support more walking and cycling, recommends active transportation infrastructure improvements, to expand the existing pedestrian and cycling networks, and recommends programs to shift travel behaviour. The approach in developing the active transportation network is based on active transportation facilities should be accommodated within all regional road corridors to provide access to adjacent land uses and destinations, and connect or integrate with existing and planned transit services.

Within the Study Area, the ATP identifies:

- Multi-use trails along one side of Mayfield Road, and Mississauga Road, south of Mayfield Road;
- Sidewalks along one side of Mayfield Road and Mississauga Road south of Mayfield Road; and
- Paved shoulders along Winston Churchill Boulevard from Embleton Road north in the short term, and Multi-use trail from Embleton Road to Mayfield Road in the ultimate conditions (this will be coordinated with Halton Region and Halton Hills).
- Paved shoulders along Mississauga Road south of Mayfield Road
- New design strategies where feasible by providing multi-use trails on both sides on Mayfield Road in the ultimate conditions

The ATP does not identify which side of the road the multi-use trails and sidewalks will be located. As part of the implementation phase, feasibility and design studies will be conducted for each corridor to determine the type of facility, location and costs. The ATP proposes multi-use trails on both sides of Mayfield Road in the ultimate build-out.

In addition, the Mount Pleasant Blocks 51-1 and 51-2 development plans contemplate the provision of two north-south trails. One trail is proposed midway between Chinguacousy Road and Creditview Road, and the other between Creditview Road and Mississauga Road. These trails will connect with the proposed multi-use trail on the south side of Mayfield Road to provide linkages across the corridor.

The Region works closely with area municipalities and neighbouring municipalities to plan and implement active transportation facilities on Regional roads to create a comprehensive and integrated active transportation network.

2.2.6 Region of Peel Municipal Class EA Studies

The following Class EA studies being conducted or recently completed by the Region of Peel may impact the Mayfield Road Class EA:

Mayfield Road from Heart Lake Road to Chinguacousy Road

The Region is undertaking a Municipal Class EA for improvements to the adjacent section of Mayfield Road from Chinguacousy Road easterly to Heart Lake Road. The preferred alternative solution identified through that study is to improve Mayfield Road by widening to 4 lanes by 2021 and 6 lanes by 2031. The improvement strategy also includes dedicated turning lanes and improved traffic signal plans/operations at major intersections, and the implementation of Transportation Supply Management (TSM) and TDM measures.

Traffic volumes and operations for the intersection of Chinguacousy Road and Mayfield Road, common to both EA studies, were reviewed and found to be comparable. Design features and parameters will be applied consistently between both sections.

Mississauga Road from Bovaird Drive to Mayfield Road

The Region has completed a Municipal Class EA to evaluate the need and feasibility of widening and improvements on Mississauga Road between Bovaird Drive and Mayfield Road. The study recommends:

- The widening of Mississauga Road from 2 to 6 lanes from Bovaird Drive to Sandalwood Parkway and from 2 to 4 lanes from Sandalwood Parkway to Mayfield Road;
- A rail overpass and a 42 m clear span bridge over Huttonville Creek; and
- Intersection improvements, transit facilities, sidewalk and multi-use trail.

Construction of the first section from Bovaird Drive to Sandalwood Parkway is scheduled in the Region’s Capital Plan to be carried out in 2014 and 2015, and will include the railway grade separation. The sections from Sandalwood Parkway to Wanless Drive and from Wanless Drive to Mayfield Road are planned to be reconstructed between 2014 and 2015 and between 2016 and 2017, respectively.

The Mississauga Road EA assumed a 4 per cent growth rate to estimate future traffic demand in horizon years 2018 and 2031. This factor is higher than the growth rate assumed in this report for Mississauga Road. Applied growth rates are discussed in **Section 4.2**.

2.3 City of Brampton and Town of Caledon

2.3.1 City of Brampton Official Plan (2006) and Recent Amendments

The City of Brampton's Official Plan (BOP) guides land use decisions in the City by providing goals, objectives, and policies based on the principles of sustainable development. The BOP defines the Northwest Brampton Urban Development Area as a mixed-use, transit oriented community centred on the Mount Pleasant GO Station/multi-modal transit mode. The OP stipulates that this new community should be planned as a compact and complete community with higher densities in accordance with the *Places to Grow* plan.

The BOP supports the development of a North-South Higher Order Transportation Corridor in West Brampton and recognizes the need for protection from development. This corridor is proposed to cross the Credit River and connect North West Brampton with the Bram West Secondary Plan and Highway 407.

2.3.2 City of Brampton Transportation and Transit Master Plan

The 2009 Sustainable Update of the Transportation and Transit Master Plan (TTMP) places stronger emphasis on transit and AT modes to achieve a more sustainable transportation system for the City. The 2009 TTMP builds on this vision, taking into consideration provincial and Metrolinx planning initiatives, recent growth trends, and the City's update of its Development Charge By-law.

The TTMP identifies several City of Brampton road network improvements for horizon years 2011, 2016, 2021 and 2031, including the following projects in the vicinity of the Study Area:

- Widening of Chinguacousy Road, Creditview Road and Mississauga Road to 4 lanes south of Mayfield Road (2021);
- Construction of the north-south Spine Road extension to Mayfield Road at 4 lanes (2021); and
- Widening of Heritage Road to 4 lanes south of Mayfield Road (2031).

The plan also identifies the widening of Region of Peel facilities in this area, including:

- Mayfield Road east of Chinguacousy Road to 4 lanes (2021);
- Winston Churchill Boulevard south of Mayfield Road to 4 lanes (2021);
- Mayfield Road east of Chinguacousy Road to 6 lanes (2031); and
- Mississauga Road to 6 lanes from Sandalwood Parkway to Mayfield Road (2031).

The Spine Road in the Mount Pleasant Secondary Plan Area and strategic midblock collector roads for both Mount Pleasant Blocks 51-1 and 51-2 are denoted in the plan. The Spine Road is intended to function as a transit-supportive, midblock community collector road.

At the moment, the TTMP is being updated by the City of Brampton in order to satisfy the provincial transportation plan requirements and to accommodate additional growth.

2.3.3 Mount Pleasant Secondary Plan Area Transportation Master Plan Study (City of Brampton)

The Mount Pleasant Secondary Plan Area (SPA 51) consists of approximately 870 hectares of land within an area bounded by Mayfield Road to the north, Mississauga Road to the west, Wanless Drive and Bovaird Drive to the south, and McLaughlin Road, Creditview Road and James Potter Road to the east. The Secondary Plan approved by City of Brampton Council on February 10, 2010 supports the application of alternative design standards to achieve a balance between the social and economic community needs while protecting the environment. The plan features mixed-use nodes and a variety of housing types and densities to encourage transit use.

The Mount Pleasant Secondary Plan Area Transportation Master Plan provides a comprehensive strategy for roads, transit, trails, bikeways and TDM to create a pedestrian and transit-oriented community, with transportation facilities integrated with the Mount Pleasant GO Rail Station. The plan satisfied Phases 1 and 2 of the Municipal Class EA requirements by establishing need and justification for the proposed arterial and collector roads, and recommends a preferred transportation solution, which features:

- Improvements to the Creditview Road alignment;
- A multi-modal Spine Road, which will run through Blocks 51-1 and 51-2 (north-south and east-west) and connect with a grid of collector roads linked to the local roadway network; and
- A trail system and bike lanes that will provide safe and effective access to the rail station and encourage transit use.

2.3.4 Mount Pleasant Blocks 51-1 and 51-2 Collector Road Environmental Assessment and Transportation Studies (City of Brampton)

Detailed transportation studies were prepared for Mount Pleasant Blocks 51-1 and 51-2 to recommend a preferred collector and local road network for the planning area, provide road cross sections, and outline intersection design, location and lane arrangements for roads within each Block and the boundary arterial roads. The aforementioned Spine Road will be a main component of the road networks for both blocks.

The study for Block 51-1 provides conceptual design recommendations for the Creditview Road and Mayfield Road intersection geometry. The design contemplates two lanes in each direction with dedicated left and right turn lanes.

The study for Block51-2 had not been finalized at the time of preparing this report, but the data and analysis from the draft report were used in the analysis presented in **Section 4**.

2.3.5 Heritage Heights Transportation Master Plan Study (City of Brampton)

The City has initiated a Secondary Plan for the Heritage Heights community, which includes Secondary Plan Areas 52 (Huttonville North) and 53 (Mount Pleasant West). Area 52 is delimited by the CN Rail tracks to the north, Winston Churchill Boulevard to the west, Credit River to the south and Mississauga Road to the east. Area 53 is defined by Mayfield Road to the north, Winston Churchill Boulevard to the west, CN Rail tracks to the south and Mississauga Road to the east.

The Heritage Heights Secondary Plan Area is being planned to accommodate a population of 43,000 inhabitants and 20,000 jobs by 2031. The secondary plan is being developed in accordance with the timeline and policies defined by Region of Peel ROPA 15 and City of Brampton OPA 96-245.

Several studies are underway to support the secondary planning, including the preparation of a Transportation Master Plan (TMP) in accordance with Phases 1 and 2 of the Municipal Class EA process. Based on the Transportation Master Plan (TMP) information presented at the third Public Information Center held on June 4, 2014 (PIC #3), different road network options have been identified and evaluated to serve the area transportation needs, including arterials, collectors, transit and AT modes in order to develop Heritage Heights as a complete community. Two potential north-south roads connecting with Mayfield Road were identified on the Preliminary Preferred Network plan presented for the section between Winston Churchill Boulevard and Heritage Road; one road would be the westerly extension of Sandalwood Parkway all the way northerly to Mayfield Road and functioning as a Major Arterial (4-lane section); the other road would be a minor collector (4-lane section). In addition, the proposed Sandalwood Parkway extension would feature a Class 1 Off-Road Pathway for Active Transportation. No further north-south collector roads were denoted for the section between Heritage Road and Mississauga Road and connecting with Mayfield Road; however the Preliminary Preferred Network assumes an interchange with GTA West approximately halfway between Heritage Road and Mississauga Road.

Through the TMP study, the City has also been examining potential corridors for the future Halton/Peel Freeway within Brampton. Three corridors for crossing the Credit River Valley, which is the key factor in determining the alignment, have been identified and assessed. The evaluation presented at PIC #3 recommended a crossing corridor between Heritage Road and 750m east of Winston Churchill Boulevard as the preferred alternative. The Preliminary Preferred Network Plan illustrates this alignment, with interchanges at Mayfield Road and proposed Sandalwood Parkway extension.

In terms of transit opportunities, the study recognizes the development of Mount Pleasant GO Station as a mobility hub anchoring Northwest Brampton and the potential of Mayfield Road and Sandalwood Parkway as future Bus Service Corridors.

The Heritage Heights TMP was still in progress at the time of preparing this report. The City of Brampton and the consultant conducting the study were contacted to obtain data and analysis for application in the Mayfield Road Class EA, and some information was made available to HMM, however a final report documenting trip assignments and especially the link flows along the proposed Sandalwood Parkway extension were still unavailable at the time of preparing this report.

2.3.6 City of Brampton Municipal Class EA Studies

The following Municipal Class EA studies being conducted or recently completed by the City of Brampton may impact the Mayfield Road Class EA:

Creditview Road from Mayfield Road to North of Bovaird Drive

Status: Filed in November 2010. This study addresses the widening of Creditview Road from Mayfield Road to a section just north of Fairhill Avenue (approximately 1,500 m north of Bovaird Drive). The study addresses Phases 3 and 4 of the Municipal Class EA process and builds up on the previously completed Phases 1 and 2 conducted under the 2009 Transportation Master Plan Study for the Mount Pleasant Secondary Plan Area. According to the City of Brampton 2011-2020 Roads Capital Program, construction is expected to be carried out from 2013 to 2014.

Heritage Road from Steeles Avenue to Riverview Heights

Status: Estimated completion in Spring 2014. The study is assessing the need for improvements to Heritage Road from Steeles Avenue to the future Riverview Heights Road, approximately 460 m north of Embleton Road. To best address operational deficiencies and the need for additional north-south capacity in the area, the City is considering a combination of improvements featuring:

- Transit Treatments – Improvements at specific locations to improve the effectiveness of transit service;
- TDM – Carpool areas, shuttle buses, flexible work hours, and other facilities to support Bus Rapid Transit at Steeles Avenue;
- Intersection Improvements – Auxiliary lanes, property access relocation, signalization, and/or roundabouts at intersections; and
- Road Widening – Widening of Heritage Road from 2 to 4 through lanes.

McLaughlin Road from Wanless Road to Mayfield Road

Status: Estimated completion in Spring 2014. This study is assessing the need for improvements to McLaughlin Road from Wanless Drive to Mayfield Road. To best address operational deficiencies and the need for additional north-south transportation capacity in the area, the City is considering a combination of improvements featuring:

- Intersection Improvements;

- TDM and Transit Service Improvements; and
- Widening of McLaughlin Road to four through lanes from Mayfield Road to Wanless Drive.

Chinguacousy Road from Wanless Drive to Mayfield Road

Status: Estimated completion in Spring 2014. This study is evaluating the potential widening of Chinguacousy Road from 2 to 4 lanes from Wanless Drive to Mayfield Road. The City of Brampton 2009 TTMP Sustainable Update and the Mount Pleasant Secondary Plan Area Transportation Master Plan study identified this widening in order to address capacity issues. The City of Brampton Capital Plan has scheduled this expansion project for 2018-2019.

2.3.7 Caledon Transportation Needs Study Update (CATSU) (Town of Caledon)

The CATS Update report dated March 2009 identified existing and future travel demands within Caledon and the transportation improvements required to accommodate projected needs. The study presents forecasts of future travel demand for horizon years 2011, 2021 and 2031 developed using the Region of Peel EMME/2 Travel Demand Forecasting Model (the Peel Model) for the weekday AM peak hour. Based on the forecasts, the Mayfield Road screenline will experience an average 1.9 per cent annual growth rate from 2011 to 2021 and an average 2.4 per cent annual growth rate from 2021 to 2031. The study concluded that the existing transportation system is not capable of accommodating this level of growth and will require significant changes and improvements to maintain acceptable operating conditions to the year 2031.

Through traffic has been identified as a significant concern in Caledon. According to 2006 Transportation Tomorrow Survey data, 45% of the peak period automobile travel on Caledon’s roads are long distance trips that pass through the municipality without having a local origin or destination. This traffic spills over to arterial and collector roads within the Town. Automobile travel is the predominant mode of transportation for Caledon commuters. The study proposes implementation of TDM measures to reduce peak hour traffic and support the development of improved inter-regional public transit services, including the development of local transit service along Mayfield Road West in the longer term.

2.3.8 Mayfield West Phase 2 Secondary Plan (Town of Caledon)

The MW2 Secondary Plan was initiated by Caledon in 2008 to determine the appropriate location and form for population & employment growth allocated to Mayfield West by Council. This Plan establishes development parameters and criteria for development of the land located adjacent to Highway 410 on its northeast quadrant with Highway 10. Council endorsed a Framework Plan in 2013 for initiation of this project as it is intended to send a strong signal in regards to future urban planning policy. The framework sets as main objective the development of healthy communities by encouraging alternative transportation modes such as pedestrians, active transportation, and by supporting public transit. Three elements need to be strongly interconnected in order to achieve that objective: density, walkability and transit. MW2 will be implemented through an amendment to Caledon's Official Paln.

Regarding cycling facilities, the Secondary Plan proposes a preliminary trail and cycling network intended to combine several path types, such as green system trails, multi-use trails and on-street bike lanes, into a complete network that connects at a community and regional scale. More specifically, the plan proposes dedicated bicycle lanes along the Spine Road and on the north section of Chinguacousy Road and multi-use paths along Mayfield Road.

Regarding transit service, the plan proposes implementation of a transit hub with additional transit service as development proceeds. An off-site transit hub will be provided adjacent and in close proximity to major commercial and employment areas for local service and interconnections. Local transit routes are expected to be provided along local roads and no rapid transit service is anticipated along major Regional roads. However, there will be a need to coordinate work between the Town of Caledon, the City of Brampton and the Region of Peel.

2.4 Region of Halton and Town of Halton Hills

2.4.1 Halton Region Transportation Master Plan

The Halton Region Transportation Master Plan (HRTMP) update approved by Council in 2012 provides a sustainable, integrated transportation plan and associated strategies considering all modes of travel to the year 2031. The plan identifies required network improvements that include widened Regional Roads to 6 lanes (where required) and new regional links and network features to accommodate cycling, walking and transit. Key to the RTMP is the assumption that 15 to 20 per cent of peak period trips will be accommodated by local and provincial (GO) transit services by the year 2031.

To help achieve these transit mode split targets, the HRTMP recommends significant enhancements to transit services, a strong commitment to transit-supportive developments and policies, and implementation of the Metrolinx RTP. The plan shows a conceptual Transit Strategy that includes implementation of Bus Rapid Transit service along Trafalgar Road in Oakville and protection for other higher-order transit corridors.

The HRTMP recommendations include the following road improvements in the vicinity of the Study Area:

- Widening of 10 Side Road/Regional Road 10 to 4 lanes from Trafalgar Road to Winston Churchill Boulevard (2031);
- Widening of Ninth Line to 4 lanes from Steeles Avenue to 10 Side Road (2016); and
- Widening of Winston Churchill Boulevard to 4 lanes from 2km south of 5 Side Road to potential bypass near 10 Side Road (2019).

In addition to the identified network improvements, the HRTMP provides direction regarding TDM, AT and public transit.

2.4.2 Town of Halton Hills Transportation Master Plan

The Halton Hills Transportation Master Plan (HHTMP) provides direction for transportation infrastructure decisions in the Town of Halton Hills to the year 2031by providing policies, objectives and goals based on sustainable development principles. The plan integrates municipal transportation planning with environmental assessment objectives and land use planning, ultimately providing for a transportation system that is sustainable, integrated and encourages a healthy and active lifestyle.

The HHTMP recommends a range of longer term road improvements relevant to the Study Area, including:

- Modification/improvement of 10 Side Road from Local Road to Major Arterial with addition of paved shoulders from Regional Road 25 to Trafalgar Road (2022);
- Modification of 15 Side Road from Arterial/Minor Arterial to Rural Collector with addition of paved shoulders from Nassagaweya-Esquesing Town Line to Trafalgar Road (2023); and
- Widening of 10 Side Road to 4 lanes from Trafalgar Road to realigned Winston Churchill Boulevard (Norval Bypass) (2031).

2.4.3 Town of Halton Hills Cycling Master Plan

The Halton Hills Cycling Master Plan (HHCMP) establishes a vision for cycling in Halton Hills to guide the implementation of a town-wide cycling system. The network includes a primary system of routes that will serve as the “backbone” of the cycling network, directly linking urban areas of Halton Hills and connecting to key destinations in surrounding municipalities. A secondary system of routes will feed into the overall network from local neighbourhoods.

The HHCMP features a range of cycling facilities to accommodate users of all ages and skill levels. The plan envisions on-road cycling routes connecting to Mayfield Road in the longer-term.

3 Existing Transportation Conditions

3.1 Road Network

The major roadways within the Study Area include:

- **Mayfield Road (Regional Road 14)** is a two-lane Regional Major Arterial Road running northeast-southwest within the Study Area. For the purposes of this report, it will be referred to as an east-west roadway. Mayfield Road forms the boundary between the City of Brampton and the Town of Caledon within the Region of Peel. The roadway has a rural cross section with a speed limit of 80 km/h, except for a 500 m section adjacent to the existing Alloa Public School, where it currently has a speed limit of 60 km/h. The length of Mayfield Road within the Study Area is approximately 5.6 km. West of Mayfield Road at Winston Churchill Boulevard the roadway becomes 17 Side Road. Seventeen Side Road is a two-lane Minor Arterial road under the jurisdiction of the Town of Halton Hills.
- **Chinguacousy Road** is a two-lane City of Brampton Minor Arterial and Town of Caledon Collector Road running northwest-southeast perpendicular to Mayfield Road. This report will refer to Chinguacousy Road and all other roads perpendicular to Mayfield Road as running north-south. It has a rural cross section with a posted speed limit of 80 km/h north and 70 km/h south of Mayfield Road.
- **Creditview Road** is a two-lane City of Brampton Minor Arterial and Town of Caledon Collector Road running north-south perpendicular to Mayfield Road. It has a rural cross section with a posted speed limit of 80 km/h north and 70 km/h south of Mayfield Road.
- **Mississauga Road (Regional Road 1)** is a two-lane Regional Major Arterial Road running north-south perpendicular to Mayfield Road. It has a rural cross section with a posted speed limit of 80 km/h.
- **Heritage Road** is a two-lane City of Brampton Minor Arterial and Town of Caledon Collector Road running north-south perpendicular to Mayfield Road. It has a rural cross section with a posted speed limit of 80 km/h north and 70 km/h south of Mayfield Road.
- **Winston Churchill Boulevard (Regional Road 19)** is a two-lane Regional Major Arterial Road running north-south perpendicular to Mayfield Road. Winston Churchill Boulevard forms a shared jurisdictional boundary between the Region of Peel and Halton Region. The road has a rural cross section with a posted speed limit of 80 km/h.

The intersections of Mayfield Road with Chinguacousy Road, Mississauga Road and Winston Churchill Boulevard are signalized. The Creditview Road and Heritage Road intersections with Mayfield Road are both two-way stop controlled with right-of-way given to Mayfield Road. **Figure 5** illustrates the existing lane configuration and traffic control at the five major intersections along the corridor.

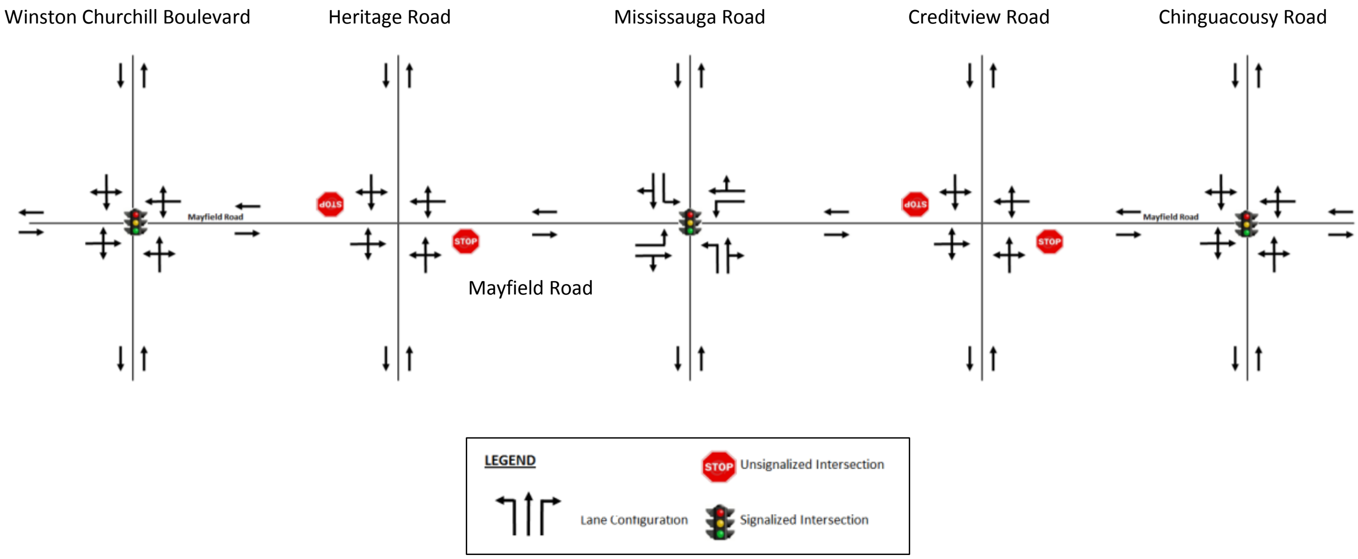


Figure 5 – Existing Lane Configuration and Traffic Control on Mayfield Road

The following summarizes the existing driveways along this section of Mayfield Road:

- **Chinguacousy Road to Creditview Road** – Eight driveways on the north side and three driveways on the south side.
- **Creditview Road to Mississauga Road** – Seven driveways serving residential properties on the south side opposite Alloa Public School. The school has three driveways on the north side of the road.
- **Mississauga Road to Heritage Road** – Three driveways on the north side and three driveways on the south side.
- **Heritage Road to Winston Churchill Boulevard** – Four driveways on the north side and three driveways on the south side.

There are heavy truck restrictions along Winston Churchill Boulevard north of Mayfield Road. Partial heavy truck restrictions by load, season and/or time of day are in effect along Chinguacousy Road, Creditview Road, and Heritage Road south of Mayfield Road. Trucks are not allowed to use those three roads north of Mayfield Road, within the Town of Caledon.

3.2 Transit and Active Transportation Network

There is currently no transit service provided along Mayfield Road within the Study Area. The closest Brampton Transit routes service Wanless Drive to the south and Mayfield Road east of McLaughlin Road.

GO Transit operates one bus route in proximity to the Study Area. The 37 – Orangeville GO Bus runs along Hurontario Street from Orangeville south through Caledon and Brampton to the Downtown Brampton Terminal. The bus stops on Hurontario Street at Mayfield Road. Six trips operate each way Monday through Friday. Most southbound trips operate in the morning and most northbound trips operate in the afternoon. No service is provided on weekends.

Pedestrian and cycling activities are uncommon within the Mayfield Road corridor, likely because the Study Area currently does not feature any AT facilities. The north-south Etobicoke Creek Trail within the City of Brampton is the closest route, located to the east between Hurontario Street and Kennedy Road.

In May 2010, Peel Region launched a program called *Walk and Roll Peel* in order to encourage residents to start cycling and walking more. The program will be a cycling and walking hub to provide information and support efforts to encourage greater active transportation. The study recommends that Peel Region support area municipalities in the monitoring and implementation of public bike systems and support for a high-level feasibility review within next five years.

The Active Transportation Plan suggests that active transportation should be accommodated within all regional road corridors to provide access to adjacent land uses and destinations. The pedestrian network in Caledon includes sidewalks on one or both sides of regional roads in more developed areas, hiking trails between towns, and the Caledon trail as the main east-west link. Sidewalks on one side of the road have been proposed along Mayfield Road, and Mississauga Road, south of Mayfield Road. In addition to sidewalks, multi-use trails have been planned or proposed on the north side Mayfield Road, as well as the east side Weston Churchill Blvd and Mississauga Road, south of Mayfield Road. To select which side of road is more appropriate for the facilities on the road network, future feasibility studies will be performed to consider safety and operation aspects of the road including frequent driveways and side street intersections.

The Regional cycling network in Caledon is less continuous in the present condition compared to the pedestrian network. Peel Region intends to complement the existing and future active transportation network by improving the facilities on regional roads to make walking and cycling a comfortable and viable option in Caledon. In addition to a proposed multi-use trail along Mayfield Road, Winston Churchill Blvd and Mississauga Road, south of Mayfield Road, paved shoulders will be provided for cyclists on Winston Churchill Blvd and only north section of Mississauga Road from Mayfield Road in the study area.

The Halton Hills Cycling Master Plan Study (2010) recommends the implementation of "On Road Cycling Routes" on Winston Churchill Boulevard from Steeles Avenue northerly to Halton-Erin Road (32 Side Road) and 17 Side Road, west of Winston Churchill Boulevard. The study recommends a "long-term" phasing for these routes.

3.3 Traffic Volumes

3.3.1 Count Information

Existing midblock and intersection traffic volumes on Mayfield Road within the Study Area were synthesized from traffic count data supplied by the Region of Peel. The Region supplied 2012 Annual Average Daily Traffic (AADT) volumes and 24-hour automatic traffic recorder (ATR) classification, speed and volume counts from surveys undertaken on March 19, 20 and 21, 2012 at various locations along Mayfield Road to provide an indication of midblock conditions. **Table 2** lists the turning movement counts provided by the Region at the five major intersections on Mayfield Road. The raw traffic count information can be found in **Appendix A**.

Table 2 – Turning Movement Counts at Mayfield Road Intersections

Intersection Location	Date of Count	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	February 12, 2013	7:45 – 8:45	5:00 – 6:00
Creditview Road and Mayfield Road	May 30, 2013	7:15 – 8:15	4:45 – 5:45
Mississauga Road and Mayfield Road	April 23, 2013	7:15 – 8:15	4:45 – 5:45
Heritage Road and Mayfield Road	May 30, 2013	7:15 – 8:15	4:15 – 5:15
Winston Churchill Boulevard and Mayfield Road	May 30, 2013	7:15 – 8:15	4:15 – 5:15

3.3.2 Midblock Traffic Volumes

Table 3 shows the midblock daily traffic volumes on Regional Roads in the Study Area from the AADT data supplied by the Region.

Table 4 summarizes the midblock truck percentages during the peak hours based on the ATR counts.

Table 3 – Midblock Daily Traffic Volumes on Study Area Roads

Location	Vehicles per Day		
	Eastbound/ Northbound	Westbound/ Southbound	Two-Way AADT
Mayfield Road – 0.7 km west of Chinguacousy Road	4,810	4,760	9,570
Mayfield Road – 0.6 km west of Creditview Road	4,470	4,400	8,870
Mayfield Road – 0.6 km east of Heritage Road	4,220	4,250	8,470
Mayfield Road – 0.8 km west of Heritage Road	3,980	3,890	7,870
Mississauga Road – 0.8 km south of Mayfield Road	2,310	2,330	4,640
Mississauga Road – 2.3 km north of Mayfield Road	1,920	2,130	4,050
Winston Churchill Boulevard – 0.6 km north of Mayfield Road	600	630	1,230

Table 4 – Midblock Truck Percentages on Mayfield Road

Location	Peak Hour Truck Percentage (%) – AM (PM)	
	Eastbound	Westbound
Mayfield Road – 0.6 km west of McLaughlin Road	4.3 (5.7)	5.3 (3.5)
Mayfield Road – 0.7 km west of Chinguacousy Road	5.3 (7.1)	6.2 (3.8)
Mayfield Road – 0.6 km west of Creditview Road	4.4 (5.8)	6.0 (3.7)
Mayfield Road – 0.6 km east of Heritage Road	3.0 (5.2)	5.0 (3.8)
Mayfield Road – 0.8 km west of Heritage Road	3.1 (5.7)	6.3 (3.0)

3.3.3 Intersection Traffic Volumes

Figure 6 and **Figure 7** depict existing weekday AM and PM peak hour turning movement volumes based on the counts supplied by the Region, after balancing volumes between intersections to rationalize the data. **Table 5** summarizes the peak hour truck percentages by direction for the five intersections. These truck percentages were used for the future traffic operations analyses as vehicle composition data for future scenarios was not available at the time of preparing this report. To account for the possibility that the percentage of trucks in the traffic stream increases above the level estimated from available historical counts, a sensitivity analysis has been performed that considers a 15% truck composition by horizon year 2031. The capacity and queue length with additional truck percentage has been evaluated and are presented in later sections of this report.

Table 5 – Intersection Truck Percentages on Mayfield Road

Location	Peak Hour Truck Percentage (%) – AM (PM)			
	NB	SB	EB	WB
Chinguacousy Road and Mayfield Road	3.9 (2.3)	4.9 (2.2)	3.8 (3.9)	9.1 (3.8)
Creditview Road and Mayfield Road	10.0 (3.4)	4.7 (0.0)	3.4 (5.6)	6.7 (4.7)
Mississauga Road and Mayfield Road	18.2 (6.2)	4.2 (5.7)	4.0 (3.2)	7.0 (2.8)
Heritage Road and Mayfield Road	8.1 (2.1)	4.5 (7.4)	3.3 (10.0)	5.6 (3.7)
Winston Churchill Boulevard and Mayfield Road	2.5 (6.1)	4.4 (5.9)	2.0 (7.4)	6.1 (2.9)

Figure 6 – 2013 Existing Conditions – AM Peak Hour Total Traffic Volumes

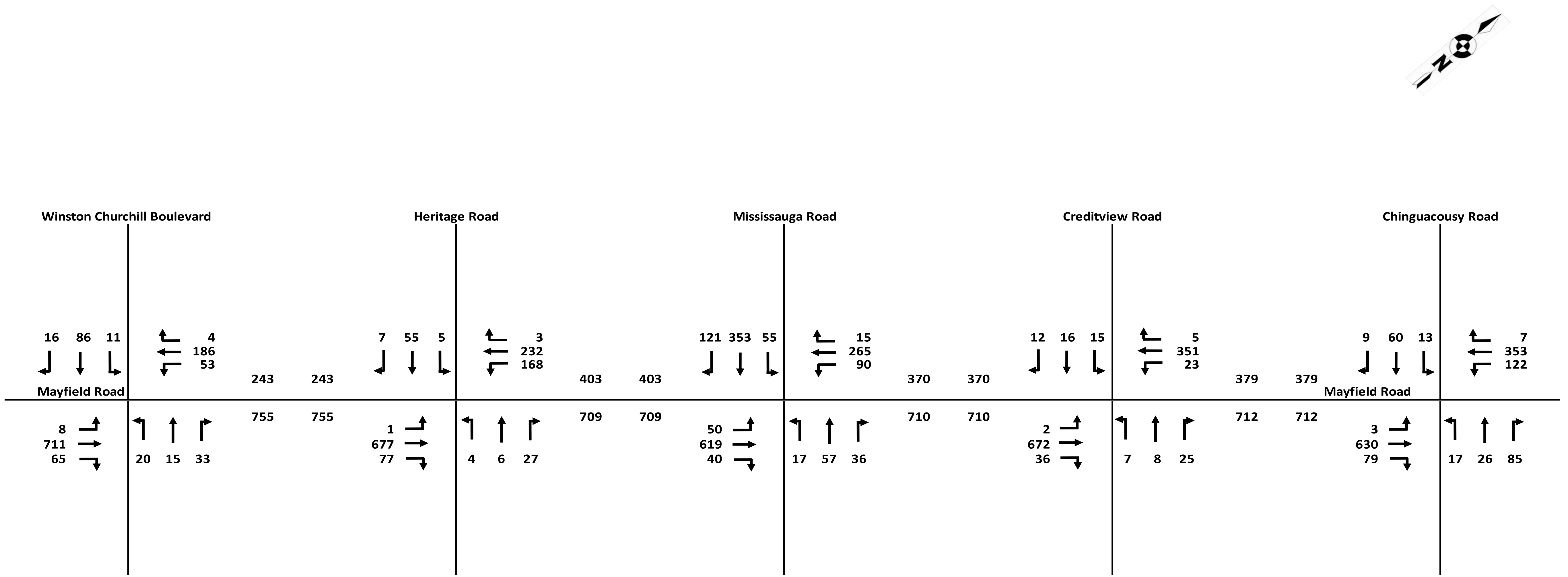


Figure 6 – 2013 Existing Conditions – AM Peak Hour Total Traffic Volumes

LEGEND

Hourly Turning Movement Volumes

Figure 7 – 2013 Existing Conditions – PM Peak Hour Total Traffic Volumes

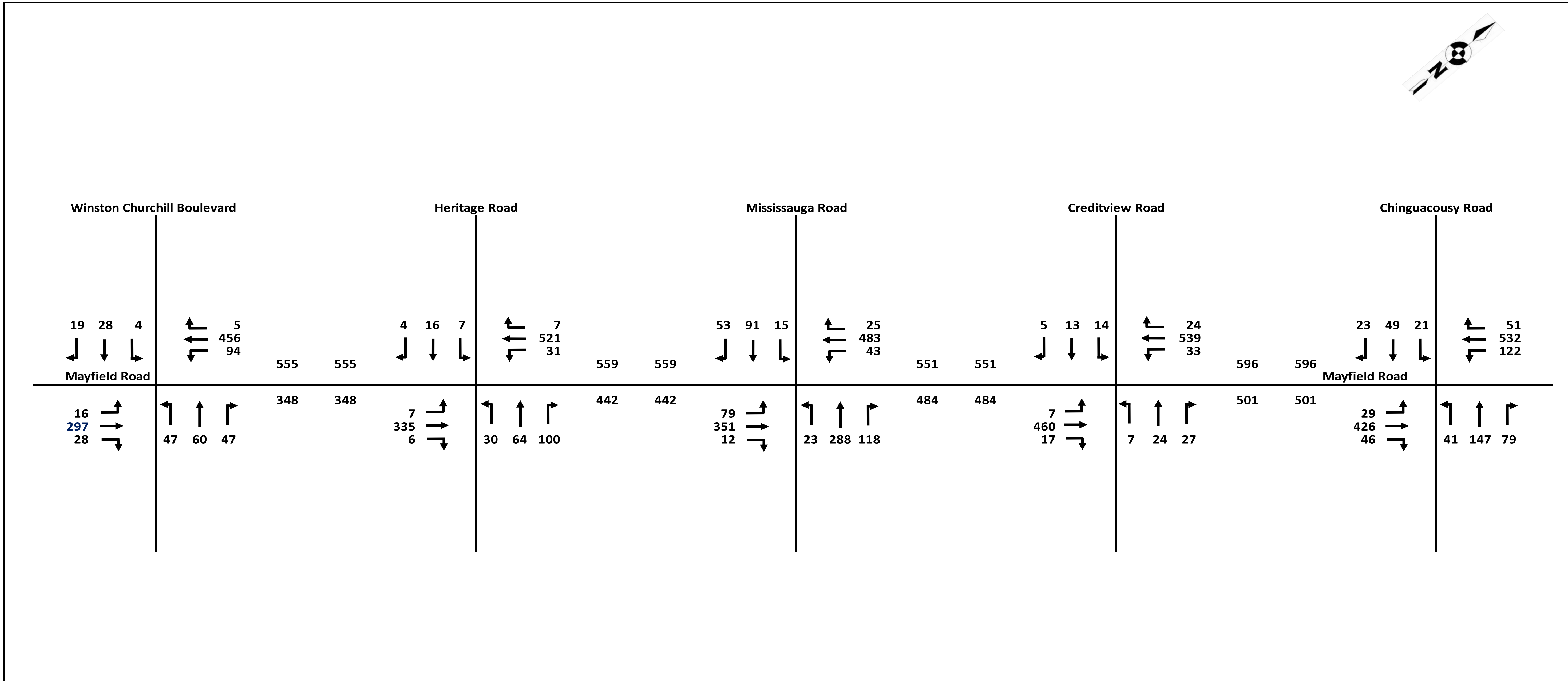


Figure 7 – 2013 Existing Conditions – PM Peak Hour Total Traffic Volumes

LEGEND

Hourly Turning Movement Volumes

3.4 Traffic Operations

3.4.1 2013 Existing Conditions – Midblock Analysis

Table 6 shows existing AM peak direction (eastbound) midblock volumes and v/c ratios along Mayfield Road based on the 2013 intersection traffic counts supplied by the Region of Peel.

Table 6 – Midblock Capacity Analysis for Mayfield Road for 2013 Existing Conditions

Section of Mayfield Road	Peak Direction Volume (vehicles per hour)	Peak Direction v/c Ratio (Capacity = 900 veh/lane)
Chinguacousy Road to Creditview Road	712	0.79
Creditview Road to Mississauga Road	710	0.79
Mississauga Road to Heritage Road	709	0.79
Heritage Road to Winston Churchill Boulevard	755	0.84
17 Side Road, west of Winston Churchill Boulevard	784	0.87

The maximum peak direction v/c ratio of 0.84 along Mayfield Road during the AM peak hour occurs between Heritage Road and Winston Churchill Boulevard. The v/c ratio for the section of 17 Side Road west of Winston Churchill Boulevard is estimated to be 0.87. These levels of capacity utilization suggest modest capacity remains available to accommodate immediate traffic growth. The v/c ratio along the remaining segments of Mayfield Road is slightly lower at 0.79 also suggesting residual capacity remains to accommodate some traffic growth.

3.4.2 2013 Existing Conditions – Intersection Analysis

Table 7 and **Table 8** summarize the findings of the signalized and unsignalized intersection analyses, respectively, for existing conditions from the detailed Synchro reports provided in **Appendix B**. The tables provide the v/c ratios for the critical movement (i.e., the highest v/c ratio) and the intersection overall (signalized only) for both the AM and PM peak hours. The LOS for the intersection and critical movement (unsignalized only) are also reported. Calculated v/c ratios in excess of 0.90 or locations with LOS F are highlighted **(bolded)**.

Table 7 – Level of Service at Signalized Intersections on Mayfield Road for 2013 Existing Conditions

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.63 – WBT	0.51	B
	PM Peak	**0.92 – WBT**	0.74	C
Mississauga Road and Mayfield Road	AM Peak	0.86 – EBT	0.74	C
	PM Peak	0.65 – WBT	0.59	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	0.75 – EBT	0.63	B

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
	PM Peak	0.70 – WBT	0.58	B

Table 8 – Level of Service at Unsignalized Intersections on Mayfield Road for 2013 Existing Conditions

Unsignalized Intersection	Time Period	Critical Movement v/c Ratio	Critical Movement LOS
Creditview Road and Mayfield Road	AM Peak	0.19 – SB	C
	PM Peak	0.21 – NB	D
Heritage Road and Mayfield Road	AM Peak	0.50 – SB	**F**
	PM Peak	0.53 – NB	D

Table 7 illustrates that all signalized intersections along Mayfield Road within the Study Area are currently operating at acceptable LOS during both AM and PM peak hours. Only one movement is experiencing a v/c ratio greater than 0.90 during the PM peak hour, which is the westbound movement at Chinguacousy Road and Mayfield Road, but its LOS is still acceptable (LOS D).

The unsignalized intersections analysis in **Table 8** indicates that most locations are operating at acceptable LOS, except for the southbound approach at Heritage Road and Mayfield Road during the AM peak hour (LOS F). However, the v/c ratio is acceptable and the number of vehicles experiencing delays greater than 1 min/veh is not very high (67 vehicles per hour).

The existing conditions operational analysis identified the following localized intersection improvement requirements:

- The introduction of exclusive eastbound and westbound left turn lanes at Chinguacousy Road and Mayfield Road would address the identified capacity deficiency. Implementing the turn lanes and optimizing signal cycle and phase timings would improve operation of the westbound through movement (v/c ratio would decrease from 0.92 to 0.69) and the overall intersection (v/c ratio would decrease from 0.74 to 0.59) during the PM peak hour;
- Installing traffic control signals at Heritage Road and Mayfield Road would alleviate delay for the southbound approach during the AM peak hour (currently LOS F), but signalization is not warranted under 2013 traffic conditions (See **Section 3.5**).

3.5 Traffic Control Signal Justification

The unsignalized intersections of Mayfield Road with Heritage Road and Creditview Road were analyzed to determine if traffic signal controls are justified under existing conditions (2013). Traffic signal warrant analysis is based on the methodologies contained in Book 12 (Traffic Signals) of the Ontario Traffic Manual (OTM). **Table 9** summarizes the criteria from OTM Book 12 used as a guideline for traffic signal control justifications.

Table 9 – Traffic Control Signal Justification Criteria per OTM Book 12

Justification 1 Minimum Vehicle Volumes	Justification 2 Delay to Cross Traffic	Justification 3 Collision Experience	Justification 4 Combination Volume/Delay/Collision
A. Total Volumes (Main Road)	A. Main Road	Average of 5 or more collisions per year over a 36- month period	Two justifications satisfied 80 percent or more
B. Crossing Volumes (Minor Road)	B. Crossing Road		

A traffic signal installation is warranted if Justification 1 (both 1A and 1B) or Justification 2 (both 2A and 2B) is 100 per cent satisfied. An average of five or more collisions of types preventable by traffic control signals occurring during each of the three preceding 12 month periods will also justify a signal installation at an unsignalized intersection. If 100 per cent satisfaction is not achieved on any of the Volume/Delay/Collision justifications, but two justifications are satisfied to at least 80 per cent, then traffic signalization may be justified.

According to OTM Book 12, each of the eight (8) highest hourly volumes in the warrant analysis must meet the compliance threshold values set out in the book to be fully justified at either 100 per cent for Justifications 1 and 2. For this analysis, the AM, midday and PM peak period traffic volumes contained in **Appendix A** were used. **Table 10** and **Table 11** summarize the traffic signal warrant analysis for the intersections of Mayfield Road with Creditview Road and Heritage Road, respectively, based on these volumes.

Table 10 – Signal Warrant Analysis for Creditview Road and Mayfield Road for 2013 Existing Conditions

Justification	Compliance		Signal Justified	
			YES	NO
1. Minimum Vehicular Volumes	A. Total Volumes	96%		NO
	B. Crossing Volumes	60%		
2. Delay to Cross Traffic	A. Main Road	92%		NO
	B. Crossing Road	77%		
3. Combination	A. Justification 1	60%		NO
	B. Justification 2	77%		
4. Collision Experience	3.5	< 5		NO

Table 11 – Signal Warrant Analysis for Heritage Road and Mayfield Road for 2013 Existing Conditions

Justification	Compliance		Signal Justified	
			YES	NO
1. Minimum Vehicular Volumes	A. Total Volumes	90%		NO
	B. Crossing Volumes	72%		
2. Delay to Cross Traffic	A. Main Road	87%		NO
	B. Crossing Road	80%		
3. Combination	A. Justification 1	72%		NO
	B. Justification 2	80%		
4.Collision Experience	1	<5		NO

The tables show that the traffic signal warrants are not met for either intersection for existing conditions. Although Justification 2 for Heritage Road and Mayfield Road is satisfied to 80 per cent for both cases, the lesser of Justification 1 is only 72 per cent and therefore does not meet the warrant for Justification 3. The traffic signal warrant analysis sheets are provided in **Appendix C**.

3.6 Road Safety

The analysis presented in this section is based on police collision reports for Mayfield Road supplied by the Region of Peel and Region of Halton for the five year period covering January 2006 to December 2010. The data from the collision reports were manually entered, including collision location, collision severity, initial impact type, road surface condition, light and environmental conditions, vehicle manoeuvre, driver action, direction of travel and sequence of events.

3.6.1 Collision Summary

The collision summary geographically identifies individual collisions including severity and impact type. A total of 62 collisions occurred along Mayfield Road within the Study Area over the 2006 to 2010 period. **Table 12** shows the distribution of these collisions by location (intersection or midblock section) and severity. **Table 13** shows the distribution by location and collision type. Signalized intersections are denoted with an asterisk (*).

The collision analysis that follows examines the crashes that occurred within the Study Area with regard to the different recorded parameters such as severity, impact type, weather condition, time of day, and lighting. The analysis is summarized for intersections, midblock sections and overall.

Table 12 – Intersection and Midblock Collisions on Mayfield Road by Location and Severity

Location Along Mayfield	Fatal Collision	Non-fatal Injury Collision	Property Damage (P.D.) only	Total Collisions	Percentage of Total Collisions
Intersections					
Chinguacousy Road *	0	2	6	8	13%
Creditview Road	0	1	3	4	6%
Mississauga Road *	0	5	5	10	16%
Heritage Road	1	9	4	14	23%
Winston Churchill Boulevard *	0	4	3	7	11%
Subtotal	**1**	**21**	**21**	**43**	**69%**
Midblock Sections					
Chinguacousy Road to Creditview Road	0	2	6	8	13%
Creditview Road to Mississauga Road	0	0	1	1	2%
Mississauga Road to Heritage Road	0	3	7	10	16%
Heritage Road to Winston Churchill Boulevard	0	0	0	0	0%
Subtotal	**0**	**5**	**14**	**19**	**31%**
GRAND TOTAL	**1**	**26**	**35**	**62**	**100%**

Table 13 – Intersection and Midblock Collisions on Mayfield Road by Location and Type

Location Along Mayfield	Right Angle	Approaching	Rear End	Sideswipe	SMV	Turning Movement	Other
Intersections							
Chinguacousy Road *	0	1	4	0	1	2	0

Location Along Mayfield	Right Angle	Approaching	Rear End	Sideswipe	SMV	Turning Movement	Other
Creditview Road	1	1	0	0	0	2	0
Mississauga Road *	2	1	3	1	2	0	1
Heritage Road	8	1	1	2	1	0	1
Winston Churchill Boulevard *	5	0	0	0	1	1	0
Subtotal	**16**	**4**	**8**	**3**	**5**	**5**	**2**
Midblock Sections							
Chinguacousy Road to Creditview Road	1	1	1	1	3	0	1
Creditview Road to Mississauga Road	0	0	0	1	0	0	0
Mississauga Road to Heritage Road	1	2	1	0	5	0	1
Heritage Road to Winston Churchill Boulevard	0	0	0	0	0	0	0
Subtotal	**2**	**3**	**2**	**2**	**8**	**0**	**2**
GRAND TOTAL	**18**	**7**	**10**	**5**	**13**	**5**	**4**

3.6.2 Intersection Collision Analysis

A total of 43 collisions (69 per cent of all collisions) occurred at the five major intersections on Mayfield Road over the 2006 to 2010 period. **Table 12** shows that 21 of these reported collisions (49 per cent) involved a non-fatal injury and 21 collisions (49 per cent) were property damage only. There was one fatal injury reported at Heritage Road and Mayfield Road. This fatal collision involved a truck and passenger car and was apparently the result of a passenger car driver’s failure to yield the right-of-way to a truck travelling along Mayfield Road.

Figure 8 shows that right angle (36 per cent) collisions were the most prevalent impact type, followed by rear end (18 per cent). None of the 43 intersection collisions involved pedestrians or cyclists, which is likely a reflection of the scarcity of active transportation users in the corridor.

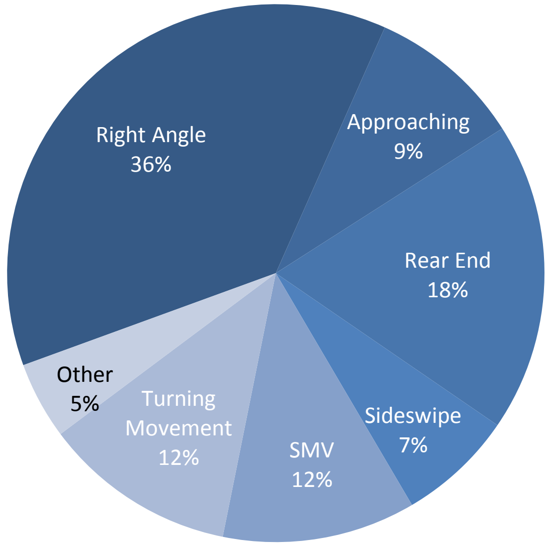


Figure 8 – Impact Type for Intersection Collisions on Mayfield Road

Figure 9 shows that almost two-thirds (63 per cent) of intersection collisions occurred in clear weather conditions. A further 18 per cent occurred in inclement weather (fog, snow and freezing rain) and 14 per cent took place during rainy conditions.

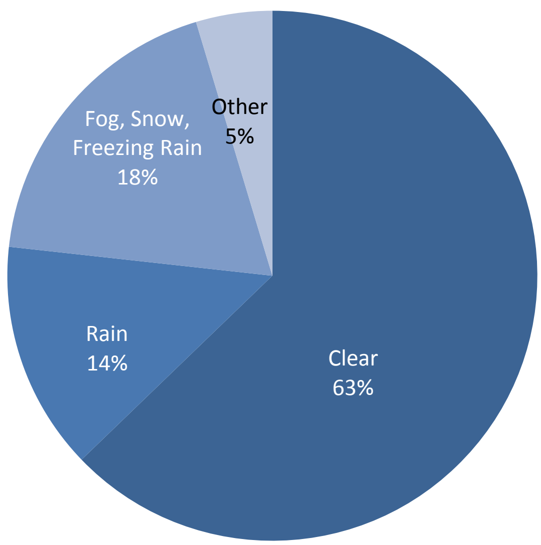


Figure 9 – Environmental Conditions for Intersection Collisions on Mayfield Road

Figure 10 indicates that just under half (46 per cent) of all intersection collisions occurred in the morning (06:00 to 11:59). Approximately one third (30 per cent) of the collisions occurred in the afternoon (12:00 to 17:59), and 14 per cent took place in the evening (18:00 to 23:59).

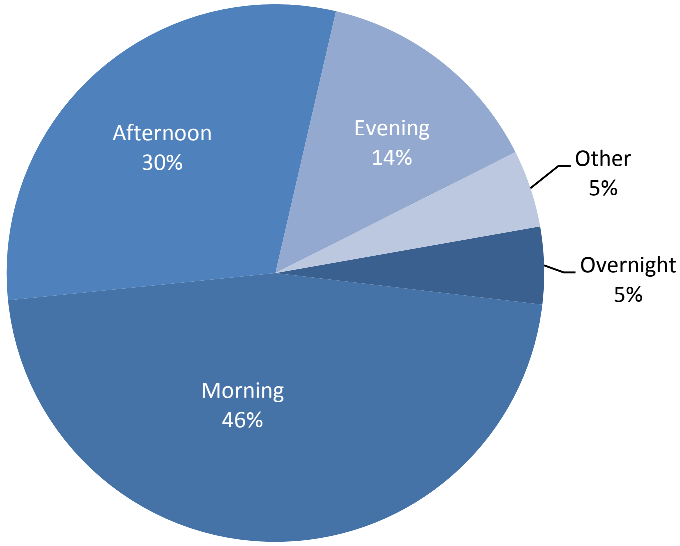


Figure 10 – Time of Day for Intersection Collisions on Mayfield Road

Figure 11 depicts that over three-quarters (79 per cent) of intersection collisions occurred in daylight, which is consistent with **Figure 10**. A further 9 per cent of the collisions happened in the dark, with the remainder occurring at either dusk or dawn.

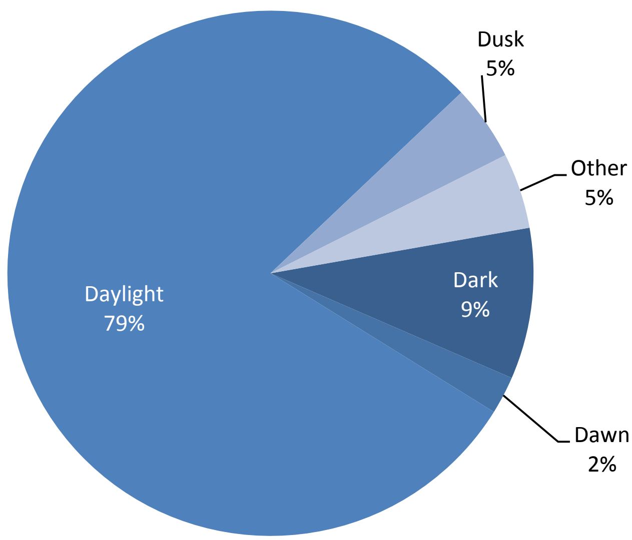


Figure 11 – Prevailing Light Conditions for Intersection Collisions on Mayfield Road

The collision history at each intersection is examined next. Intersections are presented in descending order based on the number of collisions that occurred at the location over the 2006 to 2010 period.

1. Heritage Road and Mayfield Road

A total of 14 collisions occurred at Heritage Road and Mayfield Road, which represents an average annual frequency of approximately 2.8 collisions per year. The summary in **Table 13** shows that the majority of these collisions were right angle (8) and sideswipe (2). While two sideswipe collisions are not a significant pattern, sideswipe and right-angle collisions may have related contributing factors, and are considered together in the following analysis. The remaining 4 collisions were classified as single motor vehicle (1), rear end (1), approaching (1), and other (1). The other collision is unknown as the police report was not legible. Ten (71 per cent) were categorized as injury collisions, with one of the collisions resulting in a fatal injury, as described at the beginning of this section.

Figure 12 illustrates the most frequently occurring collisions at the intersection. Of the 8 right angle collisions, the predominant approaches were westbound/northbound and eastbound/southbound. The 2 sideswipe collisions occurred in the eastbound/southbound direction. The remaining collisions occurred in and around the intersection in the northbound direction for approaching, and east of the intersection for rear end and single motor vehicle.

These collision patterns suggest the following contributing factors and/or apparent driver actions:

- *Right Angle* – Restricted sightlines to crossing road, inconspicuous intersection, inappropriate gap acceptance, speeding, disobey traffic control, improper turn.
- *Sideswipe* – Poor road surface friction, poor delineation, inappropriate gap acceptance, speeding, evasive manoeuvres.

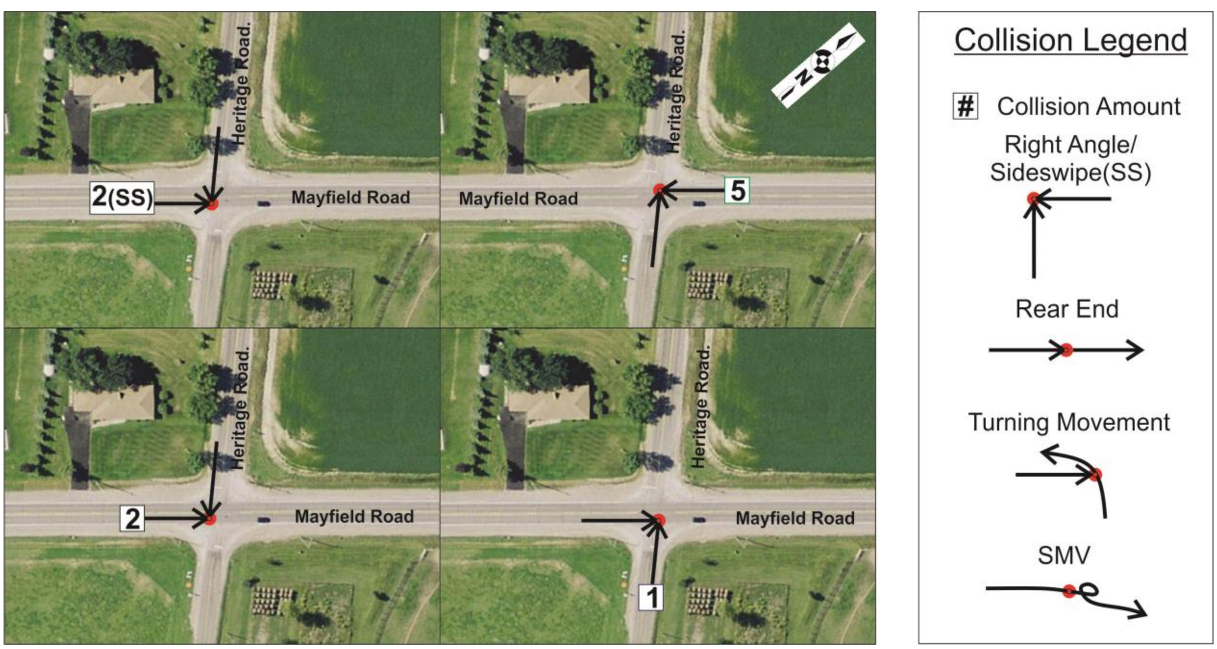


Figure 12 – Most Frequently Occurring Collisions at Heritage Road and Mayfield Road

2. *Mississauga Road and Mayfield Road*

A total of 10 collisions occurred at Mississauga Road and Mayfield Road, which represents an average annual frequency of 2 collisions per year. The summary in **Table 13** shows that the majority of these collisions were rear end (3), right angle (2), and single motor vehicle (2). The remaining 3 collisions were approaching (1), sideswipe (1), and other (1). Five (50 per cent) were classified as injury collisions.

Figure 13 illustrates the most frequently occurring collisions at the intersection. Of the 3 rear end collisions, there was one collision in each of the northbound, southbound, and eastbound directions. The 2 right angle collisions occurred in the eastbound/northbound direction. The 2 single motor vehicle collisions occurred south of the intersection, with one car was traveling north and the other south along Mississauga Road. The remaining collisions occurred in and around the intersection in the northbound approach for sideswipe and approaching, and in the eastbound/northbound direction for the other collisions.

These collision patterns suggest the following contributing factors and/or apparent driver actions:

- *Rear End* – Inconspicuous intersection, poor road surface friction, speeding, distracted driving.
- *Right Angle* – Restricted sightlines to signal heads, inconspicuous intersection, inadequate clearance interval, speeding, disobey traffic control, improper turn.
- *Single Motor Vehicle* – Poor road surface friction, poor delineation, shoulder width and type, roadside design, speeding, evasive manoeuvres

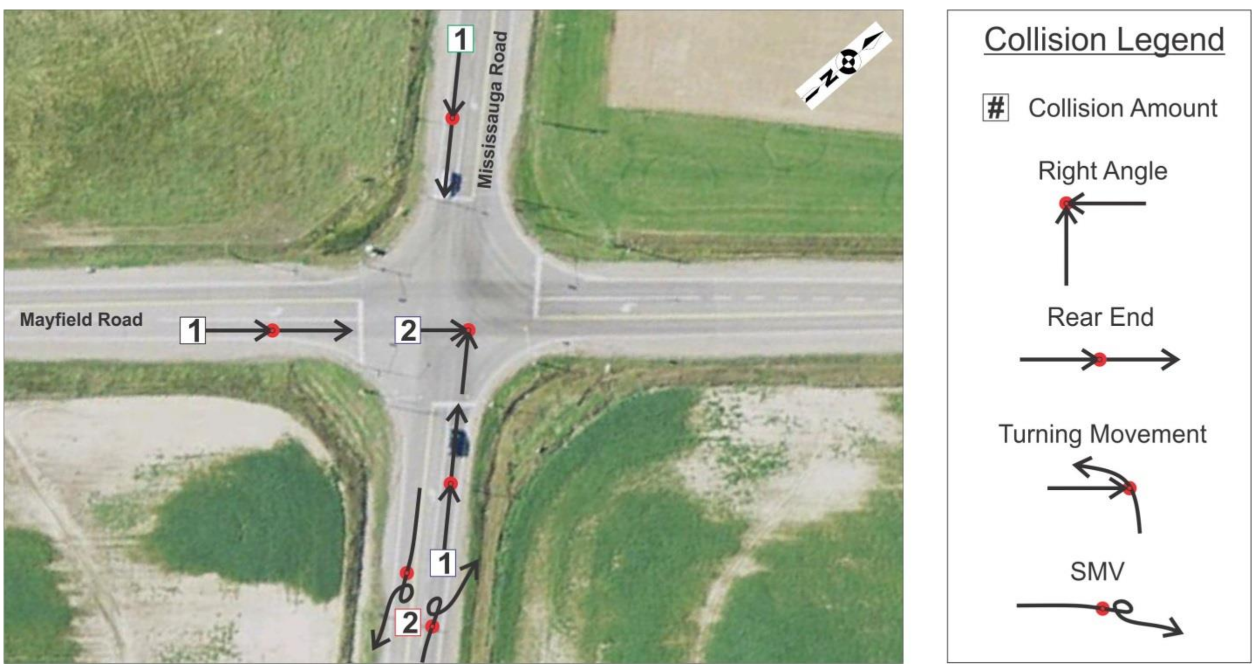


Figure 13 – Most Frequently Occurring Collisions at Mississauga Road and Mayfield Road

3. *Chinguacousy Road and Mayfield Road*

A total of 8 collisions occurred at Chinguacousy Road and Mayfield Road, which represents an average annual frequency of approximately 1.6 collisions per year. The summary in **Table 13** shows that the majority of these collisions were rear end (4) and turning movement (2). The remaining two collisions were classified as single motor vehicle (1) and approaching (1). Two (25 per cent) were categorized as injury collisions.

Figure 14 illustrates the most frequently occurring collisions at the intersection. Of the 4 rear end collisions, the predominant approaches were westbound (3) and northbound (1). The 2 turning movement collisions also involved westbound and northbound vehicles turning left, and appear to be similar to a rear end collision type. The remaining collisions occurred outside the intersection to the east for the eastbound and westbound movements for single motor vehicle and approaching collisions, respectively.

These collision patterns suggest the following contributing factors and/or apparent driver actions:

- *Rear End* – Inconspicuous intersection, poor road surface friction, speeding, distracted driving.
- *Turning Movement* – Inconspicuous intersection, inadequate clearance interval, speeding, disobey traffic control, improper turn.

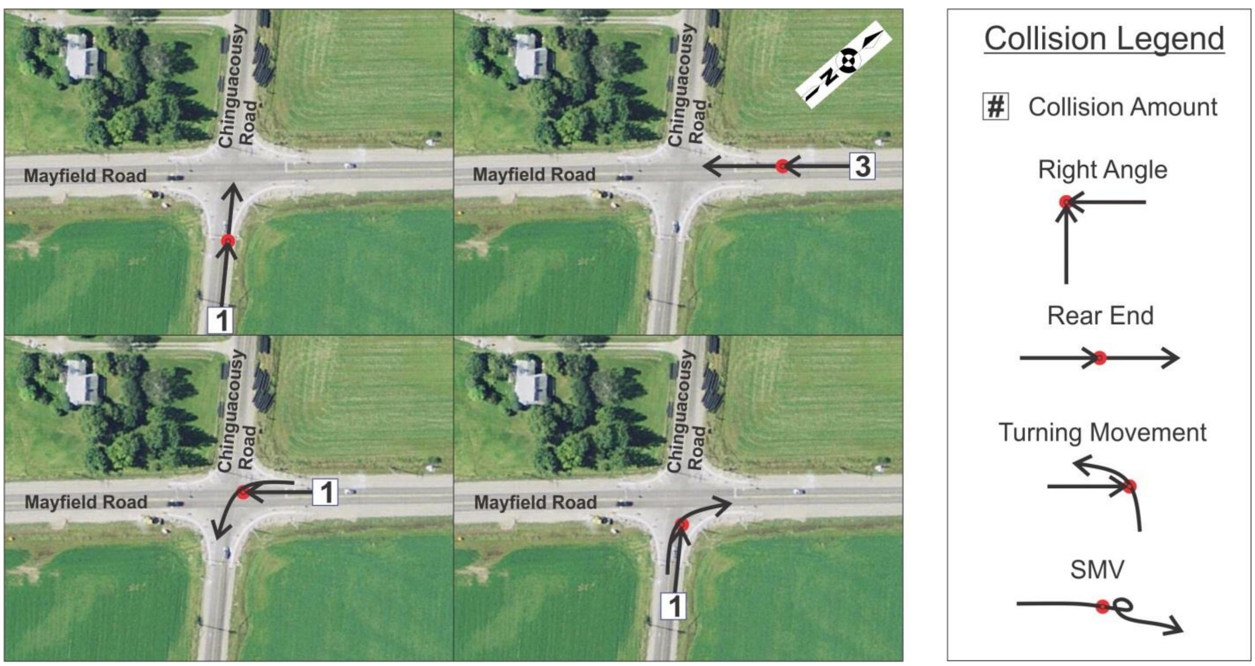


Figure 14 – Most Frequently Occurring Collisions at Chinguacousy Road and Mayfield Road

4. Winston Churchill Boulevard and Mayfield Road

A total of 7 collisions occurred at Winston Churchill Boulevard and Mayfield Road, which represents an average annual frequency of approximately 1.4 collisions per year. The summary in **Table 13** shows that the majority of these collisions were right angle (5). The remaining two collisions were classified as single motor vehicle (1) and turning movement (1). Four (57 per cent) were categorized as injury collisions.

Figure 15 illustrates the most frequently occurring collisions at the intersection. Of the 5 right angle collisions, the predominant approaches were westbound/northbound (2 collisions). The other 3 right angle collisions involved all other directions of travel as illustrated. The remaining collisions occurred in the southbound direction for single motor vehicle, and in the middle of the intersection in the eastbound and westbound direction for the turning movement collision.

This collision pattern suggests the following contributing factors and/or apparent driver actions:

- *Right Angle* – Restricted sightlines to signal heads, inconspicuous intersection, inadequate clearance interval, speeding, disobey traffic control, improper turn.

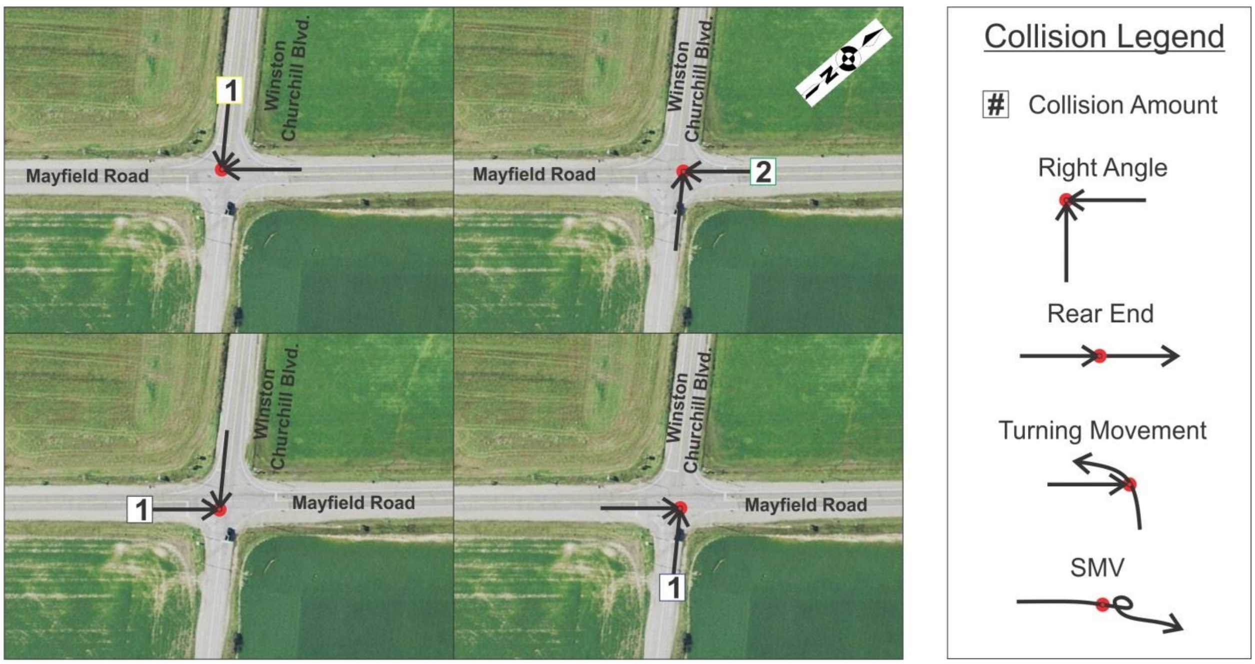


Figure 15 – Most Frequently Occurring Collisions at Winston Churchill Boulevard and Mayfield Road

5. *Creditview Road and Mayfield Road*

A total of 4 collisions occurred at Creditview Road and Mayfield Road, which represents an average annual frequency of approximately 0.8 collisions per year. The summary in **Table 13** shows that the majority of these collisions were turning movement (2) collisions. The remaining two collisions were classified as right angle (1) and approaching (1). One (25 per cent) was categorized as an injury collision.

Figure 16 illustrates the most frequently occurring collisions at the intersection. Of the 2 turning movement collisions, one involved an eastbound left turn with southbound movement and the other involved a southbound left turn with eastbound movement. The remaining collisions occurred in and around the intersection along the eastbound/westbound direction for the approaching collision and the westbound/northbound movements for the right angle collision.

These collisions suggest the following contributing factors and/or apparent driver actions:

- *Turning Movement* – Restricted sightlines to crossing road, inconspicuous intersection, inappropriate gap acceptance, speeding, improper turn.

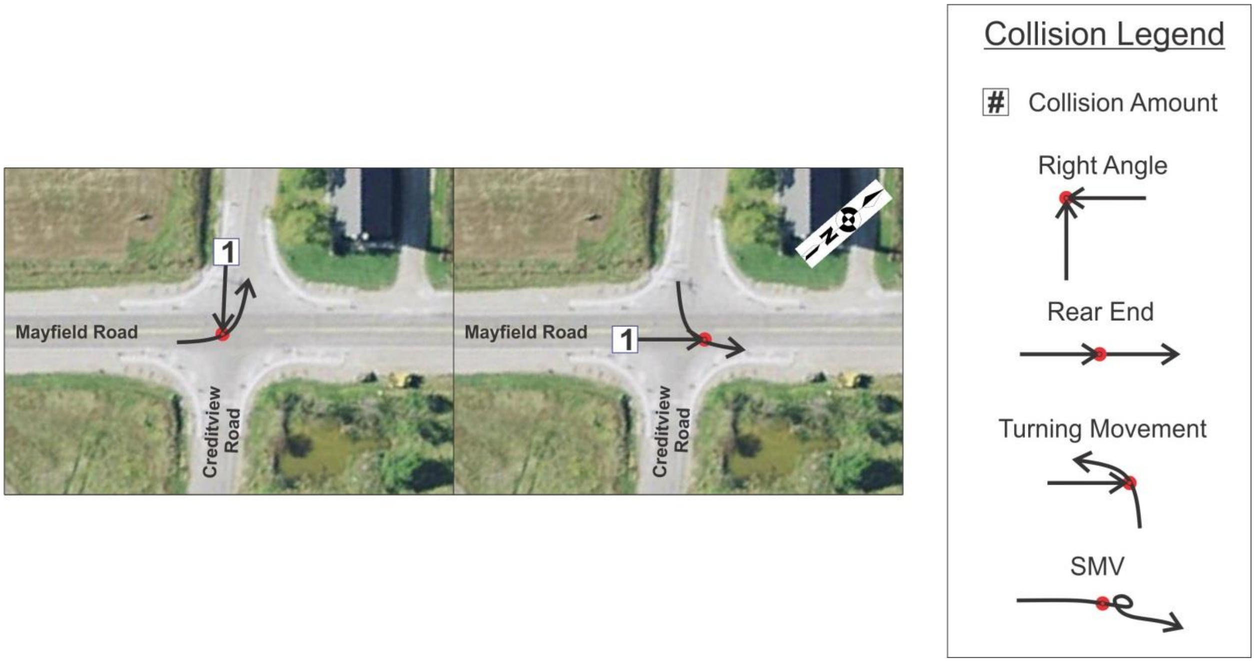


Figure 16 – Most Frequently Occurring Collisions at Creditview Road and Mayfield Road

3.6.3 Midblock Collision Analysis

A total of 19 collisions (31 per cent of all collisions) occurred midblock along Mayfield Road over the 2006 to 2010 period. **Table 12** shows that five of these reported collisions (26 per cent) involved a non-fatal injury. The remaining collisions were categorized as property damage only with no fatalities being reported. It is noted that there were no reported collisions for the section of Mayfield Road from Heritage Road to Winston Churchill Boulevard.

Figure 17 shows that single motor vehicle (42 per cent) collisions were the most prevalent impact type, followed by approaching (16 per cent). None of the 19 midblock collisions involved pedestrians or cyclists.

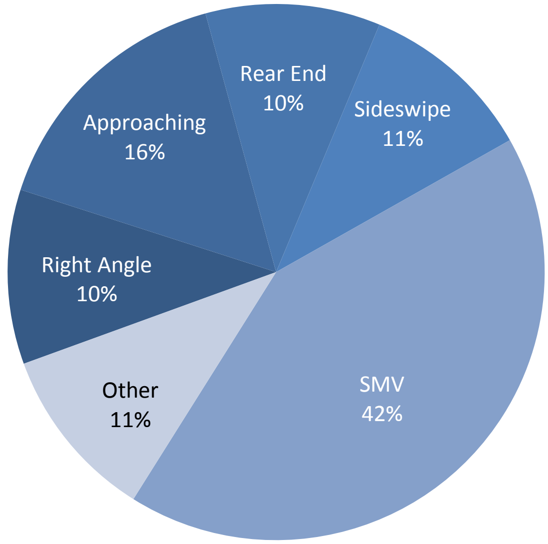


Figure 17 – Impact Type for Midblock Collisions on Mayfield Road

Figure 18 shows that 68 per cent of the midblock collisions occurred in clear weather conditions. A further 21 per cent occurred in inclement weather (fog, snow or freezing rain) and 11 per cent took place during rainy conditions.

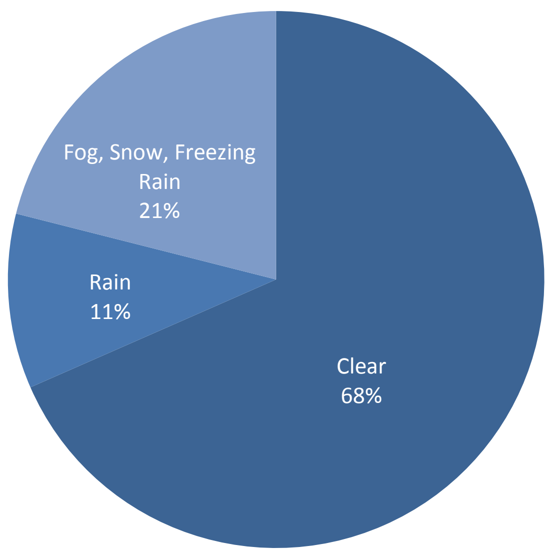


Figure 18 – Environmental Conditions for Midblock Collisions on Mayfield Road

Figure 19 indicates that approximately 37 per cent of all midblock collisions occurred overnight (00:00 to 05:59). About one quarter (26 per cent) of the collisions happened during the evening (18:00 to 23:59), approximately 21 per cent in the morning (06:00 to 11:59), and the remaining 16 per cent took place in the afternoon (12:00 to 17:59).

The midblock collisions occurring at night are a concern, with over 63 per cent of all crashes occurring between 18:00 and 05:59. Generally, it is expected that the majority of collisions occur during the day since most travel occurs in daylight hours. By comparison, 79 per cent of all intersection collisions in this Study Area occurred during daylight.

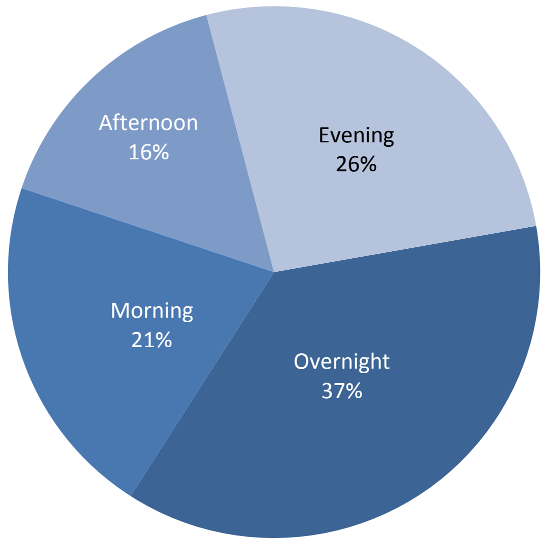


Figure 19 – Time of Day for Midblock Collisions on Mayfield Road

Figure 20 depicts that almost two-thirds of the midblock collisions occurred in dark conditions, which is consistent with **Figure 19**. A further 32 per cent of the collisions happened in the daylight, with the remainder (5 per cent) taking place at dawn.

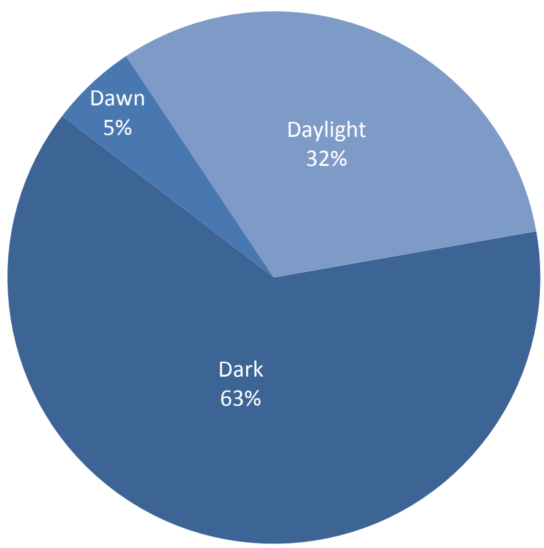


Figure 20 – Prevailing Light Conditions for Midblock Collisions on Mayfield Road

The following summarizes the collision experience for each of the three midblock sections, sorted in descending order based on the number of collisions that occurred within that segment between 2006 and 2010. As previously noted, there were no collisions reported in the Heritage Road to Winston Churchill Boulevard section.

1. Mississauga Road to Heritage Road

A total of 10 collisions occurred along Mayfield Road between Mississauga Road and Heritage Road, which represents an average annual frequency of 2 collisions per year. The summary in **Table 13** shows that the majority were single motor vehicle (5) and approaching (2) collisions. Three (30 per cent) were classified as injury collisions. This pattern suggests poor road surface friction, poor delineation, shoulder width and type, roadside design, speeding, evasive manoeuvres.

2. Chinguacousy Road to Creditview Road

A total of 8 collisions occurred along Mayfield Road between Chinguacousy Road and Creditview Road, which represents an average annual frequency of approximately 1.6 collisions per year. The summary in **Table 13** shows that the majority were single motor vehicle (3) collisions. The five remaining collisions were right angle, approaching, rear-end, sideswipe, and other. These collisions may be related to the driveways along the segment. Two (25 per cent) were classified as injury collisions. The single motor vehicle collisions suggests poor road surface friction, poor delineation, shoulder width and type, roadside design, speeding, evasive manoeuvres. The other collisions suggest conflicts with driveways along the corridor, though no pattern could be identified.

3. Creditview Road to Mississauga Road

One collision occurred along Mayfield Road between Creditview Road and Mississauga Road, which represents an average annual frequency of approximately 0.2 collisions per year. The summary in **Table 13** shows the collision was a sideswipe. The collision was classified as property damage only. Improvements will not be identified based on the single collision in this segment.

3.6.4 Collisions Involving Animals

Three of the recorded collisions involved animals crossing Mayfield Road. This relatively low frequency suggests that mitigation measures related to animal crossings are not required at this time.

3.6.5 Collision Analysis Summary

Overall, the Mayfield Road corridor is performing relatively well from a safety perspective with a low, or low to moderate potential for collision reduction. Based on the review of collision history, the locations of greatest concern from a safety perspective are the five intersections, which are listed below in order of collision frequency:

1. Heritage Road

2. Mississauga Road
3. Winston Churchill Boulevard
4. Chinguacousy Road
5. Creditview Road

Nearly 70 per cent of all Study Area collisions occurred at these locations. The intersection of Heritage Road and Mayfield Road is of particular concern as 10 of the 14 collisions resulted in injuries, one of which produced a fatality, and all were the result of right angle impact. The Winston Churchill Boulevard and Mayfield Road intersection also experienced a relatively high number of right angle collisions.

The safety review also highlighted concerns with two of the midblock segments. The locations on Mayfield Road of greatest concern, in terms of collisions and injuries, are listed below in order of collision frequency:

1. Mississauga Road to Heritage Road
2. Chinguacousy Road to Creditview Road

Single motor vehicle collisions are the most frequently occurring impact type within these sections. Only one collision was reported in the five-year period between Creditview Road and Mississauga Road. No collisions were reported between Heritage Road and Winston Churchill Boulevard. Midblock collisions occurring at night are also a concern.

3.6.6 Design and Operational Recommendations

Table 14 to **Table 19** identify the likely list of factors contributing to collisions for each intersection and road segment, and provide recommendations for design and operational elements to be considered in the preliminary design. Expected safety benefits are based on Crash Modification Factors (CMFs) available from the CMF Clearinghouse (CMFClearinghouse.org).[3] Some elements do not have CMFs available. Design and operational considerations should be confirmed for appropriateness and feasibility through site visits and/or further analysis prior to implementation.

[3] A Crash Modification Factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The lower the CMF, the greater the long-term expected safety benefit (e.g. CMF of 0.65 has a greater expected safety benefit than a CMF of 0.82). The CMF Clearinghouse builds upon the CMFs included in the Highway Safety Manual 1st Edition. The website is funded by the U.S. Department of Transportation Federal Highway Administration and maintained by the University of North Carolina Highway Safety Research Center. www.cmfclearinghouse.org (Accessed January 8, 2014)

Table 14 – Design and Operational Recommendations for Heritage Road and Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Right Angle Collisions		
Restricted Sightlines to Crossing Road	Increase triangle sight distance	CMF = 0.53 for Injury CMF = 0.89 for Property Damage Only
Inconspicuous Intersection	Provide intersection illumination	CMF = 0.62 for Nighttime Injury
	Install flashing beacons at stop controlled intersections (rural)	CMF = 0.84 for Angle
	Install larger street name signs for Heritage Road at the intersection of Mayfield Road	Positive Guidance is generally accepted as a way to reduce collision risk. Refer to OTM Book 1b. No CMF available.
	Install advance street name signs for Heritage Road on Mayfield Road	CMF = 0.984 for All CMF = 0.897 for Sideswipe
Inappropriate Gap Acceptance	Install intersection conflict warning system, to assist drivers in accepting appropriate gaps	Activated systems are available, or a static system using signs can assist drivers in better judging the gap. No CMF available.
	Convert stop-controlled intersection into single-lane roundabout (rural)	CMF = 0.42 for All
	Convert minor-road stop control to all-way stop control (rural)	CMF = 0.52 for All
	Install traffic signals (if warranted)	CMF = 0.56 for All CMF = 0.23 for Angle
Speeding Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Sideswipe Collisions		
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Poor Delineation	Install wider markings without resurfacing (rural)	CMF = 0.78 for Fatal & Injury
	Install wider markings with resurfacing (rural)	CMF = 0.75 for Fatal & Injury
Inappropriate Gap Acceptance	Install intersection conflict warning system, to assist drivers in accepting appropriate gaps	Activated systems are available, or a static system using signs can assist drivers in judging the gap. No CMF available.
Speeding Evasive Manoeuvres	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.

Table 15 – Design and Operational Recommendations for Mississauga Road and Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Rear End Collisions		
Inconspicuous Intersection	Provide intersection illumination	CMF = 0.62 for Nighttime Injury
	Replace 8-inch red signal heads with 12-inch	CMF = 0.58 for Angle CMF = 0.97 for All
	Install larger street name signs for Mississauga Road at the intersection of Mayfield Road	Positive Guidance is generally accepted as a way to reduce collision risk. Refer to OTM Book 1b. No CMF available.
	Install advance street name signs for Mississauga Road on Mayfield Road	CMF = 0.984 for All CMF = 0.897 for Sideswipe
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Speeding Distracted Driving	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Right Angle Collisions		
Restricted Sightlines to Signal Heads	Review and confirm signal head placement	No CMF available.
Inconspicuous Intersection	Same considerations as Rear-End Collisions	See above.
Inadequate Clearance Interval	Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice	CMF = 0.96 for Angle CMF = 0.92 for All
	Convert signalized intersection to modern roundabout (rural)	CMF = 0.625 for All
Speeding Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Single Motor Vehicle Collisions		
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Poor Delineation	Install wider markings without resurfacing (rural)	CMF = 0.78 for Fatal & Injury
	Install wider markings with resurfacing (rural)	CMF = 0.75 for Fatal & Injury
Shoulder Width and Type	Improve shoulder width and type	Magnitude of safety benefit depends on amount of width increase, in combination with shoulder type.
Roadside Design	Flatten slopes, increase clear zone	Magnitude of safety benefit depends on before/after conditions.
Speeding Evasive Manoeuvres	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.

Table 16 – Design and Operational Recommendations for Chinguacousy Road and Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Rear End Collisions		
Inconspicuous Intersection	Provide intersection illumination	CMF = 0.62 for Nighttime Injury
	Replace 8-inch red signal heads with 12-inch	CMF = 0.58 for Angle CMF = 0.97 for All
	Install larger street name signs for Chinguacousy Road at the intersection of Mayfield Road	Positive Guidance is generally accepted as a way to reduce collision risk. Refer to OTM Book 1b. No CMF available.
	Install advance street name signs for Chinguacousy Road on Mayfield Road	CMF = 0.984 for All CMF = 0.897 for Sideswipe
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Speeding Distracted Driving	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Turning Movement Collisions		
Inconspicuous Intersection	Same considerations as Rear-End Collisions	See above.
Inadequate Clearance Interval	Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice	CMF = 0.96 for Angle CMF = 0.92 for All
	Convert signalized intersection to modern roundabout (rural)	CMF = 0.625 for All
Speeding Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.

Table 17 – Design and Operational Recommendations for Winston Churchill Boulevard and Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Right Angle Collisions		
Restricted Sightlines to Signal Heads	Review and confirm signal head placement	No CMF available.
Inconspicuous Intersection	Provide intersection illumination	CMF = 0.62 for Nighttime Injury
	Replace 8-inch red signal heads with 12-inch	CMF = 0.58 for Angle CMF = 0.97 for All
	Install larger street name signs for Mississauga Road at the intersection of Mayfield Road	Positive Guidance is generally accepted as a way to reduce collision risk. Refer to OTM Book 1b. No CMF available.
	Install advance street name signs for Mississauga Road on Mayfield Road	CMF = 0.984 for All CMF = 0.897 for Sideswipe
Inadequate Clearance Interval	Modify change plus clearance interval to ITE 1985 Proposed Recommended Practice	CMF = 0.96 for Angle CMF = 0.92 for All
	Convert signalized intersection to modern roundabout (rural)	CMF = 0.625 for All
Speeding Disobey Traffic Control Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.

Table 18 – Design and Operational Recommendations for Creditview Road and Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Turning Movement Collisions		
Restricted Sightlines to Crossing Road	Increase triangle sight distance	CMF = 0.53 for Injury CMF = 0.89 for Property Damage Only
Inconspicuous Intersection	Provide intersection illumination	CMF = 0.62 for Nighttime Injury
	Provide flashing beacons at stop controlled intersections (rural)	CMF = 0.84 for Angle
	Install larger street name signs for Creditview Road at the intersection of Mayfield Road	Positive Guidance is generally accepted as a way to reduce collision risk. Refer to OTM Book 1b. No CMF available.
	Install advance street name signs for Creditview Road on Mayfield Road	CMF = 0.984 for All CMF = 0.897 for Sideswipe
Inappropriate Gap Acceptance	Install intersection conflict warning system, to assist drivers in accepting appropriate gaps	Activated systems are available, or a static system using signs can assist drivers in judging the gap. No CMF available.
	Convert stop-controlled intersection into single-lane roundabout (rural)	CMF = 0.42 for All
	Convert minor-road stop control to all-way stop control (rural)	CMF = 0.52 for All
	Install traffic signal (if warranted)	CMF = 0.56 for All CMF = 0.23 for Angle
Speeding Improper Turn	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.

Table 19 – Design and Operational Recommendations for Midblock Segments of Mayfield Road

Potential Contributing Factor	Related Design and/or Operational Considerations	Expected Safety Benefit[3]
Single Motor Vehicle Collisions		
Poor Road Surface Friction	Resurface pavement	CMF = 1.01 for All CMF = 0.95 for Fatal & Serious Injury
Poor Delineation	Install wider markings without resurfacing (rural)	CMF = 0.78 for Fatal & Injury
	Install wider markings with resurfacing (rural)	CMF = 0.75 for Fatal & Injury
Shoulder Width and Type	Improve shoulder width and type	Magnitude of safety benefit depends on amount of width increase, in combination with shoulder type.
	Install wider markings and shoulder rumble strips with resurfacing (rural)	CMF = 0.77 for Fatal & Injury
	Install shoulder rumble strips (two-lane, rural)	CMF = 0.85 for Single Vehicle[4]
Roadside Design	Flatten slopes, increase clear zone	Magnitude of safety benefit depends on before/after conditions.
	Apply "safety edge" treatment to pavement edge	CMF = 0.95 for All[5]
Speeding Evasive Manoeuvres	Address driver error through education and enforcement	Work with Peel Regional Police to educate/enforce. No CMF available.
Driveway Related Collisions		
No Specific Pattern or Factors Identified	Consider driveway design during preliminary design, including but not limited to sightlines, driver expectations, speeding, shoulder width and type, and gap acceptance	No CMF available.
All Types Of Collisions		
Nighttime	Provide roadway illumination (rural)	CMF = 0.8 for Injury

4 Page 1 of "NCHRP Report 641: Guidance for the Design and Application of Shoulder and Centerline Rumble Strips", Torbic et al., 2009

5 http://www.fhwa.dot.gov/publications/research/safety/hsis/11025/11025.pdf

4 Future Transportation Conditions

4.1 Network Assumptions

4.1.1 Road Network Expansion

There are a number of planned road improvements in proximity to the Study Area. The Region of Peel Road Capital Program (2010 to 2031) identifies the following road widening projects:

- Mayfield Road between Chinguacousy Road and Hurontario Street from 2 to 4 lanes (2015) and from 4 to 6 lanes (2024);
- Mississauga Road between Bovaird Drive and Mayfield Road from 2 to 4 lanes; and

The City of Brampton Capital Road Projects (2010 to 2031) identifies the following road widenings:

- Chinguacousy Road between Wanless Drive and Mayfield Road from 2 to 4 lanes (2016); and
- Creditview Road between Fairhill Drive and Mayfield Road from 2 to 4 lanes.

Timing for construction of the GTA West Transportation Corridor (including the Halton/Peel Freeway) is undefined at this time but could occur by 2031. This controlled access freeway corridor could be located between Heritage Road and Mississauga Road. With planning for the highway corridor in the early stages, MTO was unable to provide information regarding the location of interchanges and interchange ramp terminal volumes at the time of preparing this report. With the absence of this information and the uncertain timing for implementation of the highway, it was decided to complete the traffic analysis of 2031 traffic conditions without the implementation of the GTA West corridor. A sensitivity analysis including a GTA West link and its ramp terminals was then undertaken to evaluate the traffic pattern changes arising from the new freeway corridor and the impact that these changes may have upon the proposed lane configuration and traffic control proposed for Mayfield Road by the 2031 horizon.

4.1.2 Future Connections to Mayfield Road

Development plans for the lands abutting Mayfield Road to the south in the City of Brampton contemplate several new connections to Mayfield Road, including:

- **Chinguacousy Road to Creditview Road** – The Mount Pleasant Block 51-2 plan proposes two new collector roads forming “T” intersections with Mayfield Road. Thornbush Boulevard/Collector Road A will be located approximately 300 m east of Creditview Road, and Brisdale Drive/Collector Road B will be located approximately 680 m west of Chinguacousy Road. Both intersections will likely be signalized. In addition, a multi-use path/trail will connect with Mayfield Road approximately 360 m west of Chinguacousy Road.

- **Creditview Road to Mississauga Road** – The Mount Pleasant Block 51-1 plan identifies two new collector roads forming "T" intersections with Mayfield Road. Collector Road E will be located approximately 300 m east of Mississauga Road, and Robert Parkinson Drive/Collector Road G will be located approximately 300 m west of Creditview Road. Both intersections will likely be signalized. In addition, a few right-in/right-out accesses may be introduced to access potential commercial development lands near the intersections of Mississauga Road and Mayfield Road (south-east corner) and Creditview Road and Mayfield Road (south-west corner). The Block 51-1 plan also identifies a multi-use path/trail connecting with Mayfield Road approximately 400 m east of Mississauga Road.
- **Mississauga Road to Heritage Road** – There are no north/south road connections in this section according to the most recent version of the draft Heritage Heights Transportation Master Plan (HHTMP). As well, the Preliminary Preferred Network locates the GTA West north-south corridor approximately 700m west of Mississauga Road and does not identify collector roads connecting with Mayfield Road in this section, but identifies an opportunity for either greenway linkage midblock or the GTA West corridor.
- **Heritage Road to Winston Churchill Boulevard** – The most recent version of the draft Heritage Heights Transportation Master Plan identifies two north-south roads connecting to Mayfield Road and serving Mount Pleasant West. This version of the HHTMP proposes that one of these roads will be the westerly extension of Sandalwood Parkway (a Major Arterial), which will form a "T" intersection at Mayfield Road and will include an off-road Class 1 pathway. The other north-south road, referred in this report as "New Collector A," will be a minor collector running approximately 500m west of Heritage Road.

The location and configuration of existing and future access roads will be reviewed in future phases of the Mayfield Road Class EA study based on the guidelines provided in the Road Characterization Study.

4.1.3 Transit Network Improvements

The City of Brampton Transportation and Transit Master Plan Sustainable Update 2009 outlines future improvements to local transit service to the year 2021. The proposed 2021 transit network includes service on Mayfield Road to Chinguacousy Road and on Chinguacousy Road to Mayfield Road. Service along Mayfield Road within the Study Area is not contemplated.

The Metrolinx RTP identifies the expansion of Regional Rail on the Kitchener GO line to full-day, two-way service and the provision of Light Rail Transit (LRT)/Bus Rapid Transit (BRT) on Hurontario Street to the Mayfield West community in the vicinity of the Study Area.

4.2 Projected Growth and Turning Movement Forecasts

4.2.1 Forecasting Approach

The analysis of future midblock and intersection traffic conditions for the 2021 and 2031 horizon years is dependent upon forecasted turning movement volumes for intersections within the Study Area. The three-step process applied to forecast future traffic volumes for the five major intersections on Mayfield Road can be described as follows:

- **Step 1** – Balance existing 2013 intersection turning movement counts (provided in **Appendix A**) between intersections to address inconsistencies. **Figure 6** and **Figure 7** provide the 2013 balanced volumes for the weekday AM and PM peak hours, respectively.
- **Step 2** – Apply growth rates from Error! Reference source not found. **Section 4.2.2** below to 2013 balanced olumes to estimate 2021 background traffic volumes. **Figure 21** and **Figure 22** show the 2021 background traffic volumes for the weekday AM and PM peak hours, respectively. Two different growth rates were used to forecast traffic volumes for Mayfield Road as noted in **Table 20** Error! Reference source not found..
- **Step 3** – Add site trips from Mount Pleasant Blocks 51-1, 51-2 shown in **Figure 23** and **Figure 24,** and from Heritage Heights, shown in **Figure 25** and **Figure 26** for AM and PM peak hours, respectively, to the 2021 background volumes to estimate 2021 total traffic volumes. Heritage Heights was assumed to be 25% built out by 2021. **Figure 27** and **Figure 28** show the 2021 total traffic volumes for the weekday AM and PM peak hours, respectively.

A similar process was followed to forecast 2031 total traffic volumes. **Figure 29** and **Figure 30** show the 2031 background traffic volumes for the weekday AM and PM peak hours, respectively, derived by factoring the 2021 background traffic volumes shown in **Figure 21** and **Figure 22** by the growth rates specified in **Table 20** Error! eference source not found.. **Figure 33** and **Figure 34** show the 2031 total traffic volumes for the weekday AM and PM peak hours, respectively, generated by adding the 2031 background traffic volumes to the 2021 site traffic volumes for Mount Pleasant Blocks 51-1 and 51-2 shown in **Figure 23** and **Figure 24** (Blocks 51-1 and 51-2 are expected to be built out by 2021) and by adding also the 2031 site traffic volumes for Heritage Heights shown in **Figure** 31 and **Figure 32**. Heritage Heights was assumed to be built out by 2031. No other development-related traffic information for lands within the Study Area was available at the time of preparing this report.

The approach applied in this study to forecast future traffic volumes attempts to account for the substantial growth planned to occur within the Study Area. Under typical circumstances, a growth factor would simply be applied to existing traffic volumes to project future conditions. But given projected development levels in the Study Area, it was assumed that background traffic growth rates would not have captured the significant anticipated change in local area travel patterns at a more micro level (e.g. turning movement, access spacing, etc.).

To account for this substantive change, the site-related traffic for Mount Pleasant Blocks 51-1 and 51-2 and Heritage Heights was added to background traffic to derive total future traffic volumes. Overall, this forecasting approach was considered comprehensive, conservative, and appropriate for an area that is expected to experience substantial growth. The resulting forecasts were comparable to the findings of other traffic studies completed in the vicinity (of which there are many), but differed due to variations in assumptions, methodology and/or base data. The figures represent the best information available at the time of preparing this report, but may be subject to refinement as other initiatives, such as the GTA West Corridor Planning and Environmental Assessment Study and the Heritage Heights Transportation Master Plan, evolve.

4.2.2 Traffic Growth Rates

Table 20 summarizes the traffic growth rates assumed in forecasting future background traffic volumes for Mayfield Road and the intersecting arterial roads (Chinguacousy Road, Creditview Road, Mississauga Road, Heritage Road and Winston Churchill Boulevard).

Table 20 – Background Traffic Growth Rates per Annum for Study Area Roads

Road	Horizon Years		
	2013 to 2018	2018 to 2021	2021 to 2031
Mayfield Road	5%	4%	4%
Intersecting Arterial Roads	2%	2%	3%

The Region of Peel provided the traffic growth rates for Mayfield Road of 5 per cent per annum over the first five years (2013 to 2018) and 4 per cent annually thereafter (2018 to 2031). These growth factors reflect the substantial levels of development expected for the northwest part of the Greater Toronto and Hamilton Area, in particular the City of Brampton and Towns of Caledon and Halton Hills.

For intersecting roads, a traffic growth rate of 2 per cent per annum was applied to turning movement volumes over the first eight years (2013 to 2021) and 3 per cent per annum thereafter (2021 to 2031). These rates are consistent with growth forecasts in the Caledon Transportation Needs Study Update (March 2009, Table 3.3, p. 33), which assumed annual growth rates of 1.9 per cent from 2011 to 2021 and 2.4 per cent between 2021 and 2031 for traffic crossing the Mayfield Road screenline. The assumed growth rates are also in the same range as:

Figure 21 – 2021 Future Conditions – AM Peak Hour Background Traffic Volumes

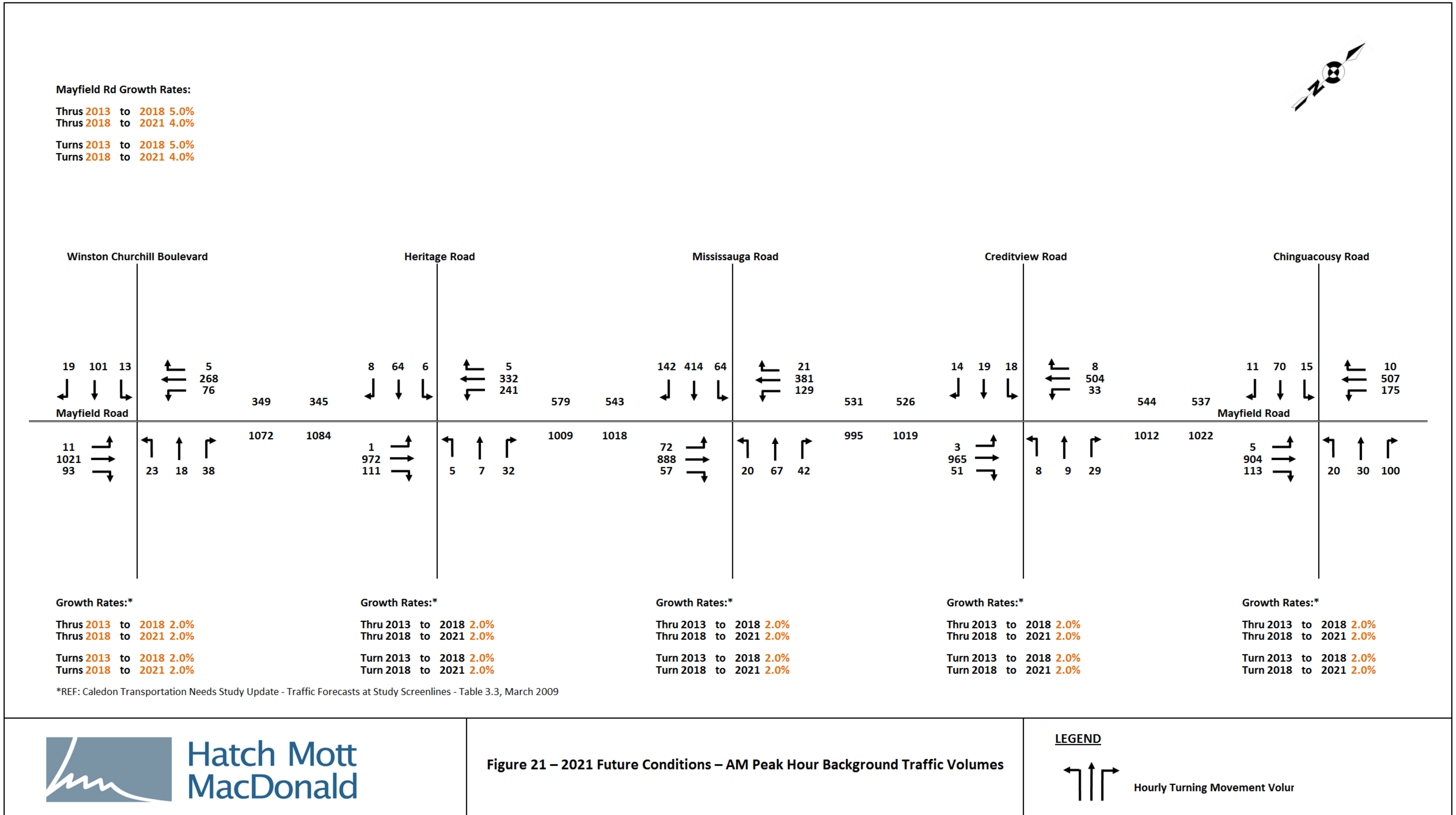


Figure 22 – 2021 Future Conditions – PM Peak Hour Background Traffic Volumes

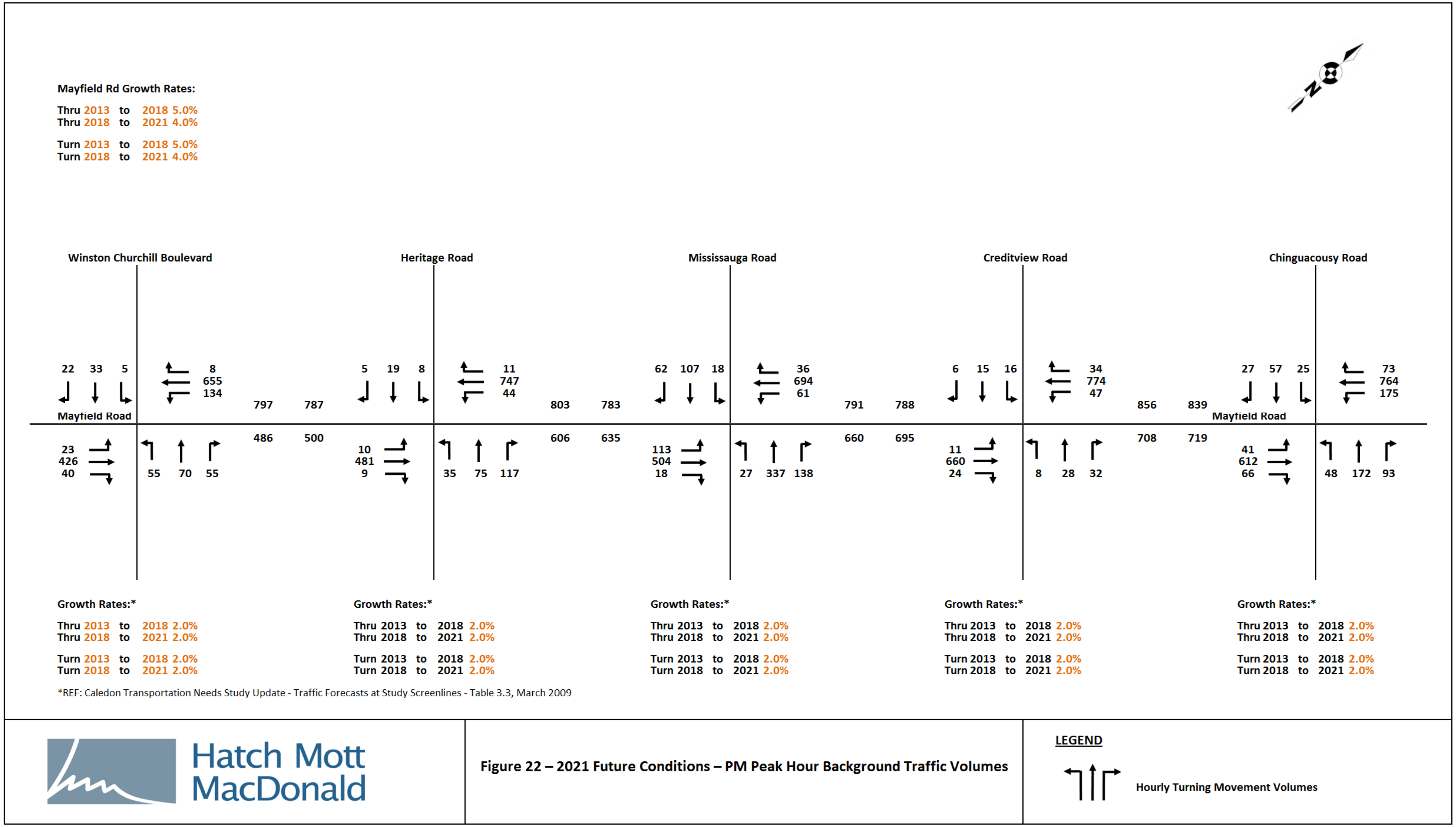


Figure 23 – 2021 Future Conditions – AM Peak Hour Mount Pleasant Blocks 51-1 and 51-2 Site Traffic Volumes

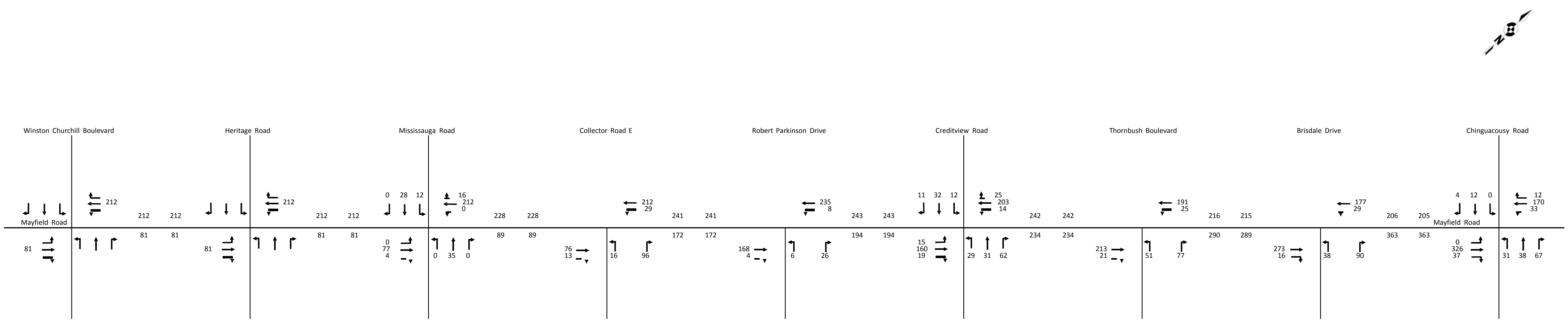


Figure 23 – 2021 Future Conditions – AM Peak Hour Site Traffic Volumes

LEGEND

Hourly Turning Movement Volumes

Figure 24 – 2021 Future Conditions – PM Peak Hour Mount Pleasant Blocks 51-1 and 51-2 Site Traffic Volumes

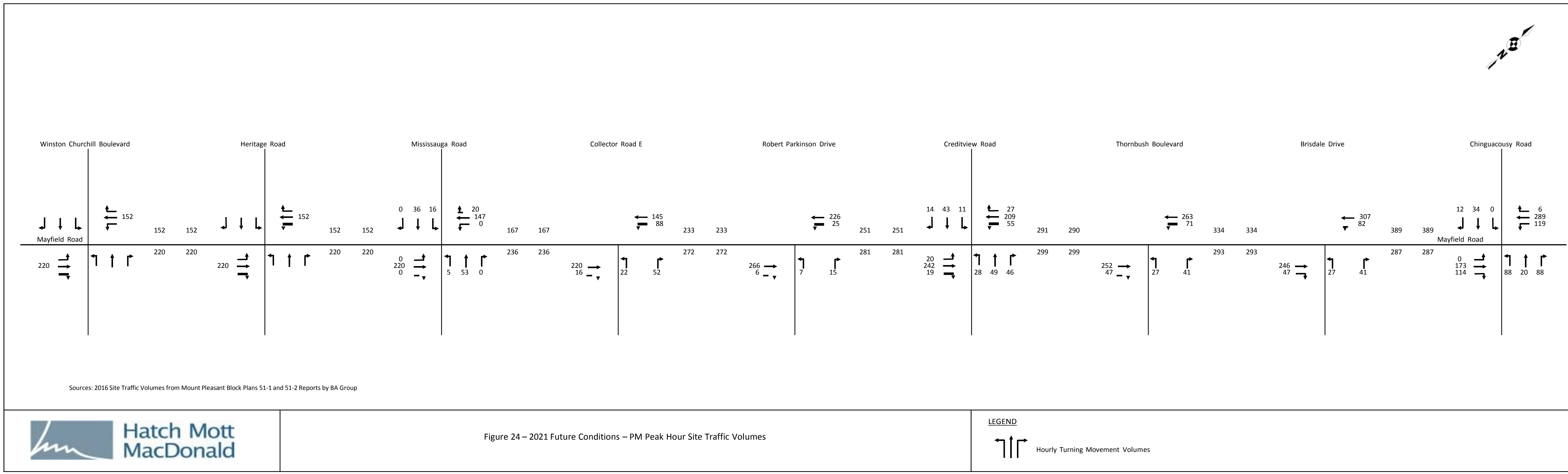


Figure 25 – 2021 Future Conditions – AM Peak Hour Heritage Heights Site Traffic Volumes

Assumptions for Trip Distribution

Ref: Schedule C Class Environmental Assessment Study for Mayfield Road from Chinguacousy Road to Heart Lake Road - Traffic Report - Final Draft, August 2013 (Appendix H) by Genivar

Trip distribution and assignment is based on traffic patterns on Mayfield Road:

	4-Leg	T	Percentage usingN/Sroads:
West:	33%	35%	20%
East:	62%	65%	
North/South:	5%	-	

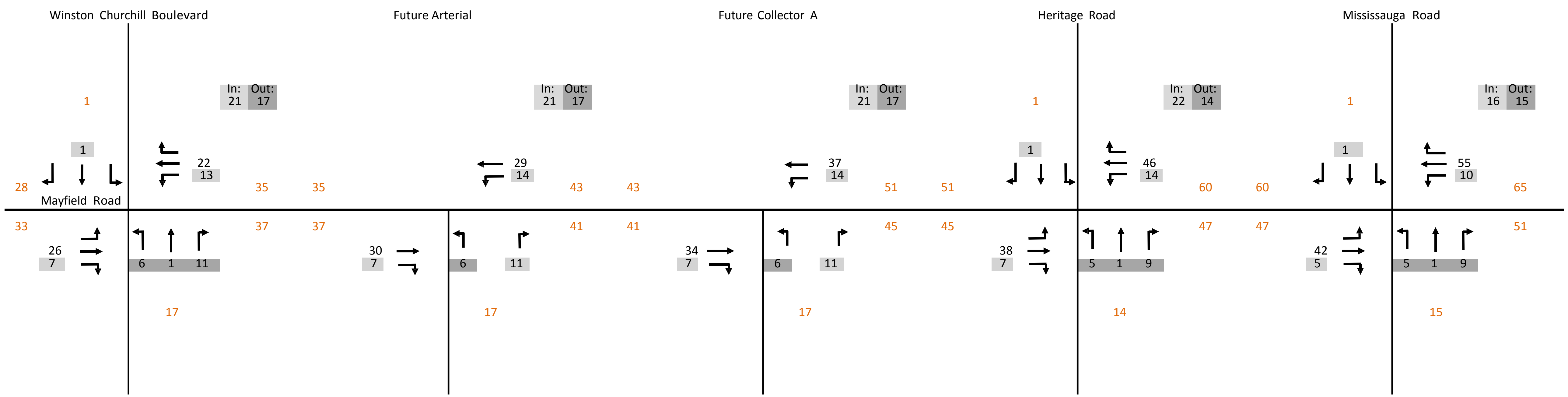


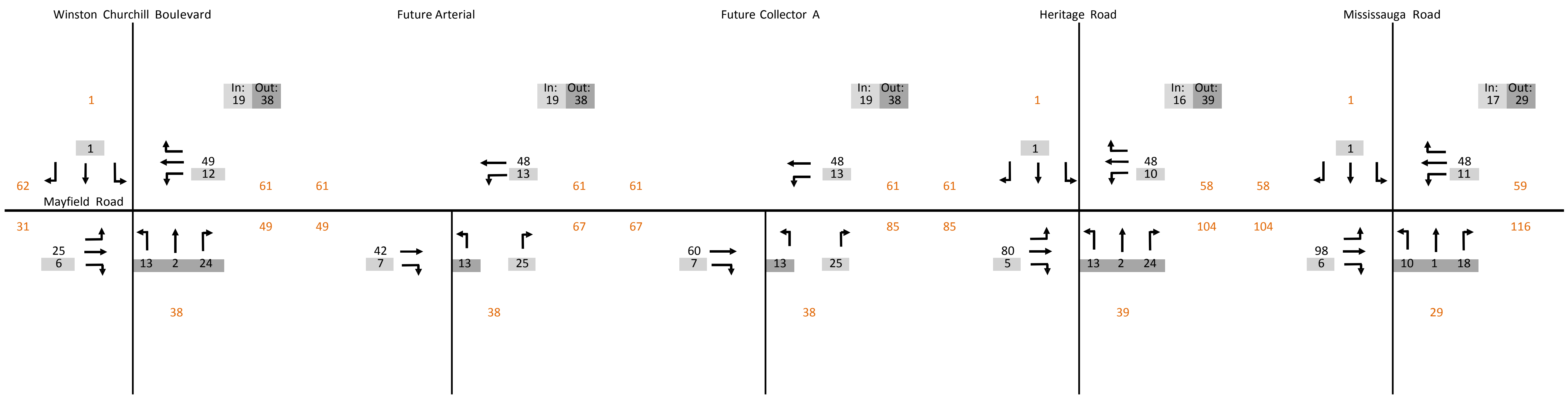
Figure 25 – 2021 Future Conditions – AM Peak Hour Heritage Heights Site Traffic Volumes

Figure 26 – 2021 Future Conditions – PM Peak Hour Heritage Heights Site Traffic Volumes

Assumptions for Trip Distribution
Ref: Schedule C Class Environmental Assessment Study for Mayfield Road from Chinguacousy Road to Heart Lake Road - Traffic Report - Final Draft, August 2013 (Appendix H) by Genivar

Trip distribution and assignment is based on traffic patterns on Mayfield Road:

	4-Leg	T	Percentage using N/S roads:
West:	33%	35%	20%
East:	62%	65%	
North/South:	5%	-	



Hatch Mott MacDonald

Figure 26 – 2021 Future Conditions – PM Peak Hour Heritage Heights Site Traffic Volumes

Figure 27 – 2021 Future Conditions – AM Peak Hour Total Traffic Volumes

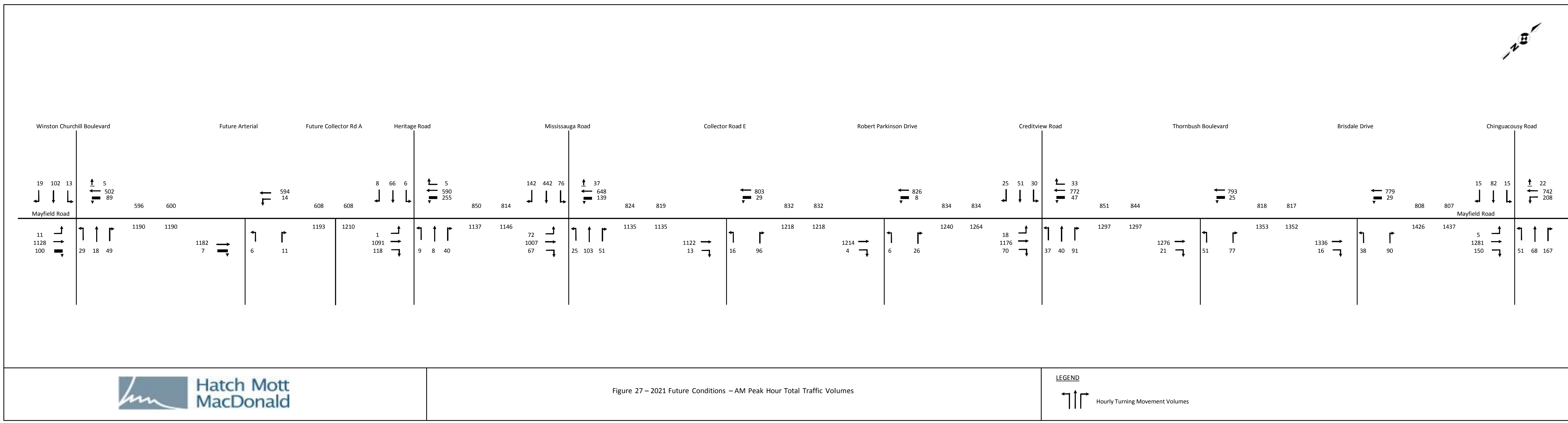


Figure 28 – 2021 Future Conditions – PM Peak Hour Total Traffic Volumes

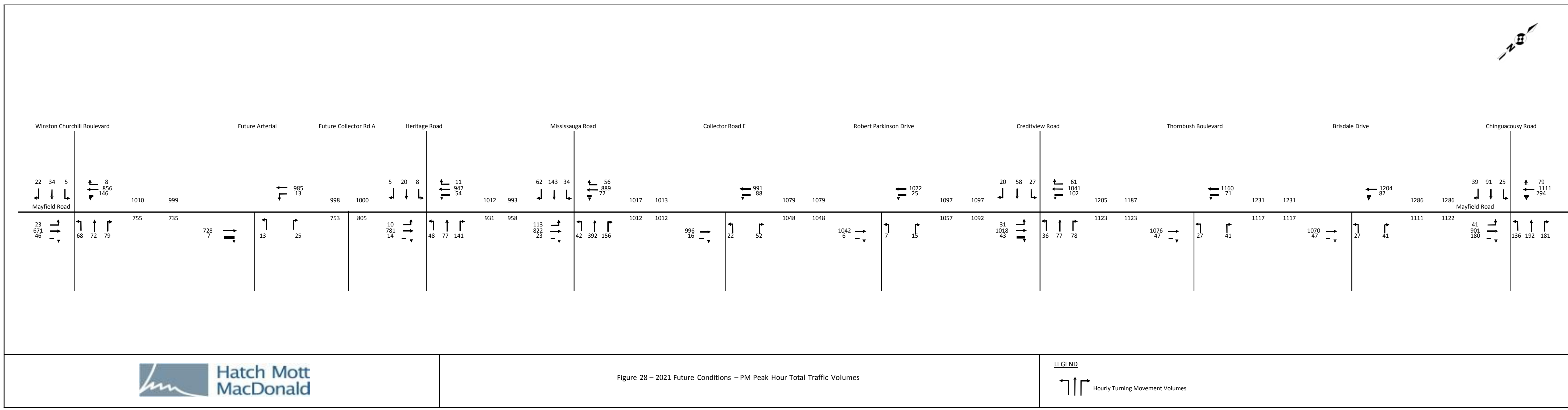


Figure 29 – 2031 Future Conditions – AM Peak Hour Background Traffic Volumes

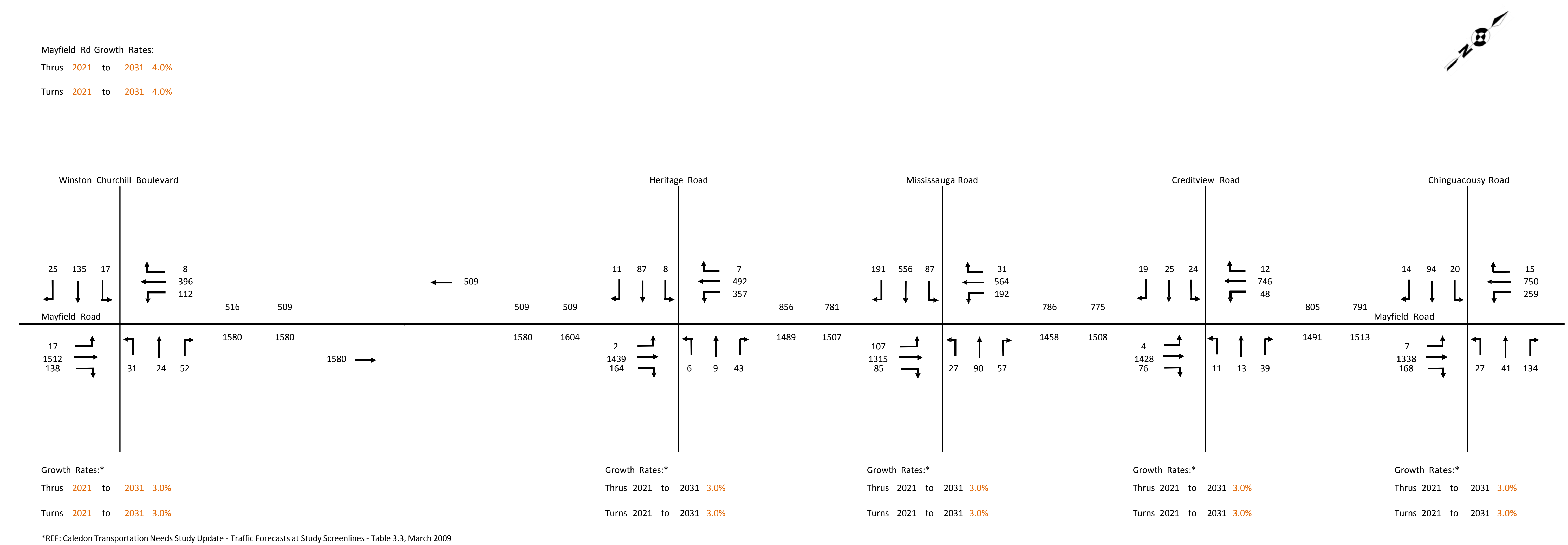


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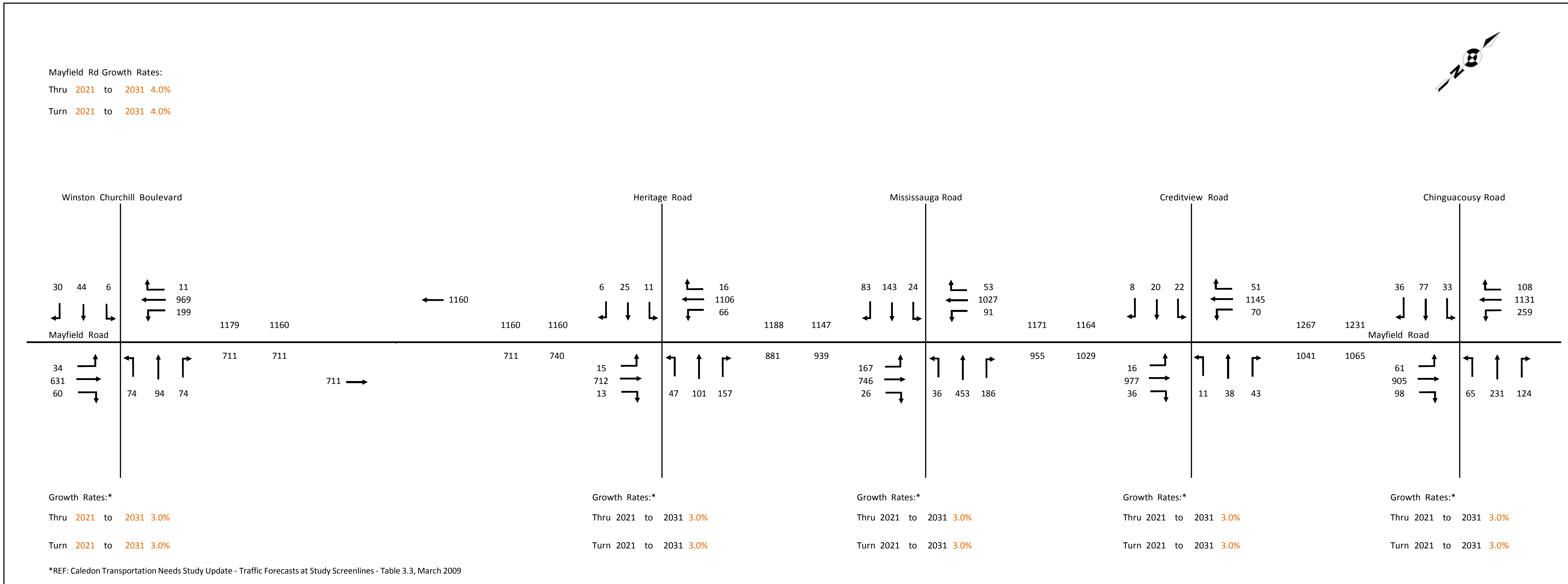
Figure 29 – 2031 Future Conditions – AM Peak Hour Background Traffic Volumes

LEGEND

Hourly Turning Movement Volumes

Figure 30 – 2031 Future Conditions – PM Peak Hour Background Traffic Volumes



Hatch Mott MacDonald

Figure 30 – 2031 Future Conditions – PM Peak Hour Background Traffic Volumes

LEGEND

Hourly Turning Movement Volumes

Figure 31 – 2031 Future Conditions – AM Peak Hour Heritage Heights Site Traffic Volumes

Assumptions for Trip Distribution

Ref: Schedule C Class Environmental Assessment Study for Mayfield Road from Chinguacousy Road to Heart Lake Road - Traffic Report - Final Draft, August 2013 (Appendix H) by Genivar

Trip distribution and assignment is based on traffic patterns on Mayfield Road:

	4-Leg	T	Percentage using N/S roads:
Wes	33%	35%	20%
East:	62%	65%	
Nort	5%	-	

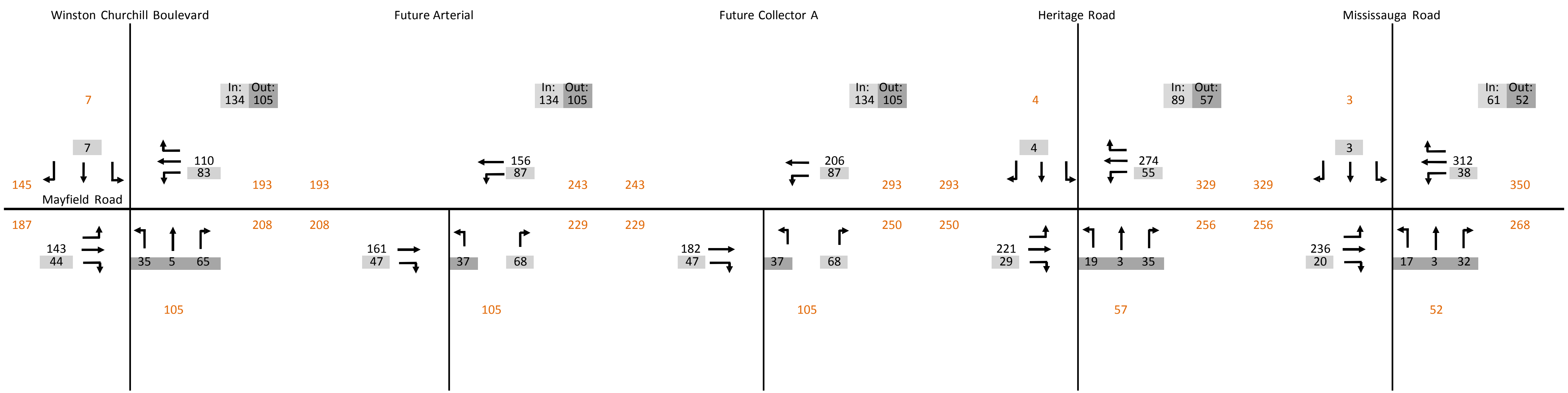


Figure 31 – 2031 Future Conditions – AM Peak Hour Heritage Heights Site Traffic Volumes

Figure 32 – 2031 Future Conditions – PM Peak Hour Heritage Heights Site Traffic Volumes

Assumptions for Trip Distribution

Ref: Schedule C Class Environmental Assessment Study for Mayfield Road from Chinguacousy Road to Heart Lake Road - Traffic Report - Final Draft, August 2013 (Appendix H) by Genivar

Trip distribution and assignment is based on traffic patterns on Mayfield Road:

	4-Leg	T	Percentage using N/S roads:
West:	33%	35%	20%
East:	62%	65%	
North/	5%	-	

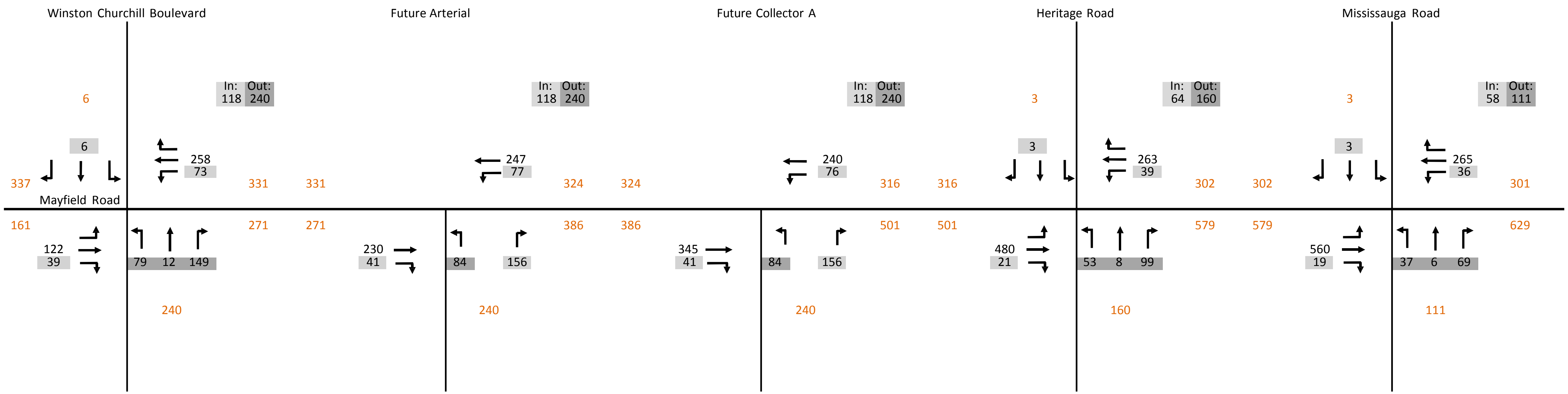


Figure 32 – 2031 Future Conditions – PM Peak Hour Heritage Heights Site Traffic Volumes

Figure 33 – 2031 Future Conditions – AM Peak Hour Total Traffic Volumes

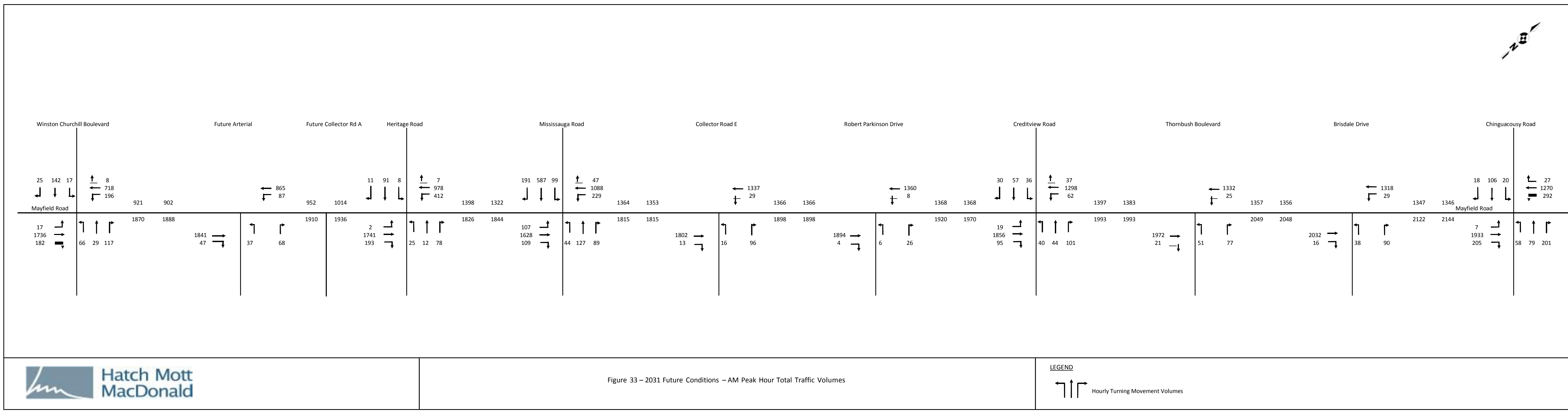
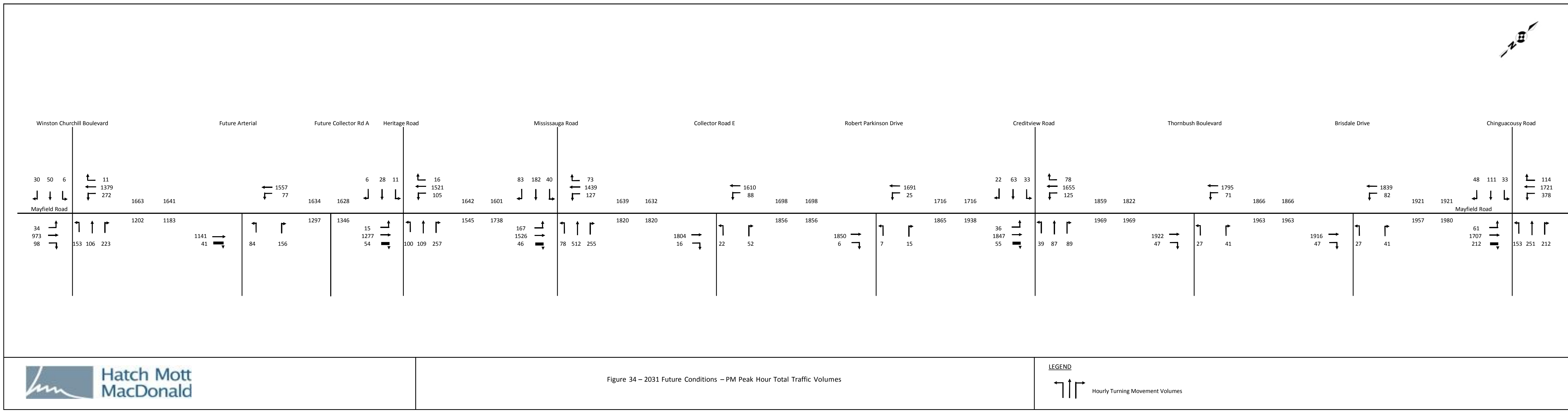


Figure 34 – 2031 Future Conditions – PM Peak Hour Total Traffic Volumes



- The Mayfield Road Class EA Study from Chinguacousy Road to Heart Lake Road (traffic report by Genivar dated August 7, 2013), which applied a constant 2 per cent annual growth rate to road sections north of Mayfield Road and 1 per cent to road sections south of Mayfield Road between 2011 and 2031. These growth rates were calculated based on AM peak hour volumes obtained from the Peel Model;
- The Mississauga Road Class EA Study from Bovaird Drive to Mayfield Road (final ESR by AECOM dated April 2013), which applied a constant 4 per cent annual growth rate to horizon years 2018 and 2031;
- The Mount Pleasant Blocks 51-1 and 51-2 Transportation Studies (reports by BA Group dated August 19, 2011 and September 2011, respectively), which applied an annual growth rate of 3 per cent; and
- The Mayfield Road EA Traffic Study from Airport Road to Coleraine Drive (report by iTrans dated May 2010), which applied annual growth rates of 2 per cent from 2012 to 2017 and 1.5 per cent from 2017 to 2032 on the north-south road.

4.3 Traffic Operations

Future midblock and intersection traffic operations along Mayfield Road within the Study Area were analyzed for the 2021 and 2031 horizon years.

4.3.1 2013 to 2021 Future Conditions – Midblock Analysis

Table 21 shows future AM peak direction (eastbound) midblock traffic volumes and v/c ratios along Mayfield Road for the year 2021 with the current roadway cross section (one lane per direction).

Table 21 – Midblock Capacity Analysis for Mayfield Road for 2021 Future Conditions

Section of Mayfield Road	Peak Direction Volume (vehicles per hour)	Peak Direction v/c Ratio (Capacity = 900 veh/lane)
Chinguacousy Road to Creditview Road	1,437	**1.60**
Creditview Road to Mississauga Road	1,264	**1.40**
Mississauga Road to Heritage Road	1,146	**1.27**
Heritage Road to Winston Churchill Boulevard	1,210	**1.34**

The table shows that the v/c ratios for all sections of Mayfield Road will be greater than 1.00 by 2021. According to the *Region of Peel Level of Service Policy*, Mayfield Road would be a candidate for widening to at least 4 lanes from Chinguacousy Road westerly to Winston Churchill Boulevard by 2021.

4.3.2 2013 to 2021 Future Conditions – Intersection Analysis

Future traffic operations at the five major intersections along Mayfield Road were analyzed using the 2021 total traffic volumes for the weekday AM and PM peak hours shown in **Figure 27** and **Figure 28**, respectively. For this analysis, the base year Synchro network was updated with the 2021 traffic volumes and the planned road network improvements detailed in **Section 4.1**.

Traffic operations were first analyzed with Mayfield Road in its current 2-lane configuration to investigate the need to widen the road as suggested in the LRTP. The intersection lane configurations for this scenario are shown in **Figure 35**.

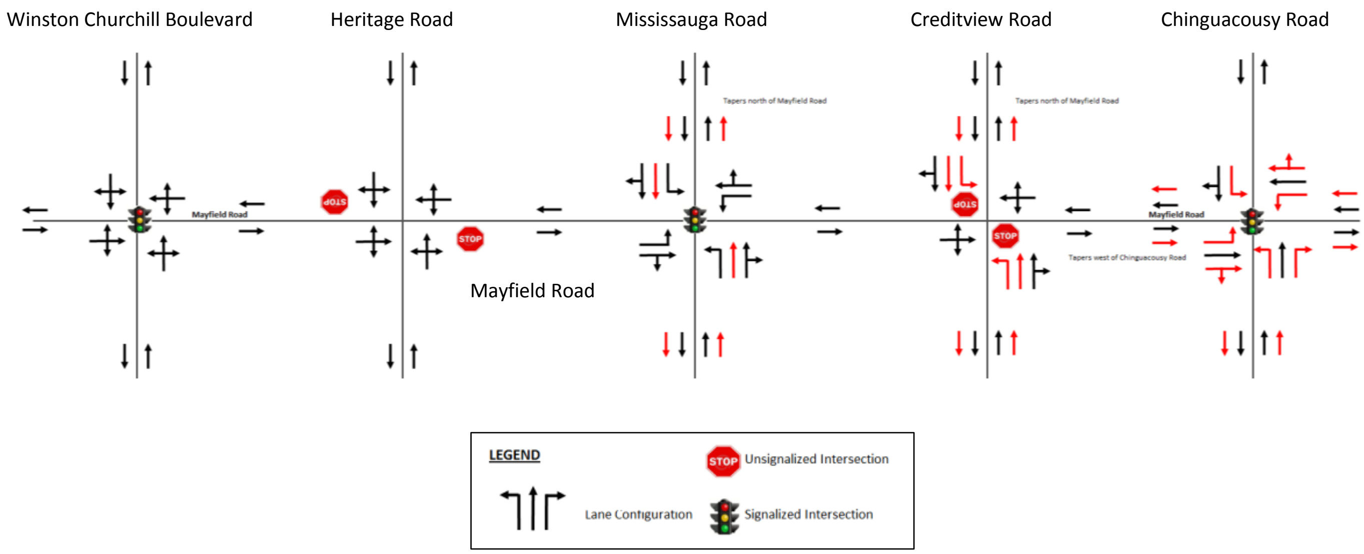


Figure 35 – Intersection Lane Configurations for 2021 Future Conditions without Improvements to Mayfield Road

Table 22 summarizes the findings of the unsignalized intersection analyses. The table provides the v/c ratios for the critical movement (i.e. the highest v/c ratio) for both the AM and PM peak hours. Calculated v/c ratios in excess of 0.90 or locations with LOS F are highlighted **(bolded**).

Table 22 shows that the northbound and southbound movements approaching the unsignalized intersections of Mayfield Road with Creditview Road and Heritage Road will operate at LOS F. Road users will experience long delays due to the difficulty in finding gaps within the Mayfield Road traffic stream. This type of operation often leads to safety concerns regarding driver acceptance of unsafe gaps in making turns.

Table 22 – Level of Service at Unsignalized Intersections on Mayfield Road for 2021 Future Conditions without Improvements to Mayfield Road

Unsignalized Intersection	Time Period	Critical Movement v/c Ratio	Critical Movement LOS
Creditview Road and Mayfield Road	AM Peak	**> 0.90 – NBL & SBL**	**F**
	PM Peak	**> 0.90 – NBL & SBL**	**F**
Heritage Road and Mayfield Road	AM Peak	**> 0.90 – NB & SB**	**F**
	PM Peak	**> 0.90 – NB & SB**	**F**

The intersections of Mayfield Road with Creditview Road and Heritage Road were analyzed to determine if traffic signal control is warranted by the year 2021. A methodology similar to the one described in **Section 3.5** was followed for the assessment. Future eight-hour traffic volumes for the year 2021 were estimated by applying the growth rates from **Table 20** to the existing volumes for the eight hours used in the warrant calculation. The AM, midday and PM peak period traffic volumes used in the analysis can be found in **Appendix C**.

Table 23 and **Table 24** summarize the results of the traffic signal warrant analysis for the intersections of Mayfield Road with Creditview Road and Heritage Road, respectively. The traffic signal warrant analysis sheets are provided in **Appendix C**. The tables show that the traffic signal warrants are met for both intersections based on projected 2021 weekday traffic volumes.

Table 23 – Signal Warrant Analysis for Creditview Road and Mayfield Road for 2021 Future Conditions

Justification	Compliance		Signal Justified	
			YES	No
1. Minimum Vehicular Volumes	A. Total Volumes	100%	YES	
	B. Crossing Volumes	100%		
2. Delay to Cross Traffic	A. Main Road	100%	YES	
	B. Crossing Road	100%		
3. Combination	A. Justification 1	100%	YES	
	B. Justification 2	100%		

Table 24 – Signal Warrant Analysis for Heritage Road and Mayfield Road for 2021 Future Conditions

Justification	Compliance		Signal Justified	
			YES	No
1. Minimum Vehicular Volumes	A. Total Volumes	100%		NO
	B. Crossing Volumes	90%		
2. Delay to Cross Traffic	A. Main Road	100%		NO
	B. Crossing Road	94%		
3. Combination	A. Justification 1	90%	YES	
	B. Justification 2	94%		

Table 25 summarizes the findings of the signalized intersection operations analyses for 2021 future condition without improvements to Mayfield Road. Heritage Road and Creditview Road have been included in this analysis on the basis of signalization being warranted at these intersections by 2021. The Synchro analysis worksheets are contained in **Appendix D**. This table provides the v/c ratios for the critical movement (i.e. the highest v/c ratio) and the overall intersection for both the AM and PM peak hours. Calculated v/c ratios in excess of 0.90 or locations with LOS F are highlighted **(bolded)**.

Table 25 – Level of Service at Signalized Intersections on Mayfield Road for 2021 Future Conditions without Improvements to Mayfield Road

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.80 – EBT & WBL	0.73	B
	PM Peak	0.81 – EBT & WBL	0.76	C
Creditview Road and Mayfield Road	AM Peak	**1.11 – EBT**	**0.92**	D
	PM Peak	**1.00 – WBT** **0.96 – EBT**	0.83	C
Mississauga Road and Mayfield Road	AM Peak	**1.36 – EBT**	**1.07**	**F**
	PM Peak	**0.96 – WBT** **1.00 – EBL**	0.85	C
Heritage Road and Mayfield Road	AM Peak	**1.39 – EBT** **1.21 – WBL**	**1.04**	**F**
	PM Peak	**1.04 – WBT** **0.91 – EBT**	0.82	D
Future Arterial – East of Winston Churchill Blvd	AM Peak	**1.58 – EBT**	0.88	**F**
	PM Peak	**1.31 – WBT** **0.98 – EBT**	0.74	**F**

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Winston Churchill Boulevard and Mayfield Road	AM Peak	**1.06 – EBT**	**0.92**	D
	PM Peak	**0.86 – WBT**	0.70	B

Table 25 illustrates that the signalized intersections at Mississauga Road and Heritage Road will have unacceptable LOS F operation during AM peak hour in 2021 future condition without improvements to Mayfield Road. The future north-south arterial, east of Winston Churchill Boulevard has unacceptable LOS F during both AM and PM peak hours. The overall v/c ratio exceeds the threshold of 0.90 for all intersections except for Chinguacousy Road and the future arterial road during AM peak. The v/c ratio for all through movements (eastbound and westbound) during AM and PM peak hours is higher than 0.90 with the exception at Chinguacousy Road, which has a v/c ratio of 0.8 and 0.81 for AM and PM peak respectively. Winston Churchill Boulevard also has a v/c ratio of 0.86 for PM peak hour.

The 2021 operations analysis of the AM and PM scenarios was revised to consider a consistent cycle length along Mayfield Road to provide progression during the peak hours. Advanced left-turns were added to left-turn movements that were found to be a v/c ratio greater than one. In addition, exclusive right-turn lanes were added at intersections where right turning traffic was greater than approximately 60 vehicles per hour (veh/h) to facilitate through movements along Mayfield Road. **Table 26** presents the operational results with these modifications exhibited in **Figure 36**. The overall intersection v/c ratio was found to be within the acceptable range except at Heritage Road where the v/c was found to be at the capacity, resulting in an unacceptable LOS E. All the critical movements in **Table 25** have been addressed except for the eastbound through movements at the intersections of Heritage Road, Winston Churchill and Future Arterial with Mayfield Road where the v/c ratio was found to exceed 0.90 during AM peak hour. Also, the WBL turning movement at Heritage Road was found to have a v/c of 1.19 during AM peak hour. The Synchro analysis worksheets are contained in **Appendix E**.

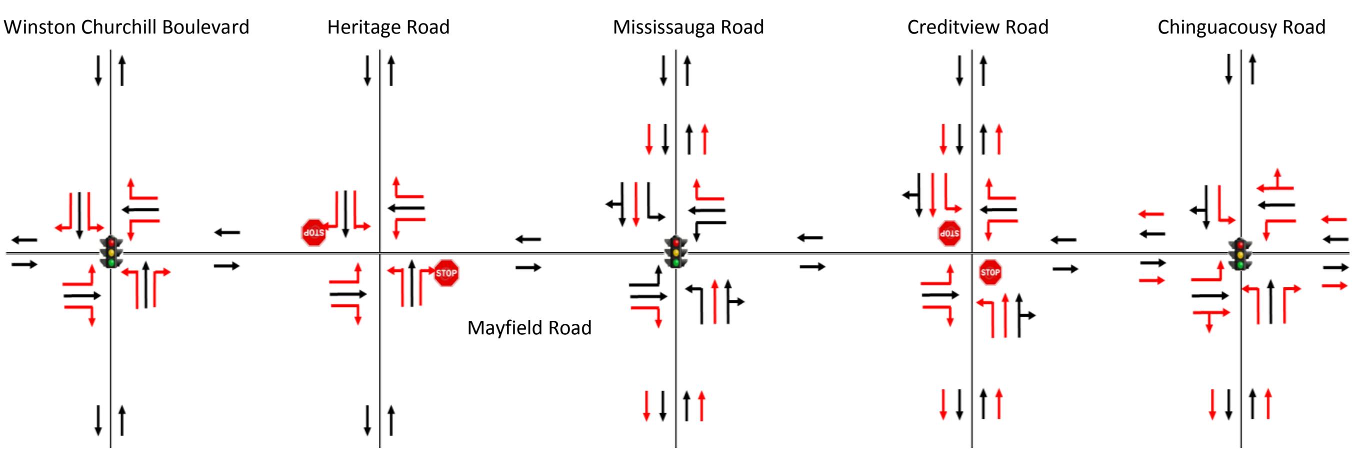


Figure 36 – Intersection Lane Configurations for 2021 Future Conditions with Intersection Improvements

Table 26 – Level of Service at Signalized Intersections on Mayfield Road for 2021 Future Conditions without Improvements to Mayfield Road and Revised Intersection Geometry and Signal Parameters

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.72 – EBT	0.66	B
	PM Peak	0.64 – EBT 0.69 – WBL	0.70	C
Creditview Road and Mayfield Road	AM Peak	0.82 – EBT	0.76	B
	PM Peak	0.75 – WBT	0.68	B
Mississauga Road and Mayfield Road	AM Peak	0.84 – WBL	0.83	C
	PM Peak	0.70 – WBT 0.75 – NBT	0.71	C
Heritage Road and Mayfield Road	AM Peak	**1.04 – EBT** **1.19 – WBL**	**1.00**	**E**
	PM Peak	0.67 – WBT	0.63	B
Future Arterial – East of Winston Churchill Blvd	AM Peak	**0.94 – EBT**	0.72	C
	PM Peak	0.85 – WBT	0.64	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	**0.93 – EBT**	0.83	C
	PM Peak	0.67 – WBT	0.63	B

The 95th percentile queues under 2021 traffic conditions were estimated to determine the length of auxiliary lanes for left and right turn movements at intersections. The 95th percentile queue is defined to be the queue length that has only a 5 percent probability of being exceeded during the analysis time period and it is a useful parameter for determining the design storage length. **Table 27** provides a comparison between the existing 2013 and the forecasted 2021 traffic condition with only one lane on each direction along Mayfield Road. Since the signal warrants were met in 2021 for the Heritage Road and Creditview Road intersections, these intersections were analyzed as signalized intersections in the 2021future condition. It is noted that in the *Mayfield Road Class EA study, from Heart Lake Road to Chinguacousy Road*, Mayfield Road will be widened to 4 lanes at Chinguacousy Road easterly to Heart Lake Road with dedicated turning lanes at intersections. This improvement was included in the Synchro network for the 2021 scenario with no improvements to Mayfield Road except revised intersection configuration including right-turn auxiliary lanes. Also, the signal timing phases were optimized to account for forecasted volumes and any intersection geometric changes.

The 95th percentile queue length comparison in **Table 27** confirms that except one movement, queues on Mayfield Road will be substantially longer by 2021. Only the westbound-through movement at Chinguacousy Road, due to the improved intersection geometry noted above, will have lower estimated queue lengths. The queue analysis from Synchro worksheets are contained in **Appendix E**.

The extended queuing by the 2021 horizon year will cause increased delay to drivers making either a left or right-turn movement at each intersection. By extending left and right-turn auxiliary lanes to the points where queuing ends, drivers will be able to enter these lanes with less delay. Extending the length of the auxiliary lanes will also reduce the queues in the through lanes. In addition, future new north-south collector roads with signalized intersections with Mayfield Road will require additional auxiliary lanes with a minimum storage length of 30 m for left and right turns (Peel Region's design requirements).

Table 27 – 95th Percentile Queue Length for existing 2013 and future 2021without improvements

Intersection	Movement	95th Percentile Queue Length (m)			
		2013 Existing		2021 with 2 Lane	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	EB Left	-	-	2.2	14.1
	EB Thru	**91.2**	68.6	**146.8**	127.5
	WB Left	-	-	38.7	53.5
	WB Thru	70.7	**#150.3**	31.6	**81.9**
Creditview Road and Mayfield Road	EB Left	-	-	2.5	4.2
	EB Thru	-	-	**215.8**	136.9
	EB Right	-	-	4.8	2.6
	WB Left	-	-	7.9	13.3
	WB Thru	-	-	84.6	**144.8**
	WB Right	-	-	2.1	3.8
Mississauga Road and Mayfield Road	EB Left	10.2	17.5	10.4	25.1
	EB Thru	**#137.2**	55.8	**190.5**	136.6
	EB Right	-	-	6.2	1.8
	WB Left	#35.4	9.3	#61	13
	WB Thru	42.1	**83.7**	84.8	**157.1**
	WB Right	-	-	3.2	5.5
Heritage Road and Mayfield Road	EB Left	-	-	0.6	1.8
	EB Thru	-	-	**#334.8**	92.7
	EB Right	-	-	9.9	0.5
	WB Left	-	-	#101	6.2
	WB Thru	-	-	104.5	**127.9**
	WB Right	-	-	0	0.3
Future Arterial – East of Winston Churchill Blvd	EB Thru	-	-	#312.2	81.8
	EB Right	-	-	1.5	1.1
	WB Left	-	-	4.6	2.3
	WB Thru	-	-	72.3	146.1
Winston Churchill Boulevard	EB Left	-	-	1.9	3

Intersection	Movement	95th Percentile Queue Length (m)			
		2013 Existing		2021 with 2 Lane	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
and Mayfield Road	EB Thru	**94.1**	36.3	**#312.5**	110.9
	EB Right	-	-	6.3	0.2
	WB Left	-	-	21.2	13
	WB Thru	22.9	**71.7**	76.1	**162.2**

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

Currently, the posted speed along Mayfield Road is 80 km/h, except for a 500 m section adjacent to the existing Alloa Public School, where a maximum speed of 60 km/h is posted and applicable all day. With the development of residential areas adjacent to Mayfield Road, it is expected the posted speeds will decrease over time and will be in the range of 60 – 70 km/h by 2021. At this posted speed, the design speed to determine an appropriate taper length for auxiliary lanes will be close to 80 km/h. Transportation Association of Canada's (TAC) Geometric Design guidelines indicate the minimum taper required for right and left-turns at this design speed and a minimum auxiliary lane width of 3.2 m, is 55 m and 50 m respectively. (TAC Geometric Design, Table 2.3.5.2 and Table 2.3.8.1).

Figure 37 indicates the queue length plus minimum required taper length at each signalized intersection. For existing intersections, a taper length of 50 m has been added to the through movement queue length during AM and PM peak hours. For new collectors and arterials, a minimum storage length of 30 m plus taper length of 50 m was considered.

From **Figure 37**, the projected queuing reach will not block any of the upstream intersections by 2021horizon year. At the proposed new arterial and collector road intersections, projected queuing can be accommodated with the proposed intersection spacing without blockage of upstream intersections. With the exception of Creditview Road and Mayfield Road, where the total queue length during signal phases may block Robert Parkinson Drive, the intersections will operate satisfactorily. However, when proposed new development adjacent to Mayfield Road occurs additional traffic will be generated/attracted to the area, resulting in increased queuing at the intersections that may contribute to blockage of upstream intersections. Greater use of Mayfield Road by trucks over the historical level assumed in this analysis may also occur by 2021. These factors would contribute to increased traffic and warrant a widening of Mayfield Road to 4 through traffic lanes.

While the through lane capacity under the 2021 projected traffic conditions appears adequate with just the provision of dedicated separate left and right turn lanes at intersections and protected and permitted traffic signal phases to accommodate the left turn movements, a widening of Mayfield Road to four through lanes between Chinguacousy Road and Winston Churchill Boulevard would be required shortly after 2021 based on potential development and increased truck use of the corridor. Given the uncertainty of when these changes may occur, it is recommended that Mayfield Road be widened to 4 through lanes between Chinguacousy Road and Winston Churchill Boulevard by 2021. Additional auxiliary turning lanes would also be provided at main intersections in the study area (**Figure 39**).

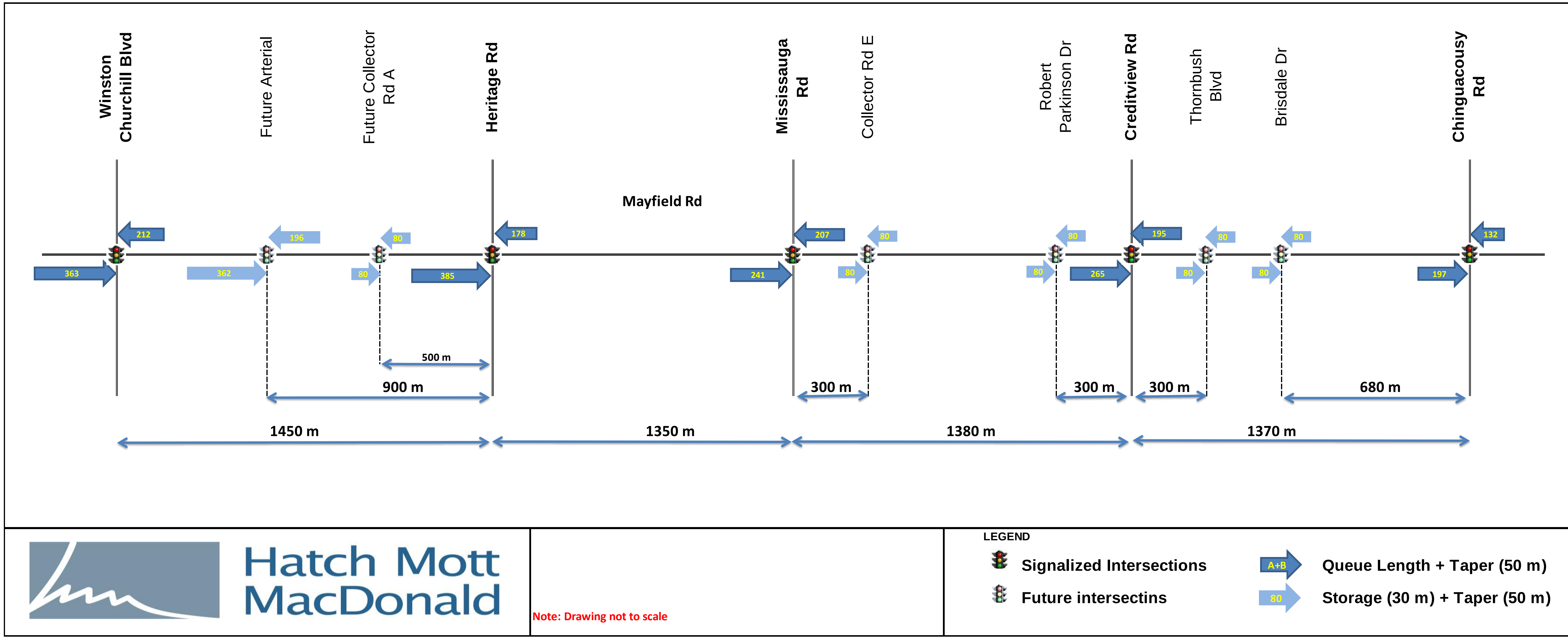


Figure 37 – Required Queue Length and Taper for 2021 Future Conditions without Improvements to Mayfield Road

Traffic operations were analyzed with the widening of Mayfield Road to 4 lanes to assess the implications of adding road capacity by the 2021 horizon year. Synchro network intersection and road configurations were updated with the added lanes along Mayfield Road as described in **Figure 38**. The analysis also assumes that the intersections of Mayfield Road with Creditview Road and Heritage Road will be signalized as a result of the signal warrant analysis in **Table 23** and **Table 24**.

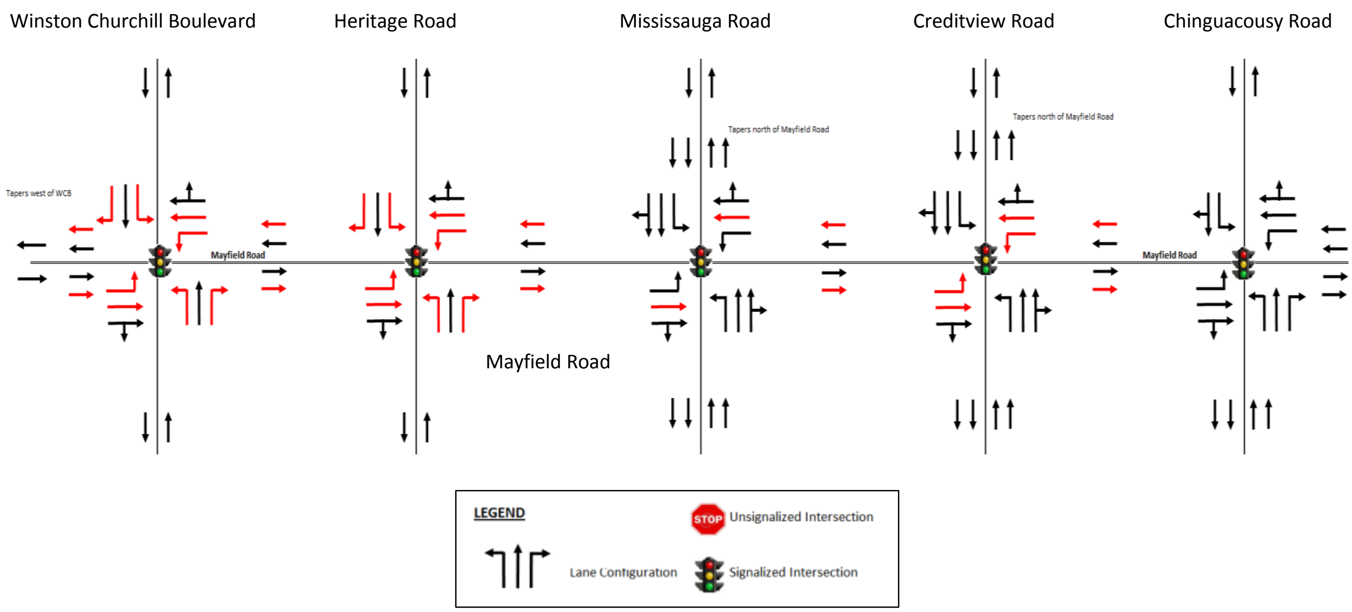


Figure 38 – Intersection Lane Configurations for 2021 Future Conditions with Widening of Mayfield Road to 4 Lanes

Table 28 summarizes the findings of the intersection analysis for this scenario from the detailed Synchro reports found in **Appendix F**.

Table 28 – Level of Service at Signalized Intersections on Mayfield Road for 2021 Future Conditions with Widening of Mayfield Road to 4 Lanes

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.71 – EBT	0.66	B
	PM Peak	0.68 – WBL	0.69	C
Creditview Road and Mayfield Road	AM Peak	0.47 – EBT	0.44	A
	PM Peak	0.44 – WBT	0.40	A
Mississauga Road and Mayfield Road	AM Peak	0.60 – EBT	0.62	C
	PM Peak	0.42 – WBT	0.48	B
Heritage Road and Mayfield Road	AM Peak	0.70 – EBT	0.59	C
	PM Peak	0.38 – WBT	0.37	A

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Future Arterial – East of Winston Churchill Blvd	AM Peak	0.68 – EBT	0.42	B
	PM Peak	0.65 – WBT	0.36	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	0.46 – EBT	0.45	A
	PM Peak	0.34 – WBT	0.36	A

The table indicates that all study area intersections will operate at good LOS and v/c ratios by 2021 horizon year after widening Mayfield Road to 4 lanes. Although the shared through - right turning lanes provide enough capacity to accommodate the traffic volume with an acceptable LOS, the shared lane configuration will increase the likelihood of rear-end collisions at the intersections. To improve the safety and reduce the number of potential accidents, it is recommended that dedicated right-turn lanes be provided at each intersection. Providing dedicated right turn lanes at each intersection may result in rear-end collisions being reduced by approximately 26%.[6]

Figure 39 provides recommended intersection lane configuration with dedicated right-turn lanes.

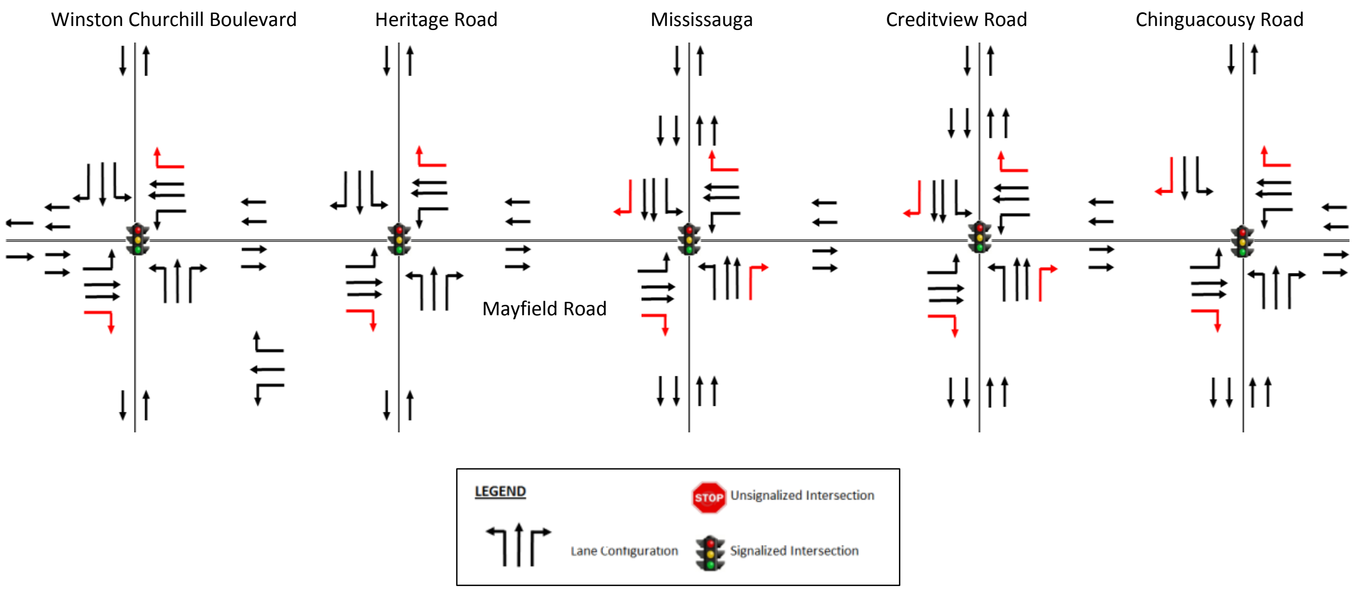


Figure 39 – Intersection Lane Configurations for 2021 Future Conditions with Dedicated Right-turn Lanes

4.3.3 2021 - 2031 Future Conditions – Midblock Analysis

Table 29 shows future AM peak direction (eastbound) midblock traffic volumes and v/c ratios along Mayfield Road for the year 2031 with Mayfield Road widened to 4 lanes (2 lanes per direction).

[6] www.cmfclearinghouse.org (Accessed March 3, 2016)

Table 29 – Midblock Capacity Analysis for Mayfield Road for 2031 Future Conditions

Section of Mayfield Road	Peak Direction Volume (vehicles per hour)	Peak Direction v/c Ratio (Capacity = 900 veh/lane)
Chinguacousy Road to Creditview Road	2,144	**1.19**
Creditview Road to Mississauga Road	1,970	**1.09**
Mississauga Road to Heritage Road	1,844	**1.02**
Heritage Road to Winston Churchill Boulevard	1,936	**1.08**

The table shows that the v/c ratio will be greater than 1.00 for all sections of Mayfield Road. According to the *Region of Peel Level of Service Policy*, Mayfield Road might be a candidate for widening to 6 lanes by 2031 from Chinguacousy Road to Winston Churchill Boulevard. To confirm whether a widening the entire roadway section is required, or whether the future traffic volumes can be accommodated by localized widening at intersections, a capacity and LOS analysis at main intersections was conducted.

4.3.4 2031 Future Conditions – Intersection Analysis

Future traffic operations at the five major intersections along Mayfield Road were analyzed using the 2031 total traffic volumes for the weekday AM and PM peak hours shown in **Figure 33** and **Figure 34**, respectively. For this analysis, the year 2021 Synchro network was updated with the 2031 traffic volumes and the widening of Mayfield Road to 4-lanes from Chinguacousy Road to Winston Churchill Boulevard.

Traffic operations were first analyzed with Mayfield Road as a 4-lane cross-section to assess the need to widen the road to 6-lanes as suggested in the LRTP. The intersection lane configurations for this scenario are shown in **Figure 40**. These configurations are the same as **Figure 38** (2021 future conditions) with the exception that Heritage Road was assumed to be four lanes south from Mayfield Road.

Table 30 summarizes the findings of the intersection analysis for this scenario. Detailed Synchro reports are provided in **Appendix G**.

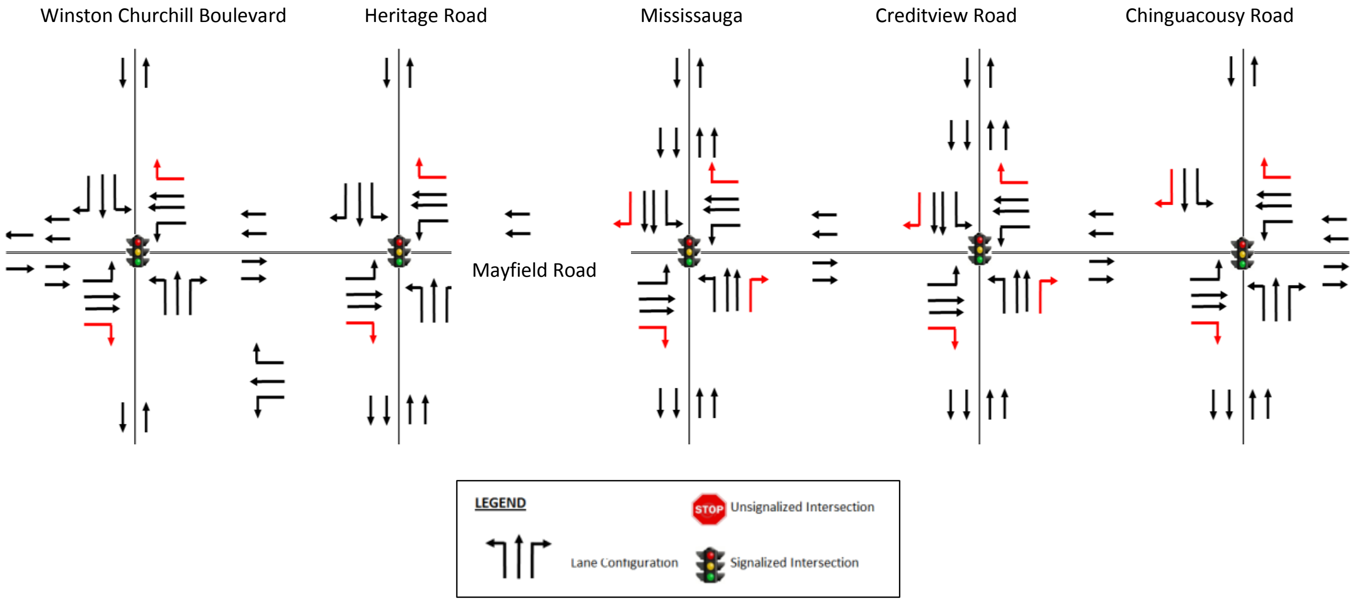


Figure 40 – Intersection Lane Configurations for 2031 Future Conditions with 4-Lane Mayfield Road

Table 30 – Level of Service at Signalized Intersections on Mayfield Road for 2031 Future Conditions with 4-Lane Mayfield Road

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	**0.92 – EBT 1.25 – WBL**	**1.16**	C
	PM Peak	**0.93 – EBT 1.26 – WBL**	**1.18**	D
Creditview Road and Mayfield Road	AM Peak	0.69 – EBT	0.65	B
	PM Peak	0.84 – EBT	0.74	B
Mississauga Road and Mayfield Road	AM Peak	**0.86 – EBT 1.24 –WBL 0.67 –NBL 0.79 –SBT**	**1.14**	D
	PM Peak	0.80 – WBT	0.78	C
Heritage Road and Mayfield Road	AM Peak	**0.82 – EBT 1.93 – WBL**	**1.56**	**E**
	PM Peak	0.61 – WBT	0.62	B
Future Arterial – East of Winston Churchill Blvd	AM Peak	0.84 – EBT	0.70	B
	PM Peak	0.73 – WBT	0.57	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	**0.81 – EBT**	0.85	C
	PM Peak	0.66 – WBL	0.73	C

Table 30 indicates that by 2031, with 4 through lanes on Mayfield Road, the intersections will perform with an overall intersection LOS D or better with the exception of Heritage Road, where LOS E operations are obtained. The overall v/c ratio will exceed 0.9 at Chinguacousy Road, Mississauga Road, and Heritage Road, particularly during the AM peak hour. In terms of critical movement's v/c ratio, all eastbound through movements along Mayfield Road during AM peak hour are less than 0.90, except for Chinguacousy Road. Due to high number of left turns during AM peak hour, westbound left turn v/c ratio at Chinguacousy Road, Mississauga Road and Heritage Road exceed 0.90. The WBL movement v/c ratios are equal to 1.25, 1.24 and 1.93 respectively at these locations.

The Synchro model for 2031 was revised to alleviate some of the deficiencies being identified in **Table 30**. The changes were mainly adding right-turn auxiliary lanes at intersections to facilitate the through movements and optimizing signal phases at each intersection. **Figure 40** illustrates the lane configuration used for the 2031 traffic analysis scenario, including separate right-turn auxiliary lanes at each intersection. **Table 31** provides updated LOS and v/c ratio performance measures with these changes applied to the subject intersections along Mayfield Road. Detailed Synchro reports are provided in **Appendix H**.

Table 31 – Level of Service at Signalized Intersections on Mayfield Road for 2031 Future Conditions with 4-lane cross-section and Revised Intersection Geometry and Signal Parameter

Signalized Intersection	Time Period	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	**0.99 – EBT** **0.95 – WBL**	0.90	C
	PM Peak	**0.98 – EBT** **1.10 – WBL**	**1.06**	D
Creditview Road and Mayfield Road	AM Peak	0.69 – EBT	0.65	B
	PM Peak	0.84 – EBT	0.74	B
Mississauga Road and Mayfield Road	AM Peak	**0.95 – EBT**	0.90	D
	PM Peak	0.80 – WBT	0.78	C
Heritage Road and Mayfield Road	AM Peak	**1.45 – WBL**	**1.18**	D
	PM Peak	0.62 – WBT	0.63	B
Future Arterial – East of Winston Churchill Blvd	AM Peak	0.84 – EBT	0.70	B
	PM Peak	0.73 – WBT	0.57	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	0.83 – EBT	0.78	C
	PM Peak	0.78 – WBL	0.74	B

Table 31 illustrates that with these modifications, all intersections on Mayfield Road will operate with an acceptable overall LOS D or better under 2031 future conditions. In terms of overall v/c ratios, most intersections will experience a ratio equal or less than 0.90 during both AM and PM peak periods. The exceptions are Chinguacousy Road (1.06 during the PM peak), and Heritage Road (1.18 during the AM peak). A number of the through and left turn movements will operate with high v/c ratios. The westbound left turns and eastbound through movements at Chinguacousy Road have slightly higher v/c ratio during both AM and PM peak hours. The eastbound through movement at Mississauga Road and Mayfield Road and westbound left turn at Heritage Road and Mayfield Road have high v/c ratios during the AM peak hours (0.95 and 1.45 respectively). These findings indicate a need to widen Mayfield Road to 6 through lanes in the area of the Chinguacousy Road intersection and the Mississauga Road intersection.

The 95th percentile queues were evaluated for future conditions to determine the required length of auxiliary lanes for left and right turns at intersections. The results are presented in **Table 32**.

Table 32 – 95th Percentile Queue Length for future 2021 and 2031 with 4 lanes and improvements at intersections

Intersection	Movement	95th Percentile Queue Length (m)			
		2021 with 4 Lane		2031 with 4 Lane	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	EB Left	2.2	14.1	2.8	24.2
	EB Thru	**146.8**	127.5	**#267.2**	#241.5
	EB Right	-	-	24.8	28.6
	WB Left	36.6	51	#97.8	#134.7
	WB Thru	31.6	**81.9**	70	**127.6**
	WB Right	-	-	1.9	8
Creditview Road and Mayfield Road	EB Left	2.5	3.9	3	3.7
	EB Thru	**54.7**	39.4	120.7	**169.5**
	EB Right	-	-	6.2	1.2
	WB Left	6.1	11.6	#28.4	#34.4
	WB Thru	30.8	**41.6**	65.2	**135.5**
	WB Right	-	-	2.6	3.5
Mississauga Road and Mayfield Road	EB Left	18.6	23.4	12.5	#51.1
	EB Thru	**113.1**	54.4	**#228**	183.9
	EB Right	-	-	2.6	0
	WB Left	18.6	13.7	#68.9	#39.1
	WB Thru	42.5	**62.4**	88.2	**171.2**
	WB Right	-	-	0.2	4.5
Heritage Road and Mayfield Road	EB Left	0.6	1.8	0.8	3.8
	EB Thru	**138.8**	31.1	**#210**	92.7

Intersection	Movement	95th Percentile Queue Length (m)			
		2021 with 4 Lane		2031 with 4 Lane	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
	EB Right	-	-	13.3	5.1
	WB Left	48.4	6.1	#164.3	25.1
	WB Thru	41.7	38.5	72.7	**118.2**
	WB Right	-	-	0	1
Future Arterial – East of Winston Churchill Blvd	EB Thru	69.3	40.6	182.3	67.1
	EB Right	-	-	6.2	3.5
	WB Left	3.4	3.3	17.3	14.3
	WB Thru	29.5	58.3	35	109.1
Winston Churchill Boulevard and Mayfield Road	EB Left	1.9	3.2	2.9	7.6
	EB Thru	**57.4**	27.9	**200.7**	64
	EB Right	-	-	19	7
	WB Left	13.3	16.2	#60.7	#96.6
	WB Thru	19.8	**34.4**	48.7	**103.1**
	WB Right	-	-	0	0.3

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

Table 32 indicates that queue lengths increase from 2021 to 2031 with Mayfield Road remaining as a roadway with 4 basis through lanes. By extending left and right-turn auxiliary lanes to the end points of queuing, drivers will be able to enter the left or right turn lanes with less delay. It is expected that the future posted speed will be in the range of 60-70 km/h by 2031. At a design speed of 80 km/h, the minimum taper required for an auxiliary lane with a width of 3.2 m is 50 m (TAC Geometric Design, Table 2.3.5.2 and Table 2.3.8.1).

Figure 41 shows the queue length including minimum required taper length at each signalized intersection. For new collectors and arterials, a minimum storage length of 30 m plus taper length of 50 m was assumed. The GTA West Corridor Planning and Environmental Assessment Study noted that interchanges with the GTAW corridor are anticipated at major arterial roads including Mayfield Road. The Preliminary Preferred Network assumes this interchange approximately halfway between Heritage Road and Mississauga Road, with the possibility of signalized ramp terminals on either side of the freeway corridor. The presence of extensive queuing at all intersections along Mayfield Road requires lengthy widening to incorporate auxiliary left and right-turns at intersections. Also, the higher traffic volume-to-capacity ratios will cause higher travel time and higher delay to commuters along Mayfield Road.

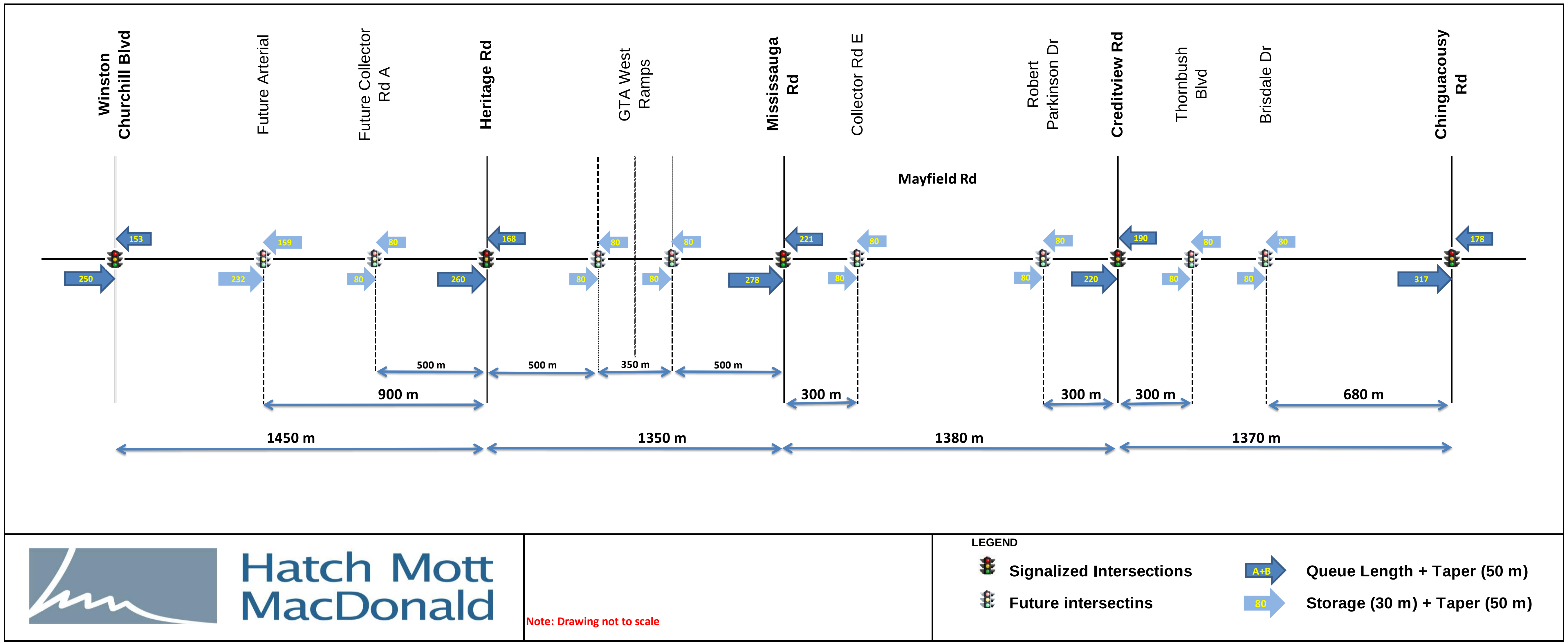


Figure 41 – Required Queue Length and Taper for 2031 Future Conditions without Improvements to Mayfield Road

Figure 41 shows the projected queue reach in horizon year 2031. With improvements at intersections, queues will not block upstream intersections at most locations on Mayfield Road. Only two sections have been identified as having queue blockage potential. The intersection spacing on the east and west sides of Creditview Road where two new north – south arterials (Robert Parkinson Drive and Thornbush Boulevard) are proposed, will not be sufficient to accommodate the projected queuing. In addition, with the construction of new GTA West corridor, the section between Heritage Road and Mississauga Road will create new intersections that are too closely spaced to accommodate the projected queues. It is conceivable that with new GTA West corridor, additional trips will be attracted to its ramp terminals on Mayfield Road. With new GTA West ramp terminals, the queue length will fill up the space among them and will block the adjacent intersections. It has been concluded therefore that a widening of Mayfield Road to include 6 through lanes in the sections from Chinguacousy Road to at west of the west ramp terminal at the proposed GTA West corridor is required to accommodate the future traffic volumes.

4.4 Roundabout Feasibility

Prior to initiating this Class EA study, Region of Peel staff completed roundabout feasibility analysis and pre-screening of all intersections along the Mayfield Road corridor. This high-level assessment was done using a number of factors including intersection spacing and traffic volumes. It was concluded that traffic signals were the preferred method of control at Chinguacousy Road, Creditview Road and Mississauga Road. However, roundabouts may be an appropriate form of control at Heritage Road and Winston Churchill Boulevard, subject to further more detailed operational assessment at these locations.

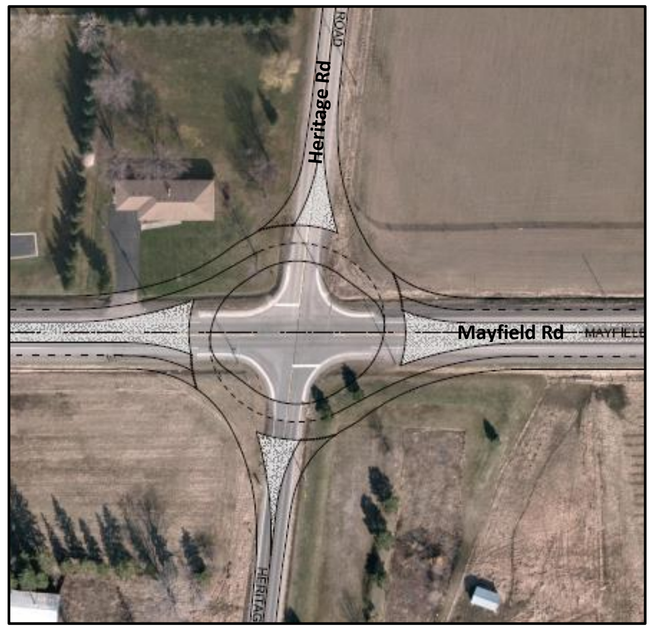
As noted above, the most recent version of the draft Heritage Heights Transportation Master Plan proposes the extension of Sandalwood Parkway as a major arterial road to connect with Mayfield Road between Heritage Road and Winston Churchill Boulevard. Given the proximity of this proposed intersection to both Heritage Road and Winston Churchill Boulevard, it may also be desirable/preferable to implement a roundabout at a proposed new arterial road intersection with Mayfield Road located approximately midway between Winston Churchill Boulevard and Heritage Road. The following sections detail the analysis of roundabouts at these three locations for the 2021 and 2031 horizon years.

The roundabout configurations presented below are preliminary in nature and subject to refinement through the design process. The sketches are intended to illustrate general design concepts, highlight potential issues (e.g. property requirements) and provide sufficient detail to facilitate the capacity and operational analysis using ARCADY (Junctions 8). It is acknowledged that the design will be further detailed through subsequent stages of the study and checked for truck turning, entry angles, fastest path, sight triangles and vehicle path overlap, in addition to provision of speed control measures on the approaches.

4.4.1 2021 Future Conditions

For the 2021 horizon, roundabout concepts were developed for Heritage Road and Winston Churchill Boulevard featuring an inscribed circle diameter of 60 m and two circulating lanes, with 2-lane approaches for Mayfield Road (4-lane cross section) and 1-lane entries for the intersecting north-south arterial roads. **Figure 42** illustrates the proposed roundabout configurations for the intersections.

Winston Churchill Boulevard and Mayfield Road



Heritage Road and Mayfield Road

Figure 42 – Preliminary Roundabout Configurations for 2021 Future Conditions

The 2021 total traffic volumes for the weekday AM and PM peak hours used for this analysis are shown in **Figure 27** and **Figure 28** respectively. **Table 33** summarizes the findings of the roundabout analysis for this scenario from the detailed ARCADY (Junctions 8) reports found in **Appendix I**. The table provides the v/c ratios for the critical movement (i.e. the highest v/c ratio) and the overall intersection for both the AM and PM peak hours. Calculated v/c ratios in excess of 0.90 or locations with LOS F are highlighted **(bolded)**.

Table 33 – Level of Service at Proposed Roundabouts on Mayfield Road for 2021 Future Conditions

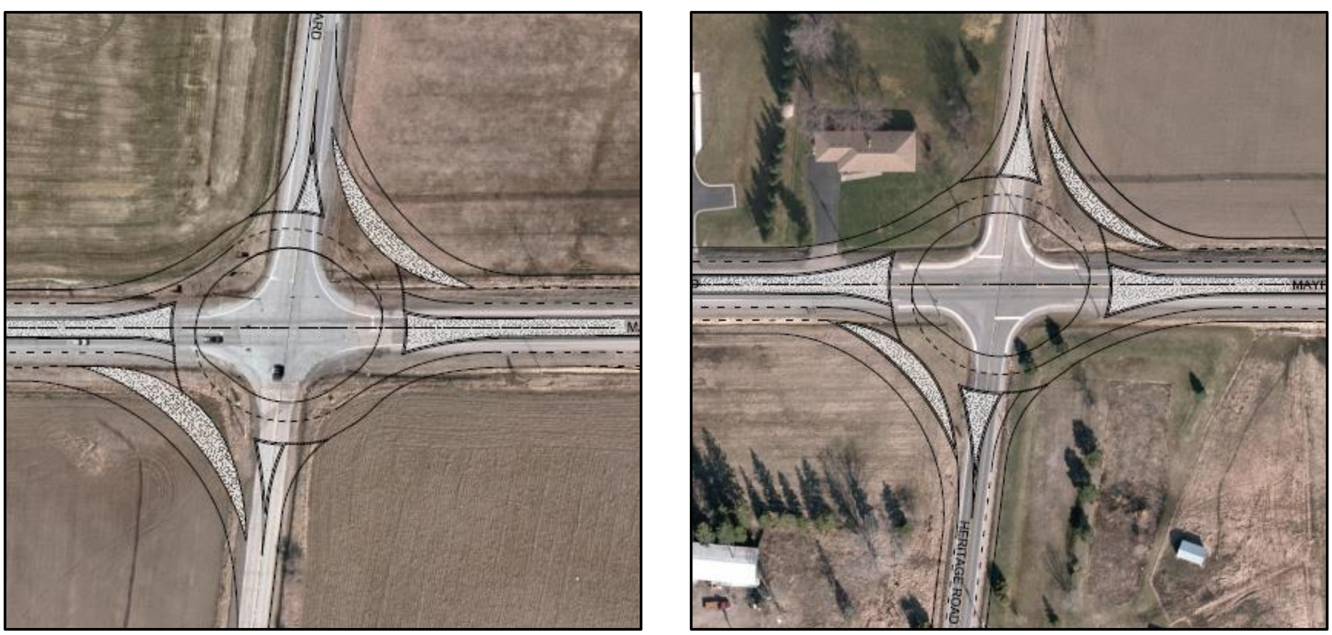
Intersection	Time Period	Critical Movement v/c Ratio	Approach LOS
Heritage Road and Mayfield Road	AM Peak	Eastbound – 0.59	A
	PM Peak	Westbound – 0.46	A
Future Arterial and Mayfield Road	AM Peak	Eastbound – 0.53	A

Intersection	Time Period	Critical Movement v/c Ratio	Approach LOS
	PM Peak	Westbound – 0.43	A
Winston Churchill Boulevard and Mayfield Road	AM Peak	Eastbound – 0.62	A
	PM Peak	Westbound – 0.50	A

The table illustrates that two-lane roundabouts would function acceptably with 2021 future traffic volumes, operating at LOS A during both the AM and PM peak hours, respectively. The roundabout approaches would operate below capacity with no v/c ratios exceeding 0.62.

4.4.2 2031 Future Conditions

For the 2031 horizon, it was assumed that Mayfield Road would be widened to a 4-lane cross section within the area between Winston Churchill Boulevard and Heritage Road. The Region has proposed providing two circulating lanes, with 2-lane approaches and right-turn by-pass lanes for Mayfield Road. The concepts provide one-lane entries for the intersecting north-south arterial roads, with the exception of the south leg of Heritage Road, which would have a two-lane approach upon entry. **Figure 43** illustrates the proposed roundabout configurations for the intersections. These concepts were initially tested without the provision of separate right-turn lanes. Use of these lanes was considered on a case-by-case basis during the analysis.



Winston Churchill Boulevard and Mayfield Road *Heritage Road and Mayfield Road*

Figure 43 – Preliminary Roundabout Configurations for 2031 Future Conditions

The 2031 total traffic volumes for the weekday AM and PM peak hours used for this analysis are shown in **Figure 33** and **Figure 34**, respectively. **Table 34** summarizes the findings of the roundabout analysis for this scenario from the detailed ARCADY (Junctions 8) reports found in **Appendix I**.

Table 34 – Level of Service at Proposed Roundabouts on Mayfield Road for 2031 Future Conditions

Intersection	Time Period	Critical Movement v/c Ratio	Approach LOS
Heritage Road and Mayfield Road	AM Peak	Eastbound – **0.97**	D
	PM Peak	Southbound – **0.90**	**F**
Future Arterial and Mayfield Road	AM Peak	Eastbound – 0.83	A
	PM Peak	Westbound – 0.72	A
Winston Churchill Boulevard and Mayfield Road	AM Peak	Eastbound – **1.02**	**F**
	PM Peak	Westbound – 0.85	B

The table illustrates that the eastbound approach at Heritage Road would operate at LOS D in the AM peak hour and the northbound approach at LOS F in the PM peak hour. The eastbound approach at Winston Churchill Boulevard would operate at LOS F during the AM peak hour and the westbound approach at LOS B during the PM peak hour. Otherwise, the remaining approaches to the intersection of the future arterial road are expected to operate at LOS A. All movements would operate below capacity with v/c ratios of 0.82 or less on all approaches.

4.4.3 Microscopic Traffic Simulation Analysis

A microscopic traffic simulation (micro-simulation) model of the Mayfield Road corridor from Heritage Road to Winston Churchill Boulevard was developed in VISSIM to assess traffic operations with the proposed roundabouts during the critical AM peak hour. Two scenarios were examined:

- 2021 Total Traffic Volumes (**Figure 27**) with 4-lane Mayfield Road (Scenario A)
- 2031 Total Traffic Volumes (**Figure 33**) with 4-lane Mayfield Road (Scenario B)

The conceptual intersection configurations shown in **Figure 42** and **Figure 43** were used for the modeling exercise. Similarly, the projected traffic volumes noted above and commercial vehicle compositions described in **Section 3.3.3** were input into the model.

Table 35 summarizes the measures of effectiveness extracted from VISSIM for each micro-simulation model scenario. Measures are stated for each approach and the overall intersection in terms of delay, average queue length and maximum queue length based on the average results of five micro-simulation runs.

Table 35 – Measures of Effectiveness for Proposed Roundabouts on Mayfield Road

Intersection	Approach	Scenario A – 2021 AM Peak Hour with 4 Lanes on Mayfield Road			Scenario B – 2031 AM Peak Hour with 4 Lanes on Mayfield Road		
		Delay (s)	Ave. Queue (m)	Max. Queue (m)	Delay (s)	Ave. Queue (m)	Max. Queue (m)
Heritage Road and Mayfield Road	NB	4.6	0.0	0.0	10.2	0.0	0.0
	SB	13.3	0.0	0.0	23.8	0.0	0.0
	EB	10.6	0.6	49.0	**73.8**	452.5	>500.0
	WB	5.9	0.0	0.0	13.4	0.2	45.3
	Overall	**8.7**	**0.2**	**49.0**	**42.9**	**113.2**	**>500.0**
Future Arterial and Mayfield Road	NB	14.3	0.0	0.0	**82.8**	0.3	9.1
	EB	7.2	0.0	0.0	**73.3**	258.2	>500.0
	WB	2.7	0.0	0.0	1.3	0.0	0.0
	Overall	**5.7**	**0.0**	**0.0**	**46.1**	**86.2**	**>500.0**
Winston Churchill Boulevard and Mayfield Road	NB	24.6	0.0	0.0	**144.0**	20.1	143.8
	SB	15.0	0.0	0.0	30.1	0.0	0.0
	EB	9.5	0.0	0.0	**67.3**	320.8	>500.0
	WB	1.4	0.0	0.0	7.6	0.0	0.0
	Overall	**8.2**	**0.0**	**0.0**	**51.2**	**85.2**	**>500.0**

The table indicates that all roundabout approaches will operate with minimal delay and queuing during the AM peak hour with 2021 traffic volumes (Scenario A). Traffic conditions would deteriorate between 2021 and 2031 if Mayfield Road remains 4-lanes (Scenario B), but would continue to be acceptable for most intersection approaches, with the northbound Winston Churchill Boulevard and proposed new arterial road intersection approaches at Mayfield Road experiencing the greatest delays (at 144.0 and 82.8 seconds respectively). A maximum queue reach of 143.8m was obtained for the northbound Winston Churchill Boulevard approach to Mayfield Road. The eastbound Mayfield Road approaches at Heritage Road, the new arterial road and Winston Churchill Boulevard will experience significant delays (at 73.8, 73.3 and 67.3 seconds respectively) and maximum queue reach beyond 500m for all there eastbound intersection approaches.

Table 36 summarizes delay and queue length on each approach and overall performance for the three intersections operating under traffic signal control and as roundabouts. The overall intersection delay under roundabout control for the Winston Churchill Boulevard and new arterial road intersections is higher than if these intersections operate under traffic signal control. The Heritage Road intersection will operate with slightly lower vehicle delay under roundabout control. Comparing the projected queue length, the analysis indicates that there will be extensive queuing on the eastbound approaches at all three intersections operating under roundabout control in the morning peak hour. This queuing is due to relatively high through and left turn movements conflicting with the eastbound though movements. Overall, it was concluded that the intersections will operate at satisfactory levels of service and delay under roundabout control for the 2021 traffic conditions but not for the 2031 traffic conditions with long queues being experienced on the eastbound approach during the AM peak hour. Roundabout capacity and level of service at the three intersections can be improved by providing separate right turn bypass lanes for the high-volume right turn movements; and/or providing opportunities for vehicles to make ‘U”-turns before and after the roundabouts to reduce the number of the left turn – through movement conflicts. Analysis of these measures has confirmed that satisfactory operations are possible under roundabout control, however, there are a number of factors in addition to capacity that must be considered in deciding the most appropriate form of intersection control. These factors include safety, construction and maintenance cost, property requirements and environmental factors, and are considered further in **Section 4.6.3**.

As indicated in **Table 36**, traffic signal control for these intersections could accommodate projected traffic volumes satisfactorily for both the 2021 and 2031 horizons.

Table 36 – Queue and Delay Comparison – Signals versus 2-lane Roundabout

Intersection	Approach	Signalized			Roundabout		
		Delay (s)	50th Queue (m)	95th Queue (m)	Delay (s)	Ave. Queue (m)	Max. Queue (m)
Heritage Road and Mayfield Road	NB	40.6	1.1	3.5	10.2	0.0	0.0
	SB	41.2	8.4	15.1	23.8	0.0	0.0
	EB	28.6	173.6	#210	73.8	452.5	>500.0
	WB	86	40.3	72.7	13.4	0.2	45.3
	Overall	**51.9**	**55.8**	**75.3**	**42.9**	**113.2**	**>500.0**
Future Arterial and Mayfield Road	NB	41.6	7.2	16.6	82.8	0.3	9.1
	EB	20.5	151.3	182.3	73.3	258.2	>500.0
	WB	7.6	28	35	1.3	0.0	0.0
	Overall	**17.1**	**62.1**	**78**	**46.1**	**86.2**	**>500.0**
Winston Churchill Boulevard and Mayfield Road	NB	46.3	5.2	12.8	144.0	20.1	143.8
	SB	49.5	27.1	45.1	30.1	0.0	0.0
	EB	22.4	147.3	200.7	67.3	320.8	>500.0
	WB	18	21	48.7	7.6	0.0	0.0
	Overall	**24.2**	**50.1**	**76.8**	**51.2**	**85.2**	**>500.0**

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

4.5 Storage Lane Requirements for Intersections

The storage lane requirements for the five major intersections on Mayfield Road were determined assuming traffic signal control, based on the estimated 95th percentile queue lengths shown in **Table 37**. The queue length of each turning movement for future conditions was determined from the Synchro analysis output sheets provided in **Appendix J**. This analysis was completed assuming Mayfield Road is widened to 6 lanes from Chinguacousy Road to west of Mississauga Road, and to four lanes from west of Mississauga Road to Winston Churchill Boulevard.

Table 37 – 95th Percentile Queue Lengths for Intersections on Mayfield Road

Intersection	Movement	95th Percentile Queue Length (m)			
		2021 with 4 Lane		2031 with 6 Lane from west of Mississauga Road to the east	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	EB Left	2.2	14.1	3.1	#32.3
	EB Right	-	-	-	-
	WB Left	36.6	51	#82	#111.4
	WB Right	-	-	-	-
	NB Left	20.1	43.6	22.3	#61.4
	NB Right	17.1	15.9	18.4	18.3
	SB Left	8.4	11.1	10.1	15.3
Creditview Road and Mayfield Road	EB Left	2.5	3.9	3.1	3.7
	EB Right	-	-	-	-
	WB Left	6.1	11.6	#27.7	22.4
	WB Right	-	-	-	-
	NB Left	15.6	13.1	16.7	15.5
	NB Right	-	-	27.5	11.3
	SB Left	13.1	10.6	15.2	13.7
	SB Right	-	-	7.1	0
Mississauga Road and Mayfield Road	EB Left	18.6	23.4	12.5	35.3
	EB Right	-	-	-	-
	WB Left	18.6	13.7	#68.9	26.5
	WB Right	-	-	-	-
	NB Left	12.3	14.3	#29.4	26
	NB Right	-	-	0	34.5
	SB Left	25.6	13.1	34.5	16.1
	SB Right	-	-	24.1	8.6
Heritage Road and Mayfield	EB Left	0.6	1.8	0.8	3.8

Intersection	Movement	95th Percentile Queue Length (m)			
		2021 with 4 Lane		2031 with 6 Lane from west of Mississauga Road to the east	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Road	EB Right	-	-	13.3	5.1
	WB Left	48.4	6.1	#164.3	25.1
	WB Right	-	-	0	1
	NB Left	5.8	16	11.4	32.4
	NB Right	0	14.2	0	59.2
	SB Left	4.5	4.7	5.3	6.4
	SB Right	0	0	0	0
Future Arterial – East of Winston Churchill Blvd	EB Right	-	-	6.2	3.5
	WB Left	3.4	3.3	17.3	14.3
	NB Left	3.1	4.4	16.6	28.1
	NB Right	3.4	4.4	11.9	22.9
Winston Churchill Boulevard and Mayfield Road	EB Left	1.9	3.2	2.9	7.6
	EB Right	-	-	19	7
	WB Left	13.3	16.2	#60.7	#96.6
	WB Right	-	-	0	0.3
	NB Left	12.9	21	25	45.4
	NB Right	9.6	10.7	16.6	36.4
	SB Left	7.5	3.5	9.1	4
	SB Right	3.7	4.2	0	6.3

The Region of Peel requires a minimum storage length of 30m for left and right turn auxiliary lanes. **Table 38** provides the recommended storage lane lengths for any auxiliary lanes at the five major intersections exceeding the minimum length. All other storage lane lengths would be 30m as per the Region's policy. Although, in few locations, the traffic analysis indicated that dedicated right turn lanes were not required from a capacity perspective, the Region of Peel should consider providing right-turn storage lanes at all major intersections within the Study Area. Auxiliary lanes offer important safety and operational benefits provided the works are constructed appropriately.

Table 38 – Recommended Storage Lane Lengths for Intersections on Mayfield Road

Intersection	Movement	Recommended Storage Lane Length (m)	
		2021	2031
Chinguacousy Road and Mayfield Road	EB Left	35	35
	WB Left	60	120

Intersection	Movement	Recommended Storage Lane Length (m)	
		2021	2031
	NB Left	50	65
	SB Left	30	30
Creditview Road and Mayfield Road	WB Left	30	30
	NB Left	30	30
	SB Left	30	30
Mississauga Road and Mayfield Road	EB Left	35	35
	WB Left	30	70
	NB Left	30	30
	SB Left	35	35
Heritage Road and Mayfield Road	WB Left	50	170
	NB Left	30	30
Winston Churchill Boulevard and Mayfield Road	WB Left	30	100
	NB Left	30	45

4.6 Other Relevant Factors

In consideration of the capacity and operation of roadway segments and intersections along the corridor, a number of assumptions were made to complete the analysis as presented above. Since there is some uncertainty surrounding some of these parameters and assumptions, sensitivity analyses and investigations were undertaken to assist in the identification of the preferred roadway widening and intersection design concept. The following questions have been examined further and are discussed in this section:

- What would be the effect upon traffic operations and capacity if the truck composition was higher than the assumed 5 percent level?
- What would be the effect to capacity and traffic operations arising from the implementation of the GTA West freeway facility have upon corridor capacity and operations?
- What form of traffic control should be used for the Heritage Road and Winston Churchill Boulevard intersections with Mayfield Road? How will changing truck composition or the GTA West implementation affect this decision?

4.6.1 Changes in Truck Composition

A sensitivity analysis was undertaken to investigate the effects upon future traffic operations resulting from truck composition increasing to 15% by horizon year 2031 in the study area from the existing 5 percent. This analysis has been performed in two steps that assume a truck composition of 10 and 15 percent for horizon year 2021 and 2031 respectively. It also assumed that traffic signal control is used at all five intersections in the corridor.

For the 2021 horizon year, a lower truck composition of 10 percent has been assumed to accommodate reasonable growth from a level of around 5 percent for existing condition. The 2021 year operations analysis was updated to reflect an increased truck composition of 10 percent for turning movements where the truck percentage was less than 10 percent. **Table 39** shows the intersection operational performance before and after increasing the truck composition to 10 percent.

Table 39 – 2021 Horizon Year Capacity Comparison with 10% Truck Composition

Signalized Intersection	Time Period	Regular Truck Composition			10% Truck Composition		
		Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.72 – EBT	0.66	B	0.77 – EBT	0.70	C
	PM Peak	0.64 – EBT 0.69 – WBL	0.70	C	0.69 – EBT 0.72 – WBL	0.73	C
Creditview Road and Mayfield Road	AM Peak	0.82 – EBT	0.76	B	0.88 – EBT	0.81	B
	PM Peak	0.75 – WBT	0.68	B	0.78 – WBT	0.72	B
Mississauga Road and Mayfield Road	AM Peak	0.84 – WBL	0.83	C	0.85 – WBL	0.85	C
	PM Peak	0.70 – WBT 0.75 – NBT	0.71	C	0.75 – WBT 0.77 – NBT	0.76	C
Heritage Road and Mayfield Road	AM Peak	**1.04 – EBT** **1.19 – WBL**	**1.00**	**E**	**1.09 – EBT** **1.36 – WBL**	**1.14**	**E**
	PM Peak	0.67 – WBT	0.63	B	0.71 – WBT	0.66	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	**0.93 – EBT**	0.83	C	**1.01 – EBT**	0.90	D
	PM Peak	0.67 – WBT	0.63	B	0.72 – WBT	0.68	B

Table 39 indicates that the increase in truck composition will contribute to a slight increase in overall intersection v/c ratio. The Overall intersection LOS remains the same except for Chinguacousy Road and Winston Churchill Boulevard intersection where the LOS has deteriorated to LOS C and D from LOS B and C respectively.

Table 40 provides a comparison of the 95th percentile queue lengths in horizon year 2021 for a 5 and 10 percent truck composition.

Table 40 - 95th Percentile Queue Length for future 2021 – Regular vs. 10% Truck

Intersection	Movement	95th Percentile Queue Length (m)			
		5% Truck Composition		10% Truck Composition	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	EB Left	2.2	14.1	2.3	14.5
	EB Thru	**146.8**	127.5	**155.6**	132.1
	WB Left	38.7	53.5	40.3	57.8
	WB Thru	31.6	**81.9**	32.1	**85.2**
Creditview Road and Mayfield Road	EB Left	2.5	4.2	2.5	4.3
	EB Thru	**215.8**	136.9	**#290.4**	154.2
	EB Right	4.8	2.6	4.8	2.7
	WB Left	7.9	13.3	8	15.1
	WB Thru	84.6	**144.8**	88	**164.6**
	WB Right	2.1	3.8	2.1	3.9
Mississauga Road and Mayfield Road	EB Left	10.4	25.1	10.9	27.2
	EB Thru	**190.5**	136.6	**221.5**	147.7
	EB Right	6.2	1.8	6.4	1.8
	WB Left	#61	13	#63	13.2
	WB Thru	84.8	**157.1**	91.4	**174**
	WB Right	3.2	5.5	3.3	5.5
Heritage Road and Mayfield Road	EB Left	0.6	1.8	0.6	1.8
	EB Thru	**#334.8**	92.7	**#346.1**	94.9
	EB Right	9.9	0.5	9.7	0.5
	WB Left	#101	6.2	#108.3	6.5
	WB Thru	104.5	**127.9**	106	**143.3**
	WB Right	0	0.3	0	0.2
Winston Churchill Boulevard and Mayfield Road	EB Left	1.9	3	1.9	3.1
	EB Thru	**#312.5**	110.9	**#335.9**	115.25
	EB Right	6.3	0.2	6.5	0.1
	WB Left	21.2	13	22.2	13.5
	WB Thru	76.1	**162.2**	79.2	**180.3**

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

Table 40 illustrates that the higher truck composition of 10 percent will increase the queue lengths at intersections on Mayfield Road by approximately 9 to 23 meters. The one exception to this is the eastbound through movement at the Creditview Road intersection where the difference is estimated to be 74 meters during AM Peak hour. The existing truck composition for this movement is 3 percent.

The 2031 horizon year operations analysis was updated to evaluate the effects of an increase in truck composition to 15 percent. **Table 41** provides the intersection operational performance under these conditions. Except for the intersections of Winston Churchill Boulevard, Mississauga Road, and Creditview Road, the LOS was found to deteriorate one level during one of the AM and PM peak hours.

Table 41 – Proposed 2031 Horizon Year on Mayfield Road (6 Lanes East of Mississauga Road) Capacity Comparison with 15% Truck Composition

Signalized Intersection	Time Period	5 % Truck Composition			15% Truck Composition		
		Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Chinguacousy Road and Mayfield Road	AM Peak	0.80 – EBT 0.83 – WBL	0.80	C	0.89 – EBT 0.89 – WBL	0.85	C
	PM Peak	0.85 – EBT 0.89 – WBL	0.90	C	**0.97 – EBT** **0.95 – WBL**	**0.95**	D
Creditview Road and Mayfield Road	AM Peak	0.51 – EBT	0.51	A	0.57 – EBT	0.55	A
	PM Peak	0.65 – EBT	0.58	B	0.72 – EBT	0.65	B
Mississauga Road and Mayfield Road	AM Peak	0.82 – WBL	0.84	C	**0.88 – WBL** **0.91 – SBT**	**0.91**	C
	PM Peak	0.61 – EBT	0.64	C	0.69 – EBT	0.71	C
Heritage Road and Mayfield Road	AM Peak	**1.45 – WBL**	**1.18**	D	**1.62 – WBL** **0.98 – EBT**	**1.32**	**E**
	PM Peak	0.62 – WBT	0.63	B	0.69 – WBT	0.70	B
Winston Churchill Boulevard and Mayfield Road	AM Peak	0.83 – EBT	0.78	C	0.95 – EBT	0.88	C
	PM Peak	0.78 – WBL	0.74	B	0.90 – WBL	0.84	B

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

The overall intersection v/c ratio is higher than 0.90 at all intersections during one of the AM and PM peak hours, with the exception of the Winston Churchill Boulevard, Mississauga Road, and Creditview Road intersections. The critical movement v/c ratio was found to be higher during at least one of the peak hours.

Table 42 provides the queue length comparison for the 2031 horizon year with a 5 percent and 15 percent truck composition.

Table 42 – 95th Percentile Queue Length for Future 2031 – Regular vs. 15% Truck

Intersection	Movement	95th Percentile Queue Length (m)			
		5% Truck Composition		15% Truck Composition	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Chinguacousy Road and Mayfield Road	EB Left	3.1	#32.3	3.1	#35
	EB Thru-Right	160.8	**158.1**	#177.4	**#183.8**
	WB Left	#82	#111.4	#95.9	#122.4
	WB Thru-Right	40.5	**71.7**	43.1	**77.4**
Creditview Road and Mayfield Road	EB Left	3.1	3.7	3.2	3.9
	EB Thru-Right	64.1	**101.5**	72.2	**111.7**
	WB Left	#27.7	22.4	#29.5	25.7

Intersection	Movement	95th Percentile Queue Length (m)			
		5% Truck Composition		15% Truck Composition	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
	WB Thru-Right	38.1	**74.8**	40.7	**81.9**
Mississauga Road and Mayfield Road	EB Left	12.5	35.3	12.7	#45.3
	EB Thru	125.3	**108.1**	127.2	**114.9**
	WB Left	#68.9	26.5	#76.3	#29.2
	WB Thru-Right	55.1	**105.5**	57.1	**112.3**
Heritage Road and Mayfield Road	EB Left	0.8	3.8	0.8	4
	EB Thru	**#210**	92.7	**#250.2**	96.1
	EB Right	13.3	5.1	13.4	5.2
	WB Left	#164.3	25.1	#172.8	30.3
	WB Thru	72.7	**118.2**	75.1	**131**
	WB Right	0	1	0	1
Winston Churchill Boulevard and Mayfield Road	EB Left	2.9	7.6	3	8.7
	EB Thru	**200.7**	64	**#250.4**	71.3
	EB Right	19	7	20.2	7.5
	WB Left	#60.7	#96.6	#67.9	#108.5
	WB Thru	48.7	**103.1**	52.3	**122.2**
	WB Right	0	0.3	0	0.3

Note: Values with # indicate that 95th percentile volume exceeds capacity and sometimes the queue may be longer.

The additional queue length was found to vary from 5 to 50 meters due to the increase in the truck composition to 15 percent in the 2031 horizon year.

It was concluded that the operational changes due the increased truck composition by themselves will not result in a need to widen Mayfield Road to 6 lanes further west from the area of the proposed GTA West corridor. However, the storage at individual intersections would need to be increased to the levels indicated in **Table 42**.

4.6.2 The 2031 Horizon Year with GTA West Corridor Sensitivity Analysis

As described in **Section 2.1** the MTO has identified a need for a freeway corridor to connect urban centres in the northwest part of the GTHA. The proposed corridor includes 6 lanes along the north-south section near the Region of Peel and Region of Halton municipal boundary (once known as the Halton/Peel Freeway) and 4 lanes for the east-west segment north of Mayfield Road. Interchanges with the corridor are anticipated at major arterial roads including Mayfield Road.

A sensitivity analysis was performed comparing the 2031volumes in the study area with and without GTA West corridor to identify the traffic volume variation and its effect on the subject study area. Peel Region provided the link volumes from the regional transportation planning model for the 2031 horizon year without the GTA West Corridor. In addition, the Region also provided the link traffic volume differences with the GTA West in operation. The difference in number of vehicles on each link with and without the GTA West corridor is shown in **Figure 44**.

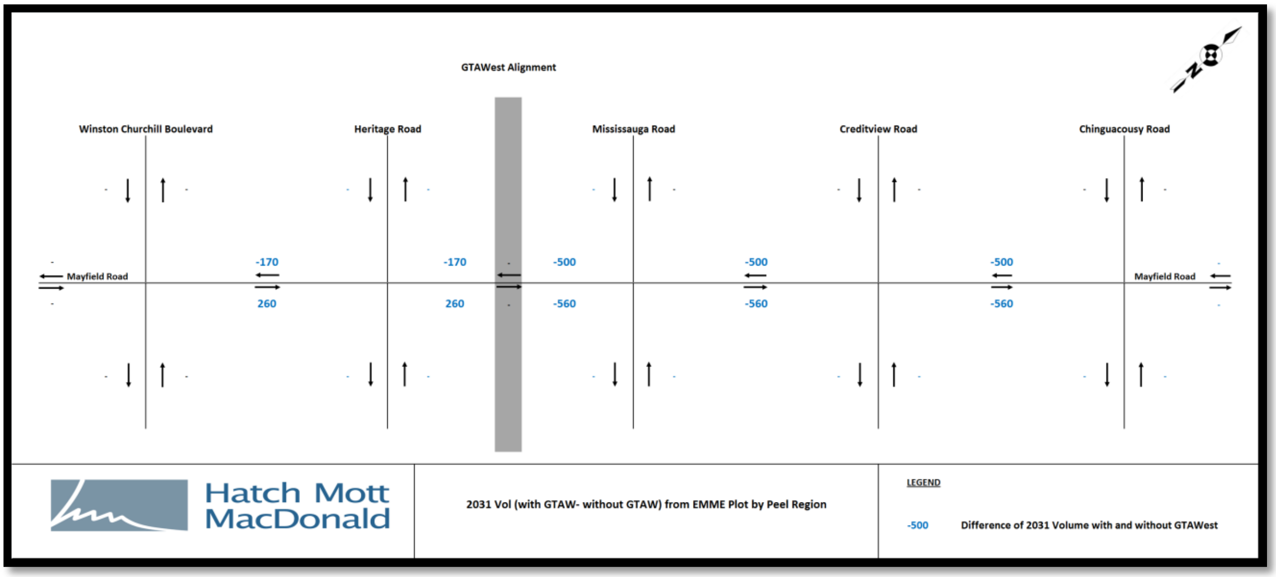


Figure 44 – Link Volume Increase/Decrease after GTA West Development

These traffic volume differences were applied to the 2031estimated traffic volumes without the GTA West facility to arrive at the estimated traffic volumes shown in **Figure 45** that reflect the GTAW facility in operation.

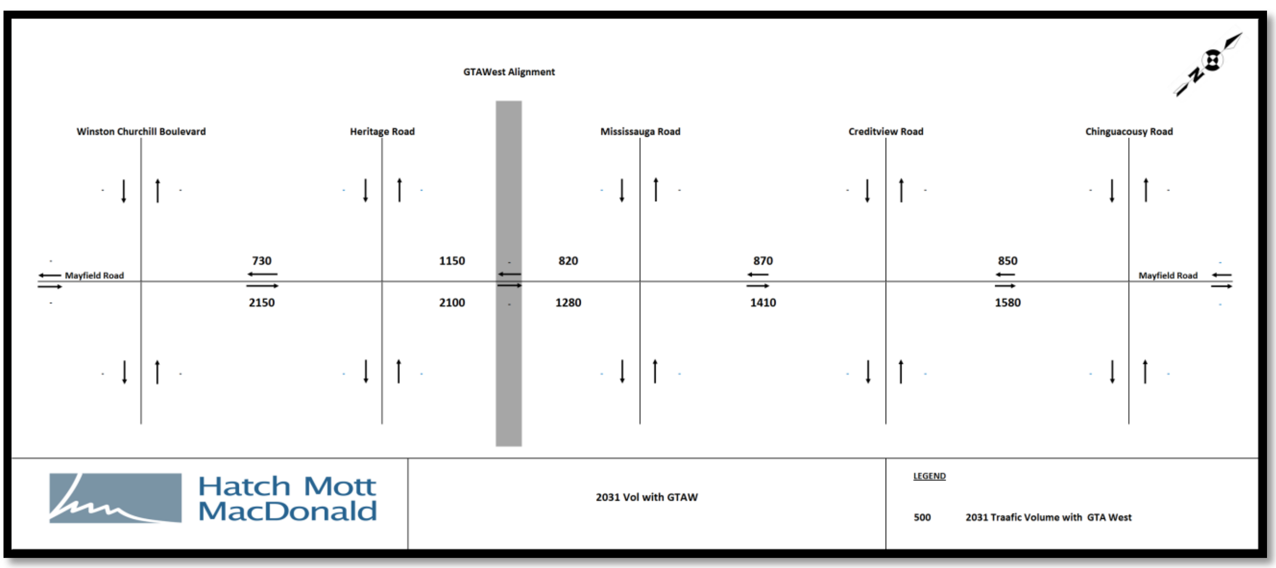


Figure 45 – 2031 Horizon Year Traffic Volume on Mayfield Road with GTA West

Figure 44 indicates that the GTA West corridor with its interchange with Mayfield Road will attract approximately 260 vehicles per hour in the eastbound direction during the AM peak hour to the section of Mayfield Road between Winston Churchill Boulevard and GTA West corridor. The existence of this corridor will change the trip distribution pattern where more vehicles will attempt to access the GTA West either north or south of Mayfield Road, resulting in a traffic volume reduction along the sections to the east of the GTA West facility. For example, the model is indicating that approximately 500 to 560 vehicles per hour on the east side of the GTAW will use other roads instead of Mayfield Road to connect to GTAW corridor.

The 2031AM peak hour operational analysis was updated to evaluate the effects of additional volumes on Mayfield Road, between Winston Churchill Boulevard and GTA West Corridor. **Table 43** compares the effect of the additional volumes on the capacity of intersections located between the GTA West corridor and Winston Churchill Boulevard, assuming these intersections operate under traffic signal control.

Table 40 – The Capacity Analysis with and without GTA West Corridor – between Winston Churchill Boulevard and GTAW

Signalized Intersection	Time Period	Without GTA West			With GTA West		
		Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS	Critical Movement v/c Ratio	Overall Intersection v/c Ratio	Overall Intersection LOS
Heritage Road and Mayfield Road	AM Peak	**1.45 – WBL**	**1.18**	D	**1.45 – WBL** **1.01 – EBT**	**1.18**	**E**
Winston Churchill Boulevard and Mayfield Road	AM Peak	0.83 – EBT	0.78	C	**0.96 – EBT**	**0.87**	C

The overall LOS at Winston Churchill Boulevard will remain the same while the overall intersection v/c ratio increases to 0.87 from 0.78. At the Heritage Road intersection, the overall capacity will degrade from LOS D to E. The Overall intersection v/c ratio remains the same as before. The eastbound through movement v/c ratio however, will be over capacity indicating that with the GTA West corridor in operation, an additional through lane in each direction may be required for the section of Mayfield between the GTAW corridor and Winston Churchill Boulevard. Protection for a possible future widening to 6 through lanes between the GTA West corridor and Winston Churchill Boulevard, and the additional property that may be required should be made.

4.6.3 Type of Intersection Control

This section examines the operation of modern two-lane roundabouts at the Heritage Road and Winston Churchill Boulevard intersections. Since the timing for a new arterial road connection to Mayfield Road between these two intersections is unknown at this time, this analysis has considered just the two regional road intersections west of the proposed GTA West freeway intersection. A roundabout at the intersection of Mississauga Road was also not considered, due to its proximity to the proposed GTA West interchange and ramp terminals.

A supplementary analysis was performed using ARCADY (Junctions 8) to estimate in which year, after 2021 that roundabouts on Mayfield Road at Winston Churchill Boulevard and at Heritage Road will fail due to an unacceptable Level of Service (LOS), delay or queuing.

For this analysis the total 2021 and 2031 AM and PM peak hour traffic volumes from **Figure 27, 28, 33** and **34** were used to estimate turning movement counts for each of the years between 2026 and 2030. A comparison of results shows that while the LOS and delay at each roundabout is satisfactory in 2029, the 95% queue length in the eastbound direction reaches a length of 230 m on Mayfield Road at Heritage Road and 360 m on Mayfield Road at Winston Churchill Boulevard. As this amount of queuing was deemed to be unsatisfactory, it was concluded that the roundabouts will begin failing in operation by approximately 2029.

Table 41 presents a summary of findings that compare operations of two-lane roundabouts with just two circulating lanes and no further improvement ("Do Nothing"), incorporating by-pass lanes for some right turn movements ("With By-Pass Lanes") and with provision of by-pass lanes under traffic conditions after implementation of the GTA West Freeway ("With GTA West and By-Pass Lanes")

Table 41 – Scenario Comparison: 2031 with Mayfield Road with 4 Traffic Lanes and with Two-Lane Roundabout

Scenario	Winston Churchill Blvd @ Mayfield Rd	Heritage Rd @ Mayfield
Do Nothing	1) During AM peak, eastbound average (95 percentile) queue reaches 330 (970) m and eastbound approach LOS fails with existing truck composition. 2) During PM peak, the westbound queue extends to 50 (160) m with existing truck composition. 3) Delay increases slightly with increased truck percentage.	1) During AM peak, eastbound average (95 percentile) queue reaches close to 200 (770) m with existing truck composition. 2) During PM peak, the northbound queue extends to 60 (250) m with existing truck composition due to the presence of high east-west volume. 3) Eastbound and northbound average (95percentile) queues worsen with higher truck percentage.
With By-Pass Lanes	1) During AM peak, the east to south bypass lane will reduce delay and queue for eastbound traffic. 2) Increased truck percentage has minimal effect on delays and queue.	1) During AM peak, the east to south bypass lane will reduce delay and queue for eastbound traffic. 2) During PM peak, the north to east bypass lane will reduce delay and queuing. 3) Increased truck percentage has minimal effect on delays and queue.
With GTA West and By-Pass Lanes	1) During AM peak, the east to south bypass lane will not result in improved operation. The eastbound LOS and queuing are unsatisfactory. 2) During PM peak, the south to west bypass lane will not result in improved operations.	1) During AM peak, the east to south bypass lane will not result in improved operation. The eastbound LOS and queueing are unsatisfactory. 2) During PM peak, the north to east bypass lane will reduce delay and queue.

Scenario	Winston Churchill Blvd @ Mayfield Rd	Heritage Rd @ Mayfield
	Westbound LOS and queuing are unsatisfactory. 3) Increased truck percentage has minimal effect on delays and queue.	3) Increased truck percentage has minimal effect on delays and queue.

Figure 46, 47 and **48** provide the LOS and total delay as well as the average queue and 95th percentile queue along critical legs for each roundabout under 2031 traffic conditions for each of the three cases described in **Table 41**, and with the truck composition ranging from 5 percent to 15 percent.

	5% Truck Composition		10% Truck Composition		15 % Truck Composition		Conclusion
	AM	PM	AM	PM	AM	PM	
Heritage Rd	Q= 13 (15) Q= 195 (773) **LOS= D** **Delay: 27 s**	Q= 27 (38) Q= 12 (15) Q= 64 (252) **LOS= B** **Delay: 14 s**	Q= 13 (16) Q= 198 (788) **LOS= D** **Delay: 27 s**	Q= 28 (47) Q= 12 (16) Q= 65 (260) **LOS= B** **Delay: 14 s**	Q= 14 (17) Q= 204 (809) **LOS= D** **Delay: 28 s**	Q= 29 (50) Q= 13 (17) Q= 68 (264) **LOS= B** **Delay: 15 s**	1) During AM peak, eastbound average (95 percentile) queue reaches close to 200 (770) m with existing truck composition. 2) During PM peak, the northbound queue extends to 60 (250) m with existing truck composition due to the presence of high east-west volume. 3) Eastbound and northbound average (95percentile) queues worsen with higher truck percentage.
Winston Churchil Blvd	Q= 6 (10) Q= 331 (968) Q= 17 (53) **LOS= E** **Delay: 46 s**	Q= 47 (158) Q= 10 (11) Q= 23 (75) **LOS= B** **Delay: 11 s**	Q= 7 (10) Q= 337 (984) Q= 17 (55) **LOS= E** **Delay: 47 s**	Q= 49 (165) Q= 11 (8) Q= 24 (79) **LOS= B** **Delay: 12 s**	Q= 7 (10) Q= 342 (998) Q= 18 (58) **LOS= E** **Delay: 48 s**	Q= 51 (173) Q= 11 (8) Q= 25 (83) **LOS= B** **Delay: 12 s**	1) During AM peak, eastbound average (95 percentile) queue reaches 330 (970) m and eastbound approach LOS fails with existing truck composition. 2) During PM peak, the westbound queue extends to 50 (160) m with existing truck composition. 3) Delay increases slightly with increased truck percentage.

Note: "Q" denotes average (95% percentile) queue measured in meter.

Figure 46 – 2031 Horizon Year with 2-Lane Roundabout - Do Nothing Scenario (No GTA West, No By-Pass Lane)

	5% Truck Composition		10% Truck Composition		15 % Truck Composition		Conclusion
	AM	PM	AM	PM	AM	PM	
Heritage Rd	Q= 13 (15) Q= 56 (199) **LOS= B** **Delay= 10 s**	Q= 27 (46) Q= 11 (8) **LOS= A** **Delay= 6 s**	Q= 13 (16) Q= 58 (205) **LOS= B** **Delay= 11 s**	Q= 28 (47) Q= 11 (8) **LOS= A** **Delay= 7 s**	Q= 14 (17) Q= 61 (215) **LOS= B** **Delay= 11 s**	Q= 29 (50) Q= 11 (8) **LOS= A** **Delay= 7 s**	1) During AM peak, the east to south bypass lane will reduce delay and queue for eastbound traffic. 2) During PM peak, the north to east bypass lane will reduce delay and queuing. 3) Increased truck percentage has minimal effect on delays and queue.
Winston Churchil Blvd	Q= 6 (10) Q= 79 (300) Q= 4 (8) **LOS= B** **Delay= 15 s**	Q= 47 (158) Q= 8 (8) Q= 5 (8) **LOS= A** **Delay= 9 s**	Q= 7 (10) Q= 83 (315) Q= 5 (8) **LOS= C** **Delay= 16 s**	Q= 49 (165) Q= 9 (8) Q= 5 (8) **LOS= A** **Delay= 10 s**	Q= 7 (10) Q= 86 (330) Q= 4 (8) **LOS= C** **Delay= 16 s**	Q= 51 (173) Q= 9 (15) Q= 6 (8) **LOS= B** **Delay= 10 s**	1) During AM peak, the east to south bypass lane will reduce delay and queue for eastbound traffic. 2) Increased truck percentage has minimal effect on delays and queue.

Note: "Q" denotes average (95% percentile) queue measured in meter.

Figure 47 – 2031 Horizon Year with 2-Lane Roundabout – With By-Pass Lane (No GTA West)

	5% Truck Composition		10% Truck Composition		15 % Truck Composition		Conclusion
	AM	PM	AM	PM	AM	PM	
Heritage Rd	Q= 13 (15) Q= 344 (995) LOS= E Delay: 43 s	Q= 63 (230) Q= 11 (8) LOS= B Delay: 11 s	Q= 13 (16) Q= 347 (1008) LOS= E Delay: 44 s	Q= 65 (236) Q= 11 (12) LOS= B Delay: 11 s	Q= 14 (17) Q= 353 (1023) LOS= E Delay: 44 s	Q= 68 (248) Q= 11 (12) LOS= B Delay: 12 s	1) During AM peak, the east to south bypass lane will not result in improved operation. The eastbound LOS and queueing are unsatisfactory. 2) During PM peak, the north to east bypass lane will reduce delay and queue. 3) Increased truck percentage has minimal effect on delays and queue.
Winston Churchil Blvd	Q= 6 (10) Q= 604 (1223) Q= 6 (15) LOS= F Delay: 75 s	Q= 231 (848) Q= 8 (15) Q= 5 (8) LOS= D Delay: 31 s	Q= 6 (10) Q= 609 (1244) Q= 6 (16) LOS= F Delay: 76 s	Q= 237 (866) Q= 9 (15) Q= 5 (8) LOS= D Delay: 32 s	Q= 7 (10) Q= 613 (1262) Q= 7 (17) LOS= F Delay: 77 s	Q= 243 (883) Q= 9 (15) Q= 6 (8) LOS= D Delay: 33 s	1) During AM peak, the east to south bypass lane will not result in improved operation. The eastbound LOS and queuing are unsatisfactory. 2) During PM peak, the south to west bypass lane will not result in improved operations. Westbound LOS and queuing are unsatisfactory. 3) Increased truck percentage has minimal effect on delays and queue.

Note: "Q" denotes average (95% percentile) queue measured in meter.

Figure 48 – 2031 Horizon Year with 2-Lane Roundabout – with By-Pass Lane and with GTA West

From this analysis it was found that:

1. With no changes to geometry or truck composition and without the GTA West freeway, roundabouts will fail in operation under 2031 traffic conditions. The effects of the increased trucks and the GTA West freeway hasten this failure.
2. With the addition of selective bypass lanes, and no changes to truck composition, satisfactory operations can be maintained. The maximum queue reach in the eastbound direction is approximately 300m. The effects of increased trucks increase the eastbound queues to approximately 315m
3. With the addition of selective bypass lanes and no changes in truck composition but with the GTA West freeway, the roundabouts will fail in operation, with queues in the eastbound direction exceeding 500m. The effects of the increased trucks hasten this failure.
4. With the addition of the GTA West freeway, Mayfield Road will need to be widened to 6 lanes from the freeway interchange westerly to Winston Churchill Boulevard. Roundabouts used on Mayfield Road within the study area would need to be designed to accommodate three circulating lanes. These types of roundabouts are a relatively new concept for drivers in Ontario. It may take some time for three-lane roundabouts to become widely accepted and for more information to be known about how well these roundabouts will actually function.

This analysis indicates that with provision of some geometric changes to the configuration of the roundabouts, satisfactory operations are possible in the period before the implementation of the GTA West freeway.

It is important to note that the traffic pattern and volume effects arising from the GTA West Freeway connection to Mayfield Road are uncertain. Also, the provincial study of the GTA West freeway corridor has not yet fully confirmed that a connection to Mayfield Road will be located within the study area.

Under these circumstances it is also uncertain that the traffic projects identified in this study will actually materialize, and if they do, at what point in time this will occur.

In terms of the advantages and disadvantages of using either roundabouts of conventional signalized intersection control, there are a number of factors that can be considered.

1. Capacity

This analysis has shown that both forms of intersection control provide an ability to accommodate high volumes of traffic. It has also been shown that at very high volumes, particularly where there are high conflicting movements (through and left turn), signalized control can provide greater capacity. Other studies have shown that the capacity of two-lane roundabouts is usually lower than channelized intersections with two through lanes in each direction and exclusive left-turn lanes.[7]

2. Right-of-way Requirements

A fully channelized signalized intersection can be accommodated within designated right-of-way of Mayfield Road. Provision of roundabouts, complete with separate bypass lanes in some quadrants will require some property to be acquired.

3. Construction and Maintenance Costs

Typically, construction costs for either a two-lane roundabout with selective bypass lanes or a conventional signalized intersection are comparable. However, given that the use of roundabouts on Mayfield Road would involve, at least initially, implementing them in a rural or semi-rural environment with a propensity for higher traffic speeds, additional geometric treatments to the approaches to the roundabout would be required, likely adding to the overall cost of these intersections.

In terms of maintenance cost, other studies have indicated annual maintenance costs for signalized intersections are between $4,000 and $5,000, while maintenance costs for roundabouts are limited to maintaining landscaping features and the added pavement surface. [8]

4. Vehicular, Pedestrian and Cyclist Safety

Numerous studies have shown significant safety improvements at intersections that have been converted into roundabouts. These benefits arise from the reduced crossing conflicts and the most severe of those conflicts. Studies have shown reductions of 35 percent in total crashes and 76 percent reductions in injury crashes. In terms of vehicular safety, roundabouts have been shown to have significant benefits. In terms of pedestrian safety can also be improved in the case of roundabouts with the judicious use of splitter islands that can be used for refuge by pedestrians. Since traffic volumes and truck composition on Mayfield Road are generally high, accommodation of cyclists could be done through the use of ramps connecting to sidewalks or multi-use paths around the perimeter of the roundabout, as are provided for pedestrian movements. In this way, pedestrian and cyclists can be afforded the same and possibly improved safety over a large, full channelized signalized intersection.

5. Driver Familiarity

Roundabouts are still relatively rare in application on regional arterial roads, particularly those in a rural or

[7] "*Modern Roundabout or Signalized and Stop-Controlled Intersections?: Case Studies of At-Grade Intersections on Alberta and Saskatchewan Rural Highways"*, Yin, D., Qiu A. Z., paper prepared for presentation at the Best Practices in Transportation Planning Session of the 2012 Conference of the Transportation Association of Canada Fredericton, New Brunswick.

[8] "*Comparative Analysis: Roundabouts vs. Signalized Intersection, Second Avenue and Scarlett Road*", Greater Grand Sudbury

suburban environment, with higher or transitional travel speeds. Drivers will not be as familiar with traversing a roundabout as a conventional intersection, although, as recent experience in the Windsor area at the temporary roundabout used for connecting Highways 401 and 3, drivers were reasonably quick in becoming more astute with traversing the roundabout an in their lane selection on the approaches to the roundabout. There will be an adjustment period however.

6. Environmental Factors

When operating within their capacity, roundabouts typically operate with lower delays than signalized intersections. With a roundabout it is not necessary for traffic to stop when entering the roundabout when no conflicts are present. When there are queues on the approaches, in some cases these are ‘rolling queues’ where traffic continues to move slowly approaching the roundabout. In off-peak hours, the performance of roundabouts is generally superior to that of signalized intersections with very low average delays.

Table 42 summarizes the assessment of roundabout and signalized intersection control as it applies to the Heritage Road and Winston Churchill Boulevard intersections. The assessment used a number of factors including capacity, safety, human and environmental factors, and construction cost. Roundabout and signalized intersection suitability was rated on a 3-point scale (Good, Fair, Poor).

Table 42 – Intersection Configuration Assessment

Factor	Roundabout	Signalized Intersection
Ability to accommodate projected demand	Good-Fair	Good
Ability to provide excess capacity	Fair-Poor	Good
Right-of-way Requirements	Fair	Good
Construction Cost	Good-Fair	Good
Maintenance Cost	Good	Fair
Vehicular Safety	Good	Fair
Pedestrian Safety	Fair	Fair
Cyclist Safety	Fair	Good
Driver Familiarity	Fair	Good
Environmental Factors	Good	Fair
Overall	**Good-Fair**	**Good-Fair**

Overall, there is not a clear preferred type of intersection configuration for these two intersections when all ten factors are considered with equal weight. However, signalized intersections were slightly preferred given they can potentially provide excess capacity to accommodate unanticipated traffic demand above the estimated horizon-year volumes.

In view of the uncertainty surrounding the future traffic conditions in the corridor and the operational characteristics and benefits from three-lane roundabouts and the relatively equal assessment between the roundabout and signalized intersection configurations, it is concluded that protection be made for the design and construction of both types of intersection configurations for these two intersections. Roundabouts could initially be implemented at these intersections in conjunction with the widening of the road to 4 basic traffic lanes. Consideration to expand these roundabouts to 3 circulating lanes at some point in the future could be given when more is known about the effects of these types of intersections and drivers and vehicle capabilities to negotiate them. If the decision is not to continue to use them, the intersections could be converted to signalized intersections in conjunction with a widening of Mayfield Road to 6 basic lanes with the GTA West freeway. In the absence of the GTA West freeway, they could still be converted to signalized control to accommodate continued growth in traffic by 2031 and beyond.

5 Recommendations

Based on the information and analysis presented in the **Mayfield Road Class EA Transportation and Traffic Report**, it is recommended that:

1. Mayfield Road to be widened to 4 lanes from Chinguacousy Road to Winston Churchill Boulevard by 2021. A further widening to 6 lanes for the section from Chinguacousy Road to the future location of the GTA West freeway west of Mississauga Road may be required by 2031. Post 2031, in conjunction with the implementation of the GTA West corridor, a further widening of Mayfield Road to 6 through lanes from the GTA West corridor interchange and Winston Churchill Boulevard will be required. Sufficient right-of-way for this widening should be made.
2. Signalized intersection configurations to be incorporated at the Chinguacousy Road, Creditview Road and Mississauga Road intersections. The intersections of Heritage Road and Winston Churchill Boulevard be designed to accommodate both a signalized intersection and a three-lane roundabout configuration.
3. A two-lane roundabout configuration to be implemented at Heritage Road and Winston Churchill Boulevard initially in conjunction with the initial widening of Mayfield Road to 4 lanes. Design of right turn by-pass lanes to be incorporated for the west to south and south to east corners, at a minimum.
4. Operation of the roundabouts to be monitored and once more is known on the location and design of the GTA West freeway and interchange with Mayfield Road, a decision can be made as to whether to expand the roundabouts to three circulating lanes, or to convert them to conventional signalized intersections.
5. Intersection improvements (i.e. turn lanes) and Active Transportation facilities be constructed with the road widening project. In order to encourage a pedestrian and bicycle friendly environment, and promote walking and cycling, the active transportation facilities recommended in the active transportation plans for the Region of Peel should be incorporated into the preliminary design concepts for Mayfield Road. These facilities will include:
    - *Multi-use trails along one side of Mayfield Road, and Mississauga Road, south of Mayfield Road;*
    - *Sidewalks along one side of Mayfield Road and Mississauga Road south of Mayfield Road;*
    - *Paved shoulders along Winston Churchill Boulevard from Embleton Road north in the short term, and Multi-use trail from Embleton Road to Mayfield Road in the ultimate conditions*
    - *Paved shoulders along Mississauga Road south of Mayfield Road*
    - *New design strategies where feasible by providing multi-use trails on both sides on Mayfield Road in the ultimate conditions*
    - *Two north-south trails. One trail is proposed midway between Chinguacousy Road and Creditview Road, and the other between Creditview Road and Mississauga Road.*

6. Transit service to be provided in the future in northwest Brampton, as specified in the City of Brampton's Transportation and Transit Master Plan and other transportation plans.
7. Where appropriate, left turn storage lanes to be provided with storage lengths according to those provided in **Table 38**.

   If warranted or justified, right turn lanes be provided at all intersections with minimum 30 m storage. For right turn lanes the Region's preferred option is to provide urban smart channels instead of channelized right turn lanes. The urban smart channels are preferred in a pedestrian environment to decrease vehicle speeds as much as possible.
8. The implications of the GTA West Transportation Corridor and proposed Mayfield Road interchange to be examined in further detail once the freeway corridor and interchange location are finalized through the MTO Planning and EA Study for corridor.
9. The traffic and access impacts of future development in northwest Brampton to be reassessed once planning for the lands has progressed further.
10. Additional commercial vehicle data to be gathered on a regular basis to monitor potential changes in truck composition in the Mayfield Road corridor.

Appendix A

Turning Movement Counts

MG8 ENG

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Region of Peel
Site #: 0001419287
Intersection: Mayfield Road & Chinguacousy Roa
TFR File #: 5
Count date: 12-Feb-2013

Weather conditions:
Cold

Person(s) who counted:
SASHA

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 117
North Entering: 82
North Peds: 0
Peds Cross: ⋈

Cyclists	1	0	0	1
Trucks	1	3	0	4
Cars	7	57	13	77
Totals	9	60	13	

Cyclists	0
Trucks	1
Cars	34
Totals	35

East Leg Total: 955
East Entering: 482
East Peds: 1
Peds Cross: ⧗

Chinguacousy Road

Cyclists	Trucks	Cars	Totals
2	35	342	379

Cars	Trucks	Cyclists	Totals
6	1	0	7
319	34	0	353
113	9	0	122
438	44	0	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	2	2
0	14	361	375
0	2	45	47
0	16	408	

Mayfield Road

Cars	Trucks	Cyclists	Totals
454	19	0	473

Chinguacousy Road

Peds Cross: ⧗
West Peds: 0
West Entering: 424
West Leg Total: 803

Cars	215
Trucks	14
Cyclists	0
Totals	229

Cars	16	26	80	122
Trucks	0	0	5	5
Cyclists	1	0	0	1
Totals	17	26	85	

Peds Cross: ⋈
South Peds: 0
South Entering: 128
South Leg Total: 357

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	11:00:00
To:	14:00:00	**To:**	12:00:00

Municipality: Region of Peel
Site #: 0001419287
Intersection: Mayfield Road & Chinguacousy Roa
TFR File #: 5
Count date: 12-Feb-2013

Weather conditions:
Cold

Person(s) who counted:
SASHA

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 50
North Entering: 18
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	3	1	0	4
Cars	3	11	0	14
Totals	6	12	0	

Cyclists	0
Trucks	5
Cars	27
Totals	32

East Leg Total: 385
East Entering: 198
East Peds: 0
Peds Cross: ⧗

Chinguacousy Road

Cyclists	Trucks	Cars	Totals
1	42	140	183

Cars	Trucks	Cyclists	Totals
6	2	0	8
124	39	0	163
25	2	0	27
155	43	0	

Mayfield Road

N

W E

S

Cyclists	Trucks	Cars	Totals
0	0	3	3
0	36	111	147
0	1	17	18
0	37	131	

Mayfield Road

Cars	Trucks	Cyclists	Totals
150	37	0	187

Chinguacousy Road

Peds Cross: ⧗
West Peds: 0
West Entering: 168
West Leg Total: 351

Cars	53
Trucks	4
Cyclists	0
Totals	57

Cars	13	18	39	70
Trucks	0	3	1	4
Cyclists	1	0	0	1
Totals	14	21	40	

Peds Cross: ⋈
South Peds: 0
South Entering: 75
South Leg Total: 132

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 17:00:00
To: 18:00:00

Municipality: Region of Peel
Site #: 0001419287
Intersection: Mayfield Road & Chinguacousy Roa
TFR File #: 5
Count date: 12-Feb-2013

Weather conditions:
Cold

Person(s) who counted:
SASHA

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 316
North Entering: 93
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	1	1	0	2
Cars	22	48	21	91
Totals	23	49	21	

Cyclists	0
Trucks	2
Cars	221
Totals	223

East Leg Total: 1174
East Entering: 705
East Peds: 1
Peds Cross: ⧗

Chinguacousy Road

Cyclists	Trucks	Cars	Totals
1	24	571	596

Mayfield Road

Cars	Trucks	Cyclists	Totals
50	1	0	51
511	21	0	532
117	5	0	122
678	27	0	

N
W E
S

Mayfield Road

Cyclists	Trucks	Cars	Totals
0	0	25	25
0	16	353	369
0	1	39	40
0	17	417	

Cars	Trucks	Cyclists	Totals
450	19	0	469

Chinguacousy Road

Peds Cross: ⧗
West Peds: 0
West Entering: 434
West Leg Total: 1030

Cars	204
Trucks	7
Cyclists	0
Totals	211

Cars	38	146	76	260
Trucks	2	1	3	6
Cyclists	1	0	0	1
Totals	41	147	79	

Peds Cross: ⋈
South Peds: 0
South Entering: 267
South Leg Total: 478

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0001419287
Intersection: Mayfield Road & Chinguacousy Roa
TFR File #: 5
Count date: 12-Feb-2013

Weather conditions:
Cold

Person(s) who counted:
SASHA

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 1040
North Entering: 487
North Peds: 2
Peds Cross: ⋈

Cyclists	1	0	1	2
Trucks	9	20	3	32
Cars	47	337	69	453
Totals	57	357	73	

Cyclists	1
Trucks	23
Cars	529
Totals	553

East Leg Total: 5443
East Entering: 2986
East Peds: 6
Peds Cross: ⧗

Chinguacousy Road

Cyclists	Trucks	Cars	Totals
7	269	2239	2515

Mayfield Road

Cars	Trucks	Cyclists	Totals
93	4	0	97
2060	254	1	2315
541	31	2	574
2694	289	3	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	3	46	49
0	197	1739	1936
0	11	198	209
0	211	1983	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2224	231	2	2457

Chinguacousy Road

Peds Cross: ⧗
West Peds: 0
West Entering: 2194
West Leg Total: 4709

Cars	1076
Trucks	62
Cyclists	2
Totals	1140

Cars	132	390	416	938
Trucks	6	16	31	53
Cyclists	5	1	1	7
Totals	143	407	448	

Peds Cross: ⋈
South Peds: 2
South Entering: 998
South Leg Total: 2138

Comments

MG8 ENG
Traffic Count Summary

Intersection: Mayfield Road & Chinguacousy Rd | **Count Date:** 12-Feb-2013 | **Municipality:** Region of Peel

	North Approach Totals						South Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	23	0	23	0	30	7:00:00	0	7	0	7	0
8:00:00	12	182	4	198	1	322	8:00:00	12	49	63	124	2
9:00:00	14	37	11	62	0	181	9:00:00	17	34	68	119	0
11:00:00	0	0	0	0	0	1	11:00:00	0	0	1	1	0
12:00:00	0	12	6	18	0	93	12:00:00	14	21	40	75	0
13:00:00	6	15	3	24	0	78	13:00:00	8	20	26	54	0
14:00:00	8	8	6	22	0	82	14:00:00	4	16	40	60	0
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	3	11	1	15	0	134	16:00:00	17	36	66	119	0
17:00:00	9	20	3	32	1	202	17:00:00	30	76	64	170	0
18:00:00	21	49	23	93	0	360	18:00:00	41	147	79	267	0
Totals:	73	357	57	487	2	1483		143	406	447	996	2

	East Approach Totals						West Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	1	7:00:00	0	0	1	1	0
8:00:00	106	224	2	332	1	784	8:00:00	4	409	39	452	0
9:00:00	88	355	9	452	1	775	9:00:00	3	285	35	323	0
11:00:00	0	1	0	1	0	4	11:00:00	0	2	1	3	0
12:00:00	27	163	8	198	0	366	12:00:00	3	147	18	168	0
13:00:00	27	148	3	178	1	338	13:00:00	4	143	13	160	0
14:00:00	24	117	10	151	1	319	14:00:00	5	145	18	168	0
15:00:00	0	1	0	1	0	5	15:00:00	0	4	0	4	0
16:00:00	84	377	7	468	0	644	16:00:00	2	153	21	176	0
17:00:00	96	396	7	499	1	803	17:00:00	3	278	23	304	0
18:00:00	122	532	51	705	1	1139	18:00:00	25	369	40	434	0
Totals:	574	2314	97	2985	6	5178		49	1935	209	2193	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	207	69	35	35	29	56	116	210

MG8 ENG

Count Date: 12-Feb-2013 Site #: 0001419287

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	138	115	1	1	0	0	3	3	0	0	0	0	0	0	0	0	0	0
7:30:00	6	4	144	6	1	0	0	0	5	2	0	0	1	1	0	0	0	0	1	1
7:45:00	6	0	167	23	2	1	0	0	7	2	0	0	1	0	0	0	0	0	1	0
8:00:00	11	5	195	28	3	1	0	0	10	3	1	1	1	0	0	0	0	0	1	0
8:15:00	11	0	198	3	3	0	0	0	10	0	1	0	1	0	0	0	0	0	1	0
8:30:00	15	4	216	18	5	2	0	0	10	0	1	0	1	0	0	0	1	1	1	0
8:45:00	19	4	224	8	9	4	0	0	10	0	1	0	1	0	0	0	1	0	1	0
9:00:00	25	6	232	8	13	4	0	0	10	0	1	0	1	0	0	0	1	0	1	0
9:00:09	25	0	232	0	13	0	0	0	10	0	1	0	1	0	0	0	1	0	1	0
11:00:00	25	0	232	0	13	0	0	0	10	0	1	0	1	0	0	0	1	0	1	0
11:15:00	25	0	235	3	14	1	0	0	10	0	1	0	1	0	0	0	1	0	1	0
11:30:00	25	0	236	1	15	1	0	0	11	1	3	2	1	0	0	0	1	0	1	0
11:45:00	25	0	242	6	15	0	0	0	11	0	4	1	1	0	0	0	1	0	1	0
12:00:00	25	0	243	1	16	1	0	0	11	0	4	0	1	0	0	0	1	0	1	0
12:15:00	28	3	246	3	16	0	1	1	11	0	4	0	1	0	0	0	1	0	1	0
12:30:00	29	1	246	0	16	0	1	0	12	1	4	0	1	0	0	0	1	0	1	0
12:45:00	29	0	253	7	16	0	1	0	12	0	4	0	1	0	0	0	1	0	1	0
13:00:00	30	1	257	4	19	3	1	0	12	0	4	0	1	0	0	0	1	0	1	0
13:15:00	33	3	259	2	20	1	1	0	14	2	6	2	1	0	0	0	1	0	1	0
13:30:00	34	1	259	0	21	1	1	0	14	0	6	0	1	0	0	0	1	0	1	0
13:45:00	35	1	260	1	21	0	1	0	14	0	6	0	1	0	0	0	1	0	1	0
14:00:00	37	2	263	3	22	1	2	1	14	0	7	1	1	0	0	0	1	0	1	0
14:00:17	37	0	263	0	22	0	2	0	14	0	7	0	1	0	0	0	1	0	1	0
15:00:00	37	0	263	0	22	0	2	0	14	0	7	0	1	0	0	0	1	0	1	0
15:15:00	37	0	264	1	22	0	2	0	14	0	7	0	1	0	0	0	1	0	1	0
15:30:00	39	2	264	0	22	0	2	0	14	0	8	1	1	0	0	0	1	0	1	0
15:45:00	39	0	271	7	22	0	2	0	14	0	8	0	1	0	0	0	1	0	1	0
16:00:00	40	1	273	2	22	0	2	0	15	1	8	0	1	0	0	0	1	0	1	0
16:15:00	42	2	280	7	23	1	2	0	17	2	8	0	1	0	0	0	1	0	2	1
16:30:00	45	3	284	4	24	1	3	1	18	1	8	0	1	0	0	0	1	0	2	0
16:45:00	47	2	285	1	25	1	3	0	18	0	8	0	1	0	0	0	1	0	2	0
17:00:00	48	1	289	4	25	0	3	0	19	1	8	0	1	0	0	0	1	0	2	0
17:15:00	50	2	289	0	26	1	3	0	19	0	8	0	1	0	0	0	1	0	2	0
17:30:00	56	6	305	16	33	7	3	0	20	1	8	0	1	0	0	0	1	0	2	0
17:45:00	60	4	323	18	37	4	3	0	20	0	8	0	1	0	0	0	1	0	2	0
18:00:00	69	9	337	14	47	10	3	0	20	0	9	1	1	0	0	0	1	0	2	0
18:15:00	69	0	337	0	47	0	3	0	20	0	9	0	1	0	0	0	1	0	2	0
18:15:07	69	0	337	0	47	0	3	0	20	0	9	0	1	0	0	0	1	0	2	0

MG8 ENG

Count Date: 12-Feb-2013 Site #: 0001419287

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	30	30	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	32	30	72	42	2	1	2	2	3	3	0	0	0	0	0	0	0	0	0	0
7:45:00	56	24	148	76	2	0	4	2	5	2	0	0	0	0	0	0	0	0	1	1
8:00:00	98	42	217	69	2	0	8	4	7	2	0	0	0	0	0	0	0	0	1	0
8:15:00	111	13	293	76	3	1	8	0	12	5	0	0	0	0	0	0	0	0	2	1
8:30:00	141	30	385	92	6	3	10	2	25	13	0	0	0	0	0	0	0	0	2	0
8:45:00	169	28	467	82	8	2	13	3	39	14	1	1	0	0	0	0	0	0	2	0
9:00:00	181	12	528	61	10	2	13	0	51	12	1	0	0	0	0	0	0	0	2	0
9:00:09	181	0	529	1	10	0	13	0	51	0	1	0	0	0	0	0	0	0	2	0
11:00:00	181	0	529	0	10	0	13	0	51	0	1	0	0	0	0	0	0	0	2	0
11:15:00	187	6	572	43	13	3	13	0	59	8	2	1	0	0	0	0	0	0	2	0
11:30:00	198	11	591	19	13	0	14	1	72	13	2	0	0	0	0	0	0	0	2	0
11:45:00	201	3	625	34	15	2	15	1	79	7	2	0	0	0	0	0	0	0	2	0
12:00:00	206	5	653	28	16	1	15	0	90	11	3	1	0	0	0	0	0	0	2	0
12:15:00	210	4	677	24	16	0	15	0	96	6	3	0	0	0	0	0	0	0	2	0
12:30:00	214	4	708	31	17	1	16	1	104	8	3	0	0	0	0	0	0	0	2	0
12:45:00	220	6	739	31	19	2	16	0	119	15	3	0	0	0	0	0	0	0	3	1
13:00:00	231	11	759	20	19	0	17	1	132	13	3	0	0	0	0	0	0	0	3	0
13:15:00	242	11	786	27	19	0	17	0	145	13	3	0	1	1	1	1	0	0	4	1
13:30:00	246	4	804	18	23	4	17	0	151	6	3	0	1	0	1	0	0	0	4	0
13:45:00	251	5	819	15	25	2	17	0	155	4	3	0	1	0	1	0	0	0	4	0
14:00:00	254	3	841	22	29	4	17	0	166	11	3	0	1	0	1	0	0	0	4	0
14:00:17	254	0	842	1	29	0	17	0	166	0	3	0	1	0	1	0	0	0	4	0
15:00:00	254	0	842	0	29	0	17	0	166	0	3	0	1	0	1	0	0	0	4	0
15:15:00	271	17	919	77	35	6	18	1	179	13	3	0	1	0	1	0	0	0	4	0
15:30:00	283	12	994	75	35	0	18	0	187	8	3	0	1	0	1	0	0	0	4	0
15:45:00	303	20	1094	100	35	0	20	2	196	9	3	0	1	0	1	0	0	0	4	0
16:00:00	334	31	1184	90	36	1	21	1	201	5	3	0	1	0	1	0	0	0	4	0
16:15:00	348	14	1269	85	38	2	23	2	215	14	3	0	1	0	1	0	0	0	4	0
16:30:00	378	30	1363	94	38	0	25	2	222	7	3	0	1	0	1	0	0	0	4	0
16:45:00	402	24	1445	82	42	4	25	0	226	4	3	0	1	0	1	0	0	0	4	0
17:00:00	424	22	1548	103	43	1	26	1	233	7	3	0	2	1	1	0	0	0	5	1
17:15:00	454	30	1633	85	51	8	28	2	238	5	3	0	2	0	1	0	0	0	6	1
17:30:00	493	39	1780	147	58	7	28	0	238	0	3	0	2	0	1	0	0	0	6	0
17:45:00	514	21	1930	150	78	20	31	3	249	11	3	0	2	0	1	0	0	0	6	0
18:00:00	541	27	2059	129	93	15	31	0	254	5	4	1	2	0	1	0	0	0	6	0
18:15:00	541	0	2060	1	93	0	31	0	254	0	4	0	2	0	1	0	0	0	6	0
18:15:07	541	0	2060	0	93	0	31	0	254	0	4	0	2	0	1	0	0	0	6	0

MG8 ENG

Count Date: 12-Feb-2013 Site #: 0001419287

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	5	5	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	31	26	5	5	0	0	3	1	0	0	0	0	0	0	0	0	0	0
7:30:00	2	0	37	6	21	16	0	0	7	4	1	1	0	0	0	0	0	0	0	0
7:45:00	4	2	43	6	37	16	0	0	7	0	3	2	2	2	0	0	0	0	2	2
8:00:00	10	6	49	6	59	22	0	0	7	0	4	1	2	0	0	0	0	0	2	0
8:15:00	11	1	62	13	74	15	0	0	7	0	6	2	2	0	0	0	0	0	2	0
8:30:00	16	5	65	3	100	26	0	0	7	0	6	0	2	0	0	0	0	0	2	0
8:45:00	20	4	69	4	117	17	0	0	7	0	8	2	3	1	0	0	0	0	2	0
9:00:00	26	6	83	14	123	6	0	0	7	0	8	0	3	0	0	0	0	0	2	0
9:00:09	26	0	83	0	124	1	0	0	7	0	8	0	3	0	0	0	0	0	2	0
11:00:00	26	0	83	0	124	0	0	0	7	0	8	0	3	0	0	0	0	0	2	0
11:15:00	30	4	88	5	129	5	0	0	8	1	8	0	3	0	0	0	0	0	2	0
11:30:00	35	5	92	4	147	18	0	0	9	1	8	0	4	1	0	0	0	0	2	0
11:45:00	36	1	95	3	160	13	0	0	9	0	8	0	4	0	0	0	0	0	2	0
12:00:00	39	3	101	6	163	3	0	0	10	1	9	1	4	0	0	0	0	0	2	0
12:15:00	41	2	105	4	167	4	0	0	11	1	10	1	4	0	0	0	0	0	2	0
12:30:00	42	1	108	3	172	5	0	0	11	0	10	0	4	0	1	1	0	0	2	0
12:45:00	45	3	113	5	179	7	0	0	11	0	11	1	4	0	1	0	0	0	2	0
13:00:00	47	2	119	6	186	7	0	0	11	0	11	0	4	0	1	0	1	1	2	0
13:15:00	47	0	126	7	194	8	0	0	11	0	11	0	4	0	1	0	1	0	2	0
13:30:00	49	2	127	1	203	9	0	0	11	0	13	2	4	0	1	0	1	0	2	0
13:45:00	50	1	131	4	217	14	0	0	11	0	14	1	4	0	1	0	1	0	2	0
14:00:00	51	1	135	4	222	5	0	0	11	0	15	1	4	0	1	0	1	0	2	0
14:00:17	51	0	135	0	222	0	0	0	11	0	15	0	4	0	1	0	1	0	2	0
15:00:00	51	0	135	0	222	0	0	0	11	0	15	0	4	0	1	0	1	0	2	0
15:15:00	58	7	138	3	237	15	1	1	11	0	16	1	4	0	1	0	1	0	2	0
15:30:00	60	2	146	8	256	19	2	1	11	0	17	1	4	0	1	0	1	0	2	0
15:45:00	64	4	161	15	270	14	2	0	12	1	19	2	4	0	1	0	1	0	2	0
16:00:00	65	1	170	9	283	13	3	1	12	0	20	1	4	0	1	0	1	0	2	0
16:15:00	74	9	189	19	300	17	3	0	14	2	24	4	4	0	1	0	1	0	2	0
16:30:00	79	5	206	17	311	11	4	1	15	1	24	0	4	0	1	0	1	0	2	0
16:45:00	83	4	224	18	323	12	4	0	15	0	25	1	4	0	1	0	1	0	2	0
17:00:00	94	11	243	19	339	16	4	0	15	0	28	3	4	0	1	0	1	0	2	0
17:15:00	98	4	264	21	352	13	5	1	15	0	30	2	4	0	1	0	1	0	2	0
17:30:00	111	13	313	49	389	37	5	0	15	0	30	0	4	0	1	0	1	0	2	0
17:45:00	121	10	359	46	402	13	5	0	16	1	30	0	4	0	1	0	1	0	2	0
18:00:00	132	11	389	30	415	13	6	1	16	0	31	1	5	1	1	0	1	0	2	0
18:15:00	132	0	390	1	416	1	6	0	16	0	31	0	5	0	1	0	1	0	2	0
18:15:07	132	0	390	0	416	0	6	0	16	0	31	0	5	0	1	0	1	0	2	0

MG8 ENG

Count Date: 12-Feb-2013 Site #: 0001419287

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	3	3	27	27	8	7	0	0	3	3	0	0	0	0	0	0	0	0	0	0
7:30:00	3	0	137	110	11	3	0	0	8	5	0	0	0	0	0	0	0	0	0	0
7:45:00	3	0	258	121	19	8	1	1	13	5	1	1	0	0	0	0	0	0	0	0
8:00:00	3	0	392	134	39	20	1	0	17	4	1	0	0	0	0	0	0	0	0	0
8:15:00	5	2	435	43	41	2	1	0	18	1	2	1	0	0	0	0	0	0	0	0
8:30:00	5	0	514	79	54	13	1	0	21	3	2	0	0	0	0	0	0	0	0	0
8:45:00	5	0	619	105	64	10	1	0	27	6	3	1	0	0	0	0	0	0	0	0
9:00:00	6	1	660	41	72	8	1	0	34	7	3	0	0	0	0	0	0	0	0	0
9:00:09	6	0	662	2	73	1	1	0	34	0	3	0	0	0	0	0	0	0	0	0
11:00:00	6	0	662	0	73	0	1	0	34	0	3	0	0	0	0	0	0	0	0	0
11:15:00	7	1	694	32	78	5	1	0	42	8	3	0	0	0	0	0	0	0	0	0
11:30:00	9	2	727	33	82	4	1	0	46	4	3	0	0	0	0	0	0	0	0	0
11:45:00	9	0	748	21	85	3	1	0	58	12	4	1	0	0	0	0	0	0	0	0
12:00:00	9	0	773	25	90	5	1	0	70	12	4	0	0	0	0	0	0	0	0	0
12:15:00	9	0	808	35	90	0	1	0	83	13	4	0	0	0	0	0	0	0	0	0
12:30:00	9	0	826	18	91	1	1	0	87	4	4	0	0	0	0	0	0	0	0	0
12:45:00	11	2	848	22	96	5	1	0	96	9	4	0	0	0	0	0	0	0	0	0
13:00:00	13	2	883	35	103	7	1	0	103	7	4	0	0	0	0	0	0	0	0	0
13:15:00	14	1	902	19	106	3	2	1	115	12	4	0	0	0	0	0	0	0	0	0
13:30:00	16	2	932	30	107	1	2	0	127	12	5	1	0	0	0	0	0	0	0	0
13:45:00	17	1	966	34	111	4	2	0	133	6	5	0	0	0	0	0	0	0	0	0
14:00:00	17	0	991	25	117	6	2	0	140	7	8	3	0	0	0	0	0	0	0	0
14:00:17	17	0	992	1	117	0	2	0	140	0	8	0	0	0	0	0	0	0	0	0
15:00:00	17	0	995	3	117	0	2	0	140	0	8	0	0	0	0	0	0	0	0	0
15:15:00	17	0	1019	24	121	4	2	0	148	8	8	0	0	0	0	0	0	0	0	0
15:30:00	17	0	1052	33	124	3	2	0	154	6	9	1	0	0	0	0	0	0	0	0
15:45:00	18	1	1088	36	132	8	2	0	161	7	9	0	0	0	0	0	0	0	0	0
16:00:00	18	0	1124	36	137	5	3	1	164	3	9	0	0	0	0	0	0	0	0	0
16:15:00	19	1	1200	76	144	7	3	0	168	4	10	1	0	0	0	0	0	0	0	0
16:30:00	19	0	1258	58	150	6	3	0	177	9	10	0	0	0	0	0	0	0	0	0
16:45:00	20	1	1295	37	152	2	3	0	177	0	10	0	0	0	0	0	0	0	0	0
17:00:00	21	1	1385	90	159	7	3	0	181	4	10	0	0	0	0	0	0	0	0	0
17:15:00	25	4	1458	73	164	5	3	0	182	1	10	0	0	0	0	0	0	0	0	0
17:30:00	36	11	1583	125	177	13	3	0	186	4	10	0	0	0	0	0	0	0	0	0
17:45:00	44	8	1662	79	186	9	3	0	192	6	11	1	0	0	0	0	0	0	0	0
18:00:00	46	2	1738	76	198	12	3	0	197	5	11	0	0	0	0	0	0	0	0	0
18:15:00	46	0	1739	1	198	0	3	0	197	0	11	0	0	0	0	0	0	0	0	0
18:15:07	46	0	1739	0	198	0	3	0	197	0	11	0	0	0	0	0	0	0	0	0

MG8 ENG

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:15:00
To: 8:15:00

Municipality: Region of Peel
Site #: 0001420659
Intersection: Mayfield Road & Creditview Road
TFR File #: 1
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
ALEX

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

Major Road: Mayfield Road runs W/E

North Leg Total: 59
North Entering: 43
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	2	0	0	2
Cars	10	16	15	41
Totals	12	16	15	

Cyclists	0
Trucks	2
Cars	14
Totals	16

East Leg Total: 1118
East Entering: 417
East Peds: 0
Peds Cross: ⧗

Creditview Road

Cyclists	Trucks	Cars	Totals
1	28	376	405

Mayfield Road

Cars	Trucks	Cyclists	Totals
4	2	0	6
361	24	1	386
23	2	0	25
388	28	1	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	2	2
2	22	637	661
0	2	33	35
2	24	672	

Mayfield Road

Cars	Trucks	Cyclists	Totals
675	24	2	701

Creditview Road

Peds Cross: ⧗
West Peds: 0
West Entering: 698
West Leg Total: 1103

Cars	72
Trucks	4
Cyclists	0
Totals	76

Cars	5	8	23	36
Trucks	2	0	2	4
Cyclists	0	0	0	0
Totals	7	8	25	

Peds Cross: ⋈
South Peds: 0
South Entering: 40
South Leg Total: 116

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 13:00:00
To: 14:00:00

Municipality: Region of Peel
Site #: 0001420659
Intersection: Mayfield Road & Creditview Road
TFR File #: 1
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
ALEX

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

Major Road: Mayfield Road runs W/E

North Leg Total: 45
North Entering: 15
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	1	0	0	1
Cars	1	5	8	14
Totals	2	5	8	

Cyclists	1
Trucks	0
Cars	29
Totals	30

East Leg Total: 448
East Entering: 236
East Peds: 0
Peds Cross: ⧗

Creditview Road

Cyclists	Trucks	Cars	Totals
8	29	181	218

Mayfield Road

Cars	Trucks	Cyclists	Totals
9	0	0	9
174	28	8	210
14	3	0	17
197	31	8	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	6	6
1	31	152	184
0	1	5	6
1	32	163	

Mayfield Road

Cars	Trucks	Cyclists	Totals
174	37	1	212

Creditview Road

Peds Cross: ⧗
West Peds: 1
West Entering: 196
West Leg Total: 414

Cars	24
Trucks	4
Cyclists	0
Totals	28

Cars	6	14	14	34
Trucks	0	0	6	6
Cyclists	0	1	0	1
Totals	6	15	20	

Peds Cross: ⋈
South Peds: 0
South Entering: 41
South Leg Total: 69

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period		One Hour Peak	
From:	15:00:00	**From:**	16:45:00
To:	18:00:00	**To:**	17:45:00

Municipality: Region of Peel
Site #: 0001420659
Intersection: Mayfield Road & Creditview Road
TFR File #: 1
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
ALEX

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

Major Road: Mayfield Road runs W/E

North Leg Total: 87
North Entering: 32
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	0	0	0	0
Cars	5	13	14	32
Totals	5	13	14	

Cyclists	0
Trucks	3
Cars	52
Totals	55

East Leg Total: 1069
East Entering: 596
East Peds: 0
Peds Cross: ⧗

Creditview Road

Cyclists	Trucks	Cars	Totals
1	27	523	551

Mayfield Road

Cars	Trucks	Cyclists	Totals
23	1	0	24
511	27	1	539
33	0	0	33
567	28	1	

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W E
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Cyclists	Trucks	Cars	Totals
0	2	5	7
3	23	406	432
2	0	14	16
5	25	425	

Mayfield Road

Cars	Trucks	Cyclists	Totals
445	25	3	473

Creditview Road

Peds Cross: ⧗
West Peds: 1
West Entering: 455
West Leg Total: 1006

Cars	60
Trucks	0
Cyclists	2
Totals	62

Cars	7	24	25	56
Trucks	0	0	2	2
Cyclists	0	0	0	0
Totals	7	24	27	

Peds Cross: ⋈
South Peds: 0
South Entering: 58
South Leg Total: 120

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0001420659
Intersection: Mayfield Road & Creditview Road
TFR File #: 1
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
ALEX

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

Major Road: Mayfield Road runs W/E

North Leg Total: 504
North Entering: 234
North Peds: 1
Peds Cross: ⋈

Cyclists	1	1	1	3
Trucks	5	0	5	10
Cars	41	83	97	221
Totals	47	84	103	

Cyclists	5
Trucks	16
Cars	249
Totals	270

East Leg Total: 6052
East Entering: 3020
East Peds: 5
Peds Cross: ⧗

Creditview Road

Cyclists	Trucks	Cars	Totals
25	225	2606	2856

Cars	Trucks	Cyclists	Totals
107	9	0	116
2503	211	23	2737
156	10	1	167
2766	230	24	

Mayfield Road

N W E S

Cyclists	Trucks	Cars	Totals
0	7	40	47
18	229	2519	2766
2	9	97	108
20	245	2656	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2758	253	21	3032

Creditview Road

Peds Cross: ⧗
West Peds: 3
West Entering: 2921
West Leg Total: 5777

Cars	336
Trucks	19
Cyclists	4
Totals	359

Cars	62	102	142	306
Trucks	9	0	19	28
Cyclists	1	5	2	8
Totals	72	107	163	

Peds Cross: ⋈
South Peds: 8
South Entering: 342
South Leg Total: 701

Comments

MG8 ENG

Traffic Count Summary

Intersection: Mayfield Road & Creditview Road	Count Date: 30-May-2013	Municipality: Region of Peel

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	18	18	9	45	0	80	8:00:00	8	7	20	35	0
9:00:00	22	12	9	43	0	73	9:00:00	2	4	24	30	0
11:00:00	0	0	0	0	0	0	11:00:00	0	0	0	0	0
12:00:00	11	10	5	26	0	51	12:00:00	7	9	9	25	0
13:00:00	8	4	3	15	0	51	13:00:00	11	11	14	36	3
14:00:00	8	5	2	15	0	56	14:00:00	6	15	20	41	0
15:00:00	1	0	0	1	0	2	15:00:00	0	0	1	1	0
16:00:00	7	10	8	25	1	87	16:00:00	22	17	23	62	4
17:00:00	13	11	4	28	0	82	17:00:00	9	13	32	54	0
18:00:00	14	14	7	35	0	93	18:00:00	7	31	20	58	1
Totals:	102	84	47	233	1	575		72	107	163	342	8

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	23	371	4	398	0	1042	8:00:00	1	617	26	644	0
9:00:00	22	372	11	405	0	927	9:00:00	5	491	26	522	0
11:00:00	0	1	0	1	0	3	11:00:00	0	2	0	2	0
12:00:00	11	144	12	167	2	328	12:00:00	6	147	8	161	0
13:00:00	13	169	15	197	0	358	13:00:00	4	154	3	161	0
14:00:00	17	210	9	236	0	432	14:00:00	6	184	6	196	1
15:00:00	0	13	1	14	0	23	15:00:00	0	9	0	9	0
16:00:00	16	425	22	463	3	808	16:00:00	5	330	10	345	0
17:00:00	32	523	23	578	0	1002	17:00:00	11	398	15	424	1
18:00:00	33	509	19	561	0	1018	18:00:00	9	434	14	457	1
Totals:	167	2737	116	3020	5	5941		47	2766	108	2921	3

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	44	36	30	30	30	49	36	53

MG8 ENG

Count Date: 30-May-2013

Intersection: Mayfield Road & Creditview Road **Municipality:** Region of Peel

Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way

Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #1: Minimum Vehicular Volumes.

A. All Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements													
	1 Lane Each Way		2 Lanes Each Way		3 Lanes	Hours Ending								Percentage Warrant
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	
100%	480	720	600	900	1125	1122	1000	379	409	488	895	1084	1111	100% Yes:
80%	385	575	480	720	900									No: X
All Approaches	100% Fulfilled					100	100			100	100	100	100	600
	80% Fulfilled								80					80
	Actual % if Below 80%							79						79
													Total:	759
													Actual Average (Total/8):	95%

B. Minor Street Both Approaches.

100%	120	170	120	170	170	80	73	51	51	56	87	82	93	100% Yes:
80%	95	135	95	135	135									No: X
Minor Street Both Approaches	100% Fulfilled													0
	80% Fulfilled													0
	Actual % if Below 80%					67	61	43	43	47	73	68	78	478
													Total:	478
													Actual Average (Total/8):	60%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Creditview Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #2: Delay to Cross Traffic.

A. Major Street Both Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements: 1 Lane Each Way		2 Lanes Each Way		3 Lanes	Hours Ending								
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	480	720	600	900	1125	1042	927	328	358	432	808	1002	1018	100% Yes:
80%	385	575	480	720	900									No: X
All Approaches	100% Fulfilled					100	100				100	100	100	500
	80% Fulfilled									80				80
	Actual % if Below 80%							68	75					143

Total:	723
Actual Average (Total/8):	90%

B. Traffic Crossing Major Street.

Flow Condition	Code 1	Code 2	Code 3	Code 4	Code 5	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	50	75	50	75	75	44	36	30	30	30	49	36	53	100% Yes:
80%	40	60	40	60	60									No: X
All Approaches	100% Fulfilled												100	100
	80% Fulfilled					80					80			160
	Actual % if Below 80%						72	60	60	60		72		324

Total:	584
Actual Average (Total/8):	73%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Creditview Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #3: Accident Experience.

Not Satisfied

A. Reportable accidents within a twelve month period averaged over 36 consequtive months susceptible to correction by a traffic signal.

Minimum Requirements	Actual Number of Accidents	Average Number of Accidents	Fulfilled
5	0 in 3 years	0 per year	0%

B. Adequate trial of less restrictive remedies has failed to reduce accident frequency.	No
C. Either Warrant 1 (Minimum Vehicular Volume) or Warrant 2 (Delay to Cross Traffic) satisfied 80% or more.	No

Warrant #4: Combination Warrant.
(Used if no warrant satisfied 100%)

Not Satisfied

Minimum Requirements	Warrant Satisfied 80% or More	Fulfilled
Two Warrants Satisfied 80%	Warrant 1 (Minimum Vehicular Volume) Warrant 2 (Delay to Cross Traffic) Warrant 3 (Accident Experience)	No No No

Conclusion: Traffic signal not warranted.

MG8 ENG

Count Date: 30-May-2013 Site #: 0001420659

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	5	5	5	5	0	0	2	2	0	0	0	0	0	0	1	1	0	0	0	0
7:30:00	9	4	12	7	3	3	2	0	0	0	1	1	0	0	1	0	0	0	0	0
7:45:00	13	4	16	4	5	2	2	0	0	0	2	1	0	0	1	0	0	0	0	0
8:00:00	16	3	17	1	7	2	2	0	0	0	2	0	0	0	1	0	0	0	0	0
8:15:00	20	4	21	4	10	3	2	0	0	0	2	0	0	0	1	0	0	0	0	0
8:30:00	25	5	22	1	12	2	2	0	0	0	2	0	0	0	1	0	0	0	0	0
8:45:00	32	7	23	1	13	1	4	2	0	0	2	0	0	0	1	0	0	0	0	0
9:00:00	36	4	29	6	16	3	4	0	0	0	2	0	0	0	1	0	0	0	0	0
9:00:07	36	0	29	0	16	0	4	0	0	0	2	0	0	0	1	0	0	0	0	0
11:00:00	36	0	29	0	16	0	4	0	0	0	2	0	0	0	1	0	0	0	0	0
11:15:00	39	3	30	1	17	1	4	0	0	0	2	0	0	0	1	0	0	0	0	0
11:30:00	42	3	34	4	18	1	4	0	0	0	2	0	0	0	1	0	0	0	0	0
11:45:00	44	2	36	2	21	3	4	0	0	0	2	0	1	1	1	0	0	0	0	0
12:00:00	46	2	39	3	21	0	4	0	0	0	2	0	1	0	1	0	0	0	0	0
12:15:00	48	2	41	2	22	1	4	0	0	0	2	0	1	0	1	0	0	0	0	0
12:30:00	51	3	43	2	22	0	4	0	0	0	2	0	1	0	1	0	0	0	0	0
12:45:00	53	2	43	0	23	1	4	0	0	0	2	0	1	0	1	0	1	1	0	0
13:00:00	54	1	43	0	23	0	4	0	0	0	2	0	1	0	1	0	1	0	0	0
13:15:00	57	3	46	3	24	1	4	0	0	0	2	0	1	0	1	0	1	0	0	0
13:30:00	59	2	48	2	24	0	4	0	0	0	2	0	1	0	1	0	1	0	0	0
13:45:00	61	2	48	0	24	0	4	0	0	0	3	1	1	0	1	0	1	0	0	0
14:00:00	62	1	48	0	24	0	4	0	0	0	3	0	1	0	1	0	1	0	0	0
14:02:01	63	1	48	0	24	0	4	0	0	0	3	0	1	0	1	0	1	0	0	0
15:00:00	63	0	48	0	24	0	4	0	0	0	3	0	1	0	1	0	1	0	0	0
15:15:00	64	1	49	1	26	2	4	0	0	0	3	0	1	0	1	0	1	0	0	0
15:30:00	64	0	52	3	28	2	4	0	0	0	3	0	1	0	1	0	1	0	1	1
15:45:00	64	0	54	2	29	1	4	0	0	0	4	1	1	0	1	0	1	0	1	0
16:00:00	69	5	58	4	30	1	5	1	0	0	5	1	1	0	1	0	1	0	1	0
16:15:00	73	4	60	2	30	0	5	0	0	0	5	0	1	0	1	0	1	0	1	0
16:30:00	75	2	63	3	32	2	5	0	0	0	5	0	1	0	1	0	1	0	1	0
16:45:00	77	2	65	2	33	1	5	0	0	0	5	0	1	0	1	0	1	0	1	0
17:00:00	82	5	69	4	34	1	5	0	0	0	5	0	1	0	1	0	1	0	1	0
17:15:00	83	1	74	5	34	0	5	0	0	0	5	0	1	0	1	0	1	0	1	0
17:30:00	86	3	76	2	34	0	5	0	0	0	5	0	1	0	1	0	1	0	1	0
17:45:00	91	5	78	2	38	4	5	0	0	0	5	0	1	0	1	0	1	0	1	0
18:00:00	96	5	83	5	41	3	5	0	0	0	5	0	1	0	1	0	1	0	1	0
18:00:13	97	1	83	0	41	0	5	0	0	0	5	0	1	0	1	0	1	0	1	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001420659

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	3	3	66	66	1	1	0	0	3	3	0	0	0	0	0	0	0	0	0	0
7:30:00	9	6	180	114	1	0	1	1	9	6	0	0	0	0	1	1	0	0	0	0
7:45:00	13	4	262	82	1	0	1	0	14	5	0	0	0	0	1	0	0	0	0	0
8:00:00	22	9	349	87	4	3	1	0	21	7	0	0	0	0	1	0	0	0	0	0
8:15:00	26	4	427	78	5	1	2	1	27	6	2	2	0	0	1	0	0	0	0	0
8:30:00	33	7	520	93	7	2	2	0	36	9	2	0	0	0	2	1	0	0	0	0
8:45:00	36	3	611	91	10	3	2	0	38	2	2	0	0	0	2	0	0	0	0	0
9:00:00	43	7	691	80	12	2	2	0	50	12	3	1	0	0	2	0	0	0	0	0
9:00:07	43	0	691	0	12	0	2	0	51	1	3	0	0	0	2	0	0	0	0	0
11:00:00	43	0	691	0	12	0	2	0	51	0	3	0	0	0	2	0	0	0	0	0
11:15:00	44	1	725	34	14	2	3	1	57	6	3	0	0	0	2	0	0	0	0	0
11:30:00	47	3	745	20	15	1	3	0	61	4	3	0	0	0	3	1	0	0	1	1
11:45:00	48	1	780	35	20	5	3	0	69	8	3	0	0	0	4	1	0	0	2	1
12:00:00	53	5	808	28	24	4	3	0	76	7	3	0	0	0	4	0	0	0	2	0
12:15:00	57	4	840	32	28	4	4	1	80	4	3	0	0	0	5	1	0	0	2	0
12:30:00	57	0	874	34	35	7	4	0	85	5	3	0	0	0	5	0	0	0	2	0
12:45:00	61	4	913	39	37	2	4	0	90	5	3	0	0	0	5	0	0	0	2	0
13:00:00	64	3	952	39	39	2	5	1	100	10	3	0	0	0	5	0	0	0	2	0
13:15:00	68	4	988	36	42	3	6	1	107	7	3	0	0	0	5	0	0	0	2	0
13:30:00	68	0	1039	51	43	1	7	1	112	5	3	0	0	0	6	1	0	0	2	0
13:45:00	71	3	1079	40	44	1	7	0	120	8	3	0	0	0	8	2	0	0	2	0
14:00:00	78	7	1126	47	48	4	8	1	128	8	3	0	0	0	13	5	0	0	2	0
14:02:01	78	0	1133	7	48	0	8	0	131	3	3	0	0	0	13	0	0	0	2	0
15:00:00	78	0	1136	3	49	1	8	0	131	0	3	0	0	0	13	0	0	0	2	0
15:15:00	82	4	1208	72	49	0	8	0	142	11	5	2	1	1	13	0	0	0	4	2
15:30:00	83	1	1323	115	58	9	8	0	149	7	5	0	1	0	15	2	0	0	5	1
15:45:00	85	2	1425	102	62	4	9	1	157	8	5	0	1	0	17	2	0	0	5	0
16:00:00	91	6	1526	101	69	7	10	1	160	3	5	0	1	0	19	2	0	0	5	0
16:15:00	94	3	1630	104	70	1	10	0	170	10	6	1	1	0	19	0	0	0	5	0
16:30:00	107	13	1764	134	78	8	10	0	175	5	6	0	1	0	19	0	0	0	5	0
16:45:00	115	8	1886	122	82	4	10	0	182	7	8	2	1	0	21	2	0	0	5	0
17:00:00	123	8	2017	131	88	6	10	0	189	7	9	1	1	0	22	1	0	0	5	0
17:15:00	129	6	2133	116	95	7	10	0	193	4	9	0	1	0	22	0	0	0	5	0
17:30:00	136	7	2269	136	99	4	10	0	199	6	9	0	1	0	22	0	0	0	5	0
17:45:00	148	12	2397	128	105	6	10	0	209	10	9	0	1	0	22	0	0	0	5	0
18:00:00	156	8	2503	106	107	2	10	0	211	2	9	0	1	0	23	1	0	0	5	0
18:00:13	156	0	2503	0	107	0	10	0	211	0	9	0	1	0	23	0	0	0	5	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001420659

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	2	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	1	3	3	5	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0
7:45:00	4	1	5	2	12	7	0	0	0	0	2	1	0	0	0	0	0	0	0	0
8:00:00	6	2	7	2	18	6	2	2	0	0	2	0	0	0	0	0	0	0	0	0
8:15:00	7	1	8	1	24	6	2	0	0	0	2	0	0	0	0	0	0	0	0	0
8:30:00	7	0	8	0	36	12	2	0	0	0	2	0	0	0	0	0	0	0	0	0
8:45:00	7	0	8	0	40	4	3	1	0	0	2	0	0	0	0	0	0	0	0	0
9:00:00	7	0	11	3	42	2	3	0	0	0	2	0	0	0	0	0	0	0	0	0
9:00:07	7	0	11	0	42	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0
11:00:00	7	0	11	0	42	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0
11:15:00	8	1	13	2	43	1	3	0	0	0	3	1	0	0	0	0	0	0	0	0
11:30:00	9	1	17	4	48	5	3	0	0	0	3	0	0	0	0	0	0	0	0	0
11:45:00	9	0	19	2	49	1	4	1	0	0	3	0	0	0	0	0	0	0	0	0
12:00:00	12	3	20	1	49	0	5	1	0	0	4	1	0	0	0	0	0	0	0	0
12:15:00	14	2	26	6	52	3	5	0	0	0	7	3	0	0	0	0	0	0	2	2
12:30:00	15	1	28	2	54	2	5	0	0	0	7	0	0	0	0	0	0	0	2	0
12:45:00	20	5	29	1	57	3	5	0	0	0	7	0	0	0	1	1	0	0	3	1
13:00:00	22	2	30	1	60	3	6	1	0	0	7	0	0	0	1	0	0	0	3	0
13:15:00	24	2	31	1	63	3	6	0	0	0	7	0	0	0	1	0	0	0	3	0
13:30:00	26	2	34	3	65	2	6	0	0	0	9	2	0	0	1	0	0	0	3	0
13:45:00	27	1	40	6	67	2	6	0	0	0	12	3	0	0	1	0	0	0	3	0
14:00:00	28	1	44	4	74	7	6	0	0	0	13	1	0	0	2	1	0	0	3	0
14:02:01	28	0	44	0	74	0	6	0	0	0	13	0	0	0	2	0	0	0	3	0
15:00:00	28	0	44	0	74	0	6	0	0	0	14	1	0	0	2	0	0	0	3	0
15:15:00	32	4	45	1	81	7	6	0	0	0	15	1	0	0	4	2	2	2	5	2
15:30:00	38	6	48	3	84	3	9	3	0	0	15	0	0	0	4	0	2	0	5	0
15:45:00	44	6	50	2	90	6	9	0	0	0	16	1	0	0	5	1	2	0	7	2
16:00:00	46	2	58	8	93	3	9	0	0	0	16	0	1	1	5	0	2	0	7	0
16:15:00	48	2	62	4	102	9	9	0	0	0	16	0	1	0	5	0	2	0	7	0
16:30:00	49	1	66	4	104	2	9	0	0	0	17	1	1	0	5	0	2	0	7	0
16:45:00	52	3	69	3	113	9	9	0	0	0	17	0	1	0	5	0	2	0	7	0
17:00:00	55	3	71	2	123	10	9	0	0	0	18	1	1	0	5	0	2	0	7	0
17:15:00	56	1	82	11	130	7	9	0	0	0	19	1	1	0	5	0	2	0	7	0
17:30:00	58	2	85	3	133	3	9	0	0	0	19	0	1	0	5	0	2	0	7	0
17:45:00	59	1	93	8	138	5	9	0	0	0	19	0	1	0	5	0	2	0	7	0
18:00:00	62	3	102	9	142	4	9	0	0	0	19	0	1	0	5	0	2	0	8	1
18:00:13	62	0	102	0	142	0	9	0	0	0	19	0	1	0	5	0	2	0	8	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001420659

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	89	89	1	1	0	0	6	6	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	236	147	6	5	0	0	10	4	0	0	0	0	1	1	0	0	0	0
7:45:00	1	1	402	166	12	6	0	0	19	9	2	2	0	0	1	0	0	0	0	0
8:00:00	1	0	591	189	24	12	0	0	24	5	2	0	0	0	2	1	0	0	0	0
8:15:00	2	1	726	135	34	10	0	0	28	4	2	0	0	0	2	0	0	0	0	0
8:30:00	4	2	850	124	40	6	1	1	34	6	2	0	0	0	2	0	0	0	0	0
8:45:00	4	0	977	127	44	4	1	0	40	6	2	0	0	0	4	2	0	0	0	0
9:00:00	4	0	1055	78	50	6	2	1	49	9	2	0	0	0	4	0	0	0	0	0
9:00:07	4	0	1055	0	50	0	2	0	49	0	2	0	0	0	4	0	0	0	0	0
11:00:00	4	0	1057	2	50	0	2	0	49	0	2	0	0	0	4	0	0	0	0	0
11:15:00	4	0	1090	33	50	0	2	0	57	8	2	0	0	0	4	0	0	0	0	0
11:30:00	6	2	1129	39	51	1	2	0	62	5	3	1	0	0	5	1	0	0	0	0
11:45:00	9	3	1151	22	51	0	3	1	67	5	5	2	0	0	5	0	0	0	0	0
12:00:00	9	0	1179	28	54	3	3	0	73	6	6	1	0	0	5	0	0	0	0	0
12:15:00	10	1	1214	35	55	1	3	0	74	1	6	0	0	0	5	0	0	0	0	0
12:30:00	10	0	1248	34	56	1	3	0	83	9	6	0	0	0	6	1	0	0	0	0
12:45:00	12	2	1282	34	56	0	3	0	87	4	6	0	0	0	7	1	0	0	0	0
13:00:00	13	1	1310	28	57	1	3	0	94	7	6	0	0	0	7	0	0	0	0	0
13:15:00	14	1	1340	30	57	0	3	0	98	4	6	0	0	0	7	0	0	0	0	0
13:30:00	16	2	1384	44	57	0	3	0	103	5	6	0	0	0	7	0	0	0	0	0
13:45:00	17	1	1422	38	61	4	3	0	112	9	6	0	0	0	7	0	0	0	0	0
14:00:00	19	2	1462	40	62	1	3	0	125	13	7	1	0	0	8	1	0	0	1	1
14:02:01	19	0	1465	3	62	0	3	0	126	1	7	0	0	0	8	0	0	0	1	0
15:00:00	19	0	1469	4	62	0	3	0	127	1	7	0	0	0	8	0	0	0	1	0
15:15:00	20	1	1521	52	62	0	3	0	139	12	7	0	0	0	9	1	0	0	1	0
15:30:00	21	1	1590	69	64	2	3	0	145	6	7	0	0	0	9	0	0	0	1	0
15:45:00	21	0	1666	76	67	3	4	1	159	14	9	2	0	0	10	1	0	0	1	0
16:00:00	23	2	1757	91	70	3	4	0	167	8	9	0	0	0	10	0	0	0	1	0
16:15:00	30	7	1829	72	74	4	4	0	175	8	9	0	0	0	11	1	0	0	1	0
16:30:00	31	1	1921	92	78	4	5	1	188	13	9	0	0	0	12	1	0	0	1	0
16:45:00	31	0	2022	101	82	4	5	0	198	10	9	0	0	0	13	1	0	0	2	1
17:00:00	32	1	2113	91	84	2	6	1	204	6	9	0	0	0	15	2	1	1	2	0
17:15:00	34	2	2224	111	89	5	6	0	209	5	9	0	0	0	16	1	2	1	2	0
17:30:00	34	0	2320	96	93	4	6	0	217	8	9	0	0	0	16	0	2	0	2	0
17:45:00	36	2	2428	108	96	3	7	1	221	4	9	0	0	0	16	0	2	0	3	1
18:00:00	40	4	2519	91	97	1	7	0	229	8	9	0	0	0	18	2	2	0	3	0
18:00:13	40	0	2519	0	97	0	7	0	229	0	9	0	0	0	18	0	2	0	3	0

MG8 ENG

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:15:00
To: 8:15:00

Municipality: Region of Peel
Site #: 0000125337
Intersection: Mayfield Road & Mississauga Road
TFR File #: 1
Count date: 23-Apr-2013

Weather conditions:

Person(s) who counted:
DAVID

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 651
North Entering: 529
North Peds: 0
Peds Cross: ⋈

Cyclists	0	1	0	1
Trucks	2	17	3	22
Cars	119	335	52	506
Totals	121	353	55	

Cyclists	1
Trucks	17
Cars	104
Totals	122

East Leg Total: 1111
East Entering: 431
East Peds: 0
Peds Cross: ⧗

Mississauga Road

Cyclists	Trucks	Cars	Totals
1	18	428	447

Mayfield Road

Cars	Trucks	Cyclists	Totals
13	3	1	17
297	11	1	309
89	16	0	105
399	30	2	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	2	46	48
0	17	572	589
0	8	30	38
0	27	648	

Mayfield Road

Cars	Trucks	Cyclists	Totals
657	23	0	680

Mississauga Road

Peds Cross: ⧗
West Peds: 0
West Entering: 675
West Leg Total: 1122

Cars	454
Trucks	41
Cyclists	1
Totals	496

Cars	12	45	33	90
Trucks	5	12	3	20
Cyclists	0	0	0	0
Totals	17	57	36	

Peds Cross: ⋈
South Peds: 5
South Entering: 110
South Leg Total: 606

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 12:45:00
To: 13:45:00

Municipality: Region of Peel
Site #: 0000125337
Intersection: Mayfield Road & Mississauga Road
TFR File #: 1
Count date: 23-Apr-2013

Weather conditions:

Person(s) who counted:
DAVID

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total: 189
North Entering: 94
North Peds: 0
Peds Cross: ⋈

Cyclists	0	1	2	3
Trucks	0	8	2	10
Cars	19	47	15	81
Totals	19	56	19	

Cyclists	3
Trucks	12
Cars	80
Totals	95

East Leg Total: 326
East Entering: 177
East Peds: 1
Peds Cross: ⧗

Mississauga Road

Cyclists	Trucks	Cars	Totals
1	27	148	176

Cars	Trucks	Cyclists	Totals
12	1	0	13
116	22	1	139
20	5	0	25
148	28	1	

Mayfield Road

N
W
E
S

Cyclists	Trucks	Cars	Totals
1	5	21	27
1	11	90	102
0	6	17	23
2	22	128	

Mayfield Road

Cars	Trucks	Cyclists	Totals
123	22	4	149

Mississauga Road

Peds Cross: ⧗
West Peds: 0
West Entering: 152
West Leg Total: 328

Cars	84
Trucks	19
Cyclists	1
Totals	104

Cars	13	47	18	78
Trucks	5	6	9	20
Cyclists	0	2	1	3
Totals	18	55	28	

Peds Cross: ⋈
South Peds: 1
South Entering: 101
South Leg Total: 205

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:45:00
To: 17:45:00

Municipality: Region of Peel
Site #: 0000125337
Intersection: Mayfield Road & Mississauga Road
TFR File #: 1
Count date: 23-Apr-2013

Weather conditions:

Person(s) who counted:
DAVID

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North (Mississauga Road)

North Leg Total: 571
North Entering: 159
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	1	1
Trucks	4	5	0	9
Cars	49	86	14	149
Totals	53	91	15	

Cyclists	7
Trucks	14
Cars	391
Totals	412

East

East Leg Total: 1201
East Entering: 644
East Peds: 0
Peds Cross: ⧗

Cars	Trucks	Cyclists	Totals
26	3	0	29
550	11	4	565
46	4	0	50
622	18	4	

Mayfield Road

Cars	Trucks	Cyclists	Totals
529	25	3	557

West (Mayfield Road)

Cyclists	Trucks	Cars	Totals
5	20	616	641

Cyclists	Trucks	Cars	Totals
1	3	91	95
2	12	410	424
0	2	13	15
3	17	514	

N W E S

Peds Cross: ⧗
West Peds: 0
West Entering: 534
West Leg Total: 1175

South (Mississauga Road)

Cars	145
Trucks	11
Cyclists	0
Totals	156

Cars	17	274	105	396
Trucks	5	8	13	26
Cyclists	1	6	0	7
Totals	23	288	118	

Peds Cross: ⋈
South Peds: 0
South Entering: 429
South Leg Total: 585

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0000125337
Intersection: Mayfield Road & Mississauga Road
TFR File #: 1
Count date: 23-Apr-2013

Weather conditions:

Person(s) who counted:
DAVID

**** Signalized Intersection ****

Major Road: Mayfield Road runs W/E

North Leg Total:	2943
North Entering:	1585
North Peds:	3
Peds Cross:	⋈

Cyclists	1	8	8	17
Trucks	29	70	20	119
Cars	358	930	161	1449
Totals	388	1008	189	

Cyclists	18
Trucks	96
Cars	1244
Totals	1358

East Leg Total:	5712
East Entering:	2863
East Peds:	1
Peds Cross:	⧗

Mississauga Road

Cyclists	Trucks	Cars	Totals
19	182	2637	2838

Mayfield Road

Cars	Trucks	Cyclists	Totals
139	17	4	160
2178	121	15	2314
331	58	0	389
2648	196	19	

N

W E

S

Cyclists	Trucks	Cars	Totals
2	24	330	356
13	107	2136	2256
0	33	139	172
15	164	2605	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2643	182	24	2849

Mississauga Road

Peds Cross:	⧗
West Peds:	0
West Entering:	2784
West Leg Total:	5622

Cars	1400
Trucks	161
Cyclists	8
Totals	1569

Cars	101	775	346	1222
Trucks	32	55	55	142
Cyclists	3	12	3	18
Totals	136	842	404	

Peds Cross:	⋈
South Peds:	18
South Entering:	1382
South Leg Total:	2951

Comments

MG8 ENG
Traffic Count Summary

Intersection: Mayfield Road & Mississauga Road	Count Date: 23-Apr-2013	Municipality: Region of Peel

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Cyclists					North/South Total Approaches		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	45	368	116	529	0	628	8:00:00	18	48	33	99	7
9:00:00	49	240	68	357	0	429	9:00:00	9	36	27	72	4
11:00:00	0	1	1	2	0	2	11:00:00	0	0	0	0	0
12:00:00	11	57	26	94	0	180	12:00:00	11	48	27	86	0
13:00:00	19	45	22	86	0	180	13:00:00	20	48	26	94	0
14:00:00	17	47	21	85	1	184	14:00:00	9	62	28	99	1
15:00:00	0	0	0	0	0	0	15:00:00	0	0	0	0	0
16:00:00	14	71	29	114	1	288	16:00:00	24	98	52	174	3
17:00:00	17	80	53	150	0	471	17:00:00	22	220	79	321	2
18:00:00	17	99	52	168	1	603	18:00:00	23	281	131	435	1
Totals:	189	1008	388	1585	3	2965		136	841	403	1380	18

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Cyclists					East/West Total Approaches		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds		Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	102	304	16	422	0	1101	8:00:00	44	588	47	679	0
9:00:00	88	303	12	403	0	873	9:00:00	37	412	21	470	0
11:00:00	1	3	2	6	0	10	11:00:00	0	4	0	4	0
12:00:00	28	100	20	148	0	295	12:00:00	21	110	16	147	0
13:00:00	21	107	14	142	0	275	13:00:00	16	104	13	133	0
14:00:00	29	138	16	183	1	336	14:00:00	27	102	24	153	0
15:00:00	0	2	0	2	0	2	15:00:00	0	0	0	0	0
16:00:00	26	331	29	386	0	629	16:00:00	41	188	14	243	0
17:00:00	44	513	25	582	0	1056	17:00:00	85	365	24	474	0
18:00:00	50	512	26	588	0	1068	18:00:00	85	382	13	480	0
Totals:	389	2313	160	2862	1	5645		356	2255	172	2783	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	431	298	79	87	89	136	259	321

MG8 ENG

Count Date: 23-Apr-2013 Site #: 0000125337

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	3	3	93	93	12	12	2	2	1	1	1	1	0	0	0	0	0	0	0	0
7:30:00	12	9	197	104	46	34	2	0	6	5	1	0	0	0	0	0	0	0	0	0
7:45:00	24	12	296	99	89	43	2	0	10	4	2	1	0	0	1	1	0	0	0	0
8:00:00	42	18	355	59	114	25	3	1	12	2	2	0	0	0	1	0	0	0	0	0
8:15:00	55	13	428	73	131	17	5	2	18	6	3	1	0	0	1	0	0	0	0	0
8:30:00	59	4	479	51	150	19	8	3	19	1	3	0	0	0	1	0	0	0	0	0
8:45:00	73	14	541	62	166	16	9	1	24	5	3	0	2	2	3	2	0	0	0	0
9:00:00	81	8	578	37	181	15	10	1	26	2	3	0	3	1	4	1	0	0	0	0
9:00:36	81	0	579	1	182	1	10	0	26	0	3	0	3	0	4	0	0	0	0	0
11:00:00	81	0	579	0	182	0	10	0	26	0	3	0	3	0	4	0	0	0	0	0
11:15:00	81	0	588	9	191	9	10	0	29	3	4	1	3	0	4	0	0	0	0	0
11:30:00	83	2	607	19	194	3	10	0	29	0	4	0	3	0	4	0	0	0	0	0
11:45:00	87	4	618	11	200	6	12	2	32	3	5	1	3	0	4	0	0	0	0	0
12:00:00	89	2	627	9	205	5	13	1	35	3	6	1	3	0	4	0	0	0	0	0
12:15:00	94	5	635	8	210	5	13	0	35	0	10	4	3	0	4	0	0	0	0	0
12:30:00	100	6	646	11	212	2	13	0	35	0	11	1	3	0	5	1	0	0	0	0
12:45:00	102	2	655	9	217	5	13	0	35	0	11	0	3	0	5	0	0	0	0	0
13:00:00	106	4	669	14	222	5	15	2	37	2	11	0	3	0	5	0	0	0	0	0
13:15:00	113	7	684	15	223	1	15	0	42	5	11	0	3	0	6	1	0	0	0	0
13:30:00	114	1	691	7	228	5	15	0	43	1	11	0	3	0	6	0	0	0	0	0
13:45:00	117	3	702	11	236	8	15	0	43	0	11	0	5	2	6	0	0	0	0	0
14:00:00	120	3	708	6	242	6	16	1	44	1	12	1	5	0	6	0	0	0	1	1
14:00:13	120	0	708	0	242	0	16	0	44	0	12	0	5	0	6	0	0	0	1	0
15:00:00	120	0	708	0	242	0	16	0	44	0	12	0	5	0	6	0	0	0	1	0
15:15:00	123	3	728	20	248	6	16	0	48	4	14	2	5	0	6	0	0	0	2	1
15:30:00	125	2	743	15	257	9	16	0	51	3	16	2	5	0	6	0	0	0	2	0
15:45:00	126	1	755	12	263	6	19	3	54	3	17	1	6	1	7	1	0	0	2	0
16:00:00	129	3	765	10	266	3	20	1	57	3	17	0	6	0	7	0	0	0	2	0
16:15:00	130	1	779	14	278	12	20	0	59	2	18	1	6	0	7	0	1	1	2	0
16:30:00	131	1	808	29	288	10	20	0	60	1	20	2	6	0	7	0	1	0	2	0
16:45:00	140	9	820	12	299	11	20	0	63	3	22	2	7	1	8	1	1	0	2	0
17:00:00	145	5	838	18	311	12	20	0	63	0	24	2	7	0	8	0	1	0	2	0
17:15:00	150	5	856	18	324	13	20	0	66	3	25	1	7	0	8	0	1	0	2	0
17:30:00	152	2	887	31	335	11	20	0	67	1	26	1	7	0	8	0	1	0	2	0
17:45:00	154	2	906	19	348	13	20	0	68	1	26	0	8	1	8	0	1	0	2	0
18:00:00	161	7	930	24	358	10	20	0	70	2	29	3	8	0	8	0	1	0	3	1
18:00:20	161	0	930	0	358	0	20	0	70	0	29	0	8	0	8	0	1	0	3	0

MG8 ENG

Count Date: 23-Apr-2013 Site #: 0000125337

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	16	16	64	64	2	2	1	1	5	5	0	0	0	0	0	0	0	0	0	0
7:30:00	42	26	133	69	2	0	7	6	6	1	1	1	0	0	0	0	0	0	0	0
7:45:00	66	24	222	89	4	2	8	1	9	3	2	1	0	0	1	1	0	0	0	0
8:00:00	90	24	291	69	13	9	12	4	12	3	2	0	0	0	1	0	1	1	0	0
8:15:00	105	15	361	70	15	2	17	5	16	4	3	1	0	0	1	0	1	0	0	0
8:30:00	124	19	447	86	18	3	24	7	24	8	3	0	0	0	3	2	1	0	0	0
8:45:00	142	18	510	63	22	4	25	1	26	2	4	1	0	0	3	0	1	0	0	0
9:00:00	162	20	573	63	23	1	28	3	31	5	4	0	0	0	3	0	1	0	0	0
9:00:36	163	1	576	3	25	2	28	0	31	0	4	0	0	0	3	0	1	0	0	0
11:00:00	163	0	576	0	25	0	28	0	31	0	4	0	0	0	3	0	1	0	0	0
11:15:00	164	1	597	21	27	2	29	1	32	1	4	0	0	0	3	0	1	0	0	0
11:30:00	171	7	619	22	31	4	30	1	37	5	6	2	0	0	3	0	1	0	0	0
11:45:00	181	10	638	19	38	7	32	2	38	1	7	1	0	0	3	0	1	0	0	0
12:00:00	187	6	666	28	42	4	32	0	41	3	7	0	0	0	3	0	1	0	0	0
12:15:00	194	7	679	13	45	3	33	1	48	7	7	0	0	0	4	1	1	0	0	0
12:30:00	197	3	699	20	49	4	34	1	52	4	7	0	0	0	4	0	3	2	0	0
12:45:00	199	2	725	26	53	4	35	1	57	5	8	1	0	0	4	0	3	0	0	0
13:00:00	203	4	753	28	53	0	37	2	60	3	8	0	0	0	4	0	3	0	0	0
13:15:00	210	7	776	23	59	6	38	1	66	6	9	1	0	0	4	0	3	0	1	1
13:30:00	215	5	793	17	62	3	40	2	72	6	9	0	0	0	4	0	3	0	1	0
13:45:00	219	4	841	48	65	3	40	0	79	7	9	0	0	0	5	1	3	0	1	0
14:00:00	225	6	868	27	68	3	44	4	80	1	9	0	0	0	7	2	3	0	1	0
14:00:13	225	0	870	2	68	0	44	0	80	0	9	0	0	0	7	0	3	0	1	0
15:00:00	225	0	870	0	68	0	44	0	80	0	9	0	0	0	7	0	3	0	1	0
15:15:00	229	4	921	51	71	3	44	0	83	3	10	1	0	0	7	0	3	0	1	0
15:30:00	232	3	995	74	75	4	48	4	85	2	10	0	0	0	9	2	4	1	1	0
15:45:00	240	8	1089	94	83	8	48	0	87	2	11	1	0	0	10	1	4	0	1	0
16:00:00	247	7	1189	100	93	10	48	0	89	2	12	1	0	0	10	0	4	0	1	0
16:15:00	254	7	1305	116	96	3	50	2	98	9	12	0	0	0	10	0	4	0	1	0
16:30:00	264	10	1406	101	103	7	50	0	101	3	12	0	0	0	11	1	4	0	1	0
16:45:00	277	13	1542	136	111	8	52	2	106	5	13	1	0	0	11	0	4	0	1	0
17:00:00	287	10	1681	139	116	5	52	0	109	3	14	1	0	0	11	0	4	0	1	0
17:15:00	298	11	1803	122	121	5	54	2	114	5	14	0	0	0	11	0	4	0	1	0
17:30:00	311	13	1959	156	133	12	56	2	115	1	16	2	0	0	11	0	4	0	1	0
17:45:00	323	12	2092	133	137	4	56	0	117	2	16	0	0	0	15	4	4	0	1	0
18:00:00	331	8	2177	85	139	2	58	2	121	4	17	1	0	0	15	0	4	0	1	0
18:00:20	331	0	2178	1	139	0	58	0	121	0	17	0	0	0	15	0	4	0	1	0

MG8 ENG

Count Date: 23-Apr-2013 Site #: 0000125337

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	4	4	4	4	2	2	0	0	2	2	1	1	2	2	0	0	0	0	2	2
7:30:00	10	6	11	7	10	8	0	0	4	2	1	0	2	0	0	0	0	0	7	5
7:45:00	12	2	26	15	17	7	2	2	5	1	1	0	2	0	0	0	0	0	7	0
8:00:00	13	1	39	13	29	12	3	1	9	4	4	3	2	0	0	0	0	0	7	0
8:15:00	16	3	49	10	35	6	5	2	14	5	4	0	2	0	0	0	0	0	7	0
8:30:00	17	1	56	7	40	5	5	0	15	1	4	0	2	0	0	0	0	0	7	0
8:45:00	17	0	64	8	50	10	6	1	16	1	5	1	2	0	0	0	0	0	11	4
9:00:00	19	2	68	4	55	5	6	0	16	0	5	0	2	0	0	0	0	0	11	0
9:00:36	19	0	68	0	55	0	6	0	16	0	5	0	2	0	0	0	0	0	11	0
11:00:00	19	0	68	0	55	0	6	0	16	0	5	0	2	0	0	0	0	0	11	0
11:15:00	20	1	79	11	59	4	7	1	17	1	8	3	2	0	1	1	0	0	11	0
11:30:00	21	1	87	8	65	6	8	1	17	0	9	1	2	0	1	0	0	0	11	0
11:45:00	22	1	94	7	71	6	8	0	20	3	11	2	2	0	1	0	0	0	11	0
12:00:00	26	4	108	14	76	5	10	2	23	3	11	0	2	0	1	0	0	0	11	0
12:15:00	30	4	115	7	79	3	10	0	26	3	13	2	2	0	3	2	0	0	11	0
12:30:00	32	2	125	10	84	5	11	1	28	2	16	3	2	0	4	1	0	0	11	0
12:45:00	34	2	133	8	87	3	13	2	31	3	16	0	2	0	4	0	0	0	11	0
13:00:00	40	6	145	12	92	5	16	3	31	0	21	5	2	0	4	0	0	0	11	0
13:15:00	45	5	156	11	94	2	17	1	33	2	25	4	2	0	4	0	1	1	11	0
13:30:00	46	1	167	11	101	7	18	1	35	2	25	0	2	0	4	0	1	0	12	1
13:45:00	47	1	180	13	105	4	18	0	37	2	25	0	2	0	6	2	1	0	12	0
14:00:00	47	0	196	16	115	10	18	0	40	3	25	0	2	0	6	0	1	0	12	0
14:00:13	47	0	196	0	115	0	18	0	40	0	25	0	2	0	6	0	1	0	12	0
15:00:00	47	0	196	0	115	0	18	0	40	0	25	0	2	0	6	0	1	0	12	0
15:15:00	50	3	206	10	123	8	18	0	42	2	27	2	2	0	6	0	1	0	12	0
15:30:00	56	6	237	31	132	9	18	0	44	2	29	2	2	0	6	0	1	0	13	1
15:45:00	59	3	260	23	141	9	21	3	44	0	32	3	2	0	6	0	1	0	14	1
16:00:00	64	5	288	28	153	12	25	4	46	2	37	5	2	0	6	0	3	2	15	1
16:15:00	70	6	332	44	170	17	26	1	46	0	38	1	2	0	6	0	3	0	15	0
16:30:00	77	7	375	43	188	18	26	0	46	0	40	2	2	0	6	0	3	0	15	0
16:45:00	81	4	432	57	207	19	27	1	47	1	41	1	2	0	6	0	3	0	17	2
17:00:00	83	2	501	69	225	18	28	1	51	4	44	3	2	0	8	2	3	0	17	0
17:15:00	90	7	569	68	248	23	30	2	54	3	47	3	2	0	9	1	3	0	17	0
17:30:00	93	3	642	73	285	37	30	0	55	1	51	4	2	0	12	3	3	0	17	0
17:45:00	98	5	706	64	312	27	32	2	55	0	54	3	3	1	12	0	3	0	17	0
18:00:00	101	3	774	68	345	33	32	0	55	0	55	1	3	0	12	0	3	0	18	1
18:00:20	101	0	775	1	346	1	32	0	55	0	55	0	3	0	12	0	3	0	18	0

MG8 ENG

Count Date: 23-Apr-2013 Site #: 0000125337

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	6	6	106	106	14	14	0	0	5	5	0	0	0	0	0	0	0	0	0	0
7:30:00	14	8	239	133	22	8	0	0	9	4	3	3	0	0	0	0	0	0	0	0
7:45:00	27	13	392	153	27	5	1	1	18	9	3	0	0	0	0	0	0	0	0	0
8:00:00	43	16	569	177	40	13	1	0	19	1	7	4	0	0	0	0	0	0	0	0
8:15:00	52	9	678	109	44	4	2	1	22	3	8	1	0	0	0	0	0	0	0	0
8:30:00	59	7	792	114	53	9	4	2	24	2	8	0	0	0	1	1	0	0	0	0
8:45:00	66	7	891	99	56	3	5	1	24	0	9	1	0	0	1	0	0	0	0	0
9:00:00	76	10	968	77	58	2	5	0	30	6	10	1	0	0	2	1	0	0	0	0
9:00:36	76	0	972	4	58	0	5	0	30	0	10	0	0	0	2	0	0	0	0	0
11:00:00	76	0	972	0	58	0	5	0	30	0	10	0	0	0	2	0	0	0	0	0
11:15:00	82	6	1000	28	58	0	8	3	32	2	10	0	0	0	2	0	0	0	0	0
11:30:00	84	2	1021	21	63	5	10	2	35	3	12	2	0	0	2	0	0	0	0	0
11:45:00	86	2	1051	30	66	3	10	0	41	6	14	2	0	0	2	0	0	0	0	0
12:00:00	92	6	1068	17	69	3	10	0	44	3	15	1	0	0	2	0	0	0	0	0
12:15:00	94	2	1092	24	69	0	10	0	47	3	15	0	0	0	2	0	0	0	0	0
12:30:00	99	5	1117	25	72	3	10	0	52	5	16	1	0	0	2	0	0	0	0	0
12:45:00	101	2	1135	18	73	1	10	0	55	3	18	2	0	0	2	0	0	0	0	0
13:00:00	106	5	1159	24	76	3	11	1	57	2	21	3	1	1	2	0	0	0	0	0
13:15:00	114	8	1183	24	82	6	12	1	59	2	22	1	1	0	2	0	0	0	0	0
13:30:00	117	3	1203	20	85	3	14	2	64	5	23	1	1	0	3	1	0	0	0	0
13:45:00	122	5	1225	22	90	5	15	1	66	2	24	1	1	0	3	0	0	0	0	0
14:00:00	127	5	1248	23	96	6	17	2	68	2	25	1	1	0	4	1	0	0	0	0
14:00:13	127	0	1248	0	96	0	17	0	68	0	25	0	1	0	4	0	0	0	0	0
15:00:00	127	0	1248	0	96	0	17	0	68	0	25	0	1	0	4	0	0	0	0	0
15:15:00	136	9	1285	37	99	3	18	1	70	2	27	2	1	0	5	1	0	0	0	0
15:30:00	150	14	1321	36	99	0	19	1	74	4	28	1	1	0	5	0	0	0	0	0
15:45:00	156	6	1358	37	103	4	19	0	75	1	29	1	1	0	6	1	0	0	0	0
16:00:00	166	10	1420	62	106	3	19	0	82	7	29	0	1	0	6	0	0	0	0	0
16:15:00	186	20	1509	89	113	7	20	1	87	5	29	0	1	0	10	4	0	0	0	0
16:30:00	207	21	1571	62	123	10	21	1	90	3	31	2	1	0	10	0	0	0	0	0
16:45:00	228	21	1666	95	123	0	21	0	94	4	31	0	1	0	10	0	0	0	0	0
17:00:00	249	21	1766	100	127	4	21	0	96	2	32	1	1	0	11	1	0	0	0	0
17:15:00	270	21	1877	111	128	1	23	2	100	4	32	0	1	0	12	1	0	0	0	0
17:30:00	293	23	1986	109	131	3	24	1	102	2	32	0	2	1	12	0	0	0	0	0
17:45:00	319	26	2076	90	136	5	24	0	106	4	33	1	2	0	12	0	0	0	0	0
18:00:00	330	11	2135	59	139	3	24	0	107	1	33	0	2	0	13	1	0	0	0	0
18:00:20	330	0	2136	1	139	0	24	0	107	0	33	0	2	0	13	0	0	0	0	0

MG8 ENG

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	**From:**	7:15:00
To:	9:00:00	**To:**	8:15:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 78
North Entering: 67
North Peds: 0
Peds Cross: ⋈

Cyclists	0	1	0	1
Trucks	1	2	0	3
Cars	6	52	5	63
Totals	7	55	5	

Cyclists	0
Trucks	1
Cars	10
Totals	11

East Leg Total: 1172
East Entering: 463
East Peds: 1
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
0	21	256	277

Cars	Trucks	Cyclists	Totals
3	1	0	4
246	20	0	266
188	5	0	193
437	26	0	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	1	1
2	22	653	677
0	3	74	77
2	25	728	

Mayfield Road

Cars	Trucks	Cyclists	Totals
682	25	2	709

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 755
West Leg Total: 1032

Cars	314
Trucks	10
Cyclists	1
Totals	325

Cars	4	6	24	34
Trucks	0	0	3	3
Cyclists	0	0	0	0
Totals	4	6	27	

Peds Cross: ⋈
South Peds: 0
South Entering: 37
South Leg Total: 362

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period		One Hour Peak	
From:	11:00:00	**From:**	13:00:00
To:	14:00:00	**To:**	14:00:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 47
North Entering: 17
North Peds: 0
Peds Cross: ⋈

Cyclists	0	2	1	3
Trucks	0	1	0	1
Cars	4	4	5	13
Totals	4	7	6	

Cyclists	3
Trucks	0
Cars	27
Totals	30

East Leg Total: 369
East Entering: 194
East Peds: 2
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
5	21	158	184

Mayfield Road

Cars	Trucks	Cyclists	Totals
7	0	0	7
145	21	5	171
14	2	0	16
166	23	5	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	4	4
1	27	122	150
0	1	7	8
1	28	133	

Mayfield Road

Cars	Trucks	Cyclists	Totals
142	31	2	175

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 162
West Leg Total: 346

Cars	25
Trucks	4
Cyclists	2
Totals	31

Cars	9	16	15	40
Trucks	0	0	4	4
Cyclists	0	3	0	3
Totals	9	19	19	

Peds Cross: ⋈
South Peds: 0
South Entering: 47
South Leg Total: 78

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 106
North Entering: 27
North Peds: 0
Peds Cross: ⋈

Cyclists	0	0	0	0
Trucks	0	1	1	2
Cars	4	15	6	25
Totals	4	16	7	

Cyclists	2
Trucks	2
Cars	75
Totals	79

East Leg Total: 1042
East Entering: 597
East Peds: 0
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
2	22	566	590

Mayfield Road

Cars	Trucks	Cyclists	Totals
8	0	0	8
532	22	2	556
33	0	0	33
573	22	2	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	7	7
2	35	301	338
0	0	6	6
2	35	314	

Mayfield Road

Cars	Trucks	Cyclists	Totals
405	38	2	445

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 351
West Leg Total: 941

Cars	54
Trucks	1
Cyclists	0
Totals	55

Cars	30	60	98	188
Trucks	0	2	2	4
Cyclists	0	2	0	2
Totals	30	64	100	

Peds Cross: ⋈
South Peds: 0
South Entering: 194
South Leg Total: 249

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 542
North Entering: 238
North Peds: 0
Peds Cross: ⋈

Cyclists	1	8	1	10
Trucks	3	7	5	15
Cars	33	152	28	213
Totals	37	167	34	

Cyclists	13
Trucks	12
Cars	279
Totals	304

East Leg Total: 5712
East Entering: 2905
East Peds: 3
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
23	156	2373	2552

Mayfield Road

Cars	Trucks	Cyclists	Totals
39	5	0	44
2235	151	22	2408
436	17	0	453
2710	173	22	

N
W E
S

Cyclists	Trucks	Cars	Totals
0	1	28	29
11	192	2224	2427
0	5	172	177
11	198	2424	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2580	214	13	2807

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 2633
West Leg Total: 5185

Cars	760
Trucks	29
Cyclists	8
Totals	797

Cars	105	212	328	645
Trucks	2	6	17	25
Cyclists	0	13	1	14
Totals	107	231	346	

Peds Cross: ⋈
South Peds: 0
South Entering: 684
South Leg Total: 1481

Comments

MG8 ENG

Traffic Count Summary

Intersection: Mayfield Road & Heritage Road	Count Date: 30-May-2013	Municipality: Region of Peel

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Cyclists					North/South		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	2	0	2	0	5	7:00:00	0	0	3	3	0
8:00:00	5	58	6	69	0	106	8:00:00	4	6	27	37	0
9:00:00	6	40	3	49	0	91	9:00:00	3	12	27	42	0
11:00:00	0	1	0	1	0	3	11:00:00	0	2	0	2	0
12:00:00	0	9	3	12	0	40	12:00:00	4	10	14	28	0
13:00:00	3	11	4	18	0	45	13:00:00	6	13	8	27	0
14:00:00	6	7	4	17	0	64	14:00:00	9	19	19	47	0
15:00:00	0	0	2	2	0	5	15:00:00	0	1	2	3	0
16:00:00	4	8	8	20	0	104	16:00:00	12	35	37	84	0
17:00:00	5	11	5	21	0	188	17:00:00	28	59	80	167	0
18:00:00	5	20	2	27	0	269	18:00:00	41	74	127	242	0
Totals:	34	167	37	238	0	920		107	231	344	682	0

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Cyclists					East/West		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	1	10	1	12	0	28	7:00:00	0	13	3	16	0
8:00:00	179	248	4	431	1	1149	8:00:00	1	629	88	718	0
9:00:00	147	236	1	384	0	897	9:00:00	2	474	37	513	0
11:00:00	0	11	0	11	0	19	11:00:00	0	8	0	8	0
12:00:00	8	129	5	142	0	279	12:00:00	2	130	5	137	0
13:00:00	13	146	4	163	0	291	13:00:00	5	114	9	128	0
14:00:00	16	171	7	194	2	356	14:00:00	4	150	8	162	0
15:00:00	1	12	0	13	0	29	15:00:00	1	15	0	16	0
16:00:00	26	393	7	426	0	670	16:00:00	3	232	9	244	0
17:00:00	29	539	8	576	0	944	17:00:00	6	352	10	368	0
18:00:00	33	507	7	547	0	868	18:00:00	5	308	8	321	0
Totals:	453	2402	44	2899	3	5530		29	2425	177	2631	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	68	49	14	22	36	51	92	120

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #1: Minimum Vehicular Volumes.

A. All Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements: 1 Lane Each Way		2 Lanes Each Way		3 Lanes	Hours Ending								
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	480	720	600	900	1125	1255	988	319	336	420	774	1132	1137	100% Yes:
80%	385	575	480	720	900									No: X
All Approaches	100% Fulfilled					100	100				100	100	100	500
	80% Fulfilled									80				80
	Actual % if Below 80%							66	70					136
													Total:	716
													Actual Average (Total/8):	90%

B. Minor Street Both Approaches.

Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	120	170	120	170	170	106	91	40	45	64	104	188	269	100% Yes:
80%	95	135	95	135	135									No: X
Minor Street Both Approaches	100% Fulfilled											100	100	200
	80% Fulfilled					80					80			160
	Actual % if Below 80%						76	33	38	53				200
													Total:	560
													Actual Average (Total/8):	70%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #2: Delay to Cross Traffic.

A. Major Street Both Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements					Hours Ending								
	1 Lane Each Way		2 Lanes Each Way		3 Lanes									
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	480	720	600	900	1125	1149	897	279	291	356	670	944	868	Yes: 100%
80%	385	575	480	720	900									No: X
All Approaches	100% Fulfilled					100	100				100	100	100	500
	80% Fulfilled													0
	Actual % if Below 80%							58	61	74				193
													Total:	693
													Actual Average (Total/8):	87%

B. Traffic Crossing Major Street.

Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	50	75	50	75	75	68	49	14	22	36	51	92	120	Yes: 100%
80%	40	60	40	60	60									No: X
All Approaches	100% Fulfilled					100					100	100	100	400
	80% Fulfilled						80							80
	Actual % if Below 80%							28	44	72				144
													Total:	624
													Actual Average (Total/8):	78%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #3: Accident Experience.

Not Satisfied

A. Reportable accidents within a twelve month period averaged over 36 consequtive months susceptible to correction by a traffic signal.

Minimum Requirements	Actual Number of Accidents	Average Number of Accidents	Fulfilled
5	0 in 3 years	0 per year	0%

B. Adequate trial of less restrictive remedies has failed to reduce accident frequency.	No
C. Either Warrant 1 (Minimum Vehicular Volume) or Warrant 2 (Delay to Cross Traffic) satisfied 80% or more.	No

Warrant #4: Combination Warrant.
(Used if no warrant satisfied 100%)

Not Satisfied

Minimum Requirements	Warrant Satisfied 80% or More	Fulfilled
Two Warrants Satisfied 80%	Warrant 1 (Minimum Vehicular Volume) Warrant 2 (Delay to Cross Traffic) Warrant 3 (Accident Experience)	No No No

Conclusion: Traffic signal not warranted.

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	12	10	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	3	28	16	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0
7:45:00	3	0	39	11	5	4	1	0	2	1	1	0	0	0	1	1	0	0	0	0
8:00:00	4	1	57	18	5	0	1	0	2	0	1	0	0	0	1	0	0	0	0	0
8:15:00	5	1	64	7	6	1	1	0	2	0	1	0	0	0	1	0	0	0	0	0
8:30:00	6	1	77	13	6	0	1	0	2	0	1	0	0	0	2	1	0	0	0	0
8:45:00	7	1	89	12	7	1	1	0	2	0	1	0	0	0	2	0	0	0	0	0
9:00:00	8	1	95	6	8	1	3	2	3	1	1	0	0	0	2	0	0	0	0	0
9:00:11	8	0	95	0	8	0	3	0	3	0	1	0	0	0	2	0	0	0	0	0
11:00:00	8	0	96	1	8	0	3	0	3	0	1	0	0	0	2	0	0	0	0	0
11:15:00	8	0	99	3	8	0	3	0	3	0	1	0	0	0	3	1	0	0	0	0
11:30:00	8	0	100	1	9	1	3	0	4	1	1	0	0	0	3	0	0	0	0	0
11:45:00	8	0	101	1	10	1	3	0	4	0	1	0	0	0	3	0	0	0	0	0
12:00:00	8	0	102	1	11	1	3	0	4	0	1	0	0	0	4	1	0	0	0	0
12:15:00	8	0	106	4	11	0	3	0	4	0	1	0	0	0	5	1	0	0	0	0
12:30:00	9	1	110	4	11	0	3	0	4	0	2	1	0	0	5	0	0	0	0	0
12:45:00	9	0	110	0	13	2	3	0	4	0	2	0	0	0	5	0	1	1	0	0
13:00:00	11	2	112	2	13	0	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:15:00	14	3	112	0	14	1	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:30:00	14	0	112	0	15	1	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:45:00	16	2	114	2	15	0	3	0	4	0	2	0	1	1	5	0	1	0	0	0
14:00:00	16	0	116	2	17	2	3	0	5	1	2	0	1	0	7	2	1	0	0	0
14:00:29	16	0	116	0	19	2	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:00:00	16	0	116	0	19	0	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:15:00	16	0	118	2	21	2	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:30:00	17	1	120	2	23	2	3	0	5	0	3	1	1	0	7	0	1	0	0	0
15:45:00	17	0	120	0	24	1	4	1	5	0	3	0	1	0	7	0	1	0	0	0
16:00:00	19	2	123	3	26	2	4	0	5	0	3	0	1	0	8	1	1	0	0	0
16:15:00	19	0	126	3	27	1	4	0	5	0	3	0	1	0	8	0	1	0	0	0
16:30:00	23	4	130	4	28	1	4	0	5	0	3	0	1	0	8	0	1	0	0	0
16:45:00	23	0	132	2	28	0	4	0	6	1	3	0	1	0	8	0	1	0	0	0
17:00:00	24	1	133	1	31	3	4	0	6	0	3	0	1	0	8	0	1	0	0	0
17:15:00	25	1	141	8	31	0	5	1	6	0	3	0	1	0	8	0	1	0	0	0
17:30:00	26	1	145	4	31	0	5	0	6	0	3	0	1	0	8	0	1	0	0	0
17:45:00	28	2	148	3	31	0	5	0	6	0	3	0	1	0	8	0	1	0	0	0
18:00:00	28	0	152	4	33	2	5	0	7	1	3	0	1	0	8	0	1	0	0	0
18:00:12	28	0	152	0	33	0	5	0	7	0	3	0	1	0	8	0	1	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	1	1	10	10	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
7:15:00	28	27	56	46	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
7:30:00	78	50	125	69	0	0	0	0	4	3	1	0	0	0	0	0	0	0	1	1
7:45:00	142	64	186	61	0	0	1	1	10	6	2	1	0	0	0	0	0	0	1	0
8:00:00	179	37	241	55	3	3	1	0	17	7	2	0	0	0	0	0	0	0	1	0
8:15:00	216	37	302	61	3	0	5	4	21	4	2	0	0	0	0	0	0	0	1	0
8:30:00	250	34	351	49	4	1	5	0	23	2	2	0	0	0	1	1	0	0	1	0
8:45:00	295	45	402	51	4	0	5	0	29	6	2	0	0	0	1	0	0	0	1	0
9:00:00	322	27	459	57	4	0	5	0	34	5	2	0	0	0	1	0	0	0	1	0
9:00:11	322	0	462	3	4	0	5	0	34	0	2	0	0	0	1	0	0	0	1	0
11:00:00	322	0	470	8	4	0	5	0	34	0	2	0	0	0	1	0	0	0	1	0
11:15:00	322	0	489	19	4	0	5	0	37	3	2	0	0	0	1	0	0	0	1	0
11:30:00	324	2	514	25	4	0	5	0	41	4	2	0	0	0	2	1	0	0	1	0
11:45:00	326	2	548	34	7	3	7	2	45	4	2	0	0	0	2	0	0	0	1	0
12:00:00	328	2	581	33	9	2	7	0	51	6	2	0	0	0	2	0	0	0	1	0
12:15:00	330	2	608	27	12	3	7	0	53	2	2	0	0	0	3	1	0	0	1	0
12:30:00	334	4	635	27	12	0	7	0	58	5	2	0	0	0	3	0	0	0	1	0
12:45:00	335	1	674	39	13	1	9	2	63	5	2	0	0	0	3	0	0	0	1	0
13:00:00	339	4	708	34	13	0	9	0	68	5	2	0	0	0	4	1	0	0	1	0
13:15:00	343	4	737	29	13	0	9	0	75	7	2	0	0	0	4	0	0	0	1	0
13:30:00	345	2	773	36	17	4	10	1	78	3	2	0	0	0	5	1	0	0	3	2
13:45:00	347	2	808	35	18	1	11	1	82	4	2	0	0	0	5	0	0	0	3	0
14:00:00	353	6	853	45	20	2	11	0	89	7	2	0	0	0	9	4	0	0	3	0
14:00:29	353	0	855	2	20	0	11	0	89	0	2	0	0	0	10	1	0	0	3	0
15:00:00	354	1	860	5	20	0	11	0	91	2	2	0	0	0	12	2	0	0	3	0
15:15:00	357	3	928	68	21	1	11	0	95	4	2	0	0	0	12	0	0	0	3	0
15:30:00	363	6	1018	90	23	2	15	4	103	8	3	1	0	0	14	2	0	0	3	0
15:45:00	369	6	1127	109	23	0	15	0	108	5	5	2	0	0	16	2	0	0	3	0
16:00:00	376	7	1227	100	24	1	15	0	110	2	5	0	0	0	19	3	0	0	3	0
16:15:00	381	5	1333	106	25	1	15	0	119	9	5	0	0	0	19	0	0	0	3	0
16:30:00	388	7	1469	136	26	1	15	0	123	4	5	0	0	0	19	0	0	0	3	0
16:45:00	395	7	1615	146	28	2	15	0	128	5	5	0	0	0	21	2	0	0	3	0
17:00:00	405	10	1742	127	32	4	15	0	132	4	5	0	0	0	21	0	0	0	3	0
17:15:00	414	9	1865	123	33	1	15	0	141	9	5	0	0	0	21	0	0	0	3	0
17:30:00	426	12	1999	134	38	5	16	1	143	2	5	0	0	0	21	0	0	0	3	0
17:45:00	431	5	2123	124	39	1	17	1	148	5	5	0	0	0	21	0	0	0	3	0
18:00:00	436	5	2229	106	39	0	17	0	151	3	5	0	0	0	22	1	0	0	3	0
18:00:12	436	0	2235	6	39	0	17	0	151	0	5	0	0	0	22	0	0	0	3	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0
7:15:00	0	0	1	1	8	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7:30:00	0	0	5	4	14	6	0	0	0	0	2	1	0	0	0	0	0	0	0	0
7:45:00	3	3	6	1	22	8	0	0	0	0	3	1	0	0	0	0	0	0	0	0
8:00:00	4	1	6	0	26	4	0	0	0	0	4	1	0	0	0	0	0	0	0	0
8:15:00	4	0	7	1	32	6	0	0	0	0	4	0	0	0	0	0	0	0	0	0
8:30:00	5	1	11	4	41	9	0	0	0	0	5	1	0	0	0	0	0	0	0	0
8:45:00	5	0	15	4	46	5	0	0	1	1	5	0	0	0	0	0	0	0	0	0
9:00:00	7	2	17	2	51	5	0	0	1	0	6	1	0	0	0	0	0	0	0	0
9:00:11	7	0	17	0	51	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0
11:00:00	7	0	19	2	51	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0
11:15:00	7	0	21	2	53	2	0	0	1	0	7	1	0	0	0	0	0	0	0	0
11:30:00	7	0	22	1	60	7	0	0	1	0	7	0	0	0	0	0	0	0	0	0
11:45:00	7	0	27	5	61	1	0	0	1	0	7	0	0	0	0	0	0	0	0	0
12:00:00	11	4	28	1	64	3	0	0	1	0	7	0	0	0	1	1	0	0	0	0
12:15:00	12	1	30	2	66	2	0	0	1	0	8	1	0	0	1	0	0	0	0	0
12:30:00	12	0	35	5	70	4	0	0	2	1	8	0	0	0	1	0	0	0	0	0
12:45:00	14	2	37	2	70	0	0	0	2	0	8	0	0	0	1	0	0	0	0	0
13:00:00	17	3	38	1	71	1	0	0	2	0	8	0	0	0	3	2	0	0	0	0
13:15:00	20	3	39	1	72	1	0	0	2	0	10	2	0	0	3	0	0	0	0	0
13:30:00	24	4	42	3	75	3	0	0	2	0	10	0	0	0	4	1	0	0	0	0
13:45:00	26	2	50	8	81	6	0	0	2	0	11	1	0	0	5	1	0	0	0	0
14:00:00	26	0	54	4	86	5	0	0	2	0	12	1	0	0	6	1	0	0	0	0
14:00:29	26	0	54	0	86	0	0	0	2	0	12	0	0	0	6	0	0	0	0	0
15:00:00	26	0	55	1	88	2	0	0	2	0	12	0	0	0	6	0	0	0	0	0
15:15:00	28	2	59	4	90	2	0	0	3	1	13	1	0	0	6	0	0	0	0	0
15:30:00	29	1	71	12	98	8	0	0	3	0	13	0	0	0	7	1	0	0	0	0
15:45:00	35	6	77	6	110	12	0	0	3	0	14	1	0	0	7	0	0	0	0	0
16:00:00	37	2	88	11	123	13	1	1	3	0	14	0	0	0	7	0	0	0	0	0
16:15:00	43	6	97	9	130	7	1	0	3	0	15	1	0	0	8	1	1	1	0	0
16:30:00	54	11	115	18	150	20	1	0	4	1	16	1	0	0	10	2	1	0	0	0
16:45:00	60	6	129	14	173	23	1	0	5	1	17	1	0	0	10	0	1	0	0	0
17:00:00	65	5	142	13	199	26	1	0	5	0	17	0	0	0	10	0	1	0	0	0
17:15:00	73	8	157	15	228	29	1	0	5	0	17	0	0	0	10	0	1	0	0	0
17:30:00	85	12	173	16	251	23	1	0	5	0	17	0	0	0	11	1	1	0	0	0
17:45:00	93	8	191	18	293	42	1	0	6	1	17	0	0	0	12	1	1	0	0	0
18:00:00	105	12	212	21	326	33	2	1	6	0	17	0	0	0	13	1	1	0	0	0
18:00:12	105	0	212	0	328	2	2	0	6	0	17	0	0	0	13	0	1	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	13	13	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	108	95	21	18	0	0	5	5	0	0	0	0	0	0	0	0	0	0
7:30:00	1	1	245	137	44	23	0	0	8	3	0	0	0	0	1	1	0	0	0	0
7:45:00	1	0	435	190	72	28	0	0	19	11	2	2	0	0	1	0	0	0	0	0
8:00:00	1	0	618	183	88	16	0	0	22	3	3	1	0	0	2	1	0	0	0	0
8:15:00	1	0	761	143	95	7	0	0	27	5	3	0	0	0	2	0	0	0	0	0
8:30:00	1	0	890	129	107	12	0	0	34	7	3	0	0	0	2	0	0	0	0	0
8:45:00	1	0	999	109	118	11	0	0	40	6	3	0	0	0	3	1	0	0	0	0
9:00:00	3	2	1067	68	125	7	0	0	46	6	3	0	0	0	3	0	0	0	0	0
9:00:11	3	0	1072	5	125	0	0	0	46	0	3	0	0	0	3	0	0	0	0	0
11:00:00	3	0	1075	3	125	0	0	0	46	0	3	0	0	0	3	0	0	0	0	0
11:15:00	3	0	1107	32	126	1	0	0	52	6	3	0	0	0	4	1	0	0	0	0
11:30:00	3	0	1134	27	128	2	0	0	55	3	3	0	0	0	4	0	0	0	0	0
11:45:00	4	1	1159	25	128	0	0	0	60	5	3	0	0	0	4	0	0	0	0	0
12:00:00	5	1	1185	26	130	2	0	0	65	5	3	0	0	0	4	0	0	0	0	0
12:15:00	7	2	1201	16	131	1	0	0	67	2	3	0	0	0	4	0	0	0	0	0
12:30:00	8	1	1229	28	132	1	0	0	69	2	4	1	0	0	5	1	0	0	0	0
12:45:00	8	0	1258	29	137	5	0	0	74	5	4	0	0	0	5	0	0	0	0	0
13:00:00	10	2	1284	26	138	1	0	0	79	5	4	0	0	0	5	0	0	0	0	0
13:15:00	12	2	1306	22	138	0	0	0	84	5	4	0	0	0	5	0	0	0	0	0
13:30:00	12	0	1341	35	140	2	0	0	90	6	4	0	0	0	5	0	0	0	0	0
13:45:00	13	1	1373	32	141	1	0	0	97	7	5	1	0	0	6	1	0	0	0	0
14:00:00	14	1	1406	33	145	4	0	0	106	9	5	0	0	0	6	0	0	0	0	0
14:00:29	14	0	1409	3	145	0	0	0	106	0	5	0	0	0	6	0	0	0	0	0
15:00:00	14	0	1417	8	145	0	1	1	110	4	5	0	0	0	6	0	0	0	0	0
15:15:00	15	1	1453	36	147	2	1	0	115	5	5	0	0	0	7	1	0	0	0	0
15:30:00	16	1	1499	46	150	3	1	0	118	3	5	0	0	0	7	0	0	0	0	0
15:45:00	17	1	1558	59	151	1	1	0	125	7	5	0	0	0	8	1	0	0	0	0
16:00:00	17	0	1625	67	154	3	1	0	132	7	5	0	0	0	8	0	0	0	0	0
16:15:00	18	1	1715	90	159	5	1	0	139	7	5	0	0	0	8	0	0	0	0	0
16:30:00	19	1	1782	67	160	1	1	0	153	14	5	0	0	0	8	0	0	0	0	0
16:45:00	21	2	1864	82	161	1	1	0	160	7	5	0	0	0	8	0	0	0	0	0
17:00:00	23	2	1941	77	164	3	1	0	167	7	5	0	0	0	9	1	0	0	0	0
17:15:00	25	2	2016	75	165	1	1	0	174	7	5	0	0	0	10	1	0	0	0	0
17:30:00	26	1	2078	62	166	1	1	0	180	6	5	0	0	0	10	0	0	0	0	0
17:45:00	27	1	2164	86	170	4	1	0	184	4	5	0	0	0	10	0	0	0	0	0
18:00:00	28	1	2222	58	172	2	1	0	192	8	5	0	0	0	11	1	0	0	0	0
18:00:12	28	0	2224	2	172	0	1	0	192	0	5	0	0	0	11	0	0	0	0	0

MG8 ENG

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	From:	7:15:00
To:	9:00:00	To:	8:15:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 78
North Entering: 67
North Peds: 0
Peds Cross: ⋈

Cyclists	0	1	0	1
Trucks	1	2	0	3
Cars	6	52	5	63
Totals	7	55	5	

Cyclists	0
Trucks	1
Cars	10
Totals	11

East Leg Total: 1172
East Entering: 463
East Peds: 1
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
0	21	256	277

Cars	Trucks	Cyclists	Totals
3	1	0	4
246	20	0	266
188	5	0	193
437	26	0	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	0	1	1
2	22	653	677
0	3	74	77
2	25	728	

Mayfield Road

Cars	Trucks	Cyclists	Totals
682	25	2	709

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 755
West Leg Total: 1032

Cars	314
Trucks	10
Cyclists	1
Totals	325

Cars	4	6	24	34
Trucks	0	0	3	3
Cyclists	0	0	0	0
Totals	4	6	27	

Peds Cross: ⋈
South Peds: 0
South Entering: 37
South Leg Total: 362

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period	One Hour Peak
From: 11:00:00	**From:** 13:00:00
To: 14:00:00	**To:** 14:00:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 47
North Entering: 17
North Peds: 0
Peds Cross: ⋈

North approach (Heritage Road, southbound):

Cyclists	0	2	1	3
Trucks	0	1	0	1
Cars	4	4	5	13
Totals	4	7	6	

North exiting:

Cyclists	3
Trucks	0
Cars	27
Totals	30

East Leg Total: 369
East Entering: 194
East Peds: 2
Peds Cross: ⧗

Heritage Road

West exiting (Mayfield Road, westbound):

Cyclists	Trucks	Cars	Totals
5	21	158	184

East approach (westbound):

Cars	Trucks	Cyclists	Totals
7	0	0	7
145	21	5	171
14	2	0	16
166	23	5	

Mayfield Road

N
W E
S

West approach (eastbound):

Cyclists	Trucks	Cars	Totals
0	0	4	4
1	27	122	150
0	1	7	8
1	28	133	

Mayfield Road

East exiting (eastbound):

Cars	Trucks	Cyclists	Totals
142	31	2	175

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 162
West Leg Total: 346

South exiting:

Cars	25
Trucks	4
Cyclists	2
Totals	31

South approach (northbound):

Cars	9	16	15	40
Trucks	0	0	4	4
Cyclists	0	3	0	3
Totals	9	19	19	

Peds Cross: ⋈
South Peds: 0
South Entering: 47
South Leg Total: 78

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 106
North Entering: 27
North Peds: 0
Peds Cross: ⋈

North approach (Heritage Road, southbound):

Cyclists	0	0	0	0
Trucks	0	1	1	2
Cars	4	15	6	25
Totals	4	16	7	

North exiting:

Cyclists	2
Trucks	2
Cars	75
Totals	79

East Leg Total: 1042
East Entering: 597
East Peds: 0
Peds Cross: ⧗

Heritage Road

West exiting (Mayfield Road, westbound):

Cyclists	Trucks	Cars	Totals
2	22	566	590

East approach:

Cars	Trucks	Cyclists	Totals
8	0	0	8
532	22	2	556
33	0	0	33
573	22	2	

Mayfield Road

N
W E
S

West approach:

Cyclists	Trucks	Cars	Totals
0	0	7	7
2	35	301	338
0	0	6	6
2	35	314	

Mayfield Road

East exiting:

Cars	Trucks	Cyclists	Totals
405	38	2	445

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 351
West Leg Total: 941

South exiting:

Cars	54
Trucks	1
Cyclists	0
Totals	55

South approach:

Cars	30	60	98	188
Trucks	0	2	2	4
Cyclists	0	2	0	2
Totals	30	64	100	

Peds Cross: ⋈
South Peds: 0
South Entering: 194
South Leg Total: 249

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0001423401
Intersection: Mayfield Road & Heritage Road
TFR File #: 8
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
STEVE

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

Major Road: Mayfield Road runs W/E

North Leg Total: 542
North Entering: 238
North Peds: 0
Peds Cross: ⋈

Cyclists	1	8	1	10
Trucks	3	7	5	15
Cars	33	152	28	213
Totals	37	167	34	

Cyclists	13
Trucks	12
Cars	279
Totals	304

East Leg Total: 5712
East Entering: 2905
East Peds: 3
Peds Cross: ⧗

Heritage Road

Cyclists	Trucks	Cars	Totals
23	156	2373	2552

Cars	Trucks	Cyclists	Totals
39	5	0	44
2235	151	22	2408
436	17	0	453
2710	173	22	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	1	28	29
11	192	2224	2427
0	5	172	177
11	198	2424	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2580	214	13	2807

Heritage Road

Peds Cross: ⧗
West Peds: 0
West Entering: 2633
West Leg Total: 5185

Cars	760
Trucks	29
Cyclists	8
Totals	797

Cars	105	212	328	645
Trucks	2	6	17	25
Cyclists	0	13	1	14
Totals	107	231	346	

Peds Cross: ⋈
South Peds: 0
South Entering: 684
South Leg Total: 1481

Comments

MG8 ENG
Traffic Count Summary

Intersection: Mayfield Road & Heritage Road	Count Date: 30-May-2013	Municipality: Region of Peel

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	2	0	2	0	5	7:00:00	0	0	3	3	0
8:00:00	5	58	6	69	0	106	8:00:00	4	6	27	37	0
9:00:00	6	40	3	49	0	91	9:00:00	3	12	27	42	0
11:00:00	0	1	0	1	0	3	11:00:00	0	2	0	2	0
12:00:00	0	9	3	12	0	40	12:00:00	4	10	14	28	0
13:00:00	3	11	4	18	0	45	13:00:00	6	13	8	27	0
14:00:00	6	7	4	17	0	64	14:00:00	9	19	19	47	0
15:00:00	0	0	2	2	0	5	15:00:00	0	1	2	3	0
16:00:00	4	8	8	20	0	104	16:00:00	12	35	37	84	0
17:00:00	5	11	5	21	0	188	17:00:00	28	59	80	167	0
18:00:00	5	20	2	27	0	269	18:00:00	41	74	127	242	0
Totals:	34	167	37	238	0	920		107	231	344	682	0

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Cyclists							Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	1	10	1	12	0	28	7:00:00	0	13	3	16	0
8:00:00	179	248	4	431	1	1149	8:00:00	1	629	88	718	0
9:00:00	147	236	1	384	0	897	9:00:00	2	474	37	513	0
11:00:00	0	11	0	11	0	19	11:00:00	0	8	0	8	0
12:00:00	8	129	5	142	0	279	12:00:00	2	130	5	137	0
13:00:00	13	146	4	163	0	291	13:00:00	5	114	9	128	0
14:00:00	16	171	7	194	2	356	14:00:00	4	150	8	162	0
15:00:00	1	12	0	13	0	29	15:00:00	1	15	0	16	0
16:00:00	26	393	7	426	0	670	16:00:00	3	232	9	244	0
17:00:00	29	539	8	576	0	944	17:00:00	6	352	10	368	0
18:00:00	33	507	7	547	0	868	18:00:00	5	308	8	321	0
Totals:	453	2402	44	2899	3	5530		29	2425	177	2631	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	68	49	14	22	36	51	92	120

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #1: Minimum Vehicular Volumes.

A. All Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements													
	1 Lane Each Way		2 Lanes Each Way		3 Lanes	Hours Ending								
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	480	720	600	900	1125	1255	988	319	336	420	774	1132	1137	100% Yes:
80%	385	575	480	720	900									No: X
All Approa-ches	100% Fulfilled					100	100				100	100	100	500
	80% Fulfilled									80				80
	Actual % if Below 80%							66	70					136
													Total:	716
													Actual Average (Total/8):	90%

B. Minor Street Both Approaches.

100%	120	170	120	170	170	106	91	40	45	64	104	188	269	100% Yes:
80%	95	135	95	135	135									No: X
Minor Street Both Approa-ches	100% Fulfilled											100	100	200
	80% Fulfilled					80					80			160
	Actual % if Below 80%						76	33	38	53				200
													Total:	560
													Actual Average (Total/8):	70%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #2: Delay to Cross Traffic.

A. Major Street Both Approaches. **Not Satisfied**

No. of Lanes	Minimum Requirements					Hours Ending								
	1 Lane Each Way		2 Lanes Each Way		3 Lanes									
Flow Condition	1 Lane F. Flow (Code 1)	1 Lane R. Flow (Code 2)	2 Lane F. Flow (Code 3)	2 Lane R. Flow (Code 4)	or More R. Flow (Code 5)	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00	Percentage Warrant
100%	480	720	600	900	1125	1149	897	279	291	356	670	944	868	100% Yes:
80%	385	575	480	720	900									No: X
All Approa-ches	100% Fulfilled					100	100				100	100	100	500
	80% Fulfilled													0
	Actual % if Below 80%							58	61	74				193
													Total:	693
													Actual Average (Total/8):	87%

B. Traffic Crossing Major Street.

100%	50	75	50	75	75	68	49	14	22	36	51	92	120	100% Yes:
80%	40	60	40	60	60									No: X
All Approa-ches	100% Fulfilled					100					100	100	100	400
	80% Fulfilled						80							80
	Actual % if Below 80%							28	44	72				144
													Total:	624
													Actual Average (Total/8):	78%

MG8 ENG

Count Date: 30-May-2013
Intersection: Mayfield Road & Heritage Road **Municipality:** Region of Peel
Major Road: Mayfield Road **Major Road Runs:** E/W one lane each way
Operating Speed of Major Road: 80 km/hr **Operating under free flow conditions**

Warrant #3: Accident Experience.

Not Satisfied

A. Reportable accidents within a twelve month period averaged over 36 consequtive months susceptible to correction by a traffic signal.

Minimum Requirements	Actual Number of Accidents	Average Number of Accidents	Fulfilled
5	0 in 3 years	0 per year	0%

B. Adequate trial of less restrictive remedies has failed to reduce accident frequency.	No
C. Either Warrant 1 (Minimum Vehicular Volume) or Warrant 2 (Delay to Cross Traffic) satisfied 80% or more.	No

Warrant #4: Combination Warrant.
(Used if no warrant satisfied 100%)

Not Satisfied

Minimum Requirements	Warrant Satisfied 80% or More	Fulfilled
Two Warrants Satisfied 80%	Warrant 1 (Minimum Vehicular Volume) Warrant 2 (Delay to Cross Traffic) Warrant 3 (Accident Experience)	No No No

Conclusion: Traffic signal not warranted.

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	12	10	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	3	3	28	16	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0
7:45:00	3	0	39	11	5	4	1	0	2	1	1	0	0	0	1	1	0	0	0	0
8:00:00	4	1	57	18	5	0	1	0	2	0	1	0	0	0	1	0	0	0	0	0
8:15:00	5	1	64	7	6	1	1	0	2	0	1	0	0	0	1	0	0	0	0	0
8:30:00	6	1	77	13	6	0	1	0	2	0	1	0	0	0	2	1	0	0	0	0
8:45:00	7	1	89	12	7	1	1	0	2	0	1	0	0	0	2	0	0	0	0	0
9:00:00	8	1	95	6	8	1	3	2	3	1	1	0	0	0	2	0	0	0	0	0
9:00:11	8	0	95	0	8	0	3	0	3	0	1	0	0	0	2	0	0	0	0	0
11:00:00	8	0	96	1	8	0	3	0	3	0	1	0	0	0	2	0	0	0	0	0
11:15:00	8	0	99	3	8	0	3	0	3	0	1	0	0	0	3	1	0	0	0	0
11:30:00	8	0	100	1	9	1	3	0	4	1	1	0	0	0	3	0	0	0	0	0
11:45:00	8	0	101	1	10	1	3	0	4	0	1	0	0	0	3	0	0	0	0	0
12:00:00	8	0	102	1	11	1	3	0	4	0	1	0	0	0	4	1	0	0	0	0
12:15:00	8	0	106	4	11	0	3	0	4	0	1	0	0	0	5	1	0	0	0	0
12:30:00	9	1	110	4	11	0	3	0	4	0	2	1	0	0	5	0	0	0	0	0
12:45:00	9	0	110	0	13	2	3	0	4	0	2	0	0	0	5	0	1	1	0	0
13:00:00	11	2	112	2	13	0	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:15:00	14	3	112	0	14	1	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:30:00	14	0	112	0	15	1	3	0	4	0	2	0	0	0	5	0	1	0	0	0
13:45:00	16	2	114	2	15	0	3	0	4	0	2	0	1	1	5	0	1	0	0	0
14:00:00	16	0	116	2	17	2	3	0	5	1	2	0	1	0	7	2	1	0	0	0
14:00:29	16	0	116	0	19	2	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:00:00	16	0	116	0	19	0	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:15:00	16	0	118	2	21	2	3	0	5	0	2	0	1	0	7	0	1	0	0	0
15:30:00	17	1	120	2	23	2	3	0	5	0	3	1	1	0	7	0	1	0	0	0
15:45:00	17	0	120	0	24	1	4	1	5	0	3	0	1	0	7	0	1	0	0	0
16:00:00	19	2	123	3	26	2	4	0	5	0	3	0	1	0	8	1	1	0	0	0
16:15:00	19	0	126	3	27	1	4	0	5	0	3	0	1	0	8	0	1	0	0	0
16:30:00	23	4	130	4	28	1	4	0	5	0	3	0	1	0	8	0	1	0	0	0
16:45:00	23	0	132	2	28	0	4	0	6	1	3	0	1	0	8	0	1	0	0	0
17:00:00	24	1	133	1	31	3	4	0	6	0	3	0	1	0	8	0	1	0	0	0
17:15:00	25	1	141	8	31	0	5	1	6	0	3	0	1	0	8	0	1	0	0	0
17:30:00	26	1	145	4	31	0	5	0	6	0	3	0	1	0	8	0	1	0	0	0
17:45:00	28	2	148	3	31	0	5	0	6	0	3	0	1	0	8	0	1	0	0	0
18:00:00	28	0	152	4	33	2	5	0	7	1	3	0	1	0	8	0	1	0	0	0
18:00:12	28	0	152	0	33	0	5	0	7	0	3	0	1	0	8	0	1	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	1	1	10	10	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
7:15:00	28	27	56	46	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
7:30:00	78	50	125	69	0	0	0	0	4	3	1	0	0	0	0	0	0	0	1	1
7:45:00	142	64	186	61	0	0	1	1	10	6	2	1	0	0	0	0	0	0	1	0
8:00:00	179	37	241	55	3	3	1	0	17	7	2	0	0	0	0	0	0	0	1	0
8:15:00	216	37	302	61	3	0	5	4	21	4	2	0	0	0	0	0	0	0	1	0
8:30:00	250	34	351	49	4	1	5	0	23	2	2	0	0	0	1	1	0	0	1	0
8:45:00	295	45	402	51	4	0	5	0	29	6	2	0	0	0	1	0	0	0	1	0
9:00:00	322	27	459	57	4	0	5	0	34	5	2	0	0	0	1	0	0	0	1	0
9:00:11	322	0	462	3	4	0	5	0	34	0	2	0	0	0	1	0	0	0	1	0
11:00:00	322	0	470	8	4	0	5	0	34	0	2	0	0	0	1	0	0	0	1	0
11:15:00	322	0	489	19	4	0	5	0	37	3	2	0	0	0	1	0	0	0	1	0
11:30:00	324	2	514	25	4	0	5	0	41	4	2	0	0	0	2	1	0	0	1	0
11:45:00	326	2	548	34	7	3	7	2	45	4	2	0	0	0	2	0	0	0	1	0
12:00:00	328	2	581	33	9	2	7	0	51	6	2	0	0	0	2	0	0	0	1	0
12:15:00	330	2	608	27	12	3	7	0	53	2	2	0	0	0	3	1	0	0	1	0
12:30:00	334	4	635	27	12	0	7	0	58	5	2	0	0	0	3	0	0	0	1	0
12:45:00	335	1	674	39	13	1	9	2	63	5	2	0	0	0	3	0	0	0	1	0
13:00:00	339	4	708	34	13	0	9	0	68	5	2	0	0	0	4	1	0	0	1	0
13:15:00	343	4	737	29	13	0	9	0	75	7	2	0	0	0	4	0	0	0	1	0
13:30:00	345	2	773	36	17	4	10	1	78	3	2	0	0	0	5	1	0	0	3	2
13:45:00	347	2	808	35	18	1	11	1	82	4	2	0	0	0	5	0	0	0	3	0
14:00:00	353	6	853	45	20	2	11	0	89	7	2	0	0	0	9	4	0	0	3	0
14:00:29	353	0	855	2	20	0	11	0	89	0	2	0	0	0	10	1	0	0	3	0
15:00:00	354	1	860	5	20	0	11	0	91	2	2	0	0	0	12	2	0	0	3	0
15:15:00	357	3	928	68	21	1	11	0	95	4	2	0	0	0	12	0	0	0	3	0
15:30:00	363	6	1018	90	23	2	15	4	103	8	3	1	0	0	14	2	0	0	3	0
15:45:00	369	6	1127	109	23	0	15	0	108	5	5	2	0	0	16	2	0	0	3	0
16:00:00	376	7	1227	100	24	1	15	0	110	2	5	0	0	0	19	3	0	0	3	0
16:15:00	381	5	1333	106	25	1	15	0	119	9	5	0	0	0	19	0	0	0	3	0
16:30:00	388	7	1469	136	26	1	15	0	123	4	5	0	0	0	19	0	0	0	3	0
16:45:00	395	7	1615	146	28	2	15	0	128	5	5	0	0	0	21	2	0	0	3	0
17:00:00	405	10	1742	127	32	4	15	0	132	4	5	0	0	0	21	0	0	0	3	0
17:15:00	414	9	1865	123	33	1	15	0	141	9	5	0	0	0	21	0	0	0	3	0
17:30:00	426	12	1999	134	38	5	16	1	143	2	5	0	0	0	21	0	0	0	3	0
17:45:00	431	5	2123	124	39	1	17	1	148	5	5	0	0	0	21	0	0	0	3	0
18:00:00	436	5	2229	106	39	0	17	0	151	3	5	0	0	0	22	1	0	0	3	0
18:00:12	436	0	2235	6	39	0	17	0	151	0	5	0	0	0	22	0	0	0	3	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	2	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0
7:15:00	0	0	1	1	8	6	0	0	0	0	1	0	0	0	0	0	0	0	0	0
7:30:00	0	0	5	4	14	6	0	0	0	0	2	1	0	0	0	0	0	0	0	0
7:45:00	3	3	6	1	22	8	0	0	0	0	3	1	0	0	0	0	0	0	0	0
8:00:00	4	1	6	0	26	4	0	0	0	0	4	1	0	0	0	0	0	0	0	0
8:15:00	4	0	7	1	32	6	0	0	0	0	4	0	0	0	0	0	0	0	0	0
8:30:00	5	1	11	4	41	9	0	0	0	0	5	1	0	0	0	0	0	0	0	0
8:45:00	5	0	15	4	46	5	0	0	1	1	5	0	0	0	0	0	0	0	0	0
9:00:00	7	2	17	2	51	5	0	0	1	0	6	1	0	0	0	0	0	0	0	0
9:00:11	7	0	17	0	51	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0
11:00:00	7	0	19	2	51	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0
11:15:00	7	0	21	2	53	2	0	0	1	0	7	1	0	0	0	0	0	0	0	0
11:30:00	7	0	22	1	60	7	0	0	1	0	7	0	0	0	0	0	0	0	0	0
11:45:00	7	0	27	5	61	1	0	0	1	0	7	0	0	0	0	0	0	0	0	0
12:00:00	11	4	28	1	64	3	0	0	1	0	7	0	0	0	1	1	0	0	0	0
12:15:00	12	1	30	2	66	2	0	0	1	0	8	1	0	0	1	0	0	0	0	0
12:30:00	12	0	35	5	70	4	0	0	2	1	8	0	0	0	1	0	0	0	0	0
12:45:00	14	2	37	2	70	0	0	0	2	0	8	0	0	0	1	0	0	0	0	0
13:00:00	17	3	38	1	71	1	0	0	2	0	8	0	0	0	3	2	0	0	0	0
13:15:00	20	3	39	1	72	1	0	0	2	0	10	2	0	0	3	0	0	0	0	0
13:30:00	24	4	42	3	75	3	0	0	2	0	10	0	0	0	4	1	0	0	0	0
13:45:00	26	2	50	8	81	6	0	0	2	0	11	1	0	0	5	1	0	0	0	0
14:00:00	26	0	54	4	86	5	0	0	2	0	12	1	0	0	6	1	0	0	0	0
14:00:29	26	0	54	0	86	0	0	0	2	0	12	0	0	0	6	0	0	0	0	0
15:00:00	26	0	55	1	88	2	0	0	2	0	12	0	0	0	6	0	0	0	0	0
15:15:00	28	2	59	4	90	2	0	0	3	1	13	1	0	0	6	0	0	0	0	0
15:30:00	29	1	71	12	98	8	0	0	3	0	13	0	0	0	7	1	0	0	0	0
15:45:00	35	6	77	6	110	12	0	0	3	0	14	1	0	0	7	0	0	0	0	0
16:00:00	37	2	88	11	123	13	1	1	3	0	14	0	0	0	7	0	0	0	0	0
16:15:00	43	6	97	9	130	7	1	0	3	0	15	1	0	0	8	1	1	1	0	0
16:30:00	54	11	115	18	150	20	1	0	4	1	16	1	0	0	10	2	1	0	0	0
16:45:00	60	6	129	14	173	23	1	0	5	1	17	1	0	0	10	0	1	0	0	0
17:00:00	65	5	142	13	199	26	1	0	5	0	17	0	0	0	10	0	1	0	0	0
17:15:00	73	8	157	15	228	29	1	0	5	0	17	0	0	0	10	0	1	0	0	0
17:30:00	85	12	173	16	251	23	1	0	5	0	17	0	0	0	11	1	1	0	0	0
17:45:00	93	8	191	18	293	42	1	0	6	1	17	0	0	0	12	1	1	0	0	0
18:00:00	105	12	212	21	326	33	2	1	6	0	17	0	0	0	13	1	1	0	0	0
18:00:12	105	0	212	0	328	2	2	0	6	0	17	0	0	0	13	0	1	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001423401

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	13	13	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	108	95	21	18	0	0	5	5	0	0	0	0	0	0	0	0	0	0
7:30:00	1	1	245	137	44	23	0	0	8	3	0	0	0	0	1	1	0	0	0	0
7:45:00	1	0	435	190	72	28	0	0	19	11	2	2	0	0	1	0	0	0	0	0
8:00:00	1	0	618	183	88	16	0	0	22	3	3	1	0	0	2	1	0	0	0	0
8:15:00	1	0	761	143	95	7	0	0	27	5	3	0	0	0	2	0	0	0	0	0
8:30:00	1	0	890	129	107	12	0	0	34	7	3	0	0	0	2	0	0	0	0	0
8:45:00	1	0	999	109	118	11	0	0	40	6	3	0	0	0	3	1	0	0	0	0
9:00:00	3	2	1067	68	125	7	0	0	46	6	3	0	0	0	3	0	0	0	0	0
9:00:11	3	0	1072	5	125	0	0	0	46	0	3	0	0	0	3	0	0	0	0	0
11:00:00	3	0	1075	3	125	0	0	0	46	0	3	0	0	0	3	0	0	0	0	0
11:15:00	3	0	1107	32	126	1	0	0	52	6	3	0	0	0	4	1	0	0	0	0
11:30:00	3	0	1134	27	128	2	0	0	55	3	3	0	0	0	4	0	0	0	0	0
11:45:00	4	1	1159	25	128	0	0	0	60	5	3	0	0	0	4	0	0	0	0	0
12:00:00	5	1	1185	26	130	2	0	0	65	5	3	0	0	0	4	0	0	0	0	0
12:15:00	7	2	1201	16	131	1	0	0	67	2	3	0	0	0	4	0	0	0	0	0
12:30:00	8	1	1229	28	132	1	0	0	69	2	4	1	0	0	5	1	0	0	0	0
12:45:00	8	0	1258	29	137	5	0	0	74	5	4	0	0	0	5	0	0	0	0	0
13:00:00	10	2	1284	26	138	1	0	0	79	5	4	0	0	0	5	0	0	0	0	0
13:15:00	12	2	1306	22	138	0	0	0	84	5	4	0	0	0	5	0	0	0	0	0
13:30:00	12	0	1341	35	140	2	0	0	90	6	4	0	0	0	5	0	0	0	0	0
13:45:00	13	1	1373	32	141	1	0	0	97	7	5	1	0	0	6	1	0	0	0	0
14:00:00	14	1	1406	33	145	4	0	0	106	9	5	0	0	0	6	0	0	0	0	0
14:00:29	14	0	1409	3	145	0	0	0	106	0	5	0	0	0	6	0	0	0	0	0
15:00:00	14	0	1417	8	145	0	1	1	110	4	5	0	0	0	6	0	0	0	0	0
15:15:00	15	1	1453	36	147	2	1	0	115	5	5	0	0	0	7	1	0	0	0	0
15:30:00	16	1	1499	46	150	3	1	0	118	3	5	0	0	0	7	0	0	0	0	0
15:45:00	17	1	1558	59	151	1	1	0	125	7	5	0	0	0	8	1	0	0	0	0
16:00:00	17	0	1625	67	154	3	1	0	132	7	5	0	0	0	8	0	0	0	0	0
16:15:00	18	1	1715	90	159	5	1	0	139	7	5	0	0	0	8	0	0	0	0	0
16:30:00	19	1	1782	67	160	1	1	0	153	14	5	0	0	0	8	0	0	0	0	0
16:45:00	21	2	1864	82	161	1	1	0	160	7	5	0	0	0	8	0	0	0	0	0
17:00:00	23	2	1941	77	164	3	1	0	167	7	5	0	0	0	9	1	0	0	0	0
17:15:00	25	2	2016	75	165	1	1	0	174	7	5	0	0	0	10	1	0	0	0	0
17:30:00	26	1	2078	62	166	1	1	0	180	6	5	0	0	0	10	0	0	0	0	0
17:45:00	27	1	2164	86	170	4	1	0	184	4	5	0	0	0	10	0	0	0	0	0
18:00:00	28	1	2222	58	172	2	1	0	192	8	5	0	0	0	11	1	0	0	0	0
18:00:12	28	0	2224	2	172	0	1	0	192	0	5	0	0	0	11	0	0	0	0	0

MG8 ENG

Morning Peak Diagram

Specified Period		One Hour Peak	
From:	7:00:00	**From:**	7:15:00
To:	9:00:00	**To:**	8:15:00

Municipality: Region of Peel
Site #: 0001424848
Intersection: Mayfield Rd & Winston Churchill Bl
TFR File #: 7
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
THOMAS

**** Signalized Intersection ****

Major Road: Mayfield Rd runs W/E

North Leg Total:	145
North Entering:	117
North Peds:	0
Peds Cross:	⋈

Cyclists	0	4	0	4
Trucks	3	2	0	5
Cars	13	80	15	108
Totals	16	86	15	

Cyclists	1
Trucks	4
Cars	23
Totals	28

East Leg Total:	1383
East Entering:	326
East Peds:	0
Peds Cross:	⧗

Winston Churchill Boulevard

Cyclists	Trucks	Cars	Totals
0	19	267	286

Cars	Trucks	Cyclists	Totals
5	0	0	5
234	16	0	250
67	4	0	71
306	20	0	

Mayfield Road

N
W E
S

Mayfield Road

Cyclists	Trucks	Cars	Totals
0	3	5	8
2	17	977	996
0	1	64	65
2	21	1046	

Cars	Trucks	Cyclists	Totals
1037	18	2	1057

Winston Churchill Boulevard

Peds Cross:	⧗
West Peds:	0
West Entering:	1069
West Leg Total:	1355

Cars	211
Trucks	7
Cyclists	4
Totals	222

Cars	20	13	45	78
Trucks	0	1	1	2
Cyclists	0	1	0	1
Totals	20	15	46	

Peds Cross:	⋈
South Peds:	0
South Entering:	81
South Leg Total:	303

Comments

MG8 ENG

Mid-day Peak Diagram

Specified Period
From: 11:00:00
To: 14:00:00

One Hour Peak
From: 13:00:00
To: 14:00:00

Municipality: Region of Peel
Site #: 0001424848
Intersection: Mayfield Rd & Winston Churchill Bl\
TFR File #: 7
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
THOMAS

**** Signalized Intersection ****

Major Road: Mayfield Rd runs W/E

North Leg Total: 78
North Entering: 38
North Peds: 0
Peds Cross: ⋈

Cyclists	0	1	0	1
Trucks	0	1	0	1
Cars	10	19	7	36
Totals	10	21	7	

Cyclists	2
Trucks	1
Cars	37
Totals	40

East Leg Total: 356
East Entering: 191
East Peds: 0
Peds Cross: ⧗

Winston Churchill Boulevard

Cyclists	Trucks	Cars	Totals
3	19	165	187

Cars	Trucks	Cyclists	Totals
3	0	2	5
139	19	2	160
26	0	0	26
168	19	4	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	1	8	9
1	22	116	139
0	2	21	23
1	25	145	

Mayfield Road

Cars	Trucks	Cyclists	Totals
138	26	1	165

Winston Churchill Boulevard

Peds Cross: ⧗
West Peds: 0
West Entering: 171
West Leg Total: 358

Cars	66
Trucks	3
Cyclists	1
Totals	70

Cars	16	26	15	57
Trucks	0	0	4	4
Cyclists	1	0	0	1
Totals	17	26	19	

Peds Cross: ⋈
South Peds: 0
South Entering: 62
South Leg Total: 132

Comments

MG8 ENG

Afternoon Peak Diagram

Specified Period		One Hour Peak	
From:	15:00:00	**From:**	16:15:00
To:	18:00:00	**To:**	17:15:00

Municipality: Region of Peel
Site #: 0001424848
Intersection: Mayfield Rd & Winston Churchill Bl
TFR File #: 7
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
THOMAS

**** Signalized Intersection ****

Major Road: Mayfield Rd runs W/E

North Leg Total:	133
North Entering:	51
North Peds:	0
Peds Cross:	⋈

North approach (Winston Churchill Boulevard, southbound):

Cyclists	0	0	0	0
Trucks	1	1	1	3
Cars	18	27	3	48
Totals	19	28	4	

North exiting:

Cyclists	5
Trucks	4
Cars	73
Totals	82

East Leg Total:	977
East Entering:	629
East Peds:	0
Peds Cross:	⧖

Winston Churchill Boulevard

West exiting (Mayfield Road):

Cyclists	Trucks	Cars	Totals
3	17	563	583

East approach:

Cars	Trucks	Cyclists	Totals
5	1	0	6
500	15	2	517
104	2	0	106
609	18	2	

Mayfield Road

N

W E

S

West approach:

Cyclists	Trucks	Cars	Totals
0	0	16	16
2	24	271	297
0	1	27	28
2	25	314	

Mayfield Road

East exiting:

Cars	Trucks	Cyclists	Totals
315	30	3	348

Winston Churchill Boulevard

Peds Cross:	⧖
West Peds:	0
West Entering:	341
West Leg Total:	924

South exiting:

Cars	158
Trucks	4
Cyclists	0
Totals	162

South approach:

Cars	45	52	41	138
Trucks	1	3	5	9
Cyclists	1	5	1	7
Totals	47	60	47	

Peds Cross:	⋈
South Peds:	0
South Entering:	154
South Leg Total:	316

Comments

MG8 ENG

Total Count Diagram

Municipality: Region of Peel
Site #: 0001424848
Intersection: Mayfield Rd & Winston Churchill Bl
TFR File #: 7
Count date: 30-May-2013

Weather conditions:

Person(s) who counted:
THOMAS

**** Signalized Intersection ****

Major Road: Mayfield Rd runs W/E

North Leg Total: 833
North Entering: 431
North Peds: 0
Peds Cross: ⋈

Cyclists	1	13	0	14
Trucks	11	10	2	23
Cars	95	247	52	394
Totals	107	270	54	

Cyclists	17
Trucks	21
Cars	364
Totals	402

East Leg Total: 5769
East Entering: 2709
East Peds: 0
Peds Cross: ⧗

Winston Churchill Boulevard

Cyclists	Trucks	Cars	Totals
22	145	2386	2553

Cars	Trucks	Cyclists	Totals
38	4	3	45
2097	130	18	2245
408	8	3	419
2543	142	24	

Mayfield Road

N
W E
S

Cyclists	Trucks	Cars	Totals
0	9	82	91
14	153	2568	2735
3	11	248	262
17	173	2898	

Mayfield Road

Cars	Trucks	Cyclists	Totals
2871	174	15	3060

Winston Churchill Boulevard

Peds Cross: ⧗
West Peds: 0
West Entering: 3088
West Leg Total: 5641

Cars	903
Trucks	29
Cyclists	19
Totals	951

Cars	194	244	251	689
Trucks	4	8	19	31
Cyclists	3	14	1	18
Totals	201	266	271	

Peds Cross: ⋈
South Peds: 1
South Entering: 738
South Leg Total: 1689

Comments

MG8 ENG

Traffic Count Summary

Intersection:	Mayfield Rd & Winston Churchill B	Count Date:	30-May-2013	Municipality:	Region of Peel

North Approach Totals							South Approach Totals					
	Includes Cars, Trucks, & Cyclists					North/South		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	21	72	16	109	0	189	8:00:00	15	19	46	80	0
9:00:00	6	46	21	73	0	139	9:00:00	16	13	37	66	1
11:00:00	0	1	0	1	0	1	11:00:00	0	0	0	0	0
12:00:00	5	16	9	30	0	89	12:00:00	11	30	18	59	0
13:00:00	3	18	12	33	0	79	13:00:00	12	18	16	46	0
14:00:00	7	21	10	38	0	100	14:00:00	17	26	19	62	0
15:00:00	0	2	0	2	0	4	15:00:00	1	1	0	2	0
16:00:00	2	26	12	40	0	161	16:00:00	41	45	35	121	0
17:00:00	7	28	12	47	0	196	17:00:00	45	58	46	149	0
18:00:00	3	40	15	58	0	211	18:00:00	43	56	54	153	0
Totals:	54	270	107	431	0	1169		201	266	271	738	1

East Approach Totals							West Approach Totals					
	Includes Cars, Trucks, & Cyclists					East/West		Includes Cars, Trucks, & Cyclists				
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0	0	7:00:00	0	0	0	0	0
8:00:00	61	235	5	301	0	1280	8:00:00	7	926	46	979	0
9:00:00	51	232	6	289	0	991	9:00:00	11	628	63	702	0
11:00:00	0	5	0	5	0	7	11:00:00	0	2	0	2	0
12:00:00	18	121	3	142	0	284	12:00:00	9	114	19	142	0
13:00:00	23	131	7	161	0	298	13:00:00	10	107	20	137	0
14:00:00	26	160	5	191	0	362	14:00:00	9	139	23	171	0
15:00:00	0	4	0	4	0	5	15:00:00	0	1	0	1	0
16:00:00	53	380	5	438	0	708	16:00:00	10	234	26	270	0
17:00:00	105	489	8	602	0	953	17:00:00	15	301	35	351	0
18:00:00	81	483	6	570	0	901	18:00:00	20	281	30	331	0
Totals:	418	2240	45	2703	0	5789		91	2733	262	3086	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00
Crossing Values:	108	68	46	33	50	88	110	102

MG8 ENG

Count Date: 30-May-2013 Site #: 0001424848

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Cyclists - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	10	10	6	6	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	11	1	32	26	10	5	0	0	0	0	1	1	0	0	1	1	0	0	0	0
7:45:00	16	5	48	16	11	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0
8:00:00	21	5	66	18	13	2	0	0	2	1	3	2	0	0	4	3	0	0	0	0
8:15:00	25	4	86	20	18	5	0	0	2	0	3	0	0	0	4	0	0	0	0	0
8:30:00	27	2	97	11	23	5	0	0	2	0	4	1	0	0	4	0	0	0	0	0
8:45:00	27	0	99	2	28	5	0	0	3	1	4	0	0	0	4	0	0	0	0	0
9:00:00	27	0	111	12	33	5	0	0	3	0	4	0	0	0	4	0	0	0	0	0
9:00:13	27	0	112	1	33	0	0	0	3	0	4	0	0	0	4	0	0	0	0	0
11:00:00	27	0	112	0	33	0	0	0	3	0	4	0	0	0	4	0	0	0	0	0
11:15:00	29	2	113	1	34	1	0	0	4	1	4	0	0	0	4	0	0	0	0	0
11:30:00	30	1	116	3	35	1	0	0	4	0	4	0	0	0	4	0	0	0	0	0
11:45:00	30	0	124	8	37	2	0	0	5	1	5	1	0	0	4	0	0	0	0	0
12:00:00	32	2	126	2	41	4	0	0	5	0	5	0	0	0	4	0	0	0	0	0
12:15:00	32	0	128	2	41	0	0	0	5	0	5	0	0	0	5	1	0	0	0	0
12:30:00	33	1	134	6	45	4	0	0	5	0	6	1	0	0	5	0	0	0	0	0
12:45:00	33	0	138	4	48	3	0	0	5	0	6	0	0	0	5	0	0	0	0	0
13:00:00	35	2	141	3	52	4	0	0	6	1	6	0	0	0	6	1	0	0	0	0
13:15:00	36	1	144	3	56	4	0	0	6	0	6	0	0	0	6	0	0	0	0	0
13:30:00	39	3	145	1	57	1	0	0	6	0	6	0	0	0	6	0	0	0	0	0
13:45:00	41	2	152	7	57	0	0	0	6	0	6	0	0	0	7	1	0	0	0	0
14:00:00	42	1	160	8	62	5	0	0	7	1	6	0	0	0	7	0	0	0	0	0
14:00:52	42	0	161	1	62	0	0	0	7	0	6	0	0	0	7	0	0	0	0	0
15:00:00	42	0	162	1	62	0	0	0	7	0	6	0	0	0	7	0	0	0	0	0
15:15:00	43	1	166	4	65	3	0	0	7	0	6	0	0	0	8	1	0	0	0	0
15:30:00	43	0	173	7	66	1	0	0	8	1	7	1	0	0	8	0	1	1	0	0
15:45:00	44	1	179	6	68	2	0	0	9	1	8	1	0	0	8	0	1	0	0	0
16:00:00	44	0	185	6	70	2	0	0	9	0	9	1	0	0	8	0	1	0	0	0
16:15:00	46	2	191	6	72	2	1	1	9	0	9	0	0	0	10	2	1	0	0	0
16:30:00	47	1	200	9	77	5	1	0	10	1	9	0	0	0	10	0	1	0	0	0
16:45:00	48	1	207	7	79	2	1	0	10	0	9	0	0	0	10	0	1	0	0	0
17:00:00	49	1	210	3	81	2	2	1	10	0	10	1	0	0	10	0	1	0	0	0
17:15:00	49	0	218	8	90	9	2	0	10	0	10	0	0	0	10	0	1	0	0	0
17:30:00	49	0	231	13	93	3	2	0	10	0	11	1	0	0	10	0	1	0	0	0
17:45:00	51	2	236	5	95	2	2	0	10	0	11	0	0	0	13	3	1	0	0	0
18:00:00	52	1	247	11	95	0	2	0	10	0	11	0	0	0	13	0	1	0	0	0
18:00:06	52	0	247	0	95	0	2	0	10	0	11	0	0	0	13	0	1	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001424848

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Cyclists - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	7	7	46	46	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0
7:30:00	27	20	106	60	1	1	1	1	6	3	0	0	0	0	0	0	0	0	0	0
7:45:00	44	17	171	65	2	1	2	1	10	4	0	0	0	0	0	0	0	0	0	0
8:00:00	58	14	222	51	5	3	3	1	13	3	0	0	0	0	0	0	0	0	0	0
8:15:00	74	16	280	58	5	0	4	1	19	6	0	0	0	0	0	0	0	0	0	0
8:30:00	86	12	330	50	6	1	4	0	21	2	0	0	0	0	1	1	0	0	0	0
8:45:00	96	10	376	46	8	2	4	0	26	5	1	1	0	0	1	0	0	0	0	0
9:00:00	107	11	436	60	9	1	5	1	30	4	2	1	0	0	1	0	0	0	0	0
9:00:13	107	0	438	2	9	0	5	0	30	0	2	0	0	0	1	0	0	0	0	0
11:00:00	107	0	441	3	9	0	5	0	30	0	2	0	0	0	1	0	0	0	0	0
11:15:00	112	5	466	25	10	1	5	0	32	2	2	0	0	0	1	0	0	0	0	0
11:30:00	114	2	484	18	10	0	5	0	35	3	2	0	0	0	2	1	0	0	0	0
11:45:00	116	2	518	34	10	0	5	0	37	2	2	0	0	0	2	0	0	0	0	0
12:00:00	125	9	546	28	12	2	5	0	45	8	2	0	0	0	2	0	0	0	0	0
12:15:00	130	5	569	23	14	2	5	0	48	3	2	0	0	0	2	0	0	0	0	0
12:30:00	135	5	599	30	14	0	6	1	54	6	2	0	0	0	3	1	0	0	0	0
12:45:00	138	3	628	29	14	0	6	0	59	5	2	0	0	0	4	1	0	0	0	0
13:00:00	146	8	656	28	19	5	6	0	64	5	2	0	1	1	4	0	0	0	0	0
13:15:00	154	8	688	32	19	0	6	0	69	5	2	0	1	0	4	0	0	0	0	0
13:30:00	163	9	719	31	21	2	6	0	71	2	2	0	1	0	5	1	0	0	0	0
13:45:00	164	1	753	34	22	1	6	0	76	5	2	0	1	0	5	0	0	0	0	0
14:00:00	172	8	795	42	22	0	6	0	83	7	2	0	1	0	6	1	2	2	0	0
14:00:52	172	0	796	1	22	0	6	0	83	0	2	0	1	0	7	1	2	0	0	0
15:00:00	172	0	798	2	22	0	6	0	83	0	2	0	1	0	7	0	2	0	0	0
15:15:00	180	8	865	67	22	0	6	0	87	4	2	0	1	0	9	2	3	1	0	0
15:30:00	194	14	955	90	24	2	6	0	93	6	3	1	2	1	10	1	3	0	0	0
15:45:00	207	13	1070	115	25	1	6	0	95	2	3	0	2	0	11	1	3	0	0	0
16:00:00	223	16	1155	85	25	0	6	0	99	4	3	0	3	1	14	3	3	0	0	0
16:15:00	244	21	1240	85	27	2	6	0	106	7	3	0	3	0	15	1	3	0	0	0
16:30:00	279	35	1374	134	30	3	6	0	110	4	4	1	3	0	15	0	3	0	0	0
16:45:00	297	18	1514	140	32	2	8	2	112	2	4	0	3	0	17	2	3	0	0	0
17:00:00	326	29	1625	111	32	0	8	0	115	3	4	0	3	0	17	0	3	0	0	0
17:15:00	348	22	1740	115	32	0	8	0	121	6	4	0	3	0	17	0	3	0	0	0
17:30:00	365	17	1861	121	36	4	8	0	124	3	4	0	3	0	17	0	3	0	0	0
17:45:00	385	20	1987	126	36	0	8	0	129	5	4	0	3	0	17	0	3	0	0	0
18:00:00	407	22	2092	105	38	2	8	0	130	1	4	0	3	0	18	1	3	0	0	0
18:00:06	408	1	2097	5	38	0	8	0	130	0	4	0	3	0	18	0	3	0	0	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001424848

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Cyclists - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	1	1	6	6	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	4	3	10	4	25	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	6	2	14	4	34	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	15	9	17	3	46	12	0	0	1	1	0	0	0	0	1	1	0	0	0	0
8:15:00	21	6	19	2	52	6	0	0	1	0	1	1	0	0	1	0	0	0	0	0
8:30:00	25	4	22	3	59	7	0	0	1	0	2	1	0	0	2	1	0	0	0	0
8:45:00	27	2	24	2	72	13	0	0	1	0	2	0	0	0	2	0	0	0	1	1
9:00:00	31	4	29	5	81	9	0	0	1	0	2	0	0	0	2	0	0	0	1	0
9:00:13	31	0	29	0	81	0	0	0	1	0	2	0	0	0	2	0	0	0	1	0
11:00:00	31	0	29	0	81	0	0	0	1	0	2	0	0	0	2	0	0	0	1	0
11:15:00	31	0	31	2	83	2	1	1	1	0	2	0	0	0	3	1	0	0	1	0
11:30:00	34	3	38	7	86	3	1	0	1	0	2	0	1	1	3	0	0	0	1	0
11:45:00	37	3	45	7	94	8	1	0	1	0	3	1	1	0	4	1	0	0	1	0
12:00:00	40	3	57	12	98	4	1	0	1	0	3	0	1	0	4	0	0	0	1	0
12:15:00	42	2	59	2	100	2	1	0	1	0	3	0	1	0	4	0	0	0	1	0
12:30:00	48	6	66	7	103	3	1	0	1	0	5	2	1	0	4	0	0	0	1	0
12:45:00	48	0	70	4	107	4	1	0	3	2	5	0	1	0	4	0	0	0	1	0
13:00:00	52	4	73	3	111	4	1	0	3	0	6	1	1	0	4	0	0	0	1	0
13:15:00	55	3	81	8	115	4	1	0	3	0	7	1	1	0	4	0	0	0	1	0
13:30:00	56	1	88	7	118	3	1	0	3	0	8	1	1	0	4	0	0	0	1	0
13:45:00	63	7	95	7	121	3	1	0	3	0	9	1	1	0	4	0	0	0	1	0
14:00:00	68	5	99	4	126	5	1	0	3	0	10	1	2	1	4	0	0	0	1	0
14:00:52	69	1	99	0	126	0	1	0	3	0	10	0	2	0	4	0	0	0	1	0
15:00:00	69	0	100	1	126	0	1	0	3	0	10	0	2	0	4	0	0	0	1	0
15:15:00	83	14	107	7	130	4	1	0	3	0	11	1	2	0	4	0	0	0	1	0
15:30:00	93	10	120	13	139	9	1	0	3	0	12	1	2	0	5	1	0	0	1	0
15:45:00	103	10	130	10	147	8	2	1	3	0	14	2	2	0	5	0	0	0	1	0
16:00:00	109	6	142	12	157	10	2	0	3	0	14	0	2	0	7	2	0	0	1	0
16:15:00	114	5	152	10	165	8	3	1	5	2	14	0	2	0	7	0	0	0	1	0
16:30:00	129	15	161	9	175	10	3	0	5	0	15	1	2	0	8	1	0	0	1	0
16:45:00	136	7	179	18	185	10	3	0	7	2	16	1	3	1	9	1	1	1	1	0
17:00:00	152	16	194	15	198	13	3	0	7	0	18	2	3	0	9	0	1	0	1	0
17:15:00	159	7	204	10	206	8	4	1	8	1	19	1	3	0	12	3	1	0	1	0
17:30:00	171	12	219	15	225	19	4	0	8	0	19	0	3	0	14	2	1	0	1	0
17:45:00	183	12	230	11	244	19	4	0	8	0	19	0	3	0	14	0	1	0	1	0
18:00:00	194	11	244	14	251	7	4	0	8	0	19	0	3	0	14	0	1	0	1	0
18:00:06	194	0	244	0	251	0	4	0	8	0	19	0	3	0	14	0	1	0	1	0

MG8 ENG

Count Date: 30-May-2013 Site #: 0001424848

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Cyclists - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	126	126	7	7	0	0	7	7	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	318	192	14	7	1	1	10	3	1	1	0	0	1	1	0	0	0	0
7:45:00	4	4	626	308	28	14	2	1	19	9	1	0	0	0	1	0	0	0	0	0
8:00:00	5	1	902	276	45	17	2	0	22	3	1	0	0	0	2	1	0	0	0	0
8:15:00	5	0	1103	201	71	26	3	1	24	2	1	0	0	0	2	0	0	0	0	0
8:30:00	10	5	1284	181	90	19	3	0	30	6	2	1	0	0	2	0	0	0	0	0
8:45:00	12	2	1409	125	97	7	3	0	36	6	4	2	0	0	3	1	0	0	0	0
9:00:00	14	2	1508	99	105	8	4	1	43	7	4	0	0	0	3	0	0	0	0	0
9:00:13	14	0	1510	2	105	0	4	0	43	0	4	0	0	0	3	0	0	0	0	0
11:00:00	14	0	1510	0	105	0	4	0	43	0	4	0	0	0	3	0	0	0	0	0
11:15:00	15	1	1542	32	107	2	4	0	47	4	4	0	0	0	4	1	0	0	0	0
11:30:00	21	6	1567	25	114	7	4	0	50	3	4	0	0	0	4	0	0	0	0	0
11:45:00	22	1	1583	16	117	3	5	1	54	4	4	0	0	0	4	0	0	0	0	0
12:00:00	22	0	1611	28	124	7	5	0	55	1	4	0	0	0	4	0	0	0	0	0
12:15:00	26	4	1626	15	130	6	5	0	57	2	5	1	0	0	4	0	0	0	0	0
12:30:00	27	1	1657	31	131	1	5	0	58	1	5	0	0	0	5	1	1	1	0	0
12:45:00	29	2	1684	27	137	6	5	0	64	6	5	0	0	0	5	0	1	0	0	0
13:00:00	32	3	1705	21	140	3	5	0	67	3	7	2	0	0	5	0	1	0	0	0
13:15:00	33	1	1727	22	147	7	5	0	71	4	7	0	0	0	5	0	1	0	0	0
13:30:00	35	2	1763	36	154	7	6	1	75	4	7	0	0	0	5	0	1	0	0	0
13:45:00	39	4	1791	28	159	5	6	0	81	6	7	0	0	0	6	1	1	0	0	0
14:00:00	40	1	1821	30	161	2	6	0	89	8	9	2	0	0	6	0	1	0	0	0
14:00:52	40	0	1822	1	161	0	6	0	89	0	9	0	0	0	6	0	1	0	0	0
15:00:00	40	0	1822	0	161	0	6	0	89	0	9	0	0	0	6	0	1	0	0	0
15:15:00	41	1	1862	40	174	13	6	0	95	6	9	0	0	0	8	2	2	1	0	0
15:30:00	42	1	1919	57	178	4	7	1	98	3	9	0	0	0	8	0	2	0	0	0
15:45:00	43	1	1969	50	182	4	8	1	102	4	9	0	0	0	9	1	2	0	0	0
16:00:00	48	5	2033	64	185	3	8	0	109	7	10	1	0	0	9	0	2	0	0	0
16:15:00	54	6	2113	80	198	13	8	0	114	5	10	0	0	0	10	1	3	1	0	0
16:30:00	55	1	2178	65	209	11	8	0	124	10	10	0	0	0	10	0	3	0	0	0
16:45:00	57	2	2245	67	216	7	8	0	129	5	11	1	0	0	10	0	3	0	0	0
17:00:00	63	6	2309	64	218	2	8	0	132	3	11	0	0	0	11	1	3	0	0	0
17:15:00	70	7	2384	75	225	7	8	0	138	6	11	0	0	0	12	1	3	0	0	0
17:30:00	74	4	2444	60	232	7	8	0	143	5	11	0	0	0	12	0	3	0	0	0
17:45:00	78	4	2517	73	238	6	9	1	146	3	11	0	0	0	12	0	3	0	0	0
18:00:00	82	4	2566	49	248	10	9	0	153	7	11	0	0	0	14	2	3	0	0	0
18:00:06	82	0	2568	2	248	0	9	0	153	0	11	0	0	0	14	0	3	0	0	0

Appendix B

Intersection Operation Reports – 2013 Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	711	65	53	186	4	20	15	33	11	86	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.6			6.6			6.6			6.6	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.93			0.98	
Flt Protected		1.00			0.99			0.99			1.00	
Satd. Flow (prot)		1851			1791			1708			1793	
Flt Permitted		1.00			0.77			0.87			0.96	
Satd. Flow (perm)		1846			1397			1515			1736	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	8	711	65	53	186	4	20	15	33	11	86	16
RTOR Reduction (vph)	0	3	0	0	0	0	0	26	0	0	7	0
Lane Group Flow (vph)	0	781	0	0	243	0	0	42	0	0	106	0
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		32.6			32.6			11.8			11.8	
Effective Green, g (s)		32.6			32.6			11.8			11.8	
Actuated g/C Ratio		0.57			0.57			0.20			0.20	
Clearance Time (s)		6.6			6.6			6.6			6.6	
Vehicle Extension (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		1044			790			310			355	
v/s Ratio Prot												
v/s Ratio Perm		c0.42			0.17			0.03			c0.06	
v/c Ratio		0.75			0.31			0.13			0.30	
Uniform Delay, d1		9.4			6.6			18.7			19.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		3.6			0.5			0.4			1.0	
Delay (s)		13.0			7.0			19.1			20.4	
Level of Service		B			A			B			C	
Approach Delay (s)		13.0			7.0			19.1			20.4	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	57.6	Sum of lost time (s)	13.2
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	677	77	168	232	3	4	6	27	5	55	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	677	77	168	232	3	4	6	27	5	55	7
Pedestrians					1							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	235			754			1322	1288	716	1318	1326	234
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	235			754			1322	1288	716	1318	1326	234
tC, single (s)	4.1			4.1			7.1	6.5	6.3	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.4	3.5	4.0	3.4
p0 queue free %	100			80			95	95	93	95	56	99
cM capacity (veh/h)	1344			852			75	133	415	104	124	777

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	755	403	37	67
Volume Left	1	168	4	5
Volume Right	77	3	27	7
cSH	1344	852	226	133
Volume to Capacity	0.00	0.20	0.16	0.50
Queue Length 95th (m)	0.0	5.1	4.0	16.5
Control Delay (s)	0.0	5.6	24.0	56.5
Lane LOS	A	A	C	F
Approach Delay (s)	0.0	5.6	24.0	56.5
Approach LOS			C	F

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	76.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	619	40	90	265	15	17	57	36	55	353	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1716	1826		1549	1817		1384	1560		1700	1763	
Flt Permitted	0.55	1.00		0.16	1.00		0.34	1.00		0.70	1.00	
Satd. Flow (perm)	1000	1826		265	1817		501	1560		1247	1763	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	50	619	40	90	265	15	17	57	36	55	353	121
RTOR Reduction (vph)	0	3	0	0	2	0	0	21	0	0	16	0
Lane Group Flow (vph)	50	656	0	90	278	0	17	72	0	55	458	0
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	33.0	33.0		33.0	33.0		33.0	33.0		33.0	33.0	
Effective Green, g (s)	33.0	33.0		33.0	33.0		33.0	33.0		33.0	33.0	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	416	760		110	757		208	650		519	734	
v/s Ratio Prot		c0.36			0.15			0.05			c0.26	
v/s Ratio Perm	0.05			0.34			0.03			0.04		
v/c Ratio	0.12	0.86		0.82	0.37		0.08	0.11		0.11	0.62	
Uniform Delay, d1	14.2	21.0		20.4	15.9		14.0	14.1		14.1	18.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.6	12.4		46.8	1.4		0.8	0.3		0.4	4.0	
Delay (s)	14.8	33.5		67.3	17.3		14.7	14.5		14.5	22.2	
Level of Service	B	C		E	B		B	B		B	C	
Approach Delay (s)		32.2			29.4			14.5			21.4	
Approach LOS		C			C			B			C	

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	79.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	672	36	23	351	5	7	8	25	15	16	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	2	672	36	23	351	5	7	8	25	15	16	12
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	356			708			1114	1096	690	1122	1112	354
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	356			708			1114	1096	690	1122	1112	354
tC, single (s)	4.1			4.2			7.4	6.5	6.3	7.1	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.8	4.0	3.4	3.5	4.0	3.5
p0 queue free %	100			97			95	96	94	91	92	98
cM capacity (veh/h)	1214			864			149	209	435	165	205	651

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	710	379	40	43
Volume Left	2	23	7	15
Volume Right	36	5	25	12
cSH	1214	864	280	230
Volume to Capacity	0.00	0.03	0.14	0.19
Queue Length 95th (m)	0.0	0.6	3.4	4.7
Control Delay (s)	0.0	0.9	20.0	24.3
Lane LOS	A	A	C	C
Approach Delay (s)	0.0	0.9	20.0	24.3
Approach LOS			C	C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	630	79	122	353	7	17	26	85	13	60	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.6			6.6			6.6			6.6	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.98			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.91			0.99	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		1819			1732			1643			1786	
Flt Permitted		1.00			0.70			0.96			0.94	
Satd. Flow (perm)		1817			1234			1580			1699	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	3	630	79	122	353	7	17	26	85	13	60	9
RTOR Reduction (vph)	0	5	0	0	1	0	0	66	0	0	5	0
Lane Group Flow (vph)	0	707	0	0	481	0	0	62	0	0	77	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		55.0			55.0			20.0			20.0	
Effective Green, g (s)		55.0			55.0			20.0			20.0	
Actuated g/C Ratio		0.62			0.62			0.23			0.23	
Clearance Time (s)		6.6			6.6			6.6			6.6	
Vehicle Extension (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		1133			769			358			385	
v/s Ratio Prot												
v/s Ratio Perm		0.39			c0.39			0.04			c0.05	
v/c Ratio		0.62			0.63			0.17			0.20	
Uniform Delay, d1		10.2			10.2			27.5			27.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			3.8			1.1			1.2	
Delay (s)		12.8			14.1			28.5			28.8	
Level of Service		B			B			C			C	
Approach Delay (s)		12.8			14.1			28.5			28.8	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	297	28	94	456	5	47	60	47	4	28	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.6			6.6			6.6			6.6	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.96			0.95	
Flt Protected		1.00			0.99			0.98			1.00	
Satd. Flow (prot)		1763			1848			1697			1714	
Flt Permitted		0.97			0.87			0.88			0.97	
Satd. Flow (perm)		1706			1626			1515			1670	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	16	297	28	94	456	5	47	60	47	4	28	19
RTOR Reduction (vph)	0	3	0	0	1	0	0	17	0	0	14	0
Lane Group Flow (vph)	0	338	0	0	554	0	0	137	0	0	37	0
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		24.8			24.8			13.0			13.0	
Effective Green, g (s)		24.8			24.8			13.0			13.0	
Actuated g/C Ratio		0.49			0.49			0.25			0.25	
Clearance Time (s)		6.6			6.6			6.6			6.6	
Vehicle Extension (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		829			790			386			425	
v/s Ratio Prot												
v/s Ratio Perm		0.20			c0.34			c0.09			0.02	
v/c Ratio		0.41			0.70			0.35			0.09	
Uniform Delay, d1		8.4			10.2			15.6			14.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.7			3.6			1.2			0.2	
Delay (s)		9.1			13.8			16.7			14.7	
Level of Service		A			B			B			B	
Approach Delay (s)		9.1			13.8			16.7			14.7	
Approach LOS		A			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	51.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	335	6	31	521	7	30	64	100	7	16	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	335	6	31	521	7	30	64	100	7	16	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	528			341			950	942	338	1070	942	524
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	528			341			950	942	338	1070	942	524
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.2	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.6	4.1	3.3
p0 queue free %	99			97			87	75	86	94	94	99
cM capacity (veh/h)	1049			1229			223	254	704	127	251	557

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	348	559	194	27
Volume Left	7	31	30	7
Volume Right	6	7	100	4
cSH	1049	1229	367	214
Volume to Capacity	0.01	0.03	0.53	0.13
Queue Length 95th (m)	0.1	0.5	20.7	3.0
Control Delay (s)	0.2	0.7	25.3	24.2
Lane LOS	A	A	D	C
Approach Delay (s)	0.2	0.7	25.3	24.2
Approach LOS			D	C

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	79	351	12	43	483	25	23	288	118	15	91	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.96		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	1849		1653	1860		1463	1731		1785	1697	
Flt Permitted	0.31	1.00		0.46	1.00		0.67	1.00		0.41	1.00	
Satd. Flow (perm)	565	1849		802	1860		1024	1731		779	1697	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	79	351	12	43	483	25	23	288	118	15	91	53
RTOR Reduction (vph)	0	2	0	0	2	0	0	19	0	0	26	0
Lane Group Flow (vph)	79	361	0	43	506	0	23	387	0	15	118	0
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	33.0	33.0		33.0	33.0		33.0	33.0		33.0	33.0	
Effective Green, g (s)	33.0	33.0		33.0	33.0		33.0	33.0		33.0	33.0	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.42	0.42		0.42	0.42	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	235	770		334	775		426	721		324	707	
v/s Ratio Prot		0.20			c0.27			c0.22			0.07	
v/s Ratio Perm	0.14			0.05			0.02			0.02		
v/c Ratio	0.34	0.47		0.13	0.65		0.05	0.54		0.05	0.17	
Uniform Delay, d1	15.7	16.7		14.2	18.5		13.8	17.4		13.7	14.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	2.0		0.8	4.2		0.2	2.9		0.3	0.5	
Delay (s)	19.5	18.8		15.0	22.8		14.0	20.2		14.0	15.0	
Level of Service	B	B		B	C		B	C		B	B	
Approach Delay (s)		18.9			22.1			19.9			14.9	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	79.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	79.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	7	460	17	33	539	24	7	24	27	14	13	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	460	17	33	539	24	7	24	27	14	13	5
Pedestrians		1										
Lane Width (m)		3.7										
Walking Speed (m/s)		1.0										
Percent Blockage		0										
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	563			477			1112	1112	468	1138	1108	552
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	563			477			1112	1112	468	1138	1108	552
tC, single (s)	4.4			4.1			7.1	6.5	6.3	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.4	3.5	4.0	3.3
p0 queue free %	99			97			96	88	95	91	94	99
cM capacity (veh/h)	887			1096			172	203	584	152	204	537

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	484	596	58	32
Volume Left	7	33	7	14
Volume Right	17	24	27	5
cSH	887	1096	282	193
Volume to Capacity	0.01	0.03	0.21	0.17
Queue Length 95th (m)	0.2	0.7	5.3	4.0
Control Delay (s)	0.2	0.8	21.0	27.3
Lane LOS	A	A	C	D
Approach Delay (s)	0.2	0.8	21.0	27.3
Approach LOS			C	D

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	29	426	46	122	532	51	41	147	79	21	49	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.6			6.6			6.6			6.6	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			0.99			0.96			0.97	
Flt Protected		1.00			0.99			0.99			0.99	
Satd. Flow (prot)		1825			1813			1774			1799	
Flt Permitted		0.94			0.81			0.94			0.90	
Satd. Flow (perm)		1719			1489			1681			1629	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	29	426	46	122	532	51	41	147	79	21	49	23
RTOR Reduction (vph)	0	5	0	0	3	0	0	19	0	0	15	0
Lane Group Flow (vph)	0	496	0	0	702	0	0	248	0	0	78	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		40.0			40.0			25.0			25.0	
Effective Green, g (s)		40.0			40.0			25.0			25.0	
Actuated g/C Ratio		0.51			0.51			0.32			0.32	
Clearance Time (s)		6.6			6.6			6.6			6.6	
Vehicle Extension (s)		5.0			5.0			5.0			5.0	
Lane Grp Cap (vph)		879			761			537			520	
v/s Ratio Prot												
v/s Ratio Perm		0.29			c0.47			c0.15			0.05	
v/c Ratio		0.56			0.92			0.46			0.15	
Uniform Delay, d1		13.1			17.7			21.2			19.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		2.6			18.3			2.8			0.6	
Delay (s)		15.7			36.0			24.1			19.6	
Level of Service		B			D			C			B	
Approach Delay (s)		15.7			36.0			24.1			19.6	
Approach LOS		B			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	26.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	78.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Appendix C

Traffic Signal Warrants Calculations

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Mayfield Road/ Creditview Road

What is the direction of the Main Road street? East-West

When was the data collected? 2013-07-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 1

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Rural

Population < 10,000 AND Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	1	617	26	8	7	20	23	371	4	18	18	9	0
9:00	5	491	26	2	4	24	22	372	11	22	12	9	0
12:00	6	147	8	7	9	9	11	144	12	11	10	5	2
13:00	4	154	3	11	11	14	13	169	15	8	4	3	3
14:00	6	184	6	6	15	20	17	210	9	8	5	2	1
16:00	5	330	10	22	17	23	16	425	22	7	10	8	8
17:00	11	398	15	9	13	32	32	523	23	13	11	4	1
18:00	9	434	14	7	31	20	33	509	19	14	14	7	2
Total	**47**	**2,755**	**108**	**72**	**107**	**162**	**167**	**2,723**	**115**	**101**	**84**	**47**	**17**

Analysis Sheet | Input Sheet | Results Sheet | Proposed Collision | GO TO Justification:

Intersection: Mayfield Road/ Creditview Road   Count Date: 2013-07-30

Justification 1: Minimum Vehicle Volumes

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	1,122	1,000	379	409	488	895	1,084	1,111		
	COMPLIANCE %				100	100	79	85	100	100	100	100	764	96
1B	120	170	120	170	80	73	51	51	56	87	82	93		
	COMPLIANCE %				67	61	43	43	47	73	68	78	478	60

Free Flow Signal Justification 1:			
	Both 1A and 1B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	1,042	927	328	358	432	808	1,002	1,018		
	COMPLIANCE %				100	100	68	75	90	100	100	100	733	92
2B	50	75	50	75	44	36	30	33	30	54	36	54		
	COMPLIANCE %				88	72	60	66	60	100	72	100	618	77

Free Flow Signal Justification 2:			
	Both 2A and 2B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Mayfield Road/ Heritage Road

What is the direction of the Main Road street? East-West

When was the data collected? 2013-05-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 1

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Rural

Population < 10,000 AND Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	1	629	88	4	6	27	179	248	4	5	58	6	1
9:00	2	474	37	3	12	27	147	236	1	6	40	3	0
12:00	2	130	5	4	10	14	8	129	5	0	9	3	0
13:00	5	114	9	6	13	8	13	146	4	3	11	4	0
14:00	4	150	8	9	19	19	16	171	7	6	7	4	2
16:00	3	232	9	12	35	37	26	393	7	4	8	8	0
17:00	6	352	10	28	59	80	29	539	8	5	11	5	0
18:00	5	308	8	41	74	127	33	507	7	5	20	2	0
Total	**28**	**2,389**	**174**	**107**	**228**	**339**	**451**	**2,369**	**43**	**34**	**164**	**35**	**3**

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Mayfield Road/ Heritage Road

Count Date: 2013-05-30

Justification 1: Minimum Vehicle Volumes

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	1,255	988	319	336	420	774	1,132	1,137		
	COMPLIANCE %				100	100	66	70	88	100	100	100	724	90
1B	120	170	120	170	106	91	40	45	64	104	188	269		
	COMPLIANCE %				88	76	33	38	53	87	100	100	575	72

Free Flow Signal Justification 1:			
	Both 1A and 1B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	1,149	897	279	291	356	670	944	868		
	COMPLIANCE %				100	100	58	61	74	100	100	100	693	87
2B	50	75	50	75	158	49	14	22	36	51	92	120		
	COMPLIANCE %				100	98	28	44	72	100	100	100	642	80

Free Flow Signal Justification 2:			
	Both 2A and 2B 100% Fullfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☑	No ☐

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimun Vehicular Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☑	NO ☐		NOT JUSTIFIED

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Creditview Road / Mayfield Road - 2019 - 2 lanes

What is the direction of the Main Road street? East-West

When was the data collected? 2013-05-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban

Population >= 10,000 AND Speed < 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	18	1,125	70	37	40	91	47	707	33	30	51	25	0
9:00	23	1,000	65	36	40	99	49	773	43	39	52	23	0
12:00	33	645	38	39	68	67	88	644	53	25	60	22	2
13:00	31	652	33	43	70	72	90	669	56	22	54	20	3
14:00	33	682	36	38	74	78	94	710	50	22	55	19	1
16:00	32	828	40	54	76	81	93	925	63	21	60	25	8
17:00	38	896	45	41	72	90	109	1,023	64	27	61	21	1
18:00	31	902	43	36	77	78	102	983	61	27	58	20	2
Total	**239**	**6,730**	**370**	**324**	**517**	**656**	**672**	**6,434**	**423**	**213**	**451**	**175**	**17**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	4	17	4	17	0	0	0	0	
Factored 8 hour pedestrian volume	25		25		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									38
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	4	17	4	17	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	25		25		0		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									38
Net 8 Hour Volume of Delayed Pedestrians									34

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Creditview Road / Mayfield Road - 2019 - 2 lanes   Count Date: 2013-05-30

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☑	☐
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☑	☐
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	☑	☐
	B	Justification 2	100	%		
4. 4-Hr Volume			100	%	☑	☐

5. Collision Experience	0	%	☐	☑

6. Pedestrians	A	Volume	Justification not met	☐	☑
	B	Delay	Justification not met		

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Mayfield Road/ Heritage Road

What is the direction of the Main Road street? East-West

When was the data collected? 2013-05-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Rural **Population < 10,000** **AND** **Speed >= 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	1	1,053	111	5	7	32	241	544	5	6	64	8	1
9:00	2	897	76	4	13	32	229	587	4	7	50	4	0
12:00	6	542	9	9	23	33	22	555	10	1	13	4	0
13:00	9	526	13	11	26	27	27	572	9	4	15	5	0
14:00	8	562	12	14	32	38	30	597	12	7	11	5	2
16:00	7	644	13	17	48	56	40	819	12	5	12	9	0
17:00	10	764	14	33	72	99	43	965	13	6	15	6	0
18:00	10	701	9	35	75	117	44	899	11	8	19	5	0
Total	**53**	**5,689**	**257**	**128**	**296**	**434**	**676**	**5,538**	**76**	**44**	**199**	**46**	**3**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	
13-24	
25-36	3

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	10,000	5	10	5	0	0	0	0	
Factored 8 hour pedestrian volume	20,005		25		0		0		
% Assigned to crossing rate	23%		34%		30%		100%		
Net 8 Hour Pedestrian Volume at Crossing									4,610
Net 8 Hour Vehicular Volume on Street Being Crossed									2,000

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	10,000	5	10	5	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	20,005		25		0		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	23%		34%		30%		100%		
Net 8 Hour Volume of Total Pedestrians									4,610
Net 8 Hour Volume of Delayed Pedestrians									12

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

Intersection: Mayfield Road/ Heritage Road   Count Date: 2013-05-30

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	90	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	94	%		
3. Combination	A	Justificaton 1	90	%	☑	☐
	B	Justification 2	94	%		
4. 4-Hr Volume			80	%	☐	☑

5. Collision Experience			20	%	☐	☑

6. Pedestrians	A	Volume	Justification met	☐	☑
	B	Delay	Justification not met		

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Creditview Road / Mayfield Road - 2019 - 2 lanes

What is the direction of the Main Road street? East-West

When was the data collected? 2013-05-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 2 or more

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000 AND Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	18	1,125	70	37	40	91	47	707	33	30	51	25	0
9:00	23	1,000	65	36	40	99	49	773	43	39	52	23	0
12:00	33	645	38	39	68	67	88	644	53	25	60	22	2
13:00	31	652	33	43	70	72	90	669	56	22	54	20	3
14:00	33	682	36	38	74	78	94	710	50	22	55	19	1
16:00	32	828	40	54	76	81	93	925	63	21	60	25	8
17:00	38	896	45	41	72	90	109	1,023	64	27	61	21	1
18:00	31	902	43	36	77	78	102	983	61	27	58	20	2
Total	**239**	**6,730**	**370**	**324**	**517**	**656**	**672**	**6,434**	**423**	**213**	**451**	**175**	**17**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	0
13-24	0
25-36	0

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	4	17	4	17	0	0	0	0	
Factored 8 hour pedestrian volume	25		25		0		0		
% Assigned to crossing rate	100%		50%		0%		0%		
Net 8 Hour Pedestrian Volume at Crossing									38
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	4	17	4	17	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	25		25		0		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	100%		50%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									38
Net 8 Hour Volume of Delayed Pedestrians									34

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Creditview Road / Mayfield Road - 2019 - 2 lanes   Count Date: 2013-05-30

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	✓	
	B	Crossing Volume	100	%		
2. Delay to Cross Traffic	A	Main Road	100	%	✓	
	B	Crossing Road	100	%		
3. Combination	A	Justificaton 1	100	%	✓	
	B	Justification 2	100	%		
4. 4-Hr Volume			100	%	✓	

5. Collision Experience	0 %	YES: ☐ NO: ✓

6. Pedestrians	A	Volume	Justification not met	YES: ☐ NO: ✓
	B	Delay	Justification not met	

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Mayfield Road/ Heritage Road

What is the direction of the Main Road street? East-West

When was the data collected? 2013-05-30

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 2 or more

c.- How many approaches? 4

d.- What is the operating environment? Rural **Population < 10,000 AND Speed >= 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	1	1,053	111	5	7	32	241	544	5	6	64	8	1
9:00	2	897	76	4	13	32	229	587	4	7	50	4	0
12:00	6	542	9	9	23	33	22	555	10	1	13	4	0
13:00	9	526	13	11	26	27	27	572	9	4	15	5	0
14:00	8	562	12	14	32	38	30	597	12	7	11	5	2
16:00	7	644	13	17	48	56	40	819	12	5	12	9	0
17:00	10	764	14	33	72	99	43	965	13	6	15	6	0
18:00	10	701	9	35	75	117	44	899	11	8	19	5	0
Total	**53**	**5,689**	**257**	**128**	**296**	**434**	**676**	**5,538**	**76**	**44**	**199**	**46**	**3**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	3
13-24	1
25-36	4

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	10,000	5	10	5	0	0	0	0	
Factored 8 hour pedestrian volume	20,005		25		0		0		
% Assigned to crossing rate	23%		34%		30%		100%		
Net 8 Hour Pedestrian Volume at Crossing									4,610
Net 8 Hour Vehicular Volume on Street Being Crossed									2,000

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	10,000	5	10	5	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds	10	10	1	6	2	4	0	0	
Factored volume of total pedestrians	20,005		25		0		0		
Factored volume of delayed pedestrians	30		8		8		0		
% Assigned to Crossing Rate	23%		34%		30%		100%		
Net 8 Hour Volume of Total Pedestrians									4,610
Net 8 Hour Volume of Delayed Pedestrians									12

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

Intersection: Mayfield Road/ Heritage Road   Count Date: 2013-05-30

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	90	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	94	%		
3. Combination	A	Justificaton 1	90	%	☑	☐
	B	Justification 2	94	%		
4. 4-Hr Volume			80	%	☐	☑

5. Collision Experience			53	%	☐	☑

6. Pedestrians	A	Volume	Justification met	☐	☑
	B	Delay	Justification not met		

Appendix D

Intersection Operation Reports – 2021 Future Conditions without Improvements

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.89		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1323	1857		1722	1811		1825	1628		1825	1784	
Flt Permitted	0.45	1.00		0.11	1.00		0.68	1.00		0.71	1.00	
Satd. Flow (perm)	622	1857		191	1811		1305	1628		1370	1784	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
RTOR Reduction (vph)	0	3	0	0	0	0	0	39	0	0	12	0
Lane Group Flow (vph)	11	1225	0	89	507	0	29	28	0	13	109	0
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	38.0	38.0		38.0	38.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	38.0	38.0		38.0	38.0		9.8	9.8		9.8	9.8	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.16	0.16		0.16	0.16	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	387	1156		118	1128		209	261		220	286	
v/s Ratio Prot		c0.66			0.28			0.02			c0.06	
v/s Ratio Perm	0.02			0.47			0.02			0.01		
v/c Ratio	0.03	1.06		0.75	0.45		0.14	0.11		0.06	0.38	
Uniform Delay, d1	4.4	11.5		8.2	6.0		22.0	21.9		21.7	22.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	43.7		35.5	1.3		0.6	0.4		0.2	1.8	
Delay (s)	4.6	55.2		43.6	7.3		22.6	22.2		21.9	24.7	
Level of Service	A	E		D	A		C	C		C	C	
Approach Delay (s)		54.7			12.7			22.3			24.4	
Approach LOS		D			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	39.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	109.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.88		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1832		1772	1774		1825	1512		1822	1794	
Flt Permitted	0.35	1.00		0.09	1.00		0.71	1.00		0.73	1.00	
Satd. Flow (perm)	666	1832		165	1774		1362	1512		1392	1794	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
RTOR Reduction (vph)	0	5	0	0	0	0	0	31	0	0	5	0
Lane Group Flow (vph)	1	1204	0	255	595	0	9	17	0	6	69	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2									1
Heavy Vehicles (%)	0%	3%	4%	3%	8%	25%	0%	0%	11%	0%	4%	14%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	41.6	40.4		51.2	45.2		19.0	19.0		19.0	19.0	
Effective Green, g (s)	41.6	40.4		51.2	45.2		19.0	19.0		19.0	19.0	
Actuated g/C Ratio	0.49	0.47		0.60	0.53		0.22	0.22		0.22	0.22	
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	339	864		211	936		302	335		308	398	
v/s Ratio Prot	0.00	c0.66		c0.08	c0.34			0.01			c0.04	
v/s Ratio Perm	0.00			0.64			0.01			0.00		
v/c Ratio	0.00	1.39		1.21	0.64		0.03	0.05		0.02	0.17	
Uniform Delay, d1	11.7	22.6		23.5	14.3		26.1	26.2		26.0	26.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	184.3		129.6	3.3		0.1	0.1		0.1	0.9	
Delay (s)	11.7	206.9		153.1	17.6		26.2	26.3		26.1	27.9	
Level of Service	B	F		F	B		C	C		C	C	
Approach Delay (s)		206.7			58.3			26.3			27.7	
Approach LOS		F			E			C			C	

Intersection Summary			
HCM 2000 Control Delay	138.1	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	85.6	Sum of lost time (s)	20.2
Intersection Capacity Utilization	105.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1716	1826		1552	1818		1384	2973		1700	3355	
Flt Permitted	0.38	1.00		0.10	1.00		0.31	1.00		0.65	1.00	
Satd. Flow (perm)	682	1826		169	1818		456	2973		1171	3355	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
RTOR Reduction (vph)	0	3	0	0	3	0	0	38	0	0	40	0
Lane Group Flow (vph)	72	1071	0	139	682	0	25	116	0	76	544	0
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	33.7	33.7		45.0	45.0		19.6	19.6		19.6	19.6	
Effective Green, g (s)	33.7	33.7		45.0	45.0		19.6	19.6		19.6	19.6	
Actuated g/C Ratio	0.43	0.43		0.58	0.58		0.25	0.25		0.25	0.25	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	295	790		209	1051		114	748		295	845	
v/s Ratio Prot		c0.59		0.05	c0.38			0.04			c0.16	
v/s Ratio Perm	0.11			0.33			0.05			0.06		
v/c Ratio	0.24	1.36		0.67	0.65		0.22	0.15		0.26	0.64	
Uniform Delay, d1	14.0	22.0		16.1	11.1		23.0	22.7		23.3	26.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	168.4		10.1	3.1		2.0	0.2		1.0	2.3	
Delay (s)	15.9	190.5		26.2	14.2		25.1	22.9		24.3	28.3	
Level of Service	B	F		C	B		C	C		C	C	
Approach Delay (s)		179.5			16.2			23.2			27.8	
Approach LOS		F			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	86.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	18.2
Intersection Capacity Utilization	112.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.90		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1845		1690	1782		1415	3098		1825	3256	
Flt Permitted	0.24	1.00		0.11	1.00		0.70	1.00		0.67	1.00	
Satd. Flow (perm)	465	1845		200	1782		1050	3098		1285	3256	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
RTOR Reduction (vph)	0	2	0	0	2	0	0	28	0	0	21	0
Lane Group Flow (vph)	18	1244	0	47	803	0	37	103	0	30	55	0
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	3%	6%	8%	6%	33%	29%	0%	8%	0%	0%	20%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	35.5	35.5		35.5	35.5		9.5	9.5		9.5	9.5	
Effective Green, g (s)	35.5	35.5		35.5	35.5		9.5	9.5		9.5	9.5	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.16	0.16		0.16	0.16	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	283	1125		121	1086		171	505		209	531	
v/s Ratio Prot		c0.67			0.45			0.03			0.02	
v/s Ratio Perm	0.04			0.23			c0.04			0.02		
v/c Ratio	0.06	1.11		0.39	0.74		0.22	0.20		0.14	0.10	
Uniform Delay, d1	4.6	11.4		5.8	8.1		21.1	21.1		20.9	20.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	60.6		9.1	4.5		1.3	0.4		0.7	0.2	
Delay (s)	5.0	71.9		14.9	12.6		22.5	21.5		21.5	20.9	
Level of Service	A	E		B	B		C	C		C	C	
Approach Delay (s)		71.0			12.7			21.7			21.1	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	58.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3455		1706	3300		1825	1921	1518	1823	1768	
Flt Permitted	0.36	1.00		0.09	1.00		0.69	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	695	3455		157	3300		1334	1921	1518	1368	1768	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
RTOR Reduction (vph)	0	9	0	0	2	0	0	0	141	0	8	0
Lane Group Flow (vph)	5	1422	0	208	762	0	51	68	26	15	89	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	40.7	40.7		53.7	53.7		12.6	12.6	12.6	12.6	12.6	
Effective Green, g (s)	40.7	40.7		53.7	53.7		12.6	12.6	12.6	12.6	12.6	
Actuated g/C Ratio	0.51	0.51		0.68	0.68		0.16	0.16	0.16	0.16	0.16	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	355	1768		261	2229		211	304	240	216	280	
v/s Ratio Prot		0.41		c0.08	0.23			0.04			c0.05	
v/s Ratio Perm	0.01			c0.46			0.04		0.02	0.01		
v/c Ratio	0.01	0.80		0.80	0.34		0.24	0.22	0.11	0.07	0.32	
Uniform Delay, d1	9.5	16.1		17.9	5.4		29.3	29.2	28.6	28.5	29.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	4.0		17.5	0.4		1.2	0.8	0.4	0.3	1.4	
Delay (s)	9.6	20.1		35.4	5.9		30.5	30.0	29.1	28.7	31.0	
Level of Service	A	C		D	A		C	C	C	C	C	
Approach Delay (s)		20.1			12.2			29.5			30.7	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	18.2
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1182	7	14	594	6	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1882		1789	1883	1789	1601
Flt Permitted	1.00		0.20	1.00	0.95	1.00
Satd. Flow (perm)	1882		377	1883	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1182	7	14	594	6	11
RTOR Reduction (vph)	1	0	0	0	0	7
Lane Group Flow (vph)	1188	0	14	594	6	4
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	20.0		20.0	20.0	16.0	16.0
Effective Green, g (s)	20.0		20.0	20.0	16.0	16.0
Actuated g/C Ratio	0.40		0.40	0.40	0.32	0.32
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	752		150	753	572	512
v/s Ratio Prot	c0.63			0.32	c0.00	
v/s Ratio Perm			0.04			0.00
v/c Ratio	1.58		0.09	0.79	0.01	0.01
Uniform Delay, d1	15.0		9.3	13.1	11.6	11.6
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	267.5		0.6	6.4	0.0	0.0
Delay (s)	282.5		9.9	19.5	11.6	11.6
Level of Service	F		A	B	B	B
Approach Delay (s)	282.5			19.3	11.6	
Approach LOS	F			B	B	

Intersection Summary			
HCM 2000 Control Delay	191.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	671	46	146	856	8	68	72	79	5	34	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.92		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1763		1789	1860		1789	1609		1460	1732	
Flt Permitted	0.16	1.00		0.27	1.00		0.72	1.00		0.66	1.00	
Satd. Flow (perm)	305	1763		506	1860		1357	1609		1016	1732	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	23	671	46	146	856	8	68	72	79	5	34	22
RTOR Reduction (vph)	0	3	0	0	0	0	0	64	0	0	18	0
Lane Group Flow (vph)	23	714	0	146	864	0	68	87	0	5	38	0
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	27.1	27.1		27.1	27.1		9.7	9.7		9.7	9.7	
Effective Green, g (s)	27.1	27.1		27.1	27.1		9.7	9.7		9.7	9.7	
Actuated g/C Ratio	0.54	0.54		0.54	0.54		0.19	0.19		0.19	0.19	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	165	955		274	1008		263	312		197	336	
v/s Ratio Prot		0.40			c0.46			c0.05			0.02	
v/s Ratio Perm	0.08			0.29			0.05			0.00		
v/c Ratio	0.14	0.75		0.53	0.86		0.26	0.28		0.03	0.11	
Uniform Delay, d1	5.7	8.8		7.4	9.8		17.1	17.2		16.3	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	5.3		7.2	9.3		1.1	1.0		0.1	0.3	
Delay (s)	7.4	14.1		14.6	19.1		18.2	18.2		16.4	16.9	
Level of Service	A	B		B	B		B	B		B	B	
Approach Delay (s)		13.9			18.5			18.2			16.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	781	14	54	947	11	48	77	141	8	20	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.90		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1744		1825	1844		1825	1670		1601	1778	
Flt Permitted	0.15	1.00		0.17	1.00		0.74	1.00		0.62	1.00	
Satd. Flow (perm)	290	1744		319	1844		1423	1670		1048	1778	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	781	14	54	947	11	48	77	141	8	20	5
RTOR Reduction (vph)	0	1	0	0	1	0	0	59	0	0	4	0
Lane Group Flow (vph)	10	794	0	54	957	0	48	159	0	8	21	0
Confl. Bikes (#/hr)			2			2			2			
Heavy Vehicles (%)	0%	10%	0%	0%	4%	0%	0%	3%	2%	14%	6%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	26.5	26.5		26.5	26.5		13.4	13.4		13.4	13.4	
Effective Green, g (s)	26.5	26.5		26.5	26.5		13.4	13.4		13.4	13.4	
Actuated g/C Ratio	0.50	0.50		0.50	0.50		0.25	0.25		0.25	0.25	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	144	870		159	920		359	421		264	448	
v/s Ratio Prot		0.46			c0.52			c0.10			0.01	
v/s Ratio Perm	0.03			0.17			0.03			0.01		
v/c Ratio	0.07	0.91		0.34	1.04		0.13	0.38		0.03	0.05	
Uniform Delay, d1	6.9	12.2		8.0	13.3		15.4	16.4		15.0	15.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	15.5		5.7	40.8		0.4	1.2		0.1	0.1	
Delay (s)	7.8	27.7		13.7	54.1		15.7	17.6		15.1	15.1	
Level of Service	A	C		B	D		B	B		B	B	
Approach Delay (s)		27.5			51.9			17.3			15.1	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	53.1	Sum of lost time (s)	13.2
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	822	23	72	889	56	42	392	156	34	143	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	1852		1653	1857		1463	3291		1785	3269	
Flt Permitted	0.12	1.00		0.14	1.00		0.62	1.00		0.38	1.00	
Satd. Flow (perm)	215	1852		245	1857		960	3291		723	3269	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	113	822	23	72	889	56	42	392	156	34	143	62
RTOR Reduction (vph)	0	1	0	0	3	0	0	67	0	0	45	0
Lane Group Flow (vph)	113	844	0	72	942	0	42	481	0	34	160	0
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	33.9	33.9		33.9	33.9		17.1	17.1		17.1	17.1	
Effective Green, g (s)	33.9	33.9		33.9	33.9		17.1	17.1		17.1	17.1	
Actuated g/C Ratio	0.53	0.53		0.53	0.53		0.27	0.27		0.27	0.27	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	113	977		129	980		255	876		192	870	
v/s Ratio Prot		0.46			0.51			c0.15			0.05	
v/s Ratio Perm	c0.52			0.29			0.04			0.05		
v/c Ratio	1.00	0.86		0.56	0.96		0.16	0.55		0.18	0.18	
Uniform Delay, d1	15.2	13.1		10.1	14.5		18.1	20.2		18.1	18.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	84.7	10.0		16.3	20.8		0.6	1.2		0.9	0.2	
Delay (s)	99.8	23.2		26.4	35.3		18.7	21.5		19.1	18.4	
Level of Service	F	C		C	D		B	C		B	B	
Approach Delay (s)		32.2			34.7			21.3			18.5	
Approach LOS		C			C			C			B	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	64.2	Sum of lost time (s)	13.2
Intersection Capacity Utilization	108.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1415	1821		1825	1814		1823	3260		1825	3491	
Flt Permitted	0.11	1.00		0.11	1.00		0.70	1.00		0.65	1.00	
Satd. Flow (perm)	168	1821		217	1814		1350	3260		1256	3491	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
RTOR Reduction (vph)	0	2	0	0	2	0	0	38	0	0	17	0
Lane Group Flow (vph)	31	1059	0	102	1100	0	36	117	0	27	61	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			5			1						
Heavy Vehicles (%)	29%	5%	0%	0%	5%	4%	0%	0%	7%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	35.4	35.4		35.4	35.4		9.5	9.5		9.5	9.5	
Effective Green, g (s)	35.4	35.4		35.4	35.4		9.5	9.5		9.5	9.5	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.16	0.16		0.16	0.16	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	102	1109		132	1105		220	533		205	570	
v/s Ratio Prot		0.58			c0.61			c0.04			0.02	
v/s Ratio Perm	0.18			0.47			0.03			0.02		
v/c Ratio	0.30	0.96		0.77	1.00		0.16	0.22		0.13	0.11	
Uniform Delay, d1	5.4	10.6		8.4	11.3		20.9	21.1		20.8	20.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.5	18.2		34.6	26.0		0.7	0.4		0.6	0.2	
Delay (s)	13.0	28.8		43.0	37.3		21.6	21.5		21.4	20.9	
Level of Service	B	C		D	D		C	C		C	C	
Approach Delay (s)		28.4			37.8			21.5			21.0	
Approach LOS		C			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	13.2
Intersection Capacity Utilization	107.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1824	3428		1755	3474		1738	1902	1550	1825	1788	
Flt Permitted	0.24	1.00		0.12	1.00		0.67	1.00	1.00	0.63	1.00	
Satd. Flow (perm)	455	3428		225	3474		1233	1902	1550	1207	1788	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
RTOR Reduction (vph)	0	20	0	0	6	0	0	0	141	0	21	0
Lane Group Flow (vph)	41	1061	0	294	1184	0	136	192	40	25	109	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	27.9	27.9		43.9	43.9		16.3	16.3	16.3	16.3	16.3	
Effective Green, g (s)	27.9	27.9		43.9	43.9		16.3	16.3	16.3	16.3	16.3	
Actuated g/C Ratio	0.38	0.38		0.60	0.60		0.22	0.22	0.22	0.22	0.22	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	172	1303		363	2077		273	422	344	268	397	
v/s Ratio Prot		0.31		c0.12	0.34			0.10			0.06	
v/s Ratio Perm	0.09			c0.36			c0.11		0.03	0.02		
v/c Ratio	0.24	0.81		0.81	0.57		0.50	0.45	0.12	0.09	0.27	
Uniform Delay, d1	15.5	20.4		16.0	9.0		25.0	24.7	22.8	22.7	23.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.2	5.7		14.1	1.1		3.0	1.6	0.3	0.3	0.8	
Delay (s)	18.8	26.1		30.2	10.1		27.9	26.3	23.1	23.0	24.4	
Level of Service	B	C		C	B		C	C	C	C	C	
Approach Delay (s)		25.8			14.1			25.6			24.2	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	73.4	Sum of lost time (s)	18.2
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	728	7	13	985	13	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881		1789	1883	1789	1601
Flt Permitted	1.00		0.20	1.00	0.95	1.00
Satd. Flow (perm)	1881		377	1883	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	728	7	13	985	13	25
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	734	0	13	985	13	8
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	20.0		20.0	20.0	16.0	16.0
Effective Green, g (s)	20.0		20.0	20.0	16.0	16.0
Actuated g/C Ratio	0.40		0.40	0.40	0.32	0.32
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	752		150	753	572	512
v/s Ratio Prot	0.39			c0.52	c0.01	
v/s Ratio Perm			0.03			0.00
v/c Ratio	0.98		0.09	1.31	0.02	0.02
Uniform Delay, d1	14.8		9.3	15.0	11.6	11.6
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	27.1		0.5	148.1	0.1	0.1
Delay (s)	41.9		9.8	163.1	11.7	11.7
Level of Service	D		A	F	B	B
Approach Delay (s)	41.9			161.1	11.7	
Approach LOS	D			F	B	

Intersection Summary			
HCM 2000 Control Delay	108.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix E

Intersection Operation Reports – 2021 Future Conditions with Improvements at Intersections

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
v/c Ratio	0.02	0.96	0.10	0.49	0.38	0.00	0.17	0.08	0.17	0.07	0.43	0.08
Control Delay	4.3	39.9	2.3	25.5	7.9	0.0	45.4	43.1	1.8	43.1	50.7	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.3	39.9	2.3	25.5	7.9	0.0	45.4	43.1	1.8	43.1	50.7	0.6
Queue Length 50th (m)	0.5	193.6	0.3	4.1	27.4	0.0	5.2	3.2	0.0	2.3	19.0	0.0
Queue Length 95th (m)	1.9	#312.5	6.3	21.2	76.1	0.0	13.2	9.3	1.3	7.4	34.2	0.0
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	501	1174	1013	180	1322	1218	275	372	400	296	390	352
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.96	0.10	0.49	0.38	0.00	0.11	0.05	0.12	0.04	0.26	0.05

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1323	1883	1567	1722	1812	1633	1825	1795	1564	1825	1883	1328
Flt Permitted	0.47	1.00	1.00	0.05	1.00	1.00	0.69	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	659	1883	1567	88	1812	1633	1328	1795	1564	1433	1883	1328
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
RTOR Reduction (vph)	0	0	34	0	0	2	0	0	43	0	0	17
Lane Group Flow (vph)	11	1128	66	89	502	3	29	18	6	13	102	2
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	77.7	76.1	76.1	90.5	82.5	82.5	14.3	14.3	14.3	14.3	14.3	14.3
Effective Green, g (s)	77.7	76.1	76.1	90.5	82.5	82.5	14.3	14.3	14.3	14.3	14.3	14.3
Actuated g/C Ratio	0.66	0.64	0.64	0.76	0.70	0.70	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	440	1208	1005	177	1260	1135	160	216	188	172	227	160
v/s Ratio Prot	0.00	c0.60		c0.03	c0.28			0.01			c0.05	
v/s Ratio Perm	0.02		0.04	0.35		0.00	0.02		0.00	0.01		0.00
v/c Ratio	0.03	0.93	0.07	0.50	0.40	0.00	0.18	0.08	0.03	0.08	0.45	0.01
Uniform Delay, d1	7.1	19.0	7.9	28.6	7.6	5.5	46.9	46.3	46.0	46.3	48.5	45.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	14.2	0.1	4.6	0.9	0.0	1.1	0.3	0.1	0.4	2.9	0.1
Delay (s)	7.2	33.2	8.1	33.2	8.5	5.5	48.0	46.7	46.2	46.7	51.4	46.0
Level of Service	A	C	A	C	A	A	D	D	D	D	D	D
Approach Delay (s)		31.0			12.2			46.8			50.2	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	118.6	Sum of lost time (s)	20.2
Intersection Capacity Utilization	97.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
v/c Ratio	0.00	1.07	0.13	1.16	0.49	0.01	0.03	0.02	0.11	0.02	0.18	0.02
Control Delay	6.0	78.0	4.2	145.7	12.1	0.0	39.8	39.4	0.6	39.5	41.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	78.0	4.2	145.7	12.1	0.0	39.8	39.4	0.6	39.5	41.9	0.1
Queue Length 50th (m)	0.1	~263.0	2.1	~52.6	52.6	0.0	1.6	1.4	0.0	1.1	12.1	0.0
Queue Length 95th (m)	0.6	#334.8	9.9	#101.0	104.5	0.0	5.8	5.4	0.0	4.5	23.6	0.0
Internal Link Dist (m)		893.8			1350.2			1343.2			1318.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	515	1016	881	219	1197	910	267	374	357	280	360	350
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	1.07	0.13	1.16	0.49	0.01	0.03	0.02	0.11	0.02	0.18	0.02

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	1865	1537	1772	1779	1306	1825	1921	1438	1820	1847	1401
Flt Permitted	0.41	1.00	1.00	0.05	1.00	1.00	0.71	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	784	1865	1537	96	1779	1306	1372	1921	1438	1441	1847	1401
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
RTOR Reduction (vph)	0	0	42	0	0	2	0	0	33	0	0	7
Lane Group Flow (vph)	1	1091	76	255	590	3	9	8	7	6	66	1
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2									1
Heavy Vehicles (%)	0%	3%	4%	3%	8%	25%	0%	0%	11%	0%	4%	14%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	72.2	71.0	71.0	89.0	80.8	80.8	23.4	23.4	23.4	23.4	23.4	23.4
Effective Green, g (s)	72.2	71.0	71.0	89.0	80.8	80.8	23.4	23.4	23.4	23.4	23.4	23.4
Actuated g/C Ratio	0.57	0.57	0.57	0.71	0.64	0.64	0.19	0.19	0.19	0.19	0.19	0.19
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	460	1054	868	214	1144	840	255	357	267	268	344	261
v/s Ratio Prot	0.00	0.58		c0.10	0.33			0.00			c0.04	
v/s Ratio Perm	0.00		0.05	c0.74		0.00	0.01		0.01	0.00		0.00
v/c Ratio	0.00	1.04	0.09	1.19	0.52	0.00	0.04	0.02	0.03	0.02	0.19	0.01
Uniform Delay, d1	11.5	27.3	12.5	45.0	12.0	8.0	41.9	41.8	41.8	41.8	43.1	41.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	37.2	0.2	122.9	1.7	0.0	0.1	0.1	0.1	0.2	1.2	0.0
Delay (s)	11.5	64.5	12.7	168.0	13.6	8.0	42.0	41.8	41.9	41.9	44.4	41.7
Level of Service	B	E	B	F	B	A	D	D	D	D	D	D
Approach Delay (s)		59.4			59.9			41.9			43.9	
Approach LOS		E			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	58.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	125.6	Sum of lost time (s)	20.2
Intersection Capacity Utilization	98.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	72	1007	67	139	648	37	25	154	76	584
v/c Ratio	0.17	0.79	0.07	0.84	0.51	0.04	0.42	0.24	0.32	0.82
Control Delay	8.2	18.9	3.9	57.6	11.1	2.5	63.8	27.0	44.3	53.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.2	18.9	3.9	57.6	11.1	2.5	63.8	27.0	44.3	53.2
Queue Length 50th (m)	5.2	138.9	2.2	20.7	63.3	0.3	4.7	9.6	14.0	60.2
Queue Length 95th (m)	10.8	196.4	6.4	#62.7	87.4	3.3	#13.9	18.2	27.4	79.3
Internal Link Dist (m)		1350.2			1354.5			1166.3		302.7
Turn Bay Length (m)	35.0		30.0	30.0		30.0	80.0		78.0	
Base Capacity (vph)	425	1277	916	165	1264	946	63	675	249	743
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.79	0.07	0.84	0.51	0.04	0.40	0.23	0.31	0.79

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1716	1865	1323	1552	1847	1366	1384	2973		1700	3355	
Flt Permitted	0.34	1.00	1.00	0.15	1.00	1.00	0.20	1.00		0.65	1.00	
Satd. Flow (perm)	622	1865	1323	243	1847	1366	296	2973		1171	3355	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
RTOR Reduction (vph)	0	0	10	0	0	10	0	41	0	0	26	0
Lane Group Flow (vph)	72	1007	57	139	648	27	25	113	0	76	558	0
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	81.4	81.4	81.4	81.4	81.4	81.4	24.3	24.3		24.3	24.3	
Effective Green, g (s)	81.4	81.4	81.4	81.4	81.4	81.4	24.3	24.3		24.3	24.3	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68	0.20	0.20		0.20	0.20	
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	425	1276	905	166	1264	935	60	607		239	685	
v/s Ratio Prot		0.54			0.35			0.04			c0.17	
v/s Ratio Perm	0.12		0.04	c0.57		0.02	0.08			0.06		
v/c Ratio	0.17	0.79	0.06	0.84	0.51	0.03	0.42	0.19		0.32	0.81	
Uniform Delay, d1	6.7	12.9	6.2	13.9	9.1	6.0	41.1	39.1		40.2	45.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	5.0	0.1	37.1	1.5	0.1	9.5	0.3		1.6	8.3	
Delay (s)	7.6	17.9	6.3	50.9	10.6	6.1	50.6	39.4		41.9	53.4	
Level of Service	A	B	A	D	B	A	D	D		D	D	
Approach Delay (s)		16.6			17.2			41.0			52.1	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	118.9	Sum of lost time (s)	13.2
Intersection Capacity Utilization	111.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	1176	70	47	772	33	37	131	30	76
v/c Ratio	0.04	0.82	0.06	0.27	0.56	0.04	0.29	0.29	0.21	0.20
Control Delay	3.7	14.9	2.2	8.7	7.2	1.3	48.8	17.0	46.4	30.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.7	14.9	2.2	8.7	7.2	1.3	48.8	17.0	46.4	30.9
Queue Length 50th (m)	0.7	113.1	1.4	2.1	47.7	0.0	6.5	3.6	5.3	4.6
Queue Length 95th (m)	2.5	215.8	4.8	7.9	84.6	2.1	15.8	11.5	13.5	11.0
Internal Link Dist (m)		1354.5			1159.0			1208.0		192.9
Turn Bay Length (m)	30.0		30.0	35.0		30.0	80.0		80.0	
Base Capacity (vph)	467	1431	1175	175	1390	938	253	816	298	775
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.82	0.06	0.27	0.56	0.04	0.15	0.16	0.10	0.10

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	5.6	5.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.90		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1865	1521	1690	1812	1213	1415	3098		1825	3256	
Flt Permitted	0.32	1.00	1.00	0.13	1.00	1.00	0.70	1.00		0.67	1.00	
Satd. Flow (perm)	610	1865	1521	230	1812	1213	1050	3098		1285	3256	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
RTOR Reduction (vph)	0	0	8	0	0	8	0	80	0	0	22	0
Lane Group Flow (vph)	18	1176	62	47	772	25	37	51	0	30	54	0
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	3%	6%	8%	6%	33%	29%	0%	8%	0%	0%	20%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	84.2	84.2	84.2	84.2	84.2	84.2	12.3	12.3		12.3	12.3	
Effective Green, g (s)	84.2	84.2	84.2	84.2	84.2	84.2	13.3	13.3		12.3	12.3	
Actuated g/C Ratio	0.77	0.77	0.77	0.77	0.77	0.77	0.12	0.12		0.11	0.11	
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	468	1431	1167	176	1390	931	127	375		144	365	
v/s Ratio Prot		c0.63			0.43			0.02			0.02	
v/s Ratio Perm	0.03		0.04	0.20		0.02	c0.04			0.02		
v/c Ratio	0.04	0.82	0.05	0.27	0.56	0.03	0.29	0.14		0.21	0.15	
Uniform Delay, d1	3.1	8.0	3.1	3.7	5.2	3.0	43.9	43.1		44.3	44.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	5.4	0.1	3.7	1.6	0.1	2.7	0.3		1.5	0.4	
Delay (s)	3.2	13.5	3.2	7.4	6.8	3.1	46.6	43.4		45.8	44.4	
Level of Service	A	B	A	A	A	A	D	D		D	D	
Approach Delay (s)		12.7			6.7			44.1			44.8	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	109.7	Sum of lost time (s)	13.2
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	5	1431	208	764	51	68	167	15	97
v/c Ratio	0.01	0.72	0.63	0.31	0.31	0.29	0.50	0.09	0.43
Control Delay	12.6	20.9	22.7	4.7	49.1	47.0	12.2	43.6	47.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	20.9	22.7	4.7	49.1	47.0	12.2	43.6	47.5
Queue Length 50th (m)	0.4	102.1	14.6	20.1	9.4	12.4	0.0	2.7	16.7
Queue Length 95th (m)	2.2	146.8	38.7	31.6	20.1	24.6	17.1	8.4	31.5
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			30.0	
Base Capacity (vph)	396	1974	380	2498	282	407	453	290	380
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.72	0.55	0.31	0.18	0.17	0.37	0.05	0.26

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3455		1706	3300		1825	1921	1517	1823	1768	
Flt Permitted	0.36	1.00		0.10	1.00		0.69	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	695	3455		171	3300		1334	1921	1517	1367	1768	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	146	0	6	0
Lane Group Flow (vph)	5	1425	0	208	763	0	51	68	21	15	91	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	62.9	62.9		83.5	83.5		13.7	13.7	13.7	13.7	13.7	
Effective Green, g (s)	62.9	62.9		83.5	83.5		13.7	13.7	13.7	13.7	13.7	
Actuated g/C Ratio	0.57	0.57		0.76	0.76		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	395	1968		332	2495		165	238	188	169	219	
v/s Ratio Prot		c0.41		c0.08	0.23			0.04			c0.05	
v/s Ratio Perm	0.01			0.39			0.04		0.01	0.01		
v/c Ratio	0.01	0.72		0.63	0.31		0.31	0.29	0.11	0.09	0.41	
Uniform Delay, d1	10.3	17.4		19.6	4.3		44.0	43.9	42.9	42.8	44.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	2.4		5.2	0.3		2.2	1.4	0.5	0.5	2.7	
Delay (s)	10.4	19.7		24.8	4.6		46.3	45.3	43.5	43.3	47.3	
Level of Service	B	B		C	A		D	D	D	D	D	
Approach Delay (s)		19.7			8.9			44.4			46.8	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.4	Sum of lost time (s)	19.2
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1182	7	14	594	6	11
v/c Ratio	0.94	0.01	0.21	0.47	0.02	0.03
Control Delay	32.0	4.7	15.4	10.3	39.7	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.0	4.7	15.4	10.3	39.7	19.7
Queue Length 50th (m)	191.6	0.3	1.0	52.4	1.1	0.0
Queue Length 95th (m)	#312.2	1.5	4.6	72.3	4.5	4.7
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	1407	1197	75	1407	370	340
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.01	0.19	0.42	0.02	0.03

Intersection Summary

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

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1182	7	14	594	6	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1883	1601	1789	1883	1789	1601
Flt Permitted	1.00	1.00	0.05	1.00	0.95	1.00
Satd. Flow (perm)	1883	1601	101	1883	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1182	7	14	594	6	11
RTOR Reduction (vph)	0	1	0	0	0	9
Lane Group Flow (vph)	1182	6	14	594	6	2
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	74.8	74.8	74.8	74.8	23.2	23.2
Effective Green, g (s)	74.8	74.8	74.8	74.8	23.2	23.2
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.21	0.21
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	1257	1069	67	1257	370	331
v/s Ratio Prot	c0.63			0.32	c0.00	
v/s Ratio Perm		0.00	0.14			0.00
v/c Ratio	0.94	0.01	0.21	0.47	0.02	0.01
Uniform Delay, d1	16.6	6.2	7.2	9.0	35.3	35.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	14.0	0.0	3.2	0.6	0.1	0.0
Delay (s)	30.6	6.2	10.4	9.6	35.4	35.3
Level of Service	C	A	B	A	D	D
Approach Delay (s)	30.4			9.6	35.3	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	112.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	23	671	46	146	856	8	68	72	79	5	34	22
v/c Ratio	0.06	0.59	0.05	0.30	0.64	0.01	0.40	0.32	0.31	0.04	0.15	0.08
Control Delay	4.3	14.5	0.1	5.7	13.3	0.0	51.8	48.0	9.1	42.6	44.4	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.3	14.5	0.1	5.7	13.3	0.0	51.8	48.0	9.1	42.6	44.4	0.6
Queue Length 50th (m)	0.9	68.7	0.0	6.3	61.0	0.0	12.6	13.2	0.0	0.9	6.1	0.0
Queue Length 95th (m)	3.0	110.9	0.2	13.0	162.2	0.0	25.3	25.7	8.9	4.2	14.5	0.0
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	393	1141	1020	482	1328	1000	291	385	375	229	388	403
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.59	0.05	0.30	0.64	0.01	0.23	0.19	0.21	0.02	0.09	0.05

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	671	46	146	856	8	68	72	79	5	34	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.96	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	1779	1537	1789	1865	1366	1789	1830	1410	1460	1847	1555
Flt Permitted	0.24	1.00	1.00	0.30	1.00	1.00	0.73	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	463	1779	1537	570	1865	1366	1384	1830	1410	1091	1847	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	23	671	46	146	856	8	68	72	79	5	34	22
RTOR Reduction (vph)	0	0	16	0	0	3	0	0	70	0	0	19
Lane Group Flow (vph)	23	671	30	146	856	5	68	72	9	5	34	3
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	78.0	75.6	75.6	85.2	79.2	79.2	13.7	13.7	13.7	13.7	13.7	13.7
Effective Green, g (s)	78.0	75.6	75.6	85.2	79.2	79.2	13.7	13.7	13.7	13.7	13.7	13.7
Actuated g/C Ratio	0.68	0.65	0.65	0.74	0.69	0.69	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	340	1164	1006	483	1278	936	164	217	167	129	219	184
v/s Ratio Prot	0.00	0.38		c0.02	c0.46			0.04			0.02	
v/s Ratio Perm	0.04		0.02	0.21		0.00	c0.05		0.01	0.00		0.00
v/c Ratio	0.07	0.58	0.03	0.30	0.67	0.01	0.41	0.33	0.06	0.04	0.16	0.01
Uniform Delay, d1	8.5	11.1	7.0	6.6	10.5	5.7	47.2	46.7	45.2	45.1	45.7	44.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	2.1	0.1	0.7	2.8	0.0	3.5	1.9	0.3	0.3	0.7	0.1
Delay (s)	8.7	13.1	7.1	7.4	13.4	5.7	50.7	48.6	45.5	45.3	46.4	45.0
Level of Service	A	B	A	A	B	A	D	D	D	D	D	D
Approach Delay (s)		12.6			12.4			48.1			45.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	115.5	Sum of lost time (s)	20.2
Intersection Capacity Utilization	81.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	10	781	14	54	947	11	48	77	141	8	20	5
v/c Ratio	0.03	0.59	0.01	0.12	0.67	0.01	0.29	0.35	0.46	0.06	0.09	0.02
Control Delay	3.9	8.0	0.4	4.4	9.6	0.1	48.7	49.3	12.4	43.5	43.8	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.9	8.0	0.4	4.4	9.6	0.1	48.7	49.3	12.4	43.5	43.8	0.2
Queue Length 50th (m)	0.4	52.8	0.0	2.2	72.6	0.0	8.8	14.1	0.0	1.4	3.6	0.0
Queue Length 95th (m)	1.8	92.7	0.5	6.2	127.9	0.3	19.1	27.1	15.8	5.6	10.2	0.0
Internal Link Dist (m)		893.8			1350.2			1343.2			1318.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	342	1335	1230	456	1412	1230	298	390	438	249	379	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.59	0.01	0.12	0.67	0.01	0.16	0.20	0.32	0.03	0.05	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	781	14	54	947	11	48	77	141	8	20	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	1746	1599	1825	1847	1599	1825	1865	1559	1601	1812	1633
Flt Permitted	0.23	1.00	1.00	0.31	1.00	1.00	0.74	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	448	1746	1599	598	1847	1599	1430	1865	1559	1191	1812	1633
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	781	14	54	947	11	48	77	141	8	20	5
RTOR Reduction (vph)	0	0	3	0	0	3	0	0	124	0	0	4
Lane Group Flow (vph)	10	781	11	54	947	8	48	77	17	8	20	1
Confl. Bikes (#/hr)			2			2			2			
Heavy Vehicles (%)	0%	10%	0%	0%	4%	0%	0%	3%	2%	14%	6%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	85.6	85.6	85.6	85.6	85.6	85.6	13.1	13.1	13.1	13.1	13.1	13.1
Effective Green, g (s)	85.6	85.6	85.6	85.6	85.6	85.6	13.1	13.1	13.1	13.1	13.1	13.1
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76	0.76	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	342	1335	1223	457	1412	1223	167	218	182	139	212	191
v/s Ratio Prot		0.45			c0.51			c0.04			0.01	
v/s Ratio Perm	0.02		0.01	0.09		0.01	0.03		0.01	0.01		0.00
v/c Ratio	0.03	0.59	0.01	0.12	0.67	0.01	0.29	0.35	0.09	0.06	0.09	0.00
Uniform Delay, d1	3.2	5.6	3.1	3.4	6.3	3.1	45.1	45.5	44.1	43.9	44.1	43.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	1.9	0.0	0.5	2.6	0.0	2.0	2.1	0.5	0.4	0.4	0.0
Delay (s)	3.3	7.5	3.1	3.9	8.9	3.1	47.1	47.6	44.5	44.3	44.5	43.6
Level of Service	A	A	A	A	A	A	D	D	D	D	D	D
Approach Delay (s)		7.3			8.6			45.9			44.3	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	111.9	Sum of lost time (s)	13.2
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	113	822	23	72	889	56	42	548	34	205
v/c Ratio	0.44	0.65	0.02	0.25	0.70	0.06	0.21	0.76	0.36	0.28
Control Delay	16.0	14.3	1.6	10.7	15.7	3.8	40.9	47.2	51.1	29.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	14.3	1.6	10.7	15.7	3.8	40.9	47.2	51.1	29.6
Queue Length 50th (m)	10.4	94.7	0.0	5.6	108.5	1.5	7.4	53.0	6.2	14.2
Queue Length 95th (m)	25.1	136.6	1.8	13.0	157.1	5.5	16.7	70.9	15.9	23.9
Internal Link Dist (m)		1350.2			1354.5			1166.3		302.7
Turn Bay Length (m)	35.0		30.0	30.0		30.0	80.0		78.0	
Base Capacity (vph)	256	1265	978	287	1277	1004	224	805	107	805
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.65	0.02	0.25	0.70	0.06	0.19	0.68	0.32	0.25

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	822	23	72	889	56	42	392	156	34	143	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	1865	1426	1653	1883	1465	1463	3288		1785	3268	
Flt Permitted	0.21	1.00	1.00	0.24	1.00	1.00	0.62	1.00		0.24	1.00	
Satd. Flow (perm)	379	1865	1426	425	1883	1465	960	3288		458	3268	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	113	822	23	72	889	56	42	392	156	34	143	62
RTOR Reduction (vph)	0	0	7	0	0	11	0	36	0	0	41	0
Lane Group Flow (vph)	113	822	16	72	889	45	42	512	0	34	164	0
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	79.5	79.5	79.5	79.5	79.5	79.5	24.4	24.4		24.4	24.4	
Effective Green, g (s)	79.5	79.5	79.5	79.5	79.5	79.5	24.4	24.4		24.4	24.4	
Actuated g/C Ratio	0.68	0.68	0.68	0.68	0.68	0.68	0.21	0.21		0.21	0.21	
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	257	1266	968	288	1278	994	200	685		95	680	
v/s Ratio Prot		0.44			c0.47			c0.16			0.05	
v/s Ratio Perm	0.30		0.01	0.17		0.03	0.04			0.07		
v/c Ratio	0.44	0.65	0.02	0.25	0.70	0.05	0.21	0.75		0.36	0.24	
Uniform Delay, d1	8.6	10.8	6.1	7.3	11.4	6.2	38.4	43.5		39.6	38.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.4	2.6	0.0	2.1	3.1	0.1	1.1	5.3		4.8	0.4	
Delay (s)	14.0	13.4	6.1	9.3	14.6	6.3	39.5	48.8		44.4	39.0	
Level of Service	B	B	A	A	B	A	D	D		D	D	
Approach Delay (s)		13.3			13.8			48.1			39.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	117.1	Sum of lost time (s)	13.2
Intersection Capacity Utilization	104.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	31	1018	43	102	1041	61	36	155	27	78
v/c Ratio	0.14	0.73	0.03	0.35	0.75	0.05	0.24	0.36	0.19	0.19
Control Delay	5.3	10.8	1.6	8.0	11.3	1.9	45.2	23.5	44.2	31.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.3	10.8	1.6	8.0	11.3	1.9	45.2	23.5	44.2	31.9
Queue Length 50th (m)	1.2	81.5	0.4	4.9	85.5	1.0	6.0	6.7	4.5	5.0
Queue Length 95th (m)	4.2	136.9	2.6	13.3	144.8	3.8	14.8	15.3	12.1	11.3
Internal Link Dist (m)		1354.5			1159.0			1208.0		192.9
Turn Bay Length (m)	30.0		30.0	35.0		30.0	80.0		80.0	
Base Capacity (vph)	215	1394	1234	294	1394	1189	395	1011	368	1037
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.73	0.03	0.35	0.75	0.05	0.09	0.15	0.07	0.08

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1415	1830	1611	1825	1830	1551	1821	3260		1825	3490	
Flt Permitted	0.19	1.00	1.00	0.20	1.00	1.00	0.70	1.00		0.65	1.00	
Satd. Flow (perm)	283	1830	1611	385	1830	1551	1349	3260		1256	3490	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
RTOR Reduction (vph)	0	0	8	0	0	8	0	69	0	0	18	0
Lane Group Flow (vph)	31	1018	35	102	1041	53	36	86	0	27	60	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			5			1						
Heavy Vehicles (%)	29%	5%	0%	0%	5%	4%	0%	0%	7%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4			8		
Actuated Green, G (s)	79.2	79.2	79.2	79.2	79.2	79.2	11.5	11.5		11.5	11.5	
Effective Green, g (s)	79.2	79.2	79.2	79.2	79.2	79.2	11.5	11.5		11.5	11.5	
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76	0.76	0.11	0.11		0.11	0.11	
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	215	1394	1228	293	1394	1182	149	360		139	386	
v/s Ratio Prot		0.56			c0.57			0.03			0.02	
v/s Ratio Perm	0.11		0.02	0.26		0.03	c0.03			0.02		
v/c Ratio	0.14	0.73	0.03	0.35	0.75	0.04	0.24	0.24		0.19	0.16	
Uniform Delay, d1	3.3	6.6	3.0	4.0	6.8	3.0	42.2	42.2		42.0	41.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	3.4	0.0	3.2	3.7	0.1	1.8	0.7		1.4	0.4	
Delay (s)	4.7	10.0	3.0	7.2	10.5	3.1	44.0	42.9		43.4	42.2	
Level of Service	A	B	A	A	B	A	D	D		D	D	
Approach Delay (s)		9.6			9.9			43.1			42.5	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	103.9	Sum of lost time (s)	13.2
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	1081	294	1190	136	192	181	25	130
v/c Ratio	0.18	0.64	0.69	0.49	0.62	0.55	0.42	0.14	0.38
Control Delay	23.5	25.1	20.9	9.1	54.3	47.2	8.5	38.8	37.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.5	25.1	20.9	9.1	54.3	47.2	8.5	38.8	37.2
Queue Length 50th (m)	4.5	81.3	20.2	50.2	25.2	35.1	0.0	4.2	19.8
Queue Length 95th (m)	14.1	127.5	53.5	81.9	43.6	55.2	15.9	11.1	35.7
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			30.0	
Base Capacity (vph)	222	1684	503	2431	319	504	544	256	486
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.64	0.58	0.49	0.43	0.38	0.33	0.10	0.27

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1824	3428		1755	3474		1738	1902	1549	1825	1788	
Flt Permitted	0.24	1.00		0.15	1.00		0.66	1.00	1.00	0.50	1.00	
Satd. Flow (perm)	455	3428		280	3474		1204	1902	1549	966	1788	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
RTOR Reduction (vph)	0	12	0	0	4	0	0	0	148	0	14	0
Lane Group Flow (vph)	41	1069	0	294	1186	0	136	192	33	25	116	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	54.2	54.2		77.6	77.6		20.2	20.2	20.2	20.2	20.2	
Effective Green, g (s)	54.2	54.2		77.6	77.6		20.2	20.2	20.2	20.2	20.2	
Actuated g/C Ratio	0.49	0.49		0.70	0.70		0.18	0.18	0.18	0.18	0.18	
Clearance Time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	222	1673		426	2428		219	346	281	175	325	
v/s Ratio Prot		0.31		c0.11	0.34			0.10			0.06	
v/s Ratio Perm	0.09			c0.37			c0.11		0.02	0.03		
v/c Ratio	0.18	0.64		0.69	0.49		0.62	0.55	0.12	0.14	0.36	
Uniform Delay, d1	16.0	21.1		14.5	7.6		41.9	41.3	37.9	38.1	39.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	1.9		6.0	0.7		7.5	3.3	0.4	0.8	1.4	
Delay (s)	17.8	23.0		20.5	8.3		49.4	44.6	38.3	38.9	41.1	
Level of Service	B	C		C	A		D	D	D	D	D	
Approach Delay (s)		22.8			10.7			43.6			40.8	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	111.0	Sum of lost time (s)	19.2
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	728	7	13	985	13	25
v/c Ratio	0.63	0.01	0.04	0.85	0.03	0.07
Control Delay	12.2	3.1	5.6	20.6	33.4	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.2	3.1	5.6	20.6	33.4	14.4
Queue Length 50th (m)	57.8	0.1	0.7	100.7	1.5	0.0
Queue Length 95th (m)	81.8	1.1	2.3	146.1	7.1	6.8
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	1823	1550	507	1823	379	359
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.00	0.03	0.54	0.03	0.07

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	728	7	13	985	13	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1883	1601	1789	1883	1789	1601
Flt Permitted	1.00	1.00	0.28	1.00	0.95	1.00
Satd. Flow (perm)	1883	1601	524	1883	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	728	7	13	985	13	25
RTOR Reduction (vph)	0	2	0	0	0	20
Lane Group Flow (vph)	728	5	13	985	13	5
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	50.6	50.6	50.6	50.6	17.5	17.5
Effective Green, g (s)	50.6	50.6	50.6	50.6	17.5	17.5
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.21	0.21
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	1160	986	322	1160	381	341
v/s Ratio Prot	0.39			c0.52	c0.01	
v/s Ratio Perm		0.00	0.02			0.00
v/c Ratio	0.63	0.00	0.04	0.85	0.03	0.02
Uniform Delay, d1	9.9	6.1	6.2	12.7	25.6	25.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.0	0.1	6.6	0.2	0.1
Delay (s)	11.4	6.1	6.3	19.3	25.8	25.6
Level of Service	B	A	A	B	C	C
Approach Delay (s)	11.3			19.1	25.6	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Appendix F

Intersection Operation Reports – 2021 Future Conditions with 4-Lane Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1323	3529		1722	3440		1825	1795	1579	1825	1883	1346
Flt Permitted	0.47	1.00		0.21	1.00		0.69	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	648	3529		372	3440		1328	1795	1579	1433	1883	1346
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	1128	100	89	502	5	29	18	49	13	102	19
RTOR Reduction (vph)	0	4	0	0	0	0	0	0	43	0	0	17
Lane Group Flow (vph)	11	1224	0	89	507	0	29	18	6	13	102	2
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	84.8	84.8		84.8	84.8		13.8	13.8	13.8	13.8	13.8	13.8
Effective Green, g (s)	84.8	84.8		84.8	84.8		13.8	13.8	13.8	13.8	13.8	13.8
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	491	2676		282	2609		163	221	194	176	232	166
v/s Ratio Prot		c0.35			0.15			0.01			c0.05	
v/s Ratio Perm	0.02			0.24			0.02		0.00	0.01		0.00
v/c Ratio	0.02	0.46		0.32	0.19		0.18	0.08	0.03	0.07	0.44	0.01
Uniform Delay, d1	3.3	5.0		4.3	3.8		43.9	43.4	43.1	43.3	45.4	43.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.6		2.9	0.2		1.1	0.3	0.1	0.4	2.8	0.1
Delay (s)	3.4	5.6		7.2	4.0		45.0	43.7	43.3	43.7	48.2	43.1
Level of Service	A	A		A	A		D	D	D	D	D	D
Approach Delay (s)		5.5			4.5			43.9			47.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	111.8	Sum of lost time (s)	13.2
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3481		1772	3371		1825	1921	1451	1822	1847	1414
Flt Permitted	0.43	1.00		0.11	1.00		0.71	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	821	3481		214	3371		1372	1921	1451	1443	1847	1414
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	1091	118	255	590	5	9	8	40	6	66	8
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	32	0	0	6
Lane Group Flow (vph)	1	1203	0	255	595	0	9	8	8	6	66	2
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2									1
Heavy Vehicles (%)	0%	3%	4%	3%	8%	25%	0%	0%	11%	0%	4%	14%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	60.2	59.1		83.1	75.0		23.4	23.4	23.4	23.4	23.4	23.4
Effective Green, g (s)	60.2	59.1		83.1	75.0		23.4	23.4	23.4	23.4	23.4	23.4
Actuated g/C Ratio	0.50	0.49		0.69	0.63		0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	422	1718		369	2112		268	375	283	282	361	276
v/s Ratio Prot	0.00	0.35		c0.10	0.18			0.00			c0.04	
v/s Ratio Perm	0.00			c0.38			0.01		0.01	0.00		0.00
v/c Ratio	0.00	0.70		0.69	0.28		0.03	0.02	0.03	0.02	0.18	0.01
Uniform Delay, d1	14.8	23.4		21.2	10.1		39.0	38.9	38.9	38.9	40.2	38.8
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	2.4		6.9	0.3		0.1	0.0	0.1	0.1	1.1	0.0
Delay (s)	14.8	25.8		28.1	10.5		39.1	38.9	39.0	39.0	41.3	38.8
Level of Service	B	C		C	B		D	D	D	D	D	D
Approach Delay (s)		25.8			15.8			39.0			40.9	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	119.7	Sum of lost time (s)	20.2
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.95		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1716	3469		1552	3454		1384	2973		1700	3362	
Flt Permitted	0.39	1.00		0.17	1.00		0.24	1.00		0.65	1.00	
Satd. Flow (perm)	707	3469		272	3454		352	2973		1171	3362	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	1007	67	139	648	37	25	103	51	76	442	142
RTOR Reduction (vph)	0	3	0	0	3	0	0	39	0	0	27	0
Lane Group Flow (vph)	72	1071	0	139	682	0	25	115	0	76	557	0
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	59.1	59.1		75.5	75.5		26.5	26.5		26.5	26.5	
Effective Green, g (s)	59.1	59.1		75.5	75.5		26.5	26.5		26.5	26.5	
Actuated g/C Ratio	0.51	0.51		0.66	0.66		0.23	0.23		0.23	0.23	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	362	1779		304	2263		80	683		269	773	
v/s Ratio Prot		c0.31		c0.05	0.20			0.04			c0.17	
v/s Ratio Perm	0.10			0.25			0.07			0.06		
v/c Ratio	0.20	0.60		0.46	0.30		0.31	0.17		0.28	0.72	
Uniform Delay, d1	15.2	19.8		11.2	8.5		36.8	35.5		36.5	40.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	1.5		2.3	0.3		4.6	0.2		1.2	4.1	
Delay (s)	16.4	21.3		13.5	8.9		41.4	35.8		37.7	45.0	
Level of Service	B	C		B	A		D	D		D	D	
Approach Delay (s)		21.0			9.6			36.6			44.2	
Approach LOS		C			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	115.2	Sum of lost time (s)	18.2
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.90		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	3506		1690	3385		1415	3098		1825	3256	
Flt Permitted	0.34	1.00		0.20	1.00		0.70	1.00		0.67	1.00	
Satd. Flow (perm)	656	3506		358	3385		1050	3098		1285	3256	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	18	1176	70	47	772	33	37	40	91	30	51	25
RTOR Reduction (vph)	0	2	0	0	2	0	0	80	0	0	22	0
Lane Group Flow (vph)	18	1244	0	47	803	0	37	51	0	30	54	0
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	3%	6%	8%	6%	33%	29%	0%	8%	0%	0%	20%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	81.3	81.3		81.3	81.3		12.8	12.8		12.8	12.8	
Effective Green, g (s)	81.3	81.3		81.3	81.3		12.8	12.8		12.8	12.8	
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.12	0.12		0.12	0.12	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	497	2656		271	2564		125	369		153	388	
v/s Ratio Prot		c0.35			0.24			0.02			0.02	
v/s Ratio Perm	0.03			0.13			c0.04			0.02		
v/c Ratio	0.04	0.47		0.17	0.31		0.30	0.14		0.20	0.14	
Uniform Delay, d1	3.2	4.9		3.6	4.1		43.1	42.3		42.6	42.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.6		1.4	0.3		2.8	0.4		1.3	0.3	
Delay (s)	3.4	5.5		5.0	4.5		45.9	42.7		43.9	42.7	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.4			4.5			43.4			43.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	107.3	Sum of lost time (s)	13.2
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	1.00		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3455		1706	3300		1825	1921	1517	1823	1768	
Flt Permitted	0.36	1.00		0.10	1.00		0.69	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	695	3455		179	3300		1334	1921	1517	1367	1768	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1281	150	208	742	22	51	68	167	15	82	15
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	146	0	6	0
Lane Group Flow (vph)	5	1425	0	208	763	0	51	68	21	15	91	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	63.7	63.7		83.4	83.4		13.7	13.7	13.7	13.7	13.7	
Effective Green, g (s)	63.7	63.7		83.4	83.4		13.7	13.7	13.7	13.7	13.7	
Actuated g/C Ratio	0.58	0.58		0.76	0.76		0.12	0.12	0.12	0.12	0.12	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	401	1995		338	2495		165	238	188	169	219	
v/s Ratio Prot		c0.41		c0.08	0.23			0.04			c0.05	
v/s Ratio Perm	0.01			0.38			0.04		0.01	0.01		
v/c Ratio	0.01	0.71		0.62	0.31		0.31	0.29	0.11	0.09	0.41	
Uniform Delay, d1	9.9	16.8		18.0	4.3		44.0	43.9	42.9	42.8	44.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	2.2		4.7	0.3		2.2	1.4	0.5	0.5	2.7	
Delay (s)	10.0	19.0		22.8	4.6		46.2	45.2	43.4	43.2	47.3	
Level of Service	A	B		C	A		D	D	D	D	D	
Approach Delay (s)		18.9			8.5			44.4			46.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	110.3	Sum of lost time (s)	18.2
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1182	7	14	594	6	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3575		1789	3579	1789	1601
Flt Permitted	1.00		0.15	1.00	0.95	1.00
Satd. Flow (perm)	3575		291	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1182	7	14	594	6	11
RTOR Reduction (vph)	1	0	0	0	0	8
Lane Group Flow (vph)	1188	0	14	594	6	3
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	33.7		33.7	33.7	21.2	21.2
Effective Green, g (s)	33.7		33.7	33.7	21.2	21.2
Actuated g/C Ratio	0.49		0.49	0.49	0.31	0.31
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	1748		142	1750	550	492
v/s Ratio Prot	c0.33			0.17	c0.00	
v/s Ratio Perm			0.05			0.00
v/c Ratio	0.68		0.10	0.34	0.01	0.01
Uniform Delay, d1	13.5		9.4	10.8	16.6	16.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4		0.6	0.2	0.0	0.0
Delay (s)	14.9		10.1	11.0	16.6	16.6
Level of Service	B		B	B	B	B
Approach Delay (s)	14.9			11.0	16.6	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	68.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	23	671	46	146	856	8	68	72	79	5	34	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3351		1789	3534		1789	1830	1437	1460	1847	1555
Flt Permitted	0.32	1.00		0.38	1.00		0.73	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	609	3351		710	3534		1384	1830	1437	1091	1847	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	23	671	46	146	856	8	68	72	79	5	34	22
RTOR Reduction (vph)	0	3	0	0	0	0	0	0	68	0	0	19
Lane Group Flow (vph)	23	714	0	146	864	0	68	72	11	5	34	3
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	66.3	66.3		66.3	66.3		13.0	13.0	13.0	13.0	13.0	13.0
Effective Green, g (s)	66.3	66.3		66.3	66.3		13.0	13.0	13.0	13.0	13.0	13.0
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	436	2401		508	2533		194	257	201	153	259	218
v/s Ratio Prot		0.21			c0.24			0.04			0.02	
v/s Ratio Perm	0.04			0.21			c0.05		0.01	0.00		0.00
v/c Ratio	0.05	0.30		0.29	0.34		0.35	0.28	0.06	0.03	0.13	0.01
Uniform Delay, d1	3.9	4.7		4.7	4.9		35.9	35.6	34.4	34.3	34.8	34.2
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.3		1.4	0.4		2.3	1.2	0.2	0.2	0.5	0.1
Delay (s)	4.1	5.0		6.1	5.3		38.2	36.8	34.7	34.5	35.3	34.3
Level of Service	A	A		A	A		D	D	C	C	D	C
Approach Delay (s)		5.0			5.4			36.5			34.9	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	92.5	Sum of lost time (s)	13.2
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	781	14	54	947	11	48	77	141	8	20	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3314		1825	3504		1825	1865	1577	1601	1812	1633
Flt Permitted	0.28	1.00		0.34	1.00		0.74	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	544	3314		662	3504		1430	1865	1577	1191	1812	1633
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	10	781	14	54	947	11	48	77	141	8	20	5
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	122	0	0	4
Lane Group Flow (vph)	10	794	0	54	958	0	48	77	19	8	20	1
Confl. Bikes (#/hr)			2			2			2			
Heavy Vehicles (%)	0%	10%	0%	0%	4%	0%	0%	3%	2%	14%	6%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	66.3	66.3		66.3	66.3		12.6	12.6	12.6	12.6	12.6	12.6
Effective Green, g (s)	66.3	66.3		66.3	66.3		12.6	12.6	12.6	12.6	12.6	12.6
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	391	2385		476	2522		195	255	215	162	247	223
v/s Ratio Prot		0.24			c0.27			c0.04			0.01	
v/s Ratio Perm	0.02			0.08			0.03		0.01	0.01		0.00
v/c Ratio	0.03	0.33		0.11	0.38		0.25	0.30	0.09	0.05	0.08	0.00
Uniform Delay, d1	3.7	4.8		3.9	5.0		35.5	35.8	34.7	34.5	34.7	34.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.4		0.5	0.4		1.4	1.4	0.4	0.3	0.3	0.0
Delay (s)	3.8	5.1		4.4	5.4		36.9	37.2	35.1	34.8	35.0	34.3
Level of Service	A	A		A	A		D	D	D	C	C	C
Approach Delay (s)		5.1			5.4			36.0			34.8	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	92.1	Sum of lost time (s)	13.2
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	822	23	72	889	56	42	392	156	34	143	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3519		1653	3528		1463	3301		1785	3277	
Flt Permitted	0.27	1.00		0.31	1.00		0.62	1.00		0.29	1.00	
Satd. Flow (perm)	489	3519		533	3528		960	3301		547	3277	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	113	822	23	72	889	56	42	392	156	34	143	62
RTOR Reduction (vph)	0	1	0	0	3	0	0	43	0	0	48	0
Lane Group Flow (vph)	113	844	0	72	942	0	42	505	0	34	157	0
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	63.5	63.5		63.5	63.5		23.0	23.0		23.0	23.0	
Effective Green, g (s)	63.5	63.5		63.5	63.5		23.0	23.0		23.0	23.0	
Actuated g/C Ratio	0.64	0.64		0.64	0.64		0.23	0.23		0.23	0.23	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	311	2241		339	2247		221	761		126	755	
v/s Ratio Prot		0.24			c0.27			c0.15			0.05	
v/s Ratio Perm	0.23			0.14			0.04			0.06		
v/c Ratio	0.36	0.38		0.21	0.42		0.19	0.66		0.27	0.21	
Uniform Delay, d1	8.6	8.6		7.6	9.0		30.9	34.8		31.5	31.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.3	0.5		1.4	0.6		0.9	2.9		2.4	0.3	
Delay (s)	11.8	9.1		9.0	9.5		31.7	37.7		33.9	31.3	
Level of Service	B	A		A	A		C	D		C	C	
Approach Delay (s)		9.4			9.5			37.3			31.6	
Approach LOS		A			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	99.7	Sum of lost time (s)	13.2
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1415	3460		1825	3447		1823	3260		1825	3498	
Flt Permitted	0.24	1.00		0.25	1.00		0.70	1.00		0.65	1.00	
Satd. Flow (perm)	354	3460		481	3447		1350	3260		1256	3498	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	31	1018	43	102	1041	61	36	77	78	27	58	20
RTOR Reduction (vph)	0	1	0	0	2	0	0	68	0	0	17	0
Lane Group Flow (vph)	31	1060	0	102	1100	0	36	87	0	27	61	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			5			1						
Heavy Vehicles (%)	29%	5%	0%	0%	5%	4%	0%	0%	7%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	66.2	66.2		66.2	66.2		12.1	12.1		12.1	12.1	
Effective Green, g (s)	66.2	66.2		66.2	66.2		12.1	12.1		12.1	12.1	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.13	0.13		0.13	0.13	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	256	2503		348	2493		178	431		166	462	
v/s Ratio Prot		0.31			c0.32			c0.03			0.02	
v/s Ratio Perm	0.09			0.21			0.03			0.02		
v/c Ratio	0.12	0.42		0.29	0.44		0.20	0.20		0.16	0.13	
Uniform Delay, d1	3.8	5.0		4.4	5.1		35.4	35.4		35.2	35.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.5		2.1	0.6		1.2	0.5		1.0	0.3	
Delay (s)	4.8	5.6		6.6	5.7		36.6	35.9		36.2	35.3	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.5			5.8			36.0			35.5	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	91.5	Sum of lost time (s)	13.2
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1824	3428		1755	3474		1738	1902	1549	1825	1788	
Flt Permitted	0.24	1.00		0.16	1.00		0.66	1.00	1.00	0.50	1.00	
Satd. Flow (perm)	455	3428		292	3474		1204	1902	1549	966	1788	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	41	901	180	294	1111	79	136	192	181	25	91	39
RTOR Reduction (vph)	0	12	0	0	4	0	0	0	148	0	14	0
Lane Group Flow (vph)	41	1069	0	294	1186	0	136	192	33	25	116	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	55.2	55.2		77.6	77.6		20.2	20.2	20.2	20.2	20.2	
Effective Green, g (s)	55.2	55.2		77.6	77.6		20.2	20.2	20.2	20.2	20.2	
Actuated g/C Ratio	0.50	0.50		0.70	0.70		0.18	0.18	0.18	0.18	0.18	
Clearance Time (s)	6.6	6.6		5.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	226	1704		433	2428		219	346	281	175	325	
v/s Ratio Prot		0.31		c0.11	0.34			0.10			0.06	
v/s Ratio Perm	0.09			c0.37			c0.11		0.02	0.03		
v/c Ratio	0.18	0.63		0.68	0.49		0.62	0.55	0.12	0.14	0.36	
Uniform Delay, d1	15.4	20.4		12.8	7.6		41.9	41.3	37.9	38.1	39.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	1.8		5.5	0.7		7.5	3.3	0.4	0.8	1.4	
Delay (s)	17.2	22.2		18.3	8.3		49.4	44.6	38.3	38.9	41.1	
Level of Service	B	C		B	A		D	D	D	D	D	
Approach Delay (s)		22.0			10.3			43.6			40.8	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	111.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	728	7	13	985	13	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3573		1789	3579	1789	1601
Flt Permitted	1.00		0.33	1.00	0.95	1.00
Satd. Flow (perm)	3573		621	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	728	7	13	985	13	25
RTOR Reduction (vph)	1	0	0	0	0	16
Lane Group Flow (vph)	734	0	13	985	13	9
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	27.6		27.6	27.6	23.1	23.1
Effective Green, g (s)	27.6		27.6	27.6	23.1	23.1
Actuated g/C Ratio	0.43		0.43	0.43	0.36	0.36
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	1524		264	1526	638	571
v/s Ratio Prot	0.21			c0.28	c0.01	
v/s Ratio Perm			0.02			0.01
v/c Ratio	0.48		0.05	0.65	0.02	0.02
Uniform Delay, d1	13.4		10.9	14.7	13.5	13.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5		0.2	1.3	0.1	0.1
Delay (s)	13.9		11.0	16.0	13.5	13.5
Level of Service	B		B	B	B	B
Approach Delay (s)	13.9			15.9	13.5	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	64.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix G

Intersection Operation Reports – 2031 Future Conditions with 4-Lane Mayfield Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1323	3520		1722	3440		1825	1795	1579	1825	1883	1347
Flt Permitted	0.38	1.00		0.05	1.00		0.58	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	523	3520		95	3440		1116	1795	1579	1418	1883	1347
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	90	0	0	22
Lane Group Flow (vph)	17	1912	0	196	725	0	66	29	27	17	142	3
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	72.0	69.7		87.7	78.4		15.9	15.9	15.9	15.9	15.9	15.9
Effective Green, g (s)	72.0	69.7		87.7	78.4		15.9	15.9	15.9	15.9	15.9	15.9
Actuated g/C Ratio	0.62	0.60		0.75	0.67		0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	338	2100		224	2309		151	244	214	193	256	183
v/s Ratio Prot	0.00	c0.54		c0.08	0.21			0.02			c0.08	
v/s Ratio Perm	0.03			0.58			0.06		0.02	0.01		0.00
v/c Ratio	0.05	0.91		0.88	0.31		0.44	0.12	0.13	0.09	0.55	0.02
Uniform Delay, d1	8.7	20.8		38.7	8.0		46.3	44.3	44.3	44.1	47.1	43.7
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	7.4		31.2	0.4		4.2	0.5	0.6	0.4	4.4	0.1
Delay (s)	8.8	28.2		70.0	8.4		50.5	44.8	44.9	44.5	51.5	43.8
Level of Service	A	C		E	A		D	D	D	D	D	D
Approach Delay (s)		28.0			21.5			46.6			49.8	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	116.8	Sum of lost time (s)	20.2
Intersection Capacity Utilization	107.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.6		5.0	4.6		4.6	4.6		4.6	4.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.87		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	3483		1772	3372		1825	2865		1822	3413	
Flt Permitted	0.27	1.00		0.05	1.00		0.69	1.00		0.70	1.00	
Satd. Flow (perm)	522	3483		93	3372		1321	2865		1334	3413	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
RTOR Reduction (vph)	0	7	0	0	0	0	0	62	0	0	8	0
Lane Group Flow (vph)	2	1927	0	412	985	0	25	28	0	8	94	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2									1
Heavy Vehicles (%)	0%	3%	4%	3%	8%	25%	0%	0%	11%	0%	4%	14%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	74.2	73.0		89.0	80.8		23.4	23.4		23.4	23.4	
Effective Green, g (s)	78.2	75.0		91.0	82.8		25.4	25.4		25.4	25.4	
Actuated g/C Ratio	0.62	0.60		0.72	0.66		0.20	0.20		0.20	0.20	
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	358	2079		214	2222		267	579		269	690	
v/s Ratio Prot	0.00	0.55		c0.17	0.29			0.01			c0.03	
v/s Ratio Perm	0.00			c1.22			0.02			0.01		
v/c Ratio	0.01	0.93		1.93	0.44		0.09	0.05		0.03	0.14	
Uniform Delay, d1	9.1	22.8		44.2	10.3		40.7	40.4		40.2	41.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	8.7		433.2	0.6		0.3	0.1		0.2	0.4	
Delay (s)	9.1	31.5		477.4	10.9		41.1	40.4		40.4	41.5	
Level of Service	A	C		F	B		D	D		D	D	
Approach Delay (s)		31.5			148.5			40.6			41.4	
Approach LOS		C			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	78.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	125.6	Sum of lost time (s)	14.2
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	1628	109	229	1088	47	44	127	89	99	587	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.94		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1716	3468		1552	3467		1384	2961		1700	3361	
Flt Permitted	0.17	1.00		0.06	1.00		0.15	1.00		0.62	1.00	
Satd. Flow (perm)	311	3468		101	3467		221	2961		1103	3361	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	1628	109	229	1088	47	44	127	89	99	587	191
RTOR Reduction (vph)	0	4	0	0	3	0	0	69	0	0	27	0
Lane Group Flow (vph)	107	1733	0	229	1132	0	44	147	0	99	751	0
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	72.3	63.4		74.5	64.5		26.4	26.4		26.4	26.4	
Effective Green, g (s)	72.3	63.4		74.5	64.5		26.4	26.4		26.4	26.4	
Actuated g/C Ratio	0.60	0.53		0.62	0.54		0.22	0.22		0.22	0.22	
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	291	1832		183	1863		48	651		242	739	
v/s Ratio Prot	0.03	0.50		c0.10	0.33			0.05			c0.22	
v/s Ratio Perm	0.19			c0.67			0.20			0.09		
v/c Ratio	0.37	0.95		1.25	0.61		0.92	0.23		0.41	1.02	
Uniform Delay, d1	12.3	26.7		38.2	19.1		45.7	38.4		40.1	46.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	11.6		150.0	1.5		101.4	0.4		2.3	37.4	
Delay (s)	13.9	38.3		188.3	20.5		147.1	38.8		42.5	84.2	
Level of Service	B	D		F	C		F	D		D	F	
Approach Delay (s)		36.9			48.7			57.1			79.5	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	50.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.2
Intersection Capacity Utilization	115.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	1856	95	62	1298	37	40	44	101	36	57	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.90		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	3511		1690	3404		1415	3096		1825	3238	
Flt Permitted	0.18	1.00		0.07	1.00		0.70	1.00		0.66	1.00	
Satd. Flow (perm)	346	3511		129	3404		1039	3096		1268	3238	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	19	1856	95	62	1298	37	40	44	101	36	57	30
RTOR Reduction (vph)	0	2	0	0	1	0	0	24	0	0	26	0
Lane Group Flow (vph)	19	1949	0	62	1334	0	40	121	0	36	61	0
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	3%	6%	8%	6%	33%	29%	0%	8%	0%	0%	20%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	84.0	84.0		84.0	84.0		13.1	13.1		13.1	13.1	
Effective Green, g (s)	84.0	84.0		84.0	84.0		13.1	13.1		13.1	13.1	
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.12	0.12		0.12	0.12	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	263	2673		98	2592		123	367		150	384	
v/s Ratio Prot		c0.56			0.39			c0.04			0.02	
v/s Ratio Perm	0.05			0.48			0.04			0.03		
v/c Ratio	0.07	0.73		0.63	0.51		0.33	0.33		0.24	0.16	
Uniform Delay, d1	3.3	7.0		6.1	5.2		44.5	44.6		44.1	43.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.8		27.2	0.7		3.2	1.1		1.7	0.4	
Delay (s)	3.9	8.8		33.2	5.9		47.8	45.7		45.8	44.0	
Level of Service	A	A		C	A		D	D		D	D	
Approach Delay (s)		8.8			7.1			46.1			44.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	110.3	Sum of lost time (s)	13.2
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	1933	205	292	1270	27	58	79	201	20	106	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3459		1706	3305		1825	1921	1517	1823	1772	
Flt Permitted	0.21	1.00		0.06	1.00		0.65	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	409	3459		99	3305		1254	1921	1517	1354	1772	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	1933	205	292	1270	27	58	79	201	20	106	18
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	141	0	5	0
Lane Group Flow (vph)	7	2132	0	292	1296	0	58	79	60	20	119	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	66.5	66.5		83.5	83.5		15.1	15.1	15.1	15.1	15.1	
Effective Green, g (s)	66.5	66.5		83.5	83.5		15.1	15.1	15.1	15.1	15.1	
Actuated g/C Ratio	0.59	0.59		0.75	0.75		0.14	0.14	0.14	0.14	0.14	
Clearance Time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	243	2057		232	2468		169	259	204	182	239	
v/s Ratio Prot		0.62		c0.12	0.39			0.04			c0.07	
v/s Ratio Perm	0.02			c0.82			0.05		0.04	0.01		
v/c Ratio	0.03	1.04		1.26	0.53		0.34	0.31	0.29	0.11	0.50	
Uniform Delay, d1	9.3	22.6		40.5	5.9		43.9	43.6	43.6	42.4	44.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	30.0		146.4	0.8		2.5	1.4	1.7	0.6	3.4	
Delay (s)	9.6	52.6		186.9	6.7		46.4	45.0	45.2	43.0	48.2	
Level of Service	A	D		F	A		D	D	D	D	D	
Approach Delay (s)		52.5			39.8			45.4			47.5	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	111.8	Sum of lost time (s)	19.2
Intersection Capacity Utilization	117.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1841	47	87	865	37	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3565		1789	3579	1789	1601
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3565		98	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1841	47	87	865	37	68
RTOR Reduction (vph)	2	0	0	0	0	58
Lane Group Flow (vph)	1886	0	87	865	37	10
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Actuated Green, G (s)	69.6		82.6	82.6	16.5	16.5
Effective Green, g (s)	69.6		82.6	82.6	16.5	16.5
Actuated g/C Ratio	0.62		0.73	0.73	0.15	0.15
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	2193		161	2613	260	233
v/s Ratio Prot	c0.53		0.03	c0.24	c0.02	
v/s Ratio Perm			0.36			0.01
v/c Ratio	0.86		0.54	0.33	0.14	0.04
Uniform Delay, d1	17.8		21.6	5.4	42.1	41.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		6.4	0.2	1.1	0.3
Delay (s)	21.8		28.0	5.6	43.3	41.9
Level of Service	C		C	A	D	D
Approach Delay (s)	21.8			7.6	42.4	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	113.1	Sum of lost time (s)	21.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		7.0	6.6		7.0	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3338		1789	3535		1789	1830	1443	1460	1847	1555
Flt Permitted	0.19	1.00		0.13	1.00		0.42	1.00	1.00	0.69	1.00	1.00
Satd. Flow (perm)	372	3338		241	3535		789	1830	1443	1058	1847	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	173	0	0	27
Lane Group Flow (vph)	34	1065	0	272	1390	0	153	106	50	6	50	3
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	Perm	NA		pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		2		1	6		7	4			8	
Permitted Phases	2			6			4		4	8		8
Actuated Green, G (s)	46.5	46.5		69.6	69.6		23.9	23.9	23.9	9.6	9.6	9.6
Effective Green, g (s)	46.5	46.5		69.6	69.6		23.9	23.9	23.9	9.6	9.6	9.6
Actuated g/C Ratio	0.44	0.44		0.65	0.65		0.22	0.22	0.22	0.09	0.09	0.09
Clearance Time (s)	6.6	6.6		7.0	6.6		7.0	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	162	1454		390	2305		245	409	323	95	166	139
v/s Ratio Prot		0.32		0.11	c0.39		c0.04	0.06			0.03	
v/s Ratio Perm	0.09			c0.35			c0.10		0.03	0.01		0.00
v/c Ratio	0.21	0.73		0.70	0.60		0.62	0.26	0.15	0.06	0.30	0.02
Uniform Delay, d1	18.7	24.9		17.8	10.6		35.7	34.1	33.3	44.4	45.4	44.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9	3.3		6.8	1.2		6.9	0.7	0.5	0.6	2.1	0.1
Delay (s)	21.6	28.3		24.6	11.8		42.6	34.8	33.7	45.0	47.5	44.4
Level of Service	C	C		C	B		D	C	C	D	D	D
Approach Delay (s)		28.0			13.9			36.8			46.3	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	106.7	Sum of lost time (s)	27.2
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.89		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	3309		1825	3505		1825	3159		1601	3386	
Flt Permitted	0.13	1.00		0.17	1.00		0.73	1.00		0.39	1.00	
Satd. Flow (perm)	246	3309		331	3505		1410	3159		665	3386	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
RTOR Reduction (vph)	0	2	0	0	1	0	0	73	0	0	5	0
Lane Group Flow (vph)	15	1329	0	105	1536	0	100	293	0	11	29	0
Confl. Bikes (#/hr)			2			2			2			
Heavy Vehicles (%)	0%	10%	0%	0%	4%	0%	0%	3%	2%	14%	6%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	80.5	80.5		80.5	80.5		17.8	17.8		17.8	17.8	
Effective Green, g (s)	80.5	80.5		80.5	80.5		17.8	17.8		17.8	17.8	
Actuated g/C Ratio	0.72	0.72		0.72	0.72		0.16	0.16		0.16	0.16	
Clearance Time (s)	6.6	6.6		6.6	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	177	2389		238	2530		225	504		106	540	
v/s Ratio Prot		0.40			c0.44			c0.09			0.01	
v/s Ratio Perm	0.06			0.32			0.07			0.02		
v/c Ratio	0.08	0.56		0.44	0.61		0.44	0.58		0.10	0.05	
Uniform Delay, d1	4.6	7.2		6.3	7.7		42.4	43.4		40.0	39.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.9		5.8	1.1		2.9	2.6		0.9	0.1	
Delay (s)	5.5	8.1		12.2	8.8		45.3	46.0		40.9	39.8	
Level of Service	A	A		B	A		D	D		D	D	
Approach Delay (s)		8.1			9.0			45.9			40.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	111.5	Sum of lost time (s)	13.2
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	167	1526	46	127	1439	73	78	512	255	40	182	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.95		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3517		1653	3537		1463	3263		1785	3270	
Flt Permitted	0.07	1.00		0.07	1.00		0.58	1.00		0.15	1.00	
Satd. Flow (perm)	123	3517		123	3537		886	3263		277	3270	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	167	1526	46	127	1439	73	78	512	255	40	182	83
RTOR Reduction (vph)	0	1	0	0	3	0	0	52	0	0	46	0
Lane Group Flow (vph)	167	1571	0	127	1509	0	78	715	0	40	219	0
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	69.4	59.4		63.4	56.4		31.2	31.2		31.2	31.2	
Effective Green, g (s)	69.4	59.4		63.4	56.4		31.2	31.2		31.2	31.2	
Actuated g/C Ratio	0.59	0.50		0.54	0.48		0.26	0.26		0.26	0.26	
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	209	1773		157	1693		234	864		73	866	
v/s Ratio Prot	c0.07	c0.45		0.05	0.43			c0.22			0.07	
v/s Ratio Perm	0.40			0.39			0.09			0.14		
v/c Ratio	0.80	0.89		0.81	0.89		0.33	0.83		0.55	0.25	
Uniform Delay, d1	30.6	26.2		24.1	27.9		34.9	40.8		37.2	34.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.3	6.9		28.4	7.5		1.8	7.3		14.0	0.3	
Delay (s)	51.9	33.1		52.6	35.5		36.7	48.1		51.2	34.4	
Level of Service	D	C		D	D		D	D		D	C	
Approach Delay (s)		34.9			36.8			47.0			36.6	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	38.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	117.8	Sum of lost time (s)	20.2
Intersection Capacity Utilization	106.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	1847	55	125	1655	78	39	87	89	33	63	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.92		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1415	3465		1825	3452		1823	3258		1825	3496	
Flt Permitted	0.08	1.00		0.06	1.00		0.70	1.00		0.64	1.00	
Satd. Flow (perm)	117	3465		112	3452		1341	3258		1231	3496	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	36	1847	55	125	1655	78	39	87	89	33	63	22
RTOR Reduction (vph)	0	1	0	0	2	0	0	79	0	0	19	0
Lane Group Flow (vph)	36	1901	0	125	1731	0	39	97	0	33	66	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			5			1						
Heavy Vehicles (%)	29%	5%	0%	0%	5%	4%	0%	0%	7%	0%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)	69.8	66.2		74.6	68.6		12.3	12.3		12.3	12.3	
Effective Green, g (s)	69.8	66.2		74.6	68.6		12.3	12.3		12.3	12.3	
Actuated g/C Ratio	0.67	0.63		0.71	0.66		0.12	0.12		0.12	0.12	
Clearance Time (s)	7.0	6.6		7.0	6.6		6.6	6.6		6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Grp Cap (vph)	122	2190		177	2261		157	382		144	410	
v/s Ratio Prot	0.01	c0.55		c0.04	0.50			c0.03			0.02	
v/s Ratio Perm	0.19			0.46			0.03			0.03		
v/c Ratio	0.30	0.87		0.71	0.77		0.25	0.26		0.23	0.16	
Uniform Delay, d1	10.5	15.7		22.1	12.5		42.0	42.0		41.9	41.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	5.0		14.9	2.5		1.7	0.7		1.7	0.4	
Delay (s)	13.4	20.7		37.1	15.0		43.7	42.8		43.6	41.9	
Level of Service	B	C		D	B		D	D		D	D	
Approach Delay (s)		20.5			16.5			42.9			42.4	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	104.7	Sum of lost time (s)	20.2
Intersection Capacity Utilization	102.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	1707	212	378	1721	114	153	251	212	33	111	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3455		1755	3476		1738	1902	1549	1825	1788	
Flt Permitted	0.10	1.00		0.06	1.00		0.57	1.00	1.00	0.35	1.00	
Satd. Flow (perm)	192	3455		109	3476		1045	1902	1549	668	1788	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	61	1707	212	378	1721	114	153	251	212	33	111	48
RTOR Reduction (vph)	0	8	0	0	4	0	0	0	174	0	13	0
Lane Group Flow (vph)	61	1911	0	378	1831	0	153	251	38	33	146	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2			6			4		4	8		
Actuated Green, G (s)	61.5	61.5		83.5	83.5		21.4	21.4	21.4	21.4	21.4	
Effective Green, g (s)	61.5	61.5		83.5	83.5		21.4	21.4	21.4	21.4	21.4	
Actuated g/C Ratio	0.52	0.52		0.71	0.71		0.18	0.18	0.18	0.18	0.18	
Clearance Time (s)	6.6	6.6		6.0	6.6		6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	99	1799		300	2457		189	344	280	121	323	
v/s Ratio Prot		0.55		c0.17	0.53			0.13			0.08	
v/s Ratio Perm	0.32			c0.72			c0.15		0.02	0.05		
v/c Ratio	0.62	1.06		1.26	0.75		0.81	0.73	0.14	0.27	0.45	
Uniform Delay, d1	20.0	28.3		41.7	10.7		46.4	45.6	40.6	41.6	43.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	25.4	40.0		141.1	2.1		24.5	9.2	0.5	2.5	2.1	
Delay (s)	45.4	68.3		182.8	12.8		70.9	54.8	41.1	44.2	45.2	
Level of Service	D	E		F	B		E	D	D	D	D	
Approach Delay (s)		67.6			41.9			54.1			45.0	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	53.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	118.1	Sum of lost time (s)	19.2
Intersection Capacity Utilization	119.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1141	41	77	1557	84	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0		7.0	7.0	7.0	7.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3560		1789	3579	1789	1601
Flt Permitted	1.00		0.18	1.00	0.95	1.00
Satd. Flow (perm)	3560		344	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1141	41	77	1557	84	156
RTOR Reduction (vph)	3	0	0	0	0	89
Lane Group Flow (vph)	1179	0	77	1557	84	67
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	56.4		56.4	56.4	24.5	24.5
Effective Green, g (s)	56.4		56.4	56.4	24.5	24.5
Actuated g/C Ratio	0.59		0.59	0.59	0.26	0.26
Clearance Time (s)	7.0		7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0		5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	2115		204	2127	461	413
v/s Ratio Prot	0.33			c0.44	c0.05	
v/s Ratio Perm			0.22			0.04
v/c Ratio	0.56		0.38	0.73	0.18	0.16
Uniform Delay, d1	11.7		10.1	13.8	27.4	27.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5		2.4	1.6	0.9	0.8
Delay (s)	12.2		12.5	15.4	28.3	28.1
Level of Service	B		B	B	C	C
Approach Delay (s)	12.2			15.3	28.2	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	94.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H

Queue and Intersection Operation Reports – 2031 Future Conditions with 4-Lane and Improved Intersections

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
v/c Ratio	0.05	0.86	0.20	0.78	0.30	0.01	0.42	0.11	0.37	0.09	0.53	0.09
Control Delay	5.8	26.4	6.6	49.1	8.2	0.0	52.3	42.6	13.9	42.3	52.3	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.8	26.4	6.6	49.1	8.2	0.0	52.3	42.6	13.9	42.3	52.3	0.7
Queue Length 50th (m)	0.8	147.3	7.6	25.0	21.0	0.0	12.4	5.2	2.1	3.0	27.1	0.0
Queue Length 95th (m)	2.9	200.7	19.0	#60.7	48.7	0.0	25.0	12.8	16.6	9.1	45.1	0.0
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	368	2030	930	260	2395	1164	233	375	413	296	394	358
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.86	0.20	0.75	0.30	0.01	0.28	0.08	0.28	0.06	0.36	0.07

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1323	3579	1567	1722	3444	1633	1825	1795	1579	1825	1883	1347
Flt Permitted	0.38	1.00	1.00	0.05	1.00	1.00	0.58	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	527	3579	1567	97	3444	1633	1119	1795	1579	1418	1883	1347
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
RTOR Reduction (vph)	0	0	40	0	0	3	0	0	91	0	0	22
Lane Group Flow (vph)	17	1736	142	196	718	5	66	29	26	17	142	3
Confl. Bikes (#/hr)			2						1			4
Heavy Vehicles (%)	38%	2%	2%	6%	6%	0%	0%	7%	2%	0%	2%	19%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	70.0	67.7	67.7	87.1	77.8	77.8	15.8	15.8	15.8	15.8	15.8	15.8
Effective Green, g (s)	70.0	67.7	67.7	87.1	77.8	77.8	15.8	15.8	15.8	15.8	15.8	15.8
Actuated g/C Ratio	0.60	0.58	0.58	0.75	0.67	0.67	0.14	0.14	0.14	0.14	0.14	0.14
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	333	2086	913	246	2307	1094	152	244	214	192	256	183
v/s Ratio Prot	0.00	c0.49		c0.08	0.21			0.02			c0.08	
v/s Ratio Perm	0.03		0.09	0.51		0.00	0.06		0.02	0.01		0.00
v/c Ratio	0.05	0.83	0.16	0.80	0.31	0.00	0.43	0.12	0.12	0.09	0.55	0.02
Uniform Delay, d1	9.3	19.6	11.1	35.6	8.0	6.3	46.0	44.0	44.1	43.9	46.9	43.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	4.1	0.4	18.4	0.4	0.0	4.1	0.5	0.5	0.4	4.4	0.1
Delay (s)	9.4	23.7	11.5	54.0	8.3	6.3	50.2	44.5	44.6	44.3	51.2	43.5
Level of Service	A	C	B	D	A	A	D	D	D	D	D	D
Approach Delay (s)		22.4			18.0			46.3			49.5	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	116.1	Sum of lost time (s)	20.2
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
v/c Ratio	0.00	0.92	0.21	1.41	0.42	0.01	0.09	0.02	0.18	0.03	0.12	0.03
Control Delay	6.0	34.3	3.9	233.0	9.4	0.0	39.2	37.6	0.9	38.0	38.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	34.3	3.9	233.0	9.4	0.0	39.2	37.6	0.9	38.0	38.9	0.1
Queue Length 50th (m)	0.1	173.6	3.3	~107.4	40.3	0.0	4.4	1.1	0.0	1.4	8.4	0.0
Queue Length 95th (m)	0.8	#210.0	13.3	#164.3	72.7	0.0	11.4	3.5	0.0	5.3	15.1	0.0
Internal Link Dist (m)		893.8			1350.2			1343.2			179.3	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	421	1901	905	293	2332	931	282	772	433	304	742	425
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.92	0.21	1.41	0.42	0.01	0.09	0.02	0.18	0.03	0.12	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.6	4.6	5.0	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3544	1550	1772	3380	1306	1825	3650	1451	1822	3510	1414
Flt Permitted	0.29	1.00	1.00	0.05	1.00	1.00	0.69	1.00	1.00	0.75	1.00	1.00
Satd. Flow (perm)	563	3544	1550	99	3380	1306	1335	3650	1451	1437	3510	1414
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
RTOR Reduction (vph)	0	0	71	0	0	2	0	0	62	0	0	9
Lane Group Flow (vph)	2	1741	122	412	978	5	25	12	16	8	91	2
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2									1
Heavy Vehicles (%)	0%	3%	4%	3%	8%	25%	0%	0%	11%	0%	4%	14%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	69.2	68.0	68.0	89.0	80.8	80.8	23.4	23.4	23.4	23.4	23.4	23.4
Effective Green, g (s)	73.2	70.0	70.0	91.0	82.8	82.8	25.4	25.4	25.4	25.4	25.4	25.4
Actuated g/C Ratio	0.58	0.56	0.56	0.72	0.66	0.66	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	360	1975	863	284	2228	860	269	738	293	290	709	285
v/s Ratio Prot	0.00	0.49		c0.18	0.29			0.00			c0.03	
v/s Ratio Perm	0.00		0.08	c0.86		0.00	0.02		0.01	0.01		0.00
v/c Ratio	0.01	0.88	0.14	1.45	0.44	0.01	0.09	0.02	0.05	0.03	0.13	0.01
Uniform Delay, d1	10.9	24.2	13.4	44.1	10.3	7.3	40.7	40.1	40.4	40.2	41.0	40.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.0	6.1	0.3	221.5	0.6	0.0	0.3	0.0	0.2	0.2	0.4	0.0
Delay (s)	11.0	30.3	13.7	265.6	10.9	7.3	41.0	40.1	40.6	40.4	41.4	40.1
Level of Service	B	C	B	F	B	A	D	D	D	D	D	D
Approach Delay (s)		28.6			86.0			40.6			41.2	
Approach LOS		C			F			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.18		
Actuated Cycle Length (s)	125.6	Sum of lost time (s)	14.2
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	107	1628	109	229	1088	47	44	127	89	99	587	191
v/c Ratio	0.37	0.95	0.15	0.82	0.53	0.06	0.79	0.21	0.21	0.41	0.84	0.43
Control Delay	12.3	42.5	1.1	54.2	16.5	0.1	116.8	40.9	1.1	47.6	58.2	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	42.5	1.1	54.2	16.5	0.1	116.8	40.9	1.1	47.6	58.2	12.9
Queue Length 50th (m)	7.1	177.6	0.0	35.1	72.0	0.0	9.1	12.1	0.0	18.8	64.7	5.5
Queue Length 95th (m)	12.5	#228.0	2.6	#68.9	88.2	0.2	#29.4	20.3	0.0	34.5	#88.2	24.1
Internal Link Dist (m)		1350.2			1354.5			1166.3			302.7	
Turn Bay Length (m)	35.0		30.0	30.0		30.0	80.0		30.0	78.0		34.8
Base Capacity (vph)	293	1719	724	299	2036	833	57	615	435	245	709	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.95	0.15	0.77	0.53	0.06	0.77	0.21	0.20	0.40	0.83	0.43

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	107	1628	109	229	1088	47	44	127	89	99	587	191
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1716	3544	1323	1552	3510	1366	1384	3017	1512	1700	3476	1580
Flt Permitted	0.24	1.00	1.00	0.06	1.00	1.00	0.19	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	430	3544	1323	101	3510	1366	282	3017	1512	1202	3476	1580
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	107	1628	109	229	1088	47	44	127	89	99	587	191
RTOR Reduction (vph)	0	0	56	0	0	20	0	0	71	0	0	128
Lane Group Flow (vph)	107	1628	53	229	1088	27	44	127	18	99	587	63
Confl. Peds. (#/hr)			5	5								
Confl. Bikes (#/hr)						2						1
Heavy Vehicles (%)	4%	3%	21%	15%	4%	18%	29%	21%	8%	5%	5%	2%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	64.0	58.0	58.0	82.4	69.4	69.4	24.0	24.0	24.0	24.0	24.0	24.0
Effective Green, g (s)	64.0	58.0	58.0	82.4	69.4	69.4	24.0	24.0	24.0	24.0	24.0	24.0
Actuated g/C Ratio	0.54	0.48	0.48	0.69	0.58	0.58	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	294	1718	641	280	2036	792	56	605	303	241	697	317
v/s Ratio Prot	0.02	c0.46		c0.12	0.31			0.04			c0.17	
v/s Ratio Perm	0.18		0.04	0.45		0.02	0.16		0.01	0.08		0.04
v/c Ratio	0.36	0.95	0.08	0.82	0.53	0.03	0.79	0.21	0.06	0.41	0.84	0.20
Uniform Delay, d1	13.9	29.4	16.5	37.7	15.3	10.8	45.4	39.9	38.7	41.6	46.0	39.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	12.4	0.3	18.6	1.0	0.1	56.5	0.4	0.2	2.4	10.0	0.6
Delay (s)	15.5	41.8	16.8	56.3	16.3	10.8	101.8	40.3	38.8	44.0	56.0	40.4
Level of Service	B	D	B	E	B	B	F	D	D	D	E	D
Approach Delay (s)		38.8			22.8			50.2			51.2	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	37.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	119.6	Sum of lost time (s)	20.2
Intersection Capacity Utilization	106.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	19	1856	95	62	1298	37	40	44	101	36	57	30
v/c Ratio	0.07	0.69	0.08	0.54	0.50	0.04	0.31	0.10	0.47	0.21	0.13	0.15
Control Delay	4.6	8.8	2.2	28.2	6.2	1.6	49.8	42.4	37.5	45.7	42.8	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	8.8	2.2	28.2	6.2	1.6	49.8	42.4	37.5	45.7	42.8	14.7
Queue Length 50th (m)	0.8	77.5	1.8	4.0	41.3	0.2	7.2	4.0	12.4	6.4	5.3	0.0
Queue Length 95th (m)	3.0	120.7	6.2	#28.4	65.2	2.6	16.9	8.8	27.5	15.3	10.7	7.2
Internal Link Dist (m)		1354.5			1159.0			1208.0			192.9	
Turn Bay Length (m)	30.0		30.0	35.0		30.0	80.0		30.0	80.0		30.0
Base Capacity (vph)	274	2689	1166	114	2614	928	237	810	361	309	810	327
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.69	0.08	0.54	0.50	0.04	0.17	0.05	0.28	0.12	0.07	0.09

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	1856	95	62	1298	37	40	44	101	36	57	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3544	1521	1690	3444	1213	1415	3650	1512	1825	3650	1361
Flt Permitted	0.19	1.00	1.00	0.08	1.00	1.00	0.72	1.00	1.00	0.73	1.00	1.00
Satd. Flow (perm)	361	3544	1521	150	3444	1213	1069	3650	1512	1396	3650	1361
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	19	1856	95	62	1298	37	40	44	101	36	57	30
RTOR Reduction (vph)	0	0	12	0	0	8	0	0	29	0	0	26
Lane Group Flow (vph)	19	1856	83	62	1298	29	40	44	72	36	57	4
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	0%	3%	6%	8%	6%	33%	29%	0%	8%	0%	0%	20%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	84.6	84.6	84.6	84.6	84.6	84.6	13.6	13.6	13.6	13.6	13.6	13.6
Effective Green, g (s)	84.6	84.6	84.6	84.6	84.6	84.6	13.6	13.6	13.6	13.6	13.6	13.6
Actuated g/C Ratio	0.76	0.76	0.76	0.76	0.76	0.76	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	274	2691	1155	113	2615	921	130	445	184	170	445	166
v/s Ratio Prot		c0.52			0.38			0.01			0.02	
v/s Ratio Perm	0.05		0.05	0.41		0.02	0.04		c0.05	0.03		0.00
v/c Ratio	0.07	0.69	0.07	0.55	0.50	0.03	0.31	0.10	0.39	0.21	0.13	0.02
Uniform Delay, d1	3.4	6.8	3.4	5.5	5.2	3.3	44.6	43.5	45.1	44.1	43.6	43.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	1.5	0.1	17.8	0.7	0.1	2.8	0.2	2.9	1.3	0.3	0.1
Delay (s)	3.9	8.2	3.5	23.3	5.9	3.4	47.4	43.7	47.9	45.4	43.9	43.2
Level of Service	A	A	A	C	A	A	D	D	D	D	D	D
Approach Delay (s)		8.0			6.6			46.8			44.1	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	13.2
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	7	1933	205	292	1270	27	58	79	201	20	124
v/c Ratio	0.03	0.99	0.23	0.94	0.51	0.03	0.35	0.31	0.53	0.11	0.51
Control Delay	12.7	42.2	8.6	71.6	6.9	1.3	49.5	46.6	11.4	43.3	50.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	42.2	8.6	71.6	6.9	1.3	49.5	46.6	11.4	43.3	50.2
Queue Length 50th (m)	0.6	188.6	11.5	44.0	45.9	0.0	10.7	14.5	0.0	3.6	22.3
Queue Length 95th (m)	2.8	#267.2	24.8	#97.8	70.0	1.9	22.3	27.4	18.4	10.1	39.1
Internal Link Dist (m)		149.1			738.5			1176.0			965.4
Turn Bay Length (m)	80.0		30.0	30.0		30.0	30.0			30.0	
Base Capacity (vph)	235	1961	911	310	2478	1078	262	402	477	283	375
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.99	0.23	0.94	0.51	0.03	0.22	0.20	0.42	0.07	0.33

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	1933	205	292	1270	27	58	79	201	20	106	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	5.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3510	1570	1706	3318	1432	1825	1921	1517	1823	1772	
Flt Permitted	0.22	1.00	1.00	0.06	1.00	1.00	0.65	1.00	1.00	0.71	1.00	
Satd. Flow (perm)	420	3510	1570	106	3318	1432	1254	1921	1517	1354	1772	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	7	1933	205	292	1270	27	58	79	201	20	106	18
RTOR Reduction (vph)	0	0	34	0	0	7	0	0	174	0	5	0
Lane Group Flow (vph)	7	1933	171	292	1270	20	58	79	27	20	119	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)									1			1
Heavy Vehicles (%)	0%	4%	4%	7%	10%	14%	0%	0%	6%	0%	5%	11%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)	62.5	62.5	62.5	83.5	83.5	83.5	15.1	15.1	15.1	15.1	15.1	
Effective Green, g (s)	62.5	62.5	62.5	83.5	83.5	83.5	15.1	15.1	15.1	15.1	15.1	
Actuated g/C Ratio	0.56	0.56	0.56	0.75	0.75	0.75	0.14	0.14	0.14	0.14	0.14	
Clearance Time (s)	6.6	6.6	6.6	5.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	234	1962	877	308	2478	1069	169	259	204	182	239	
v/s Ratio Prot		0.55		c0.14	0.38			0.04			c0.07	
v/s Ratio Perm	0.02		0.11	c0.57		0.01	0.05		0.02	0.01		
v/c Ratio	0.03	0.99	0.19	0.95	0.51	0.02	0.34	0.31	0.13	0.11	0.50	
Uniform Delay, d1	11.1	24.2	12.2	39.0	5.8	3.6	43.9	43.6	42.6	42.4	44.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	17.1	0.5	38.1	0.8	0.0	2.5	1.4	0.6	0.6	3.4	
Delay (s)	11.3	41.3	12.7	77.1	6.6	3.7	46.4	45.0	43.2	43.0	48.2	
Level of Service	B	D	B	E	A	A	D	D	D	D	D	
Approach Delay (s)		38.5			19.5			44.2			47.5	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	32.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	111.8	Sum of lost time (s)	18.2
Intersection Capacity Utilization	110.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1841	47	87	865	37	68
v/c Ratio	0.83	0.05	0.44	0.34	0.14	0.23
Control Delay	21.0	5.7	19.1	5.7	47.5	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	5.7	19.1	5.7	47.5	13.3
Queue Length 50th (m)	151.3	2.0	4.3	28.0	7.2	0.0
Queue Length 95th (m)	182.3	6.2	17.3	35.0	16.6	11.9
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	2509	1129	198	2880	267	297
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.04	0.44	0.30	0.14	0.23

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1841	47	87	865	37	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3579	1601	1789	3579	1789	1601
Flt Permitted	1.00	1.00	0.05	1.00	0.95	1.00
Satd. Flow (perm)	3579	1601	100	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1841	47	87	865	37	68
RTOR Reduction (vph)	0	8	0	0	0	58
Lane Group Flow (vph)	1841	39	87	865	37	10
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	68.3	68.3	81.2	81.2	16.5	16.5
Effective Green, g (s)	68.3	68.3	81.2	81.2	16.5	16.5
Actuated g/C Ratio	0.61	0.61	0.73	0.73	0.15	0.15
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	2188	978	161	2601	264	236
v/s Ratio Prot	c0.51		0.03	c0.24	c0.02	
v/s Ratio Perm		0.02	0.36			0.01
v/c Ratio	0.84	0.04	0.54	0.33	0.14	0.04
Uniform Delay, d1	17.4	8.6	20.4	5.5	41.4	40.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	0.0	6.4	0.2	1.1	0.3
Delay (s)	20.8	8.7	26.8	5.7	42.5	41.2
Level of Service	C	A	C	A	D	D
Approach Delay (s)	20.5			7.6	41.6	
Approach LOS	C			A	D	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	111.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
v/c Ratio	0.17	0.42	0.09	0.78	0.56	0.01	0.61	0.31	0.59	0.03	0.15	0.10
Control Delay	9.8	8.5	2.6	31.9	10.2	0.3	50.1	39.3	22.6	34.2	36.2	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	8.5	2.6	31.9	10.2	0.3	50.1	39.3	22.6	34.2	36.2	11.0
Queue Length 50th (m)	2.0	37.5	1.1	30.9	62.1	0.0	27.0	17.6	14.9	1.0	8.1	0.0
Queue Length 95th (m)	7.6	64.0	7.0	#96.6	103.1	0.3	45.4	31.3	36.4	4.0	17.3	6.3
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	204	2335	1086	348	2448	954	428	575	546	332	580	511
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.42	0.09	0.78	0.56	0.01	0.36	0.18	0.41	0.02	0.09	0.06

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3380	1537	1789	3544	1366	1789	1830	1441	1460	1847	1555
Flt Permitted	0.15	1.00	1.00	0.27	1.00	1.00	0.72	1.00	1.00	0.69	1.00	1.00
Satd. Flow (perm)	297	3380	1537	506	3544	1366	1364	1830	1441	1058	1847	1555
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
RTOR Reduction (vph)	0	0	24	0	0	3	0	0	109	0	0	24
Lane Group Flow (vph)	34	973	74	272	1379	8	153	106	114	6	50	6
Confl. Bikes (#/hr)			2			2			7			
Heavy Vehicles (%)	0%	8%	4%	2%	3%	17%	2%	5%	11%	25%	4%	5%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	73.6	73.6	73.6	73.6	73.6	73.6	19.7	19.7	19.7	19.7	19.7	19.7
Effective Green, g (s)	73.6	73.6	73.6	73.6	73.6	73.6	19.7	19.7	19.7	19.7	19.7	19.7
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	205	2335	1062	349	2449	944	252	338	266	195	341	287
v/s Ratio Prot		0.29			0.39			0.06			0.03	
v/s Ratio Perm	0.11		0.05	c0.54		0.01	c0.11		0.08	0.01		0.00
v/c Ratio	0.17	0.42	0.07	0.78	0.56	0.01	0.61	0.31	0.43	0.03	0.15	0.02
Uniform Delay, d1	5.7	7.1	5.3	11.0	8.3	5.1	39.8	37.6	38.4	35.6	36.4	35.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.5	0.1	15.7	0.9	0.0	6.0	1.1	2.3	0.1	0.4	0.1
Delay (s)	7.5	7.7	5.5	26.7	9.3	5.1	45.8	38.7	40.7	35.7	36.8	35.6
Level of Service	A	A	A	C	A	A	D	D	D	D	D	D
Approach Delay (s)		7.5			12.1			41.9			36.3	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	106.5	Sum of lost time (s)	13.2
Intersection Capacity Utilization	79.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
v/c Ratio	0.09	0.55	0.05	0.43	0.62	0.01	0.39	0.17	0.73	0.05	0.05	0.02
Control Delay	8.5	10.0	3.3	15.7	11.0	0.9	44.4	38.5	41.7	37.0	36.6	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	10.0	3.3	15.7	11.0	0.9	44.4	38.5	41.7	37.0	36.6	0.2
Queue Length 50th (m)	0.9	59.9	0.9	8.3	77.4	0.0	17.9	9.8	33.9	1.9	2.4	0.0
Queue Length 95th (m)	3.8	92.7	5.1	25.1	118.2	1.0	32.4	16.8	59.2	6.4	6.1	0.0
Internal Link Dist (m)		893.8			1350.2			1343.2			179.3	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	169	2326	1141	242	2461	1140	359	899	461	292	874	439
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.55	0.05	0.43	0.62	0.01	0.28	0.12	0.56	0.04	0.03	0.01

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1825	3318	1612	1825	3510	1612	1825	3544	1578	1601	3444	1633
Flt Permitted	0.13	1.00	1.00	0.18	1.00	1.00	0.74	1.00	1.00	0.68	1.00	1.00
Satd. Flow (perm)	242	3318	1612	346	3510	1612	1418	3544	1578	1151	3444	1633
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
RTOR Reduction (vph)	0	0	11	0	0	5	0	0	66	0	0	5
Lane Group Flow (vph)	15	1277	43	105	1521	11	100	109	191	11	28	1
Confl. Bikes (#/hr)			2			2			2			
Heavy Vehicles (%)	0%	10%	0%	0%	4%	0%	0%	3%	2%	14%	6%	0%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	78.6	78.6	78.6	78.6	78.6	78.6	20.3	20.3	20.3	20.3	20.3	20.3
Effective Green, g (s)	78.6	78.6	78.6	78.6	78.6	78.6	20.3	20.3	20.3	20.3	20.3	20.3
Actuated g/C Ratio	0.70	0.70	0.70	0.70	0.70	0.70	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	169	2326	1130	242	2461	1130	256	641	285	208	623	295
v/s Ratio Prot		0.38			c0.43			0.03			0.01	
v/s Ratio Perm	0.06		0.03	0.30		0.01	0.07		c0.12	0.01		0.00
v/c Ratio	0.09	0.55	0.04	0.43	0.62	0.01	0.39	0.17	0.67	0.05	0.04	0.00
Uniform Delay, d1	5.3	8.1	5.1	7.2	8.8	5.0	40.4	38.8	42.8	38.0	37.9	37.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.9	0.1	5.6	1.2	0.0	2.1	0.3	7.7	0.2	0.1	0.0
Delay (s)	6.4	9.1	5.2	12.8	10.0	5.1	42.5	39.0	50.4	38.2	38.0	37.6
Level of Service	A	A	A	B	B	A	D	D	D	D	D	D
Approach Delay (s)		8.9			10.1			46.1			38.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	112.1	Sum of lost time (s)	13.2
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	167	1526	46	127	1439	73	78	512	255	40	182	83
v/c Ratio	0.73	0.83	0.06	0.66	0.80	0.09	0.35	0.64	0.56	0.31	0.23	0.20
Control Delay	43.1	29.3	0.2	39.6	28.9	2.1	41.2	43.4	19.0	43.0	36.1	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.1	29.3	0.2	39.6	28.9	2.1	41.2	43.4	19.0	43.0	36.1	6.3
Queue Length 50th (m)	18.6	134.2	0.0	11.9	125.4	0.0	13.4	49.9	15.6	6.8	16.0	0.0
Queue Length 95th (m)	#51.1	183.9	0.0	#39.1	171.2	4.5	26.4	65.7	38.9	16.3	24.8	8.7
Internal Link Dist (m)		1350.2			1354.5			1166.3			302.7	
Turn Bay Length (m)	35.0		30.0	30.0		30.0	80.0		30.0	78.0		34.8
Base Capacity (vph)	234	1828	782	192	1792	781	280	1014	530	162	995	496
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.83	0.06	0.66	0.80	0.09	0.28	0.50	0.48	0.25	0.18	0.17

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	167	1526	46	127	1439	73	78	512	255	40	182	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7	3.5	3.7	3.7
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1733	3544	1426	1653	3579	1464	1463	3544	1443	1785	3476	1492
Flt Permitted	0.07	1.00	1.00	0.07	1.00	1.00	0.64	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	129	3544	1426	123	3579	1464	981	3544	1443	570	3476	1492
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	167	1526	46	127	1439	73	78	512	255	40	182	83
RTOR Reduction (vph)	0	0	22	0	0	36	0	0	126	0	0	64
Lane Group Flow (vph)	167	1526	24	127	1439	37	78	512	129	40	182	19
Confl. Bikes (#/hr)			3			4			7			1
Heavy Vehicles (%)	3%	3%	13%	8%	2%	10%	22%	3%	11%	0%	5%	8%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	69.2	58.5	58.5	65.8	56.8	56.8	25.6	25.6	25.6	25.6	25.6	25.6
Effective Green, g (s)	69.2	58.5	58.5	65.8	56.8	56.8	25.6	25.6	25.6	25.6	25.6	25.6
Actuated g/C Ratio	0.61	0.52	0.52	0.58	0.50	0.50	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	230	1829	736	192	1794	733	221	800	326	128	785	337
v/s Ratio Prot	c0.07	c0.43		0.05	0.40			c0.14			0.05	
v/s Ratio Perm	0.38		0.02	0.33		0.02	0.08		0.09	0.07		0.01
v/c Ratio	0.73	0.83	0.03	0.66	0.80	0.05	0.35	0.64	0.40	0.31	0.23	0.06
Uniform Delay, d1	26.0	23.3	13.5	20.9	23.6	14.4	36.9	39.7	37.3	36.5	35.8	34.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.1	4.7	0.1	10.8	3.9	0.1	2.0	2.4	1.6	2.9	0.3	0.1
Delay (s)	39.2	27.9	13.6	31.7	27.5	14.6	38.9	42.1	38.9	39.4	36.1	34.5
Level of Service	D	C	B	C	C	B	D	D	D	D	D	C
Approach Delay (s)		28.6			27.2			40.8			36.1	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	30.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	113.3	Sum of lost time (s)	20.2
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	36	1847	55	125	1655	78	39	87	89	33	63	22
v/c Ratio	0.21	0.85	0.05	0.70	0.71	0.07	0.24	0.20	0.33	0.21	0.14	0.08
Control Delay	6.8	20.5	0.5	39.9	13.7	1.3	44.6	41.6	11.3	43.8	41.0	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.8	20.5	0.5	39.9	13.7	1.3	44.6	41.6	11.3	43.8	41.0	0.5
Queue Length 50th (m)	1.4	130.1	0.0	8.8	104.2	0.0	6.5	7.6	0.0	5.5	5.4	0.0
Queue Length 95th (m)	3.7	169.5	1.2	#34.4	135.5	3.5	15.7	14.3	11.4	13.8	11.1	0.0
Internal Link Dist (m)		1354.5			1159.0			1208.0			192.9	
Turn Bay Length (m)	30.0		30.0	35.0		30.0	80.0		30.0	80.0		30.0
Base Capacity (vph)	168	2171	1041	178	2346	1078	405	1082	519	397	1082	545
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.85	0.05	0.70	0.71	0.07	0.10	0.08	0.17	0.08	0.06	0.04

Intersection Summary

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	1847	55	125	1655	78	39	87	89	33	63	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1415	3476	1610	1825	3476	1551	1823	3650	1526	1825	3650	1611
Flt Permitted	0.09	1.00	1.00	0.06	1.00	1.00	0.71	1.00	1.00	0.70	1.00	1.00
Satd. Flow (perm)	138	3476	1610	111	3476	1551	1370	3650	1526	1340	3650	1611
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	36	1847	55	125	1655	78	39	87	89	33	63	22
RTOR Reduction (vph)	0	0	20	0	0	27	0	0	79	0	0	19
Lane Group Flow (vph)	36	1847	35	125	1655	51	39	87	10	33	63	3
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			5			1						
Heavy Vehicles (%)	29%	5%	0%	0%	5%	4%	0%	0%	7%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		8
Actuated Green, G (s)	70.4	66.8	66.8	75.2	69.2	69.2	12.3	12.3	12.3	12.3	12.3	12.3
Effective Green, g (s)	70.4	66.8	66.8	75.2	69.2	69.2	12.3	12.3	12.3	12.3	12.3	12.3
Actuated g/C Ratio	0.67	0.63	0.63	0.71	0.66	0.66	0.12	0.12	0.12	0.12	0.12	0.12
Clearance Time (s)	7.0	6.6	6.6	7.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	135	2205	1021	176	2284	1019	160	426	178	156	426	188
v/s Ratio Prot	0.01	c0.53		c0.04	0.48			0.02			0.02	
v/s Ratio Perm	0.17		0.02	0.46		0.03	c0.03		0.01	0.02		0.00
v/c Ratio	0.27	0.84	0.03	0.71	0.72	0.05	0.24	0.20	0.06	0.21	0.15	0.01
Uniform Delay, d1	9.4	15.0	7.2	21.5	11.8	6.4	42.3	42.1	41.4	42.1	41.8	41.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	4.0	0.1	15.5	2.0	0.1	1.7	0.5	0.3	1.4	0.3	0.1
Delay (s)	11.7	19.0	7.3	37.0	13.9	6.5	43.9	42.6	41.6	43.5	42.1	41.2
Level of Service	B	B	A	D	B	A	D	D	D	D	D	D
Approach Delay (s)		18.5			15.1			42.4			42.3	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	105.3	Sum of lost time (s)	20.2
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	1707	212	378	1721	114	153	251	212	33	159
v/c Ratio	0.50	0.98	0.26	1.09	0.69	0.10	0.81	0.73	0.47	0.27	0.47
Control Delay	38.0	47.9	11.1	110.9	12.2	3.0	77.4	58.7	9.1	47.8	43.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	47.9	11.1	110.9	12.2	3.0	77.4	58.7	9.1	47.8	43.6
Queue Length 50th (m)	8.7	189.2	14.7	~79.6	105.7	3.0	31.6	50.9	0.0	6.1	27.4
Queue Length 95th (m)	24.2	#241.5	28.6	#134.7	127.6	8.0	#61.4	76.9	18.3	15.3	46.8
Internal Link Dist (m)		149.1			738.5			1176.0			965.4
Turn Bay Length (m)	80.0		30.0	30.0		30.0	30.0			30.0	
Base Capacity (vph)	123	1737	828	346	2481	1124	207	376	477	132	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.98	0.26	1.09	0.69	0.10	0.74	0.67	0.44	0.25	0.43

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	61	1707	212	378	1721	114	153	251	212	33	111	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	6.6	6.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1825	3510	1585	1755	3510	1563	1738	1902	1549	1825	1788	
Flt Permitted	0.13	1.00	1.00	0.06	1.00	1.00	0.57	1.00	1.00	0.35	1.00	
Satd. Flow (perm)	250	3510	1585	115	3510	1563	1045	1902	1549	668	1788	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	61	1707	212	378	1721	114	153	251	212	33	111	48
RTOR Reduction (vph)	0	0	44	0	0	19	0	0	174	0	13	0
Lane Group Flow (vph)	61	1707	168	378	1721	95	153	251	38	33	146	0
Confl. Peds. (#/hr)	1					1						
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	4%	3%	4%	4%	2%	5%	1%	4%	0%	2%	4%
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		2		1	6			4			8	
Permitted Phases	2		2	6		6	4		4	8		
Actuated Green, G (s)	58.5	58.5	58.5	83.5	83.5	83.5	21.4	21.4	21.4	21.4	21.4	
Effective Green, g (s)	58.5	58.5	58.5	83.5	83.5	83.5	21.4	21.4	21.4	21.4	21.4	
Actuated g/C Ratio	0.50	0.50	0.50	0.71	0.71	0.71	0.18	0.18	0.18	0.18	0.18	
Clearance Time (s)	6.6	6.6	6.6	6.0	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Grp Cap (vph)	123	1738	785	345	2481	1105	189	344	280	121	323	
v/s Ratio Prot		0.49		c0.18	0.49			0.13			0.08	
v/s Ratio Perm	0.24		0.11	c0.60		0.06	c0.15		0.02	0.05		
v/c Ratio	0.50	0.98	0.21	1.10	0.69	0.09	0.81	0.73	0.14	0.27	0.45	
Uniform Delay, d1	19.9	29.3	16.8	41.0	9.9	5.4	46.4	45.6	40.6	41.6	43.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	13.6	17.8	0.6	76.6	1.6	0.2	24.5	9.2	0.5	2.5	2.1	
Delay (s)	33.5	47.0	17.4	117.7	11.6	5.5	70.9	54.8	41.1	44.2	45.2	
Level of Service	C	D	B	F	B	A	E	D	D	D	D	
Approach Delay (s)		43.5			29.4			54.1			45.0	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	38.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	118.1	Sum of lost time (s)	19.2
Intersection Capacity Utilization	112.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1141	41	77	1557	84	156
v/c Ratio	0.54	0.04	0.35	0.73	0.18	0.31
Control Delay	12.1	2.9	14.3	15.8	33.7	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	2.9	14.3	15.8	33.7	12.7
Queue Length 50th (m)	54.8	0.4	6.1	90.2	10.9	4.6
Queue Length 95th (m)	67.1	3.5	14.3	109.1	28.1	22.9
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	3100	1391	318	3100	460	501
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.03	0.24	0.50	0.18	0.31

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1141	41	77	1557	84	156
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3579	1601	1789	3579	1789	1601
Flt Permitted	1.00	1.00	0.19	1.00	0.95	1.00
Satd. Flow (perm)	3579	1601	367	3579	1789	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1141	41	77	1557	84	156
RTOR Reduction (vph)	0	14	0	0	0	89
Lane Group Flow (vph)	1141	27	77	1557	84	67
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Actuated Green, G (s)	56.4	56.4	56.4	56.4	24.5	24.5
Effective Green, g (s)	56.4	56.4	56.4	56.4	24.5	24.5
Actuated g/C Ratio	0.59	0.59	0.59	0.59	0.26	0.26
Clearance Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lane Grp Cap (vph)	2127	951	218	2127	461	413
v/s Ratio Prot	0.32			c0.44	c0.05	
v/s Ratio Perm		0.02	0.21			0.04
v/c Ratio	0.54	0.03	0.35	0.73	0.18	0.16
Uniform Delay, d1	11.5	7.9	9.9	13.8	27.4	27.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.0	2.1	1.6	0.9	0.8
Delay (s)	11.9	8.0	11.9	15.4	28.3	28.1
Level of Service	B	A	B	B	C	C
Approach Delay (s)	11.8			15.3	28.2	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	94.9	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Appendix I

Roundabout Capacity and Operational Analysis Report

ARCADY 7

Version: 7.1.0.228 [21st Feb 2011]

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 E-mail: software@trl.co.uk Web: http://www.trlsoftware.co.uk

The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

File: C:\MAYFIELD ROAD EA - 314225\ROUNDABOUT\Mayfield Rd Roundabouts\ARCADY\NEW\Mayfield Rd 2014 02 07_with T intersection & only 2 Scenarios.arc7
Report generation date: 11/28/2014 5:32:00 PM

Summary of roundabout performance

	Queue (PCE)	Delay (s)	RFC	LOS
	2021 Two_Lane Approach - 2021 AM			
Roundabout 1 - Arm 1	0.60	2.29	0.37	A
Roundabout 1 - Arm 2	0.13	5.20	0.11	A
Roundabout 1 - Arm 3	1.45	4.00	0.59	A
Roundabout 1 - Arm 4	0.10	6.02	0.09	A
Roundabout 2 - Arm 1	0.41	2.27	0.29	A
Roundabout 2 - Arm 2	0.20	4.86	0.16	A
Roundabout 2 - Arm 3	1.65	4.39	0.62	A
Roundabout 2 - Arm 4	0.21	7.06	0.17	A
Roundabout 3 - Arm 1	0.36	1.96	0.26	A
Roundabout 3 - Arm 3	1.15	3.18	0.53	A
Roundabout 3 - Arm 4	0.03	6.11	0.03	A
	2021 Two_Lane Approach - 2021 PM			
Roundabout 1 - Arm 1	0.85	2.75	0.46	A
Roundabout 1 - Arm 2	0.06	5.61	0.05	A
Roundabout 1 - Arm 3	0.55	2.35	0.35	A
Roundabout 1 - Arm 4	0.54	6.70	0.35	A
Roundabout 2 - Arm 1	1.01	3.33	0.50	A

ARCADY 7

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File: C:\MAYFIELD ROAD EA - 314225\ROUNDABOUT\Mayfield Rd Roundabouts\ARCADY\NEW\Mayfield Rd 2014 02 07_with T intersection & only 2 Scenarios.arc7
Report generation date: 11/28/2014 5:35:10 PM

Summary of roundabout performance

	Queue (PCE)	Delay (s)	RFC	LOS
	2021 Two_Lane Approach - 2021 AM			
Roundabout 1 - Arm 1	0.60	2.29	0.37	A
Roundabout 1 - Arm 2	0.13	5.20	0.11	A
Roundabout 1 - Arm 3	1.45	4.00	0.59	A
Roundabout 1 - Arm 4	0.10	6.02	0.09	A
Roundabout 2 - Arm 1	0.41	2.27	0.29	A
Roundabout 2 - Arm 2	0.20	4.86	0.16	A
Roundabout 2 - Arm 3	1.65	4.39	0.62	A

Roundabout 2 - Arm 4	0.21	7.06	0.17	A
Roundabout 3 - Arm 1	0.36	1.96	0.26	A
Roundabout 3 - Arm 3	1.15	3.18	0.53	A
Roundabout 3 - Arm 4	0.03	6.11	0.03	A
	2021 Two_Lane Approach - 2021 PM			
Roundabout 1 - Arm 1	0.85	2.75	0.46	A
Roundabout 1 - Arm 2	0.06	5.61	0.05	A
Roundabout 1 - Arm 3	0.55	2.35	0.35	A
Roundabout 1 - Arm 4	0.54	6.70	0.35	A
Roundabout 2 - Arm 1	1.01	3.33	0.50	A
Roundabout 2 - Arm 2	0.11	6.05	0.10	A
Roundabout 2 - Arm 3	0.59	2.62	0.37	A
Roundabout 2 - Arm 4	0.39	5.90	0.28	A
Roundabout 3 - Arm 1	0.78	2.55	0.43	A
Roundabout 3 - Arm 3	0.52	2.25	0.34	A
Roundabout 3 - Arm 4	0.05	4.54	0.05	A
	2031 Two_Lane with RT By-pass - 2031 AM			
Roundabout 1 - Arm 1	1.59	3.74	0.61	A
Roundabout 1 - Arm 2	0.33	9.80	0.24	A
Roundabout 1 - Arm 3	17.27	31.98	0.97	D
Roundabout 1 - Arm 4	0.51	14.85	0.34	B
Roundabout 2 - Arm 1	0.90	3.10	0.47	A
Roundabout 2 - Arm 2	0.41	7.42	0.29	A
Roundabout 2 - Arm 3	46.24	73.68	1.02	F
Roundabout 2 - Arm 4	2.24	36.45	0.71	E
Roundabout 3 - Arm 1	0.81	2.61	0.44	A
Roundabout 3 - Arm 3	4.80	8.91	0.83	A
Roundabout 3 - Arm 4	0.11	3.52	0.10	A
	2031 Two_Lane with RT By-pass - 2031 PM			
Roundabout 1 - Arm 1	3.17	6.40	0.76	A
Roundabout 1 - Arm 2	0.18	13.04	0.15	B

Roundabout 1 - Arm 3	1.60	3.99	0.61	A
Roundabout 1 - Arm 4	7.01	52.87	0.90	F
Roundabout 2 - Arm 1	5.59	11.61	0.85	B
Roundabout 2 - Arm 2	0.46	17.83	0.32	C
Roundabout 2 - Arm 3	1.38	4.09	0.58	A
Roundabout 2 - Arm 4	3.07	21.61	0.76	C
Roundabout 3 - Arm 1	2.59	5.28	0.72	A
Roundabout 3 - Arm 3	1.23	3.35	0.55	A
Roundabout 3 - Arm 4	0.20	2.72	0.16	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2021 AM - runs from 08:00:00 to 09:30:00
2021 PM - runs from 08:00:00 to 09:30:00
2031 AM - runs from 08:00:00 to 09:30:00
2031 PM - runs from 08:00:00 to 09:30:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	1/15/2014
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	HMMG\rif43211
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations

0.85	5.75	False

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
False	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A2 - 2021 Two_Lane Approach - D3 - 2021 AM,

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2021 Two_Lane Approach		True	False	(D1)	False	100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2021 AM,	2021 AM			False	True	False		08:00	09:30	90	15	Varies by Arm

Roundabout Network

Roundabout Type(s)

Roundabout	ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay

1	1	Mayfield Rd_Heritage Rd	1,2,3,4	Standard	False	False	False
2	2	Mayfield Rd_Winston Churchill Blvd	1,2,3,4	Standard	False	False	False
3	3	Mayfield Rd_Sandalwood Parkway extension	1,3,4	Standard	False	False	False

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	((Mini-roundabouts only))

Arms

Arms

ID	Name	Description
1	Mayfield Rd WB	
2	Heritage Rd NB	
3	Mayfield Rd EB	
4	Heritage Rd SB	
1	Mayfield Rd WB	
2	Winston Churchill Rd SB	
3	Mayfield Rd EB	
4	Winston Churchill Bv NB	
1	Mayfield Rd WB	
3	Mayfield Rd EB	
4	Sandalwood Parkway extension NB	

Capacity Options

Roundabout	Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	**1**	0.00	3700.00	False	0.00
1	**2**	0.00	1850.00	False	0.00
1	**3**	0.00	3700.00	False	0.00
1	**4**	0.00	1850.00	False	0.00
2	**1**	0.00	3700.00	False	0.00
2	**2**	0.00	1850.00	False	0.00

2	3	0.00	3700.00	False	0.00
2	4	0.00	1850.00	False	0.00
3	1	0.00	99999.00	False	0.00
3	3	0.00	99999.00	False	0.00
3	4	0.00	99999.00	False	0.00

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	1	8.00	8.00	0.00	30.57	64.15	19.99	False
1	2	3.50	4.25	6.81	30.00	60.00	30.00	False
1	3	7.00	8.00	10.12	31.40	64.19	19.93	False
1	4	3.50	4.25	6.82	30.00	60.00	30.00	False
2	1	7.37	8.00	4.05	30.00	60.64	39.51	False
2	2	3.50	4.25	6.85	30.00	60.00	34.63	False
2	3	7.47	8.00	3.89	30.00	60.71	37.92	False
2	4	3.50	4.25	6.85	30.00	60.00	34.63	False
3	1	8.00	8.00	0.00	30.57	64.15	19.99	False
3	3	7.00	8.00	10.12	31.40	64.19	19.93	False
3	4	3.50	4.25	6.82	30.00	60.00	30.00	False

Mini Roundabout Geometry

Roundabout	Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	1	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	2	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	3	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	4	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	1	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	2	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	3	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	4	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	1	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	3	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)

3	4	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)

Large Roundabout Data

Roundabout	Arm	Circulating flow (PCE/hr)	Entry-to-exit separation (m)
1	1	(0.00)	(0.00)
1	2	(0.00)	(0.00)
1	3	(0.00)	(0.00)
1	4	(0.00)	(0.00)
2	1	(0.00)	(0.00)
2	2	(0.00)	(0.00)
2	3	(0.00)	(0.00)
2	4	(0.00)	(0.00)
3	1	(0.00)	(0.00)
3	3	(0.00)	(0.00)
3	4	(0.00)	(0.00)

Pedestrian Crossings

Roundabout	Arm	Crossing Type
1	1	None
1	2	None
1	3	None
1	4	None
2	1	None
2	2	None
2	3	None
2	4	None
3	1	None
3	3	None
3	4	None

Unsignalled Pedestrian Crossing Crossings

Roundabout	Arm	Space between crossing and intersection entry	Vehicles queueing on exit (PCE)	Central Refuge	Crossing Data Type	Crossing length (m)	Crossing time (s)	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)

		(PCE)									
1	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Signalled Pedestrian Crossing/ Adaptive Pedestrian Crossing Crossings

Roundabout	Arm	Yellow time preceding red (s)	Yellow time regarded as green (s)	Time from traffic red start to walk start (s)	Time period walk shown (s)	Clearance Period (s)	Traffic minimum green (s)	Space between crossing and intersection entry (PCE)
1	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Roundabout	Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	**1**	False	((calculated))	((calculated))	0.688	2549.182
1	**2**	False	((calculated))	((calculated))	0.483	1248.557

1	3	False	((calculated))	((calculated))	0.676	2475.107
1	4	False	((calculated))	((calculated))	0.483	1248.622
2	1	False	((calculated))	((calculated))	0.656	2321.138
2	2	False	((calculated))	((calculated))	0.476	1229.075
2	3	False	((calculated))	((calculated))	0.662	2348.681
2	4	False	((calculated))	((calculated))	0.476	1229.075
3	1	False	((calculated))	((calculated))	0.688	2549.182
3	3	False	((calculated))	((calculated))	0.676	2475.107
3	4	False	((calculated))	((calculated))	0.483	1248.622

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
False	False	True	True	Truck Percentages	2.00	False	False	False	True	True

Entry Flows

General Flows Data

Roundabout	Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
1	1	ONE HOUR	True	850.00	100.000	N/A
1	2	ONE HOUR	True	80.00	100.000	N/A
1	3	Linked Arm	False		N/A	N/A
1	4	ONE HOUR	True	57.00	100.000	N/A
2	1	Linked Arm	False		N/A	N/A
2	2	ONE HOUR	True	134.00	100.000	N/A
2	3	ONE HOUR	True	1239.00	100.000	N/A
2	4	ONE HOUR	True	96.00	100.000	N/A

3	1	Linked Arm	False		N/A	N/A
3	3	Linked Arm	False		N/A	N/A
3	4	ONE HOUR	True	17.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Roundabout	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)
1	1	1	639.92	639.92	N/A	N/A
1	1	2	60.23	60.23	N/A	N/A
1	1	3	0.00	0.00	N/A	N/A
1	1	4	42.91	42.91	N/A	N/A
1	2	1	0.00	0.00	N/A	N/A
1	2	2	100.88	100.88	N/A	N/A
1	2	3	932.78	932.78	N/A	N/A
1	2	4	72.27	72.27	N/A	N/A
1	3	1	0.00	0.00	N/A	N/A
1	3	3	0.00	0.00	N/A	N/A
1	3	4	12.80	12.80	N/A	N/A
2	1	1	764.13	764.13	N/A	N/A
2	1	2	71.92	71.92	N/A	N/A
2	1	3	0.00	0.00	N/A	N/A
2	1	4	51.24	51.24	N/A	N/A
2	2	1	0.00	0.00	N/A	N/A
2	2	2	120.46	120.46	N/A	N/A
2	2	3	1113.84	1113.84	N/A	N/A
2	2	4	86.30	86.30	N/A	N/A
2	3	1	0.00	0.00	N/A	N/A
2	3	3	0.00	0.00	N/A	N/A
2	3	4	15.28	15.28	N/A	N/A
3	1	1	935.87	935.87	N/A	N/A
3	1	2	88.08	88.08	N/A	N/A

3	**1**	**3**	0.00	0.00	N/A	N/A
3	**1**	**4**	62.76	62.76	N/A	N/A
3	**2**	**1**	0.00	0.00	N/A	N/A
3	**2**	**2**	147.54	147.54	N/A	N/A
3	**2**	**3**	1364.16	1364.16	N/A	N/A
3	**2**	**4**	105.70	105.70	N/A	N/A
3	**3**	**1**	0.00	0.00	N/A	N/A
3	**3**	**3**	0.00	0.00	N/A	N/A
3	**3**	**4**	18.72	18.72	N/A	N/A
4	**1**	**1**	935.87	935.87	N/A	N/A
4	**1**	**2**	88.08	88.08	N/A	N/A
4	**1**	**3**	0.00	0.00	N/A	N/A
4	**1**	**4**	62.76	62.76	N/A	N/A
4	**2**	**1**	0.00	0.00	N/A	N/A
4	**2**	**2**	147.54	147.54	N/A	N/A
4	**2**	**3**	1364.16	1364.16	N/A	N/A
4	**2**	**4**	105.70	105.70	N/A	N/A
4	**3**	**1**	0.00	0.00	N/A	N/A
4	**3**	**3**	0.00	0.00	N/A	N/A
4	**3**	**4**	18.72	18.72	N/A	N/A
5	**1**	**1**	764.13	764.13	N/A	N/A
5	**1**	**2**	71.92	71.92	N/A	N/A
5	**1**	**3**	0.00	0.00	N/A	N/A
5	**1**	**4**	51.24	51.24	N/A	N/A
5	**2**	**1**	0.00	0.00	N/A	N/A
5	**2**	**2**	120.46	120.46	N/A	N/A
5	**2**	**3**	1113.84	1113.84	N/A	N/A
5	**2**	**4**	86.30	86.30	N/A	N/A
5	**3**	**1**	0.00	0.00	N/A	N/A
5	**3**	**3**	0.00	0.00	N/A	N/A
5	**3**	**4**	15.28	15.28	N/A	N/A
6	**1**	**1**	639.92	639.92	N/A	N/A
6	**1**	**2**	60.23	60.23	N/A	N/A
6	**1**	**3**	0.00	0.00	N/A	N/A

6	1	4	42.91	42.91	N/A	N/A
6	2	1	0.00	0.00	N/A	N/A
6	2	2	100.88	100.88	N/A	N/A
6	2	3	932.78	932.78	N/A	N/A
6	2	4	72.27	72.27	N/A	N/A
6	3	1	0.00	0.00	N/A	N/A
6	3	3	0.00	0.00	N/A	N/A
6	3	4	12.80	12.80	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	5.000	590.000	255.000
	2	6.000	0.000	8.000	66.000
	3	1091.000	1.000	0.000	118.000
	4	40.000	8.000	9.000	0.000

Turning Proportions (PCE) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.69	0.30
	2	0.08	0.00	0.10	0.83
	3	0.90	0.00	0.00	0.10
	4	0.70	0.14	0.16	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.000	5.000	502.000	89.000
	2	13.000	0.000	19.000	102.000

	3	1128.000	11.000	0.000	100.000
	4	49.000	18.000	29.000	0.000

Turning Proportions (PCE) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.84	0.15
	2	0.10	0.00	0.14	0.76
	3	0.91	0.01	0.00	0.08
	4	0.51	0.19	0.30	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.000	594.000	14.000
	3	1182.000	0.000	7.000
	4	11.000	6.000	0.000

Turning Proportions (PCE) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.00	0.98	0.02
	3	0.99	0.00	0.01
	4	0.65	0.35	0.00

Vehicle Mix

Average PCE Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020

	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020
	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	1.020	1.020	1.020

	3	1.020	1.020	1.020
	4	1.020	1.020	1.020

Truck Percentages - Roundabout 3 (for whole period)

	To			
From		1	3	4
	1	2.000	2.000	2.000
	3	2.000	2.000	2.000
	4	2.000	2.000	2.000

Results

Results Summary

Roundabout	Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
1	1	0.37	2.29	0.60	A	779.97	1169.96	41.21	2.11	0.46	41.21	2.11	0.688	2549.182
1	2	0.11	5.20	0.13	A	73.41	110.11	8.59	4.68	0.10	8.59	4.68	0.483	1248.557
1	3	0.59	4.00	1.45	A	1094.75	1642.13	89.47	3.27	0.99	89.48	3.27	0.676	2475.107
1	4	0.09	6.02	0.10	A	52.30	78.46	6.86	5.25	0.08	6.86	5.25	0.483	1248.622
2	1	0.29	2.27	0.41	A	549.36	824.04	29.24	2.13	0.32	29.24	2.13	0.656	2321.138
2	2	0.16	4.86	0.20	A	122.96	184.44	13.67	4.45	0.15	13.67	4.45	0.476	1229.075
2	3	0.62	4.39	1.65	A	1136.93	1705.39	101.01	3.55	1.12	101.02	3.55	0.662	2348.681
2	4	0.17	7.06	0.21	A	88.09	132.14	13.11	5.95	0.15	13.11	5.96	0.476	1229.075
3	1	0.26	1.96	0.36	A	556.82	835.24	25.84	1.86	0.29	25.84	1.86	0.688	2549.182
3	3	0.53	3.18	1.15	A	1091.48	1637.22	74.93	2.75	0.83	74.93	2.75	0.676	2475.107
3	4	0.03	6.11	0.03	A	15.60	23.40	2.07	5.31	0.02	2.07	5.31	0.483	1248.622

Main Results

Main results: (8:00 AM-8:15 AM)

Roundabout	Arm	Demand	Arrivals	Entry Flow	Exit Flow	Circulating Flow	Pedestrian	Capacity	Saturation	RFC	Start	End Queue

		(PCE/hr)	(PCE)	(PCE/hr)	(PCE/hr)	(PCE/hr)	Demand (Ped/hr)	(PCE/hr)	Capacity (PCE/hr)		Queue (PCE)	(PCE)
1	1	639.92	159.98	638.55	837.97	13.47	0.00	2539.91	2466.91	0.252	0.00	0.34
1	2	60.23	15.06	59.95	10.49	641.54	0.00	938.62	33.62	0.064	0.00	0.07
1	3	893.72	223.43	891.16	455.97	245.52	0.00	2309.12	1954.31	0.387	0.00	0.64
1	4	42.91	10.73	42.70	327.93	808.75	0.00	857.90	395.31	0.050	0.00	0.05
2	1	449.10	112.27	448.11	893.03	43.45	0.00	2292.63	2204.34	0.196	0.00	0.25
2	2	100.88	25.22	100.43	25.49	466.06	0.00	1007.45	142.77	0.100	0.00	0.11
2	3	932.78	233.20	929.90	413.38	153.11	0.00	2247.36	2049.76	0.415	0.00	0.72
2	4	72.27	18.07	71.88	218.41	864.59	0.00	817.94	326.46	0.088	0.00	0.10
3	1	455.97	113.99	455.08	893.72	4.49	0.00	2546.09	2530.04	0.179	0.00	0.22
3	3	893.03	223.26	890.72	449.10	10.48	0.00	2468.02	2435.72	0.362	0.00	0.58
3	4	12.80	3.20	12.73	15.72	885.48	0.00	820.83	78.81	0.016	0.00	0.02

Main results: (8:15 AM-8:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	764.13	191.03	763.75	1006.41	16.15	0.00	2538.07	2466.91	0.301	0.34	0.44
1	2	71.92	17.98	71.83	12.56	767.34	0.00	877.85	33.62	0.082	0.07	0.09
1	3	1071.42	267.86	1070.38	545.40	293.78	0.00	2276.49	1954.31	0.471	0.64	0.90
1	4	51.24	12.81	51.17	392.77	971.38	0.00	779.33	395.31	0.066	0.05	0.07
2	1	538.01	134.50	537.75	1068.63	52.06	0.00	2286.98	2204.34	0.235	0.25	0.31
2	2	120.46	30.12	120.33	30.54	559.26	0.00	963.13	142.77	0.125	0.11	0.15
2	3	1113.84	278.46	1112.66	496.02	183.57	0.00	2227.20	2049.76	0.500	0.72	1.01
2	4	86.30	21.58	86.16	261.70	1034.53	0.00	737.13	326.46	0.117	0.10	0.13
3	1	545.40	136.35	545.17	1071.42	5.39	0.00	2545.47	2530.04	0.214	0.22	0.28
3	3	1068.63	267.16	1067.83	538.01	12.55	0.00	2466.62	2435.72	0.433	0.58	0.78
3	4	15.28	3.82	15.26	18.84	1061.55	0.00	735.77	78.81	0.021	0.02	0.02

Main results: (8:30 AM-8:45 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	935.87	233.97	935.24	1230.39	19.76	0.00	2535.58	2466.91	0.369	0.44	0.59

1	**2**	88.08	22.02	87.94	15.37	939.63	0.00	794.61	33.62	0.111	0.09	0.13
1	**3**	1310.67	327.67	1308.53	667.85	359.72	0.00	2231.91	1954.31	0.587	0.90	1.44
1	**4**	62.76	15.69	62.63	480.73	1187.52	0.00	674.91	395.31	0.093	0.07	0.10
2	**1**	658.73	164.68	658.33	1307.75	63.70	0.00	2279.35	2204.34	0.289	0.31	0.41
2	**2**	147.54	36.88	147.33	37.38	684.65	0.00	903.51	142.77	0.163	0.15	0.20
2	**3**	1364.16	341.04	1361.64	607.24	224.74	0.00	2199.95	2049.76	0.620	1.01	1.64
2	**4**	105.70	26.42	105.42	320.35	1266.03	0.00	627.05	326.46	0.169	0.13	0.20
3	**1**	667.85	166.96	667.51	1310.67	6.59	0.00	2544.64	2530.04	0.262	0.28	0.36
3	**3**	1307.75	326.94	1306.28	658.73	15.37	0.00	2464.72	2435.72	0.531	0.78	1.14
3	**4**	18.72	4.68	18.68	23.06	1298.59	0.00	621.25	78.81	0.030	0.02	0.03

Main results: (8:45 AM-9:00 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	935.87	233.97	935.86	1235.85	19.80	0.00	2535.55	2466.91	0.369	0.59	0.60
1	**2**	88.08	22.02	88.08	15.40	940.27	0.00	794.30	33.62	0.111	0.13	0.13
1	**3**	1314.54	328.63	1314.48	668.32	360.03	0.00	2231.70	1954.31	0.589	1.44	1.45
1	**4**	62.76	15.69	62.76	481.61	1192.89	0.00	672.31	395.31	0.093	0.10	0.10
2	**1**	659.53	164.88	659.52	1310.17	63.86	0.00	2279.24	2204.34	0.289	0.41	0.41
2	**2**	147.54	36.88	147.53	37.46	685.92	0.00	902.91	142.77	0.163	0.20	0.20
2	**3**	1364.16	341.04	1364.12	608.35	225.10	0.00	2199.71	2049.76	0.620	1.64	1.65
2	**4**	105.70	26.42	105.69	320.89	1268.34	0.00	625.96	326.46	0.169	0.20	0.21
3	**1**	668.32	167.08	668.31	1314.54	6.61	0.00	2544.63	2530.04	0.263	0.36	0.36
3	**3**	1310.17	327.54	1310.14	659.53	15.39	0.00	2464.70	2435.72	0.532	1.14	1.15
3	**4**	18.72	4.68	18.72	23.10	1302.43	0.00	619.39	78.81	0.030	0.03	0.03

Main results: (9:00 AM-9:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	764.13	191.03	764.75	1014.69	16.21	0.00	2538.02	2466.91	0.301	0.60	0.44
1	**2**	71.92	17.98	72.06	12.60	768.36	0.00	877.35	33.62	0.082	0.13	0.09
1	**3**	1077.28	269.32	1079.40	546.14	294.28	0.00	2276.15	1954.31	0.473	1.45	0.92
1	**4**	51.24	12.81	51.37	394.14	979.54	0.00	775.39	395.31	0.066	0.10	0.07

2	1	539.30	134.83	539.70	1072.23	52.30	0.00	2286.83	2204.34	0.236	0.41	0.32
2	2	120.46	30.12	120.67	30.67	561.32	0.00	962.15	142.77	0.125	0.20	0.15
2	3	1113.84	278.46	1116.34	497.84	184.15	0.00	2226.81	2049.76	0.500	1.65	1.03
2	4	86.30	21.58	86.58	262.55	1037.95	0.00	735.51	326.46	0.117	0.21	0.14
3	1	546.14	136.54	546.48	1077.28	5.41	0.00	2545.46	2530.04	0.215	0.36	0.28
3	3	1072.23	268.06	1073.69	539.30	12.58	0.00	2466.60	2435.72	0.435	1.15	0.79
3	4	15.28	3.82	15.32	18.90	1067.36	0.00	732.96	78.81	0.021	0.03	0.02

Main results: (9:15 AM-9:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	639.92	159.98	640.31	847.95	13.57	0.00	2539.84	2466.91	0.252	0.44	0.34
1	2	60.23	15.06	60.31	10.55	643.33	0.00	937.76	33.62	0.064	0.09	0.07
1	3	900.90	225.22	901.97	457.27	246.37	0.00	2308.54	1954.31	0.390	0.92	0.66
1	4	42.91	10.73	42.99	329.81	818.53	0.00	853.17	395.31	0.050	0.07	0.05
2	1	451.48	112.87	451.74	897.08	43.75	0.00	2292.44	2204.34	0.197	0.32	0.25
2	2	100.88	25.22	101.01	25.66	469.83	0.00	1005.66	142.77	0.100	0.15	0.11
2	3	932.78	233.20	933.99	416.69	154.15	0.00	2246.67	2049.76	0.415	1.03	0.73
2	4	72.27	18.07	72.42	219.73	868.40	0.00	816.13	326.46	0.089	0.14	0.10
3	1	457.27	114.32	457.49	900.90	4.52	0.00	2546.07	2530.04	0.180	0.28	0.22
3	3	897.08	224.27	897.89	451.48	10.53	0.00	2467.99	2435.72	0.363	0.79	0.58
3	4	12.80	3.20	12.82	15.82	892.60	0.00	817.39	78.81	0.016	0.02	0.02

Queueing Delay Results

Queueing Delay results: (8:00 AM-8:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	5.07	0.34	1.930	A	A
1	2	1.02	0.07	4.178	A	A
1	3	9.43	0.63	2.585	A	A
1	4	0.78	0.05	4.503	A	A
2	1	3.67	0.24	1.989	A	A

2	**2**	1.66	0.11	4.046	A	A
2	**3**	10.57	0.70	2.781	A	A
2	**4**	1.44	0.10	4.920	A	A
3	**1**	3.29	0.22	1.755	A	A
3	**3**	8.49	0.57	2.325	A	A
3	**4**	0.24	0.02	4.544	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	6.50	0.43	2.069	A	A
1	**2**	1.34	0.09	4.555	A	A
1	**3**	13.27	0.88	3.041	A	A
1	**4**	1.05	0.07	5.042	A	A
2	**1**	4.65	0.31	2.099	A	A
2	**2**	2.14	0.14	4.357	A	A
2	**3**	14.89	0.99	3.292	A	A
2	**4**	1.98	0.13	5.639	A	A
3	**1**	4.12	0.27	1.834	A	A
3	**3**	11.46	0.76	2.624	A	A
3	**4**	0.32	0.02	5.096	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	8.80	0.59	2.293	A	A
1	**2**	1.86	0.12	5.194	A	A
1	**3**	20.94	1.40	3.968	A	A
1	**4**	1.52	0.10	5.995	A	A
2	**1**	6.13	0.41	2.265	A	A
2	**2**	2.91	0.19	4.854	A	A
2	**3**	23.88	1.59	4.367	A	A
2	**4**	3.00	0.20	7.036	A	A
3	**1**	5.37	0.36	1.956	A	A

3	3	16.80	1.12	3.165	A	A
3	4	0.46	0.03	6.093	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	8.93	0.60	2.295	A	A
1	2	1.90	0.13	5.198	A	A
1	3	21.70	1.45	4.003	A	A
1	4	1.56	0.10	6.023	A	A
2	1	6.21	0.41	2.266	A	A
2	2	2.97	0.20	4.860	A	A
2	3	24.76	1.65	4.394	A	A
2	4	3.09	0.21	7.057	A	A
3	1	5.44	0.36	1.956	A	A
3	3	17.24	1.15	3.179	A	A
3	4	0.47	0.03	6.112	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	6.69	0.45	2.072	A	A
1	2	1.40	0.09	4.562	A	A
1	3	14.14	0.94	3.075	A	A
1	4	1.11	0.07	5.074	A	A
2	1	4.79	0.32	2.103	A	A
2	2	2.24	0.15	4.366	A	A
2	3	15.80	1.05	3.315	A	A
2	4	2.10	0.14	5.662	A	A
3	1	4.23	0.28	1.839	A	A
3	3	12.04	0.80	2.638	A	A
3	4	0.33	0.02	5.118	A	A

Queueing Delay results: (9:15 AM-9:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	5.22	0.35	1.934	A	A
1	2	1.07	0.07	4.186	A	A
1	3	10.00	0.67	2.612	A	A
1	4	0.83	0.06	4.532	A	A
2	1	3.80	0.25	1.996	A	A
2	2	1.74	0.12	4.060	A	A
2	3	11.11	0.74	2.801	A	A
2	4	1.52	0.10	4.939	A	A
3	1	3.39	0.23	1.760	A	A
3	3	8.90	0.59	2.339	A	A
3	4	0.25	0.02	4.563	A	A

Overview: Standard Roundabout Geometry

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
1	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
1	2	3.50	4.25	6.81	30.00	60.00	30.00	False	0.483	1248.557
1	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
1	4	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622
2	1	7.37	8.00	4.05	30.00	60.64	39.51	False	0.656	2321.138
2	2	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
2	3	7.47	8.00	3.89	30.00	60.71	37.92	False	0.662	2348.681
2	4	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
3	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
3	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
3	4	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622

Overview: Time Segment Results

Time Segment Results

Time Segment	Roundabout	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	1	1	639.92	2539.91	0.252	0.00	0.00	0.34	5.07	(0.00)	1.930
1	1	2	60.23	938.62	0.064	0.00	0.00	0.07	1.02	(0.00)	4.178
1	1	3	893.72	2309.12	0.387	0.00	0.00	0.64	9.43	(0.00)	2.585
1	1	4	42.91	857.90	0.050	0.00	0.00	0.05	0.78	(0.00)	4.503
1	2	1	449.10	2292.63	0.196	0.00	0.00	0.25	3.67	(0.00)	1.989
1	2	2	100.88	1007.45	0.100	0.00	0.00	0.11	1.66	(0.00)	4.046
1	2	3	932.78	2247.36	0.415	0.00	0.00	0.72	10.57	(0.00)	2.781
1	2	4	72.27	817.94	0.088	0.00	0.00	0.10	1.44	(0.00)	4.920
1	3	1	455.97	2546.09	0.179	0.00	0.00	0.22	3.29	(0.02)	1.755
1	3	3	893.03	2468.02	0.362	0.00	0.00	0.58	8.49	(0.02)	2.325
1	3	4	12.80	820.83	0.016	0.00	0.00	0.02	0.24	(0.02)	4.544
2	1	1	764.13	2538.07	0.301	0.00	0.34	0.44	6.50	(0.00)	2.069
2	1	2	71.92	877.85	0.082	0.00	0.07	0.09	1.34	(0.00)	4.555
2	1	3	1071.42	2276.49	0.471	0.00	0.64	0.90	13.27	(0.00)	3.041
2	1	4	51.24	779.33	0.066	0.00	0.05	0.07	1.05	(0.00)	5.042
2	2	1	538.01	2286.98	0.235	0.00	0.25	0.31	4.65	(0.00)	2.099
2	2	2	120.46	963.13	0.125	0.00	0.11	0.15	2.14	(0.00)	4.357
2	2	3	1113.84	2227.20	0.500	0.00	0.72	1.01	14.89	(0.00)	3.292
2	2	4	86.30	737.13	0.117	0.00	0.10	0.13	1.98	(0.00)	5.639
2	3	1	545.40	2545.47	0.214	0.00	0.22	0.28	4.12	(0.02)	1.834
2	3	3	1068.63	2466.62	0.433	0.00	0.58	0.78	11.46	(0.02)	2.624
2	3	4	15.28	735.77	0.021	0.00	0.02	0.02	0.32	(0.02)	5.096
3	1	1	935.87	2535.58	0.369	0.00	0.44	0.59	8.80	(0.00)	2.293
3	1	2	88.08	794.61	0.111	0.00	0.09	0.13	1.86	(0.00)	5.194
3	1	3	1310.67	2231.91	0.587	0.00	0.90	1.44	20.94	(0.00)	3.968
3	1	4	62.76	674.91	0.093	0.00	0.07	0.10	1.52	(0.00)	5.995
3	2	1	658.73	2279.35	0.289	0.00	0.31	0.41	6.13	(0.00)	2.265
3	2	2	147.54	903.51	0.163	0.00	0.15	0.20	2.91	(0.00)	4.854
3	2	3	1364.16	2199.95	0.620	0.00	1.01	1.64	23.88	(0.00)	4.367
3	2	4	105.70	627.05	0.169	0.00	0.13	0.20	3.00	(0.00)	7.036

3	**3**	**1**	667.85	2544.64	0.262	0.00	0.28	0.36	5.37	(0.02)	1.956
3	**3**	**3**	1307.75	2464.72	0.531	0.00	0.78	1.14	16.80	(0.02)	3.165
3	**3**	**4**	18.72	621.25	0.030	0.00	0.02	0.03	0.46	(0.02)	6.093
4	**1**	**1**	935.87	2535.55	0.369	0.00	0.59	0.60	8.93	(0.00)	2.295
4	**1**	**2**	88.08	794.30	0.111	0.00	0.13	0.13	1.90	(0.00)	5.198
4	**1**	**3**	1314.54	2231.70	0.589	0.00	1.44	1.45	21.70	(0.00)	4.003
4	**1**	**4**	62.76	672.31	0.093	0.00	0.10	0.10	1.56	(0.00)	6.023
4	**2**	**1**	659.53	2279.24	0.289	0.00	0.41	0.41	6.21	(0.00)	2.266
4	**2**	**2**	147.54	902.91	0.163	0.00	0.20	0.20	2.97	(0.00)	4.860
4	**2**	**3**	1364.16	2199.71	0.620	0.00	1.64	1.65	24.76	(0.00)	4.394
4	**2**	**4**	105.70	625.96	0.169	0.00	0.20	0.21	3.09	(0.00)	7.057
4	**3**	**1**	668.32	2544.63	0.263	0.00	0.36	0.36	5.44	(0.02)	1.956
4	**3**	**3**	1310.17	2464.70	0.532	0.00	1.14	1.15	17.24	(0.02)	3.179
4	**3**	**4**	18.72	619.39	0.030	0.00	0.03	0.03	0.47	(0.02)	6.112
5	**1**	**1**	764.13	2538.02	0.301	0.00	0.60	0.44	6.69	(0.00)	2.072
5	**1**	**2**	71.92	877.35	0.082	0.00	0.13	0.09	1.40	(0.00)	4.562
5	**1**	**3**	1077.28	2276.15	0.473	0.00	1.45	0.92	14.14	(0.00)	3.075
5	**1**	**4**	51.24	775.39	0.066	0.00	0.10	0.07	1.11	(0.00)	5.074
5	**2**	**1**	539.30	2286.83	0.236	0.00	0.41	0.32	4.79	(0.00)	2.103
5	**2**	**2**	120.46	962.15	0.125	0.00	0.20	0.15	2.24	(0.00)	4.366
5	**2**	**3**	1113.84	2226.81	0.500	0.00	1.65	1.03	15.80	(0.00)	3.315
5	**2**	**4**	86.30	735.51	0.117	0.00	0.21	0.14	2.10	(0.00)	5.662
5	**3**	**1**	546.14	2545.46	0.215	0.00	0.36	0.28	4.23	(0.02)	1.839
5	**3**	**3**	1072.23	2466.60	0.435	0.00	1.15	0.79	12.04	(0.02)	2.638
5	**3**	**4**	15.28	732.96	0.021	0.00	0.03	0.02	0.33	(0.02)	5.118
6	**1**	**1**	639.92	2539.84	0.252	0.00	0.44	0.34	5.22	(0.00)	1.934
6	**1**	**2**	60.23	937.76	0.064	0.00	0.09	0.07	1.07	(0.00)	4.186
6	**1**	**3**	900.90	2308.54	0.390	0.00	0.92	0.66	10.00	(0.00)	2.612
6	**1**	**4**	42.91	853.17	0.050	0.00	0.07	0.05	0.83	(0.00)	4.532
6	**2**	**1**	451.48	2292.44	0.197	0.00	0.32	0.25	3.80	(0.00)	1.996
6	**2**	**2**	100.88	1005.66	0.100	0.00	0.15	0.11	1.74	(0.00)	4.060
6	**2**	**3**	932.78	2246.67	0.415	0.00	1.03	0.73	11.11	(0.00)	2.801
6	**2**	**4**	72.27	816.13	0.089	0.00	0.14	0.10	1.52	(0.00)	4.939
6	**3**	**1**	457.27	2546.07	0.180	0.00	0.28	0.22	3.39	(0.02)	1.760

6	**3**	**3**	897.08	2467.99	0.363	0.00	0.79	0.58	8.90	(0.02)	2.339
6	**3**	**4**	12.80	817.39	0.016	0.00	0.02	0.02	0.25	(0.02)	4.563

Roundabout 2 - Arm 2	0.11	6.05	0.10	A
Roundabout 2 - Arm 3	0.59	2.62	0.37	A
Roundabout 2 - Arm 4	0.39	5.90	0.28	A
Roundabout 3 - Arm 1	0.78	2.55	0.43	A
Roundabout 3 - Arm 3	0.52	2.25	0.34	A
Roundabout 3 - Arm 4	0.05	4.54	0.05	A
	2031 Two_Lane with RT By-pass - 2031 AM			
Roundabout 1 - Arm 1	1.59	3.74	0.61	A
Roundabout 1 - Arm 2	0.33	9.80	0.24	A
Roundabout 1 - Arm 3	17.27	31.98	0.97	D
Roundabout 1 - Arm 4	0.51	14.85	0.34	B
Roundabout 2 - Arm 1	0.90	3.10	0.47	A
Roundabout 2 - Arm 2	0.41	7.42	0.29	A
Roundabout 2 - Arm 3	46.24	73.68	1.02	F
Roundabout 2 - Arm 4	2.24	36.45	0.71	E
Roundabout 3 - Arm 1	0.81	2.61	0.44	A
Roundabout 3 - Arm 3	4.80	8.91	0.83	A
Roundabout 3 - Arm 4	0.11	3.52	0.10	A
	2031 Two_Lane with RT By-pass - 2031 PM			
Roundabout 1 - Arm 1	3.17	6.40	0.76	A
Roundabout 1 - Arm 2	0.18	13.04	0.15	B
Roundabout 1 - Arm 3	1.60	3.99	0.61	A
Roundabout 1 - Arm 4	7.01	52.87	0.90	F
Roundabout 2 - Arm 1	5.59	11.61	0.85	B
Roundabout 2 - Arm 2	0.46	17.83	0.32	C
Roundabout 2 - Arm 3	1.38	4.09	0.58	A
Roundabout 2 - Arm 4	3.07	21.61	0.76	C
Roundabout 3 - Arm 1	2.59	5.28	0.72	A
Roundabout 3 - Arm 3	1.23	3.35	0.55	A
Roundabout 3 - Arm 4	0.20	2.72	0.16	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2021 AM - runs from 08:00:00 to 09:30:00
2021 PM - runs from 08:00:00 to 09:30:00
2031 AM - runs from 08:00:00 to 09:30:00
2031 PM - runs from 08:00:00 to 09:30:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	1/15/2014
Version	

Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	HMMG\rif43211
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	False

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
False	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A2 - 2021 Two_Lane Approach - D4 - 2021 PM,

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2021 Two_Lane Approach		True	False	(D1)	False	100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2021 PM,	2021 PM			False	True	False		08:00	09:30	90	15	Varies by Arm

Roundabout Network

Roundabout Type(s)

Roundabout	ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	1	Mayfield Rd_Heritage Rd	1,2,3,4	Standard	False	False	False
2	2	Mayfield Rd_Winston Churchill Blvd	1,2,3,4	Standard	False	False	False
3	3	Mayfield Rd_Sandalwood Parkway extension	1,3,4	Standard	False	False	False

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	((Mini-roundabouts only))

Arms

Arms

ID	Name	Description
1	Mayfield Rd WB	
2	Heritage Rd NB	
3	Mayfield Rd EB	
4	Heritage Rd SB	
1	Mayfield Rd WB	
2	Winston Churchill Rd SB	
3	Mayfield Rd EB	
4	Winston Churchill Bv NB	
1	Mayfield Rd WB	
3	Mayfield Rd EB	
4	Sandalwood Parkway extension NB	

Capacity Options

Roundabout	Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	**1**	0.00	3700.00	False	0.00
1	**2**	0.00	1850.00	False	0.00
1	**3**	0.00	3700.00	False	0.00
1	**4**	0.00	1850.00	False	0.00
2	**1**	0.00	3700.00	False	0.00
2	**2**	0.00	1850.00	False	0.00
2	**3**	0.00	3700.00	False	0.00
2	**4**	0.00	1850.00	False	0.00
3	**1**	0.00	99999.00	False	0.00
3	**3**	0.00	99999.00	False	0.00
3	**4**	0.00	99999.00	False	0.00

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only

1	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False
1	**2**	3.50	4.25	6.81	30.00	60.00	30.00	False
1	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
1	**4**	3.50	4.25	6.82	30.00	60.00	30.00	False
2	**1**	7.37	8.00	4.05	30.00	60.64	39.51	False
2	**2**	3.50	4.25	6.85	30.00	60.00	34.63	False
2	**3**	7.47	8.00	3.89	30.00	60.71	37.92	False
2	**4**	3.50	4.25	6.85	30.00	60.00	34.63	False
3	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False
3	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
3	**4**	3.50	4.25	6.82	30.00	60.00	30.00	False

Mini Roundabout Geometry

Roundabout	Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)

Large Roundabout Data

Roundabout	Arm	Circulating flow (PCE/hr)	Entry-to-exit separation (m)
1	**1**	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)

Pedestrian Crossings

Roundabout	Arm	Crossing Type
1	**1**	None
1	**2**	None
1	**3**	None

1	4	None
2	1	None
2	2	None
2	3	None
2	4	None
3	1	None
3	3	None
3	4	None

Unsignalled Pedestrian Crossing Crossings

Roundabout	Arm	Space between crossing and intersection entry (PCE)	Vehicles queueing on exit (PCE)	Central Refuge	Crossing Data Type	Crossing length (m)	Crossing time (s)	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)
1	1	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	2	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	3	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	4	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	1	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	2	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	3	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	4	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	1	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	3	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	4	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Signalled Pedestrian Crossing/ Adaptive Pedestrian Crossing Crossings

Roundabout	Arm	Yellow time preceding red (s)	Yellow time regarded as green (s)	Time from traffic red start to walk start (s)	Time period walk shown (s)	Clearance Period (s)	Traffic minimum green (s)	Space between crossing and intersection entry (PCE)
1	1	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	2	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	3	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	4	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	1	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	2	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	3	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	4	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	1	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	3	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	4	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Roundabout	Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)

1	**1**	False	((calculated))	((calculated))	0.688	2549.182
1	**2**	False	((calculated))	((calculated))	0.483	1248.557
1	**3**	False	((calculated))	((calculated))	0.676	2475.107
1	**4**	False	((calculated))	((calculated))	0.483	1248.622
2	**1**	False	((calculated))	((calculated))	0.656	2321.138
2	**2**	False	((calculated))	((calculated))	0.476	1229.075
2	**3**	False	((calculated))	((calculated))	0.662	2348.681
2	**4**	False	((calculated))	((calculated))	0.476	1229.075
3	**1**	False	((calculated))	((calculated))	0.688	2549.182
3	**3**	False	((calculated))	((calculated))	0.676	2475.107
3	**4**	False	((calculated))	((calculated))	0.483	1248.622

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
False	False	True	True	Truck Percentages	2.00	False	False	False	True	True

Entry Flows

General Flows Data

Roundabout	Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
1	**1**	ONE HOUR	True	1012.00	100.000	N/A
1	**2**	ONE HOUR	True	33.00	100.000	N/A
1	**3**	Linked Arm	False		N/A	N/A
1	**4**	ONE HOUR	True	266.00	100.000	N/A
2	**1**	Linked Arm	False		N/A	N/A
2	**2**	ONE HOUR	True	61.00	100.000	N/A
2	**3**	ONE HOUR	True	740.00	100.000	N/A
2	**4**	ONE HOUR	True	219.00	100.000	N/A
3	**1**	Linked Arm	False		N/A	N/A
3	**3**	Linked Arm	False		N/A	N/A
3	**4**	ONE HOUR	True	38.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Roundabout	Arm	Direct Demand Entry Flow	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow	Direct Demand Pedestrian Flow

			(PCE/hr)		(PCE/hr)	(Ped/hr)
1	1	1	761.89	761.89	N/A	N/A
1	1	2	24.84	24.84	N/A	N/A
1	1	3	0.00	0.00	N/A	N/A
1	1	4	200.26	200.26	N/A	N/A
1	2	1	0.00	0.00	N/A	N/A
1	2	2	45.92	45.92	N/A	N/A
1	2	3	557.11	557.11	N/A	N/A
1	2	4	164.87	164.87	N/A	N/A
1	3	1	0.00	0.00	N/A	N/A
1	3	3	0.00	0.00	N/A	N/A
1	3	4	28.61	28.61	N/A	N/A
2	1	1	909.77	909.77	N/A	N/A
2	1	2	29.67	29.67	N/A	N/A
2	1	3	0.00	0.00	N/A	N/A
2	1	4	239.13	239.13	N/A	N/A
2	2	1	0.00	0.00	N/A	N/A
2	2	2	54.84	54.84	N/A	N/A
2	2	3	665.24	665.24	N/A	N/A
2	2	4	196.88	196.88	N/A	N/A
2	3	1	0.00	0.00	N/A	N/A
2	3	3	0.00	0.00	N/A	N/A
2	3	4	34.16	34.16	N/A	N/A
3	1	1	1114.23	1114.23	N/A	N/A
3	1	2	36.33	36.33	N/A	N/A
3	1	3	0.00	0.00	N/A	N/A
3	1	4	292.87	292.87	N/A	N/A
3	2	1	0.00	0.00	N/A	N/A
3	2	2	67.16	67.16	N/A	N/A
3	2	3	814.76	814.76	N/A	N/A
3	2	4	241.12	241.12	N/A	N/A
3	3	1	0.00	0.00	N/A	N/A
3	3	3	0.00	0.00	N/A	N/A
3	3	4	41.84	41.84	N/A	N/A
4	1	1	1114.23	1114.23	N/A	N/A
4	1	2	36.33	36.33	N/A	N/A
4	1	3	0.00	0.00	N/A	N/A
4	1	4	292.87	292.87	N/A	N/A
4	2	1	0.00	0.00	N/A	N/A
4	2	2	67.16	67.16	N/A	N/A
4	2	3	814.76	814.76	N/A	N/A
4	2	4	241.12	241.12	N/A	N/A
4	3	1	0.00	0.00	N/A	N/A
4	3	3	0.00	0.00	N/A	N/A
4	3	4	41.84	41.84	N/A	N/A
5	1	1	909.77	909.77	N/A	N/A
5	1	2	29.67	29.67	N/A	N/A

5	**1**	**3**	0.00	0.00	N/A	N/A
5	**1**	**4**	239.13	239.13	N/A	N/A
5	**2**	**1**	0.00	0.00	N/A	N/A
5	**2**	**2**	54.84	54.84	N/A	N/A
5	**2**	**3**	665.24	665.24	N/A	N/A
5	**2**	**4**	196.88	196.88	N/A	N/A
5	**3**	**1**	0.00	0.00	N/A	N/A
5	**3**	**3**	0.00	0.00	N/A	N/A
5	**3**	**4**	34.16	34.16	N/A	N/A
6	**1**	**1**	761.89	761.89	N/A	N/A
6	**1**	**2**	24.84	24.84	N/A	N/A
6	**1**	**3**	0.00	0.00	N/A	N/A
6	**1**	**4**	200.26	200.26	N/A	N/A
6	**2**	**1**	0.00	0.00	N/A	N/A
6	**2**	**2**	45.92	45.92	N/A	N/A
6	**2**	**3**	557.11	557.11	N/A	N/A
6	**2**	**4**	164.87	164.87	N/A	N/A
6	**3**	**1**	0.00	0.00	N/A	N/A
6	**3**	**3**	0.00	0.00	N/A	N/A
6	**3**	**4**	28.61	28.61	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Roundabout 1 (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	11.000	947.000	54.000
	2	8.000	0.000	5.000	20.000
	3	781.000	10.000	0.000	14.000
	4	141.000	77.000	48.000	0.000

Turning Proportions (PCE) - Roundabout 1 (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.00	0.01	0.94	0.05
	2	0.24	0.00	0.15	0.61
	3	0.97	0.01	0.00	0.02
	4	0.53	0.29	0.18	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 2 (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	0.000	8.000	856.000	146.000
	2	5.000	0.000	22.000	34.000
	3	671.000	23.000	0.000	46.000

	4	79.000	72.000	68.000	0.000

Turning Proportions (PCE) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.85	0.14
	2	0.08	0.00	0.36	0.56
	3	0.91	0.03	0.00	0.06
	4	0.36	0.33	0.31	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.000	985.000	13.000
	3	728.000	0.000	7.000
	4	25.000	13.000	0.000

Turning Proportions (PCE) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.00	0.99	0.01
	3	0.99	0.00	0.01
	4	0.66	0.34	0.00

Vehicle Mix

Average PCE Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020
	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 2 (for whole period)

	To

		1	2	3	4
From	1	1.020	1.020	1.020	1.020
	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 2 (for whole period)

	To				
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 3 (for whole period)

	To			
		1	3	4
From	1	1.020	1.020	1.020
	3	1.020	1.020	1.020
	4	1.020	1.020	1.020

Truck Percentages - Roundabout 3 (for whole period)

	To			
		1	3	4
From	1	2.000	2.000	2.000
	3	2.000	2.000	2.000
	4	2.000	2.000	2.000

Results

Results Summary

Roundabout	Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
1	1	0.46	2.75	0.85	A	928.63	1392.94	56.70	2.44	0.63	56.70	2.44	0.688	2549.182
1	2	0.05	5.61	0.06	A	30.28	45.42	3.76	4.97	0.04	3.76	4.97	0.483	1248.557
1	3	0.35	2.35	0.55	A	708.67	1063.01	38.34	2.16	0.43	38.34	2.16	0.676	2475.107
1	4	0.35	6.70	0.54	A	244.09	366.13	34.75	5.69	0.39	34.75	5.70	0.483	1248.622
2	1	0.50	3.33	1.01	A	916.99	1375.48	66.19	2.89	0.74	66.19	2.89	0.656	2321.138

2	**2**	0.10	6.05	0.11	A	55.97	83.96	7.40	5.29	0.08	7.40	5.29	0.476	1229.075
2	**3**	0.37	2.62	0.59	A	679.04	1018.56	40.56	2.39	0.45	40.56	2.39	0.662	2348.681
2	**4**	0.28	5.90	0.39	A	200.96	301.44	26.04	5.18	0.29	26.04	5.18	0.476	1229.075
3	**1**	0.43	2.55	0.78	A	917.30	1375.95	52.73	2.30	0.59	52.73	2.30	0.688	2549.182
3	**3**	0.34	2.25	0.52	A	692.55	1038.82	36.16	2.09	0.40	36.16	2.09	0.676	2475.107
3	**4**	0.05	4.54	0.05	A	34.87	52.30	3.66	4.20	0.04	3.66	4.20	0.483	1248.622

Main Results

Main results: (8:00 AM-8:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	761.89	190.47	760.08	672.11	100.79	0.00	2479.80	2488.98	0.307	0.00	0.45
1	**2**	24.84	6.21	24.72	73.10	787.77	0.00	867.98	48.39	0.029	0.00	0.03
1	**3**	579.02	144.76	577.75	750.96	61.54	0.00	2433.50	2357.56	0.238	0.00	0.32
1	**4**	200.26	50.06	199.21	65.59	573.70	0.00	971.46	123.78	0.206	0.00	0.26
2	**1**	749.24	187.31	747.20	566.88	122.15	0.00	2241.00	2153.57	0.334	0.00	0.51
2	**2**	45.92	11.48	45.69	77.13	792.22	0.00	852.36	169.00	0.054	0.00	0.06
2	**3**	557.11	139.28	555.78	700.69	137.22	0.00	2257.87	2071.16	0.247	0.00	0.33
2	**4**	164.87	41.22	164.05	168.03	524.98	0.00	979.44	298.83	0.168	0.00	0.21
3	**1**	750.96	187.74	749.25	579.02	9.75	0.00	2542.47	2531.54	0.295	0.00	0.43
3	**3**	566.88	141.72	565.67	749.24	9.76	0.00	2468.51	2452.81	0.230	0.00	0.30
3	**4**	28.61	7.15	28.49	15.15	560.28	0.00	977.94	74.91	0.029	0.00	0.03

Main results: (8:15 AM-8:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	909.77	227.44	909.20	806.64	120.81	0.00	2466.02	2488.98	0.369	0.45	0.59
1	**2**	29.67	7.42	29.63	87.61	942.40	0.00	793.28	48.39	0.037	0.03	0.04
1	**3**	693.94	173.49	693.58	898.37	73.65	0.00	2425.31	2357.56	0.286	0.32	0.41
1	**4**	239.13	59.78	238.75	78.53	688.70	0.00	915.90	123.78	0.261	0.26	0.36
2	**1**	897.83	224.46	897.13	678.28	146.35	0.00	2225.12	2153.57	0.404	0.51	0.69
2	**2**	54.84	13.71	54.76	92.41	951.07	0.00	776.82	169.00	0.071	0.06	0.08
2	**3**	665.24	166.31	664.86	841.13	164.69	0.00	2239.69	2071.16	0.297	0.33	0.43
2	**4**	196.88	49.22	196.61	201.54	628.02	0.00	930.44	298.83	0.212	0.21	0.27
3	**1**	898.37	224.59	897.85	693.94	11.68	0.00	2541.14	2531.54	0.354	0.43	0.56
3	**3**	678.28	169.57	677.95	897.83	11.70	0.00	2467.20	2452.81	0.275	0.30	0.39
3	**4**	34.16	8.54	34.13	18.15	671.49	0.00	924.21	74.91	0.037	0.03	0.04

Main results: (8:30 AM-8:45 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow	Exit Flow	Circulating Flow	Pedestrian Demand	Capacity (PCE/hr)	Saturation Capacity	RFC	Start Queue	End Queue

				(PCE/hr)	(PCE/hr)	(PCE/hr)	(Ped/hr)		(PCE/hr)		(PCE)	(PCE)
1	1	1114.23	278.56	1113.22	987.33	147.83	0.00	2447.42	2488.98	0.455	0.59	0.85
1	2	36.33	9.08	36.27	107.22	1153.84	0.00	691.13	48.39	0.053	0.04	0.06
1	3	849.56	212.39	848.99	1099.93	90.17	0.00	2414.14	2357.56	0.352	0.41	0.55
1	4	292.87	73.22	292.15	96.15	843.01	0.00	841.35	123.78	0.348	0.36	0.54
2	1	1099.03	274.76	1097.74	830.50	179.14	0.00	2203.61	2153.57	0.499	0.69	1.01
2	2	67.16	16.79	67.02	113.11	1163.77	0.00	675.68	169.00	0.099	0.08	0.11
2	3	814.76	203.69	814.11	1029.26	201.53	0.00	2215.31	2071.16	0.368	0.43	0.59
2	4	241.12	60.28	240.64	246.65	769.00	0.00	863.40	298.83	0.279	0.27	0.39
3	1	1099.93	274.98	1099.05	849.56	14.29	0.00	2539.34	2531.54	0.433	0.56	0.78
3	3	830.50	207.63	829.98	1099.03	14.32	0.00	2465.43	2452.81	0.337	0.39	0.52
3	4	41.84	10.46	41.78	22.22	822.07	0.00	851.46	74.91	0.049	0.04	0.05

Main results: (8:45 AM-9:00 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	1114.23	278.56	1114.22	989.53	148.19	0.00	2447.17	2488.98	0.455	0.85	0.85
1	2	36.33	9.08	36.33	107.46	1154.96	0.00	690.58	48.39	0.053	0.06	0.06
1	3	850.86	212.72	850.86	1101.01	90.28	0.00	2414.07	2357.56	0.352	0.55	0.55
1	4	292.87	73.22	292.86	96.27	844.87	0.00	840.45	123.78	0.348	0.54	0.54
2	1	1100.97	275.24	1100.94	831.26	179.46	0.00	2203.40	2153.57	0.500	1.01	1.01
2	2	67.16	16.79	67.16	113.31	1167.09	0.00	674.10	169.00	0.100	0.11	0.11
2	3	814.76	203.69	814.75	1032.16	202.08	0.00	2214.95	2071.16	0.368	0.59	0.59
2	4	241.12	60.28	241.12	247.23	769.61	0.00	863.11	298.83	0.279	0.39	0.39
3	1	1101.01	275.25	1101.00	850.86	14.31	0.00	2539.33	2531.54	0.434	0.78	0.78
3	3	831.26	207.82	831.26	1100.97	14.34	0.00	2465.41	2452.81	0.337	0.52	0.52
3	4	41.84	10.46	41.84	22.26	823.34	0.00	850.85	74.91	0.049	0.05	0.05

Main results: (9:00 AM-9:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	909.77	227.44	910.77	810.18	121.36	0.00	2465.64	2488.98	0.369	0.85	0.60
1	2	29.67	7.42	29.73	87.98	944.15	0.00	792.43	48.39	0.037	0.06	0.04
1	3	696.04	174.01	696.60	900.06	73.83	0.00	2425.20	2357.56	0.287	0.55	0.41
1	4	239.13	59.78	239.84	78.73	691.70	0.00	914.45	123.78	0.262	0.54	0.36
2	1	900.90	225.22	902.16	679.49	146.85	0.00	2224.79	2153.57	0.405	1.01	0.70
2	2	54.84	13.71	54.97	92.72	956.29	0.00	774.34	169.00	0.071	0.11	0.08
2	3	665.24	166.31	665.88	845.71	165.56	0.00	2239.12	2071.16	0.297	0.59	0.43
2	4	196.88	49.22	197.35	202.45	629.00	0.00	929.98	298.83	0.212	0.39	0.28
3	1	900.06	225.01	900.93	696.04	11.70	0.00	2541.12	2531.54	0.354	0.78	0.56
3	3	679.49	169.87	680.00	900.90	11.74	0.00	2467.17	2452.81	0.275	0.52	0.39
3	4	34.16	8.54	34.21	18.21	673.53	0.00	923.23	74.91	0.037	0.05	0.04

Main results: (9:15 AM-9:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)

1	**1**	761.89	190.47	762.47	677.98	101.53	0.00	2479.29	2488.98	0.307	0.60	0.45
1	**2**	24.84	6.21	24.88	73.61	790.39	0.00	866.71	48.39	0.029	0.04	0.03
1	**3**	582.61	145.65	582.97	753.47	61.80	0.00	2433.33	2357.56	0.239	0.41	0.32
1	**4**	200.26	50.06	200.65	65.90	578.87	0.00	968.96	123.78	0.207	0.36	0.27
2	**1**	753.97	188.49	754.68	568.86	122.90	0.00	2240.51	2153.57	0.337	0.70	0.52
2	**2**	45.92	11.48	46.00	77.60	799.98	0.00	848.67	169.00	0.054	0.08	0.06
2	**3**	557.11	139.28	557.50	707.48	138.50	0.00	2257.02	2071.16	0.247	0.43	0.34
2	**4**	164.87	41.22	165.15	169.39	526.62	0.00	978.66	298.83	0.168	0.28	0.21
3	**1**	753.47	188.37	753.99	582.61	9.80	0.00	2542.44	2531.54	0.296	0.56	0.43
3	**3**	568.86	142.22	569.19	753.97	9.82	0.00	2468.47	2452.81	0.230	0.39	0.31
3	**4**	28.61	7.15	28.64	15.24	563.77	0.00	976.25	74.91	0.029	0.04	0.03

Queueing Delay Results

Queueing Delay results: (8:00 AM-8:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	6.66	0.44	2.133	A	A
1	**2**	0.44	0.03	4.354	A	A
1	**3**	4.70	0.31	1.978	A	A
1	**4**	3.84	0.26	4.749	A	A
2	**1**	7.52	0.50	2.455	A	A
2	**2**	0.85	0.06	4.551	A	A
2	**3**	4.92	0.33	2.157	A	A
2	**4**	3.00	0.20	4.498	A	A
3	**1**	6.30	0.42	2.046	A	A
3	**3**	4.49	0.30	1.929	A	A
3	**4**	0.45	0.03	3.867	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	8.79	0.59	2.359	A	A
1	**2**	0.58	0.04	4.808	A	A
1	**3**	6.05	0.40	2.120	A	A
1	**4**	5.25	0.35	5.421	A	A
2	**1**	10.14	0.68	2.763	A	A
2	**2**	1.14	0.08	5.085	A	A
2	**3**	6.37	0.42	2.331	A	A
2	**4**	4.00	0.27	5.003	A	A
3	**1**	8.23	0.55	2.234	A	A
3	**3**	5.72	0.38	2.052	A	A
3	**4**	0.58	0.04	4.125	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	12.50	0.83	2.751	A	A

1	2	0.83	0.06	5.607	A	A
1	3	8.17	0.54	2.346	A	A
1	4	7.85	0.52	6.678	A	A
2	1	14.80	0.99	3.318	A	A
2	2	1.64	0.11	6.031	A	A
2	3	8.73	0.58	2.619	A	A
2	4	5.74	0.38	5.896	A	A
3	1	11.45	0.76	2.548	A	A
3	3	7.65	0.51	2.245	A	A
3	4	0.77	0.05	4.535	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	12.74	0.85	2.754	A	A
1	2	0.85	0.06	5.611	A	A
1	3	8.30	0.55	2.348	A	A
1	4	8.11	0.54	6.705	A	A
2	1	15.18	1.01	3.330	A	A
2	2	1.68	0.11	6.049	A	A
2	3	8.87	0.59	2.621	A	A
2	4	5.89	0.39	5.903	A	A
3	1	11.66	0.78	2.552	A	A
3	3	7.76	0.52	2.246	A	A
3	4	0.79	0.05	4.538	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	9.12	0.61	2.362	A	A
1	2	0.61	0.04	4.814	A	A
1	3	6.25	0.42	2.124	A	A
1	4	5.60	0.37	5.450	A	A
2	1	10.65	0.71	2.778	A	A
2	2	1.20	0.08	5.104	A	A
2	3	6.58	0.44	2.334	A	A
2	4	4.23	0.28	5.014	A	A
3	1	8.54	0.57	2.241	A	A
3	3	5.90	0.39	2.056	A	A
3	4	0.60	0.04	4.131	A	A

Queueing Delay results: (9:15 AM-9:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	6.89	0.46	2.140	A	A
1	2	0.46	0.03	4.363	A	A
1	3	4.88	0.33	1.984	A	A
1	4	4.09	0.27	4.781	A	A

2	1	7.90	0.53	2.472	A	A
2	2	0.89	0.06	4.574	A	A
2	3	5.09	0.34	2.160	A	A
2	4	3.18	0.21	4.514	A	A
3	1	6.54	0.44	2.055	A	A
3	3	4.64	0.31	1.933	A	A
3	4	0.47	0.03	3.874	A	A

Overview: Standard Roundabout Geometry

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
1	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
1	2	3.50	4.25	6.81	30.00	60.00	30.00	False	0.483	1248.557
1	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
1	4	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622
2	1	7.37	8.00	4.05	30.00	60.64	39.51	False	0.656	2321.138
2	2	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
2	3	7.47	8.00	3.89	30.00	60.71	37.92	False	0.662	2348.681
2	4	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
3	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
3	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
3	4	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622

Overview: Time Segment Results

Time Segment Results

Time Segment	Roundabout	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	1	1	761.89	2479.80	0.307	0.00	0.00	0.45	6.66	(0.00)	2.133
1	1	2	24.84	867.98	0.029	0.00	0.00	0.03	0.44	(0.00)	4.354
1	1	3	579.02	2433.50	0.238	0.00	0.00	0.32	4.70	(0.00)	1.978
1	1	4	200.26	971.46	0.206	0.00	0.00	0.26	3.84	(0.00)	4.749
1	2	1	749.24	2241.00	0.334	0.00	0.00	0.51	7.52	(0.00)	2.455
1	2	2	45.92	852.36	0.054	0.00	0.00	0.06	0.85	(0.00)	4.551
1	2	3	557.11	2257.87	0.247	0.00	0.00	0.33	4.92	(0.00)	2.157
1	2	4	164.87	979.44	0.168	0.00	0.00	0.21	3.00	(0.00)	4.498
1	3	1	750.96	2542.47	0.295	0.00	0.00	0.43	6.30	(0.02)	2.046
1	3	3	566.88	2468.51	0.230	0.00	0.00	0.30	4.49	(0.02)	1.929
1	3	4	28.61	977.94	0.029	0.00	0.00	0.03	0.45	(0.02)	3.867
2	1	1	909.77	2466.02	0.369	0.00	0.45	0.59	8.79	(0.00)	2.359

2	1	2	29.67	793.28	0.037	0.00	0.03	0.04	0.58	(0.00)	4.808
2	1	3	693.94	2425.31	0.286	0.00	0.32	0.41	6.05	(0.00)	2.120
2	1	4	239.13	915.90	0.261	0.00	0.26	0.36	5.25	(0.00)	5.421
2	2	1	897.83	2225.12	0.404	0.00	0.51	0.69	10.14	(0.00)	2.763
2	2	2	54.84	776.82	0.071	0.00	0.06	0.08	1.14	(0.00)	5.085
2	2	3	665.24	2239.69	0.297	0.00	0.33	0.43	6.37	(0.00)	2.331
2	2	4	196.88	930.44	0.212	0.00	0.21	0.27	4.00	(0.00)	5.003
2	3	1	898.37	2541.14	0.354	0.00	0.43	0.56	8.23	(0.02)	2.234
2	3	3	678.28	2467.20	0.275	0.00	0.30	0.39	5.72	(0.02)	2.052
2	3	4	34.16	924.21	0.037	0.00	0.03	0.04	0.58	(0.02)	4.125
3	1	1	1114.23	2447.42	0.455	0.00	0.59	0.85	12.50	(0.00)	2.751
3	1	2	36.33	691.13	0.053	0.00	0.04	0.06	0.83	(0.00)	5.607
3	1	3	849.56	2414.14	0.352	0.00	0.41	0.55	8.17	(0.00)	2.346
3	1	4	292.87	841.35	0.348	0.00	0.36	0.54	7.85	(0.00)	6.678
3	2	1	1099.03	2203.61	0.499	0.00	0.69	1.01	14.80	(0.00)	3.318
3	2	2	67.16	675.68	0.099	0.00	0.08	0.11	1.64	(0.00)	6.031
3	2	3	814.76	2215.31	0.368	0.00	0.43	0.59	8.73	(0.00)	2.619
3	2	4	241.12	863.40	0.279	0.00	0.27	0.39	5.74	(0.00)	5.896
3	3	1	1099.93	2539.34	0.433	0.00	0.56	0.78	11.45	(0.02)	2.548
3	3	3	830.50	2465.43	0.337	0.00	0.39	0.52	7.65	(0.02)	2.245
3	3	4	41.84	851.46	0.049	0.00	0.04	0.05	0.77	(0.02)	4.535
4	1	1	1114.23	2447.17	0.455	0.00	0.85	0.85	12.74	(0.00)	2.754
4	1	2	36.33	690.58	0.053	0.00	0.06	0.06	0.85	(0.00)	5.611
4	1	3	850.86	2414.07	0.352	0.00	0.55	0.55	8.30	(0.00)	2.348
4	1	4	292.87	840.45	0.348	0.00	0.54	0.54	8.11	(0.00)	6.705
4	2	1	1100.97	2203.40	0.500	0.00	1.01	1.01	15.18	(0.00)	3.330
4	2	2	67.16	674.10	0.100	0.00	0.11	0.11	1.68	(0.00)	6.049
4	2	3	814.76	2214.95	0.368	0.00	0.59	0.59	8.87	(0.00)	2.621
4	2	4	241.12	863.11	0.279	0.00	0.39	0.39	5.89	(0.00)	5.903
4	3	1	1101.01	2539.33	0.434	0.00	0.78	0.78	11.66	(0.02)	2.552
4	3	3	831.26	2465.41	0.337	0.00	0.52	0.52	7.76	(0.02)	2.246
4	3	4	41.84	850.85	0.049	0.00	0.05	0.05	0.79	(0.02)	4.538
5	1	1	909.77	2465.64	0.369	0.00	0.85	0.60	9.12	(0.00)	2.362
5	1	2	29.67	792.43	0.037	0.00	0.06	0.04	0.61	(0.00)	4.814
5	1	3	696.04	2425.20	0.287	0.00	0.55	0.41	6.25	(0.00)	2.124
5	1	4	239.13	914.45	0.262	0.00	0.54	0.36	5.60	(0.00)	5.450
5	2	1	900.90	2224.79	0.405	0.00	1.01	0.70	10.65	(0.00)	2.778
5	2	2	54.84	774.34	0.071	0.00	0.11	0.08	1.20	(0.00)	5.104
5	2	3	665.24	2239.12	0.297	0.00	0.59	0.43	6.58	(0.00)	2.334
5	2	4	196.88	929.98	0.212	0.00	0.39	0.28	4.23	(0.00)	5.014
5	3	1	900.06	2541.12	0.354	0.00	0.78	0.56	8.54	(0.02)	2.241
5	3	3	679.49	2467.17	0.275	0.00	0.52	0.39	5.90	(0.02)	2.056
5	3	4	34.16	923.23	0.037	0.00	0.05	0.04	0.60	(0.02)	4.131
6	1	1	761.89	2479.29	0.307	0.00	0.60	0.45	6.89	(0.00)	2.140
6	1	2	24.84	866.71	0.029	0.00	0.04	0.03	0.46	(0.00)	4.363
6	1	3	582.61	2433.33	0.239	0.00	0.41	0.32	4.88	(0.00)	1.984
6	1	4	200.26	968.96	0.207	0.00	0.36	0.27	4.09	(0.00)	4.781

6	**2**	**1**	753.97	2240.51	0.337	0.00	0.70	0.52	7.90	(0.00)	2.472
6	**2**	**2**	45.92	848.67	0.054	0.00	0.08	0.06	0.89	(0.00)	4.574
6	**2**	**3**	557.11	2257.02	0.247	0.00	0.43	0.34	5.09	(0.00)	2.160
6	**2**	**4**	164.87	978.66	0.168	0.00	0.28	0.21	3.18	(0.00)	4.514
6	**3**	**1**	753.47	2542.44	0.296	0.00	0.56	0.43	6.54	(0.02)	2.055
6	**3**	**3**	568.86	2468.47	0.230	0.00	0.39	0.31	4.64	(0.02)	1.933
6	**3**	**4**	28.61	976.25	0.029	0.00	0.04	0.03	0.47	(0.02)	3.874

ARCADY 7

Version: 7.1.0.228 [21st Feb 2011]

For sales and distribution information, program advice and maintenance, contact TRL:
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File: C:\MAYFIELD ROAD EA - 314225\ROUNDABOUT\Mayfield Rd Roundabouts\ARCADY\NEW\Mayfield Rd 2014 02 07_with T intersection & only 2 Scenarios.arc7
Report generation date: 11/28/2014 5:28:16 PM

Summary of roundabout performance

	Queue (PCE)	Delay (s)	RFC	LOS
	2021 Two_Lane Approach - 2021 AM			
Roundabout 1 - Arm 1	0.60	2.29	0.37	A
Roundabout 1 - Arm 2	0.13	5.20	0.11	A
Roundabout 1 - Arm 3	1.45	4.00	0.59	A
Roundabout 1 - Arm 4	0.10	6.02	0.09	A
Roundabout 2 - Arm 1	0.41	2.27	0.29	A
Roundabout 2 - Arm 2	0.20	4.86	0.16	A
Roundabout 2 - Arm 3	1.65	4.39	0.62	A
Roundabout 2 - Arm 4	0.21	7.06	0.17	A
Roundabout 3 - Arm 1	0.36	1.96	0.26	A
Roundabout 3 - Arm 3	1.15	3.18	0.53	A
Roundabout 3 - Arm 4	0.03	6.11	0.03	A
	2021 Two_Lane Approach - 2021 PM			
Roundabout 1 - Arm 1	0.85	2.75	0.46	A
Roundabout 1 - Arm 2	0.06	5.61	0.05	A
Roundabout 1 - Arm 3	0.55	2.35	0.35	A
Roundabout 1 - Arm 4	0.54	6.70	0.35	A
Roundabout 2 - Arm 1	1.01	3.33	0.50	A

Roundabout 2 - Arm 2	0.11	6.05	0.10	A
Roundabout 2 - Arm 3	0.59	2.62	0.37	A
Roundabout 2 - Arm 4	0.39	5.90	0.28	A
Roundabout 3 - Arm 1	0.78	2.55	0.43	A
Roundabout 3 - Arm 3	0.52	2.25	0.34	A
Roundabout 3 - Arm 4	0.05	4.54	0.05	A
	2031 Two_Lane with RT By-pass - 2031 AM			
Roundabout 1 - Arm 1	1.59	3.74	0.61	A
Roundabout 1 - Arm 2	0.33	9.80	0.24	A
Roundabout 1 - Arm 3	17.27	31.98	0.97	D
Roundabout 1 - Arm 4	0.51	14.85	0.34	B
Roundabout 2 - Arm 1	0.90	3.10	0.47	A
Roundabout 2 - Arm 2	0.41	7.42	0.29	A
Roundabout 2 - Arm 3	46.24	73.68	1.02	F
Roundabout 2 - Arm 4	2.24	36.45	0.71	E
Roundabout 3 - Arm 1	0.81	2.61	0.44	A
Roundabout 3 - Arm 3	4.80	8.91	0.83	A
Roundabout 3 - Arm 4	0.11	3.52	0.10	A
	2031 Two_Lane with RT By-pass - 2031 PM			
Roundabout 1 - Arm 1	3.17	6.40	0.76	A
Roundabout 1 - Arm 2	0.18	13.04	0.15	B
Roundabout 1 - Arm 3	1.60	3.99	0.61	A
Roundabout 1 - Arm 4	7.01	52.87	0.90	F
Roundabout 2 - Arm 1	5.59	11.61	0.85	B
Roundabout 2 - Arm 2	0.46	17.83	0.32	C
Roundabout 2 - Arm 3	1.38	4.09	0.58	A
Roundabout 2 - Arm 4	3.07	21.61	0.76	C
Roundabout 3 - Arm 1	2.59	5.28	0.72	A
Roundabout 3 - Arm 3	1.23	3.35	0.55	A
Roundabout 3 - Arm 4	0.20	2.72	0.16	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2021 AM - runs from 08:00:00 to 09:30:00
2021 PM - runs from 08:00:00 to 09:30:00
2031 AM - runs from 08:00:00 to 09:30:00
2031 PM - runs from 08:00:00 to 09:30:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	1/15/2014
Version	

Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	HMMG\rif43211
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	False

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
False	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A4 - 2031 Two_Lane with RT By-pass - D5 - 2031 AM,

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2031 Two_Lane with RT By-pass		True	False	(D1)	False	100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031 AM,	2031 AM			False	True	False		08:00	09:30	90	15	Varies by Arm

Roundabout Network

Roundabout Type(s)

Roundabout	ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	1	Mayfield Rd_Heritage Rd	1,2,3,4	Standard	False	False	False
2	2	Mayfield Rd_Winston Churchill Blvd	1,2,3,4	Standard	False	False	False
3	3	Mayfield Rd_Sandalwood Parkway extension	1,3,4	Standard	False	False	False

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	((Mini-roundabouts only))

Arms

Arms

ID	Name	Description
1	Mayfield Rd WB	
2	Heritage Rd NB	
3	Mayfield Rd EB	
4	Heritage Rd SB	
1	Mayfield Rd WB	
2	Winston Churchill Rd SB	
3	Mayfield Rd EB	
4	Winston Churchill Bv NB	
1	Mayfield Rd WB	
3	Mayfield Rd EB	
4	Sandalwood Parkway extension NB	

Capacity Options

Roundabout	Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	**1**	0.00	3700.00	False	0.00
1	**2**	0.00	1850.00	False	0.00
1	**3**	0.00	3700.00	False	0.00
1	**4**	0.00	1850.00	False	0.00
2	**1**	0.00	3700.00	False	0.00
2	**2**	0.00	1850.00	False	0.00
2	**3**	0.00	3700.00	False	0.00
2	**4**	0.00	1850.00	False	0.00
3	**1**	0.00	99999.00	False	0.00
3	**3**	0.00	99999.00	False	0.00
3	**4**	0.00	99999.00	False	0.00

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False

1	**2**	3.50	4.25	6.81	30.00	60.00	30.00	False
1	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
1	**4**	3.50	4.25	6.82	30.00	60.00	30.00	False
2	**1**	7.37	8.00	4.05	30.00	60.64	39.51	False
2	**2**	3.50	4.25	6.85	30.00	60.00	34.63	False
2	**3**	7.47	8.00	3.89	30.00	60.71	37.92	False
2	**4**	3.50	4.25	6.85	30.00	60.00	34.63	False
3	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False
3	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
3	**4**	7.00	8.00	10.12	31.40	64.19	19.93	False

Mini Roundabout Geometry

Roundabout	Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)

Large Roundabout Data

Roundabout	Arm	Circulating flow (PCE/hr)	Entry-to-exit separation (m)
1	**1**	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)

Pedestrian Crossings

Roundabout	Arm	Crossing Type
1	**1**	None
1	**2**	None
1	**3**	None
1	**4**	None

2	**1**	None
2	**2**	None
2	**3**	None
2	**4**	None
3	**1**	None
3	**3**	None
3	**4**	None

Unsignalled Pedestrian Crossing Crossings

Roundabout	Arm	Space between crossing and intersection entry (PCE)	Vehicles queueing on exit (PCE)	Central Refuge	Crossing Data Type	Crossing length (m)	Crossing time (s)	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)
1	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Signalled Pedestrian Crossing/ Adaptive Pedestrian Crossing Crossings

Roundabout	Arm	Yellow time preceding red (s)	Yellow time regarded as green (s)	Time from traffic red start to walk start (s)	Time period walk shown (s)	Clearance Period (s)	Traffic minimum green (s)	Space between crossing and intersection entry (PCE)
1	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Roundabout	Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	**1**	False	((calculated))	((calculated))	0.688	2549.182

1	2	False	((calculated))	((calculated))	0.483	1248.557
1	3	False	((calculated))	((calculated))	0.676	2475.107
1	4	False	((calculated))	((calculated))	0.483	1248.622
2	1	False	((calculated))	((calculated))	0.656	2321.138
2	2	False	((calculated))	((calculated))	0.476	1229.075
2	3	False	((calculated))	((calculated))	0.662	2348.681
2	4	False	((calculated))	((calculated))	0.476	1229.075
3	1	False	((calculated))	((calculated))	0.688	2549.182
3	3	False	((calculated))	((calculated))	0.676	2475.107
3	4	False	((calculated))	((calculated))	0.676	2475.107

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
False	False	True	True	Truck Percentages	2.00	False	False	False	True	True

Entry Flows

General Flows Data

Roundabout	Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
1	1	ONE HOUR	True	1397.00	100.000	N/A
1	2	ONE HOUR	True	110.00	100.000	N/A
1	3	Linked Arm	False		N/A	N/A
1	4	ONE HOUR	True	115.00	100.000	N/A
2	1	Linked Arm	False		N/A	N/A
2	2	ONE HOUR	True	184.00	100.000	N/A
2	3	ONE HOUR	True	1935.00	100.000	N/A
2	4	ONE HOUR	True	212.00	100.000	N/A
3	1	Linked Arm	False		N/A	N/A
3	3	Linked Arm	False		N/A	N/A
3	4	ONE HOUR	True	105.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Roundabout	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)

1	**1**	**1**	1051.73	1051.73	N/A	N/A
1	**1**	**2**	82.81	82.81	N/A	N/A
1	**1**	**3**	0.00	0.00	N/A	N/A
1	**1**	**4**	86.58	86.58	N/A	N/A
1	**2**	**1**	0.00	0.00	N/A	N/A
1	**2**	**2**	138.52	138.52	N/A	N/A
1	**2**	**3**	1456.77	1456.77	N/A	N/A
1	**2**	**4**	159.60	159.60	N/A	N/A
1	**3**	**1**	0.00	0.00	N/A	N/A
1	**3**	**3**	0.00	0.00	N/A	N/A
1	**3**	**4**	79.05	79.05	N/A	N/A
2	**1**	**1**	1255.87	1255.87	N/A	N/A
2	**1**	**2**	98.89	98.89	N/A	N/A
2	**1**	**3**	0.00	0.00	N/A	N/A
2	**1**	**4**	103.38	103.38	N/A	N/A
2	**2**	**1**	0.00	0.00	N/A	N/A
2	**2**	**2**	165.41	165.41	N/A	N/A
2	**2**	**3**	1739.53	1739.53	N/A	N/A
2	**2**	**4**	190.58	190.58	N/A	N/A
2	**3**	**1**	0.00	0.00	N/A	N/A
2	**3**	**3**	0.00	0.00	N/A	N/A
2	**3**	**4**	94.39	94.39	N/A	N/A
3	**1**	**1**	1538.13	1538.13	N/A	N/A
3	**1**	**2**	121.11	121.11	N/A	N/A
3	**1**	**3**	0.00	0.00	N/A	N/A
3	**1**	**4**	126.62	126.62	N/A	N/A
3	**2**	**1**	0.00	0.00	N/A	N/A
3	**2**	**2**	202.59	202.59	N/A	N/A
3	**2**	**3**	2130.47	2130.47	N/A	N/A
3	**2**	**4**	233.42	233.42	N/A	N/A
3	**3**	**1**	0.00	0.00	N/A	N/A
3	**3**	**3**	0.00	0.00	N/A	N/A
3	**3**	**4**	115.61	115.61	N/A	N/A
4	**1**	**1**	1538.13	1538.13	N/A	N/A
4	**1**	**2**	121.11	121.11	N/A	N/A
4	**1**	**3**	0.00	0.00	N/A	N/A
4	**1**	**4**	126.62	126.62	N/A	N/A
4	**2**	**1**	0.00	0.00	N/A	N/A
4	**2**	**2**	202.59	202.59	N/A	N/A
4	**2**	**3**	2130.47	2130.47	N/A	N/A
4	**2**	**4**	233.42	233.42	N/A	N/A
4	**3**	**1**	0.00	0.00	N/A	N/A
4	**3**	**3**	0.00	0.00	N/A	N/A
4	**3**	**4**	115.61	115.61	N/A	N/A
5	**1**	**1**	1255.87	1255.87	N/A	N/A
5	**1**	**2**	98.89	98.89	N/A	N/A
5	**1**	**3**	0.00	0.00	N/A	N/A

5	1	4	103.38	103.38	N/A	N/A
5	2	1	0.00	0.00	N/A	N/A
5	2	2	165.41	165.41	N/A	N/A
5	2	3	1739.53	1739.53	N/A	N/A
5	2	4	190.58	190.58	N/A	N/A
5	3	1	0.00	0.00	N/A	N/A
5	3	3	0.00	0.00	N/A	N/A
5	3	4	94.39	94.39	N/A	N/A
6	1	1	1051.73	1051.73	N/A	N/A
6	1	2	82.81	82.81	N/A	N/A
6	1	3	0.00	0.00	N/A	N/A
6	1	4	86.58	86.58	N/A	N/A
6	2	1	0.00	0.00	N/A	N/A
6	2	2	138.52	138.52	N/A	N/A
6	2	3	1456.77	1456.77	N/A	N/A
6	2	4	159.60	159.60	N/A	N/A
6	3	1	0.00	0.00	N/A	N/A
6	3	3	0.00	0.00	N/A	N/A
6	3	4	79.05	79.05	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	7.000	978.000	412.000
	2	8.000	0.000	11.000	91.000
	3	1741.000	2.000	0.000	193.000
	4	78.000	12.000	25.000	0.000

Turning Proportions (PCE) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.70	0.29
	2	0.07	0.00	0.10	0.83
	3	0.90	0.00	0.00	0.10
	4	0.68	0.10	0.22	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.000	8.000	718.000	196.000
	2	17.000	0.000	25.000	142.000
	3	1736.000	17.000	0.000	182.000
	4	117.000	29.000	66.000	0.000

Turning Proportions (PCE) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.78	0.21
	2	0.09	0.00	0.14	0.77
	3	0.90	0.01	0.00	0.09
	4	0.55	0.14	0.31	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.000	865.000	87.000
	3	1841.000	0.000	47.000
	4	68.000	37.000	0.000

Turning Proportions (PCE) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.00	0.91	0.09
	3	0.98	0.00	0.02
	4	0.65	0.35	0.00

Vehicle Mix

Average PCE Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020
	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020

	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 2 (for whole period)

	To				
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 3 (for whole period)

	To			
		1	3	4
From	1	1.020	1.020	1.020
	3	1.020	1.020	1.020
	4	1.020	1.020	1.020

Truck Percentages - Roundabout 3 (for whole period)

	To			
		1	3	4
From	1	2.000	2.000	2.000
	3	2.000	2.000	2.000
	4	2.000	2.000	2.000

Results

Results Summary

Roundabout	Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
1	1	0.61	3.74	1.59	A	1281.91	1922.87	98.95	3.09	1.10	98.96	3.09	0.688	2549.182
1	2	0.24	9.80	0.33	A	100.94	151.41	19.13	7.58	0.21	19.13	7.58	0.483	1248.557
1	3	0.97	31.98	17.27	D	1733.27	2599.91	600.58	13.86	6.67	600.63	13.86	0.676	2475.107
1	4	0.34	14.85	0.51	B	105.53	158.29	28.12	10.66	0.31	28.12	10.66	0.483	1248.622
2	1	0.47	3.10	0.90	A	878.76	1318.14	59.94	2.73	0.67	59.94	2.73	0.656	2321.138
2	2	0.29	7.42	0.41	A	168.84	253.26	26.07	6.18	0.29	26.07	6.18	0.476	1229.075

2	**3**	1.02	73.68	46.24	F	1775.59	2663.38	1205.85	27.17	13.40	1205.91	27.17	0.662	2348.681
2	**4**	0.71	36.45	2.24	E	194.53	291.80	93.52	19.23	1.04	93.53	19.23	0.476	1229.075
3	**1**	0.44	2.61	0.81	A	930.09	1395.14	54.46	2.34	0.61	54.46	2.34	0.688	2549.182
3	**3**	0.83	8.91	4.80	A	1714.52	2571.78	256.60	5.99	2.85	256.63	5.99	0.676	2475.107
3	**4**	0.10	3.52	0.11	A	96.35	144.52	7.32	3.04	0.08	7.32	3.04	0.676	2475.107

Main Results

Main results: (8:00 AM-8:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1051.73	262.93	1048.84	1326.32	29.10	0.00	2529.15	2461.16	0.416	0.00	0.72
1	**2**	82.81	20.70	82.30	15.67	1062.27	0.00	735.36	24.43	0.113	0.00	0.13
1	**3**	1410.44	352.61	1403.40	761.18	383.39	0.00	2215.91	1969.53	0.637	0.00	1.76
1	**4**	86.58	21.64	85.94	517.31	1269.48	0.00	635.31	391.10	0.136	0.00	0.16
2	**1**	717.81	179.45	715.92	1399.60	83.59	0.00	2266.30	2198.65	0.317	0.00	0.47
2	**2**	138.52	34.63	137.76	40.57	758.94	0.00	868.18	136.66	0.160	0.00	0.19
2	**3**	1456.77	364.19	1448.57	625.47	271.23	0.00	2169.19	1961.22	0.672	0.00	2.05
2	**4**	159.60	39.90	158.14	394.75	1325.05	0.00	598.99	378.19	0.266	0.00	0.37
3	**1**	761.18	190.29	759.43	1410.44	27.78	0.00	2530.06	2321.65	0.301	0.00	0.44
3	**3**	1399.60	349.90	1394.10	717.81	69.40	0.00	2428.19	2331.67	0.576	0.00	1.38
3	**4**	79.05	19.76	78.83	104.11	1359.39	0.00	1556.06	937.98	0.051	0.00	0.05

Main results: (8:15 AM-8:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1255.87	313.97	1254.75	1589.22	34.88	0.00	2525.17	2461.16	0.497	0.72	1.00
1	**2**	98.89	24.72	98.66	18.77	1270.86	0.00	634.59	24.43	0.156	0.13	0.19
1	**3**	1688.44	422.11	1681.55	910.68	458.84	0.00	2164.90	1969.53	0.780	1.76	3.49
1	**4**	103.38	25.85	103.01	619.30	1521.09	0.00	513.75	391.10	0.201	0.16	0.25
2	**1**	860.19	215.05	859.57	1672.40	100.07	0.00	2255.48	2198.65	0.381	0.47	0.63
2	**2**	165.41	41.35	165.12	48.57	911.08	0.00	795.84	136.66	0.208	0.19	0.27
2	**3**	1739.53	434.88	1730.60	750.78	325.41	0.00	2133.33	1961.22	0.815	2.05	4.28
2	**4**	190.58	47.65	189.39	472.93	1583.08	0.00	476.29	378.19	0.400	0.37	0.67
3	**1**	910.68	227.67	910.13	1688.44	33.23	0.00	2526.30	2321.65	0.360	0.44	0.57
3	**3**	1672.40	418.10	1668.91	860.19	83.17	0.00	2418.88	2331.67	0.691	1.38	2.25
3	**4**	94.39	23.60	94.31	124.72	1627.37	0.00	1374.89	937.98	0.069	0.05	0.07

Main results: (8:30 AM-8:45 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1538.13	384.53	1535.81	1845.20	42.48	0.00	2519.94	2461.16	0.610	1.00	1.58

1	**2**	121.11	30.28	120.56	22.83	1555.46	0.00	497.10	24.43	0.244	0.19	0.32
1	**3**	1982.56	495.64	1947.27	1114.57	561.44	0.00	2095.53	1969.53	0.946	3.49	12.31
1	**4**	126.62	31.65	125.77	746.80	1761.91	0.00	397.41	391.10	0.319	0.25	0.47
2	**1**	1052.57	263.14	1051.48	1964.84	120.18	0.00	2242.29	2198.65	0.469	0.63	0.90
2	**2**	202.59	50.65	202.01	58.19	1113.47	0.00	699.60	136.66	0.290	0.27	0.41
2	**3**	2130.47	532.62	2028.76	917.39	398.08	0.00	2085.24	1961.22	1.022	4.28	29.71
2	**4**	233.42	58.35	228.41	570.24	1856.60	0.00	346.22	378.19	0.674	0.67	1.92
3	**1**	1114.57	278.64	1113.65	1982.56	40.69	0.00	2521.17	2321.65	0.442	0.57	0.80
3	**3**	1964.84	491.21	1956.48	1052.57	101.77	0.00	2406.30	2331.67	0.817	2.25	4.34
3	**4**	115.61	28.90	115.47	150.48	1907.78	0.00	1185.32	937.98	0.098	0.07	0.11

Main results: (8:45 AM-9:00 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1538.13	384.53	1538.09	1895.21	42.75	0.00	2519.76	2461.16	0.610	1.58	1.59
1	**2**	121.11	30.28	121.10	22.97	1557.87	0.00	495.93	24.43	0.244	0.32	0.33
1	**3**	2022.18	505.54	2002.33	1116.37	562.60	0.00	2094.75	1969.53	0.965	12.31	17.27
1	**4**	126.62	31.65	126.43	753.41	1811.53	0.00	373.44	391.10	0.339	0.47	0.51
2	**1**	1055.07	263.77	1055.04	1998.90	122.16	0.00	2240.99	2198.65	0.471	0.90	0.90
2	**2**	202.59	50.65	202.57	59.05	1118.16	0.00	697.37	136.66	0.291	0.41	0.41
2	**3**	2130.47	532.62	2064.37	921.40	399.33	0.00	2084.41	1961.22	1.022	29.71	46.24
2	**4**	233.42	58.35	232.14	574.78	1888.92	0.00	330.86	378.19	0.705	1.92	2.24
3	**1**	1116.37	279.09	1116.35	2022.18	40.73	0.00	2521.14	2321.65	0.443	0.80	0.81
3	**3**	1998.90	499.72	1997.03	1055.07	102.02	0.00	2406.13	2331.67	0.831	4.34	4.80
3	**4**	115.61	28.90	115.60	151.73	1947.32	0.00	1158.59	937.98	0.100	0.11	0.11

Main results: (9:00 AM-9:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1255.87	313.97	1258.17	1783.22	35.45	0.00	2524.78	2461.16	0.497	1.59	1.02
1	**2**	98.89	24.72	99.43	19.12	1274.49	0.00	632.84	24.43	0.156	0.33	0.19
1	**3**	1853.86	463.47	1896.41	913.38	460.55	0.00	2163.75	1969.53	0.857	17.27	6.63
1	**4**	103.38	25.85	104.08	642.37	1714.59	0.00	420.27	391.10	0.246	0.51	0.34
2	**1**	864.04	216.01	865.11	1832.30	104.43	0.00	2252.62	2198.65	0.384	0.90	0.64
2	**2**	165.41	41.35	165.99	51.01	918.53	0.00	792.30	136.66	0.209	0.41	0.27
2	**3**	1739.53	434.88	1904.86	757.17	327.34	0.00	2132.05	1961.22	0.816	46.24	4.90
2	**4**	190.58	47.65	195.70	491.17	1741.03	0.00	401.18	378.19	0.475	2.24	0.96
3	**1**	913.38	228.34	914.29	1853.86	33.30	0.00	2526.26	2321.65	0.362	0.81	0.58
3	**3**	1832.30	458.08	1838.42	864.04	83.55	0.00	2418.62	2331.67	0.758	4.80	3.27
3	**4**	94.39	23.60	94.51	129.32	1792.65	0.00	1263.15	937.98	0.075	0.11	0.08

Main results: (9:15 AM-9:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1051.73	262.93	1052.88	1379.01	29.58	0.00	2528.82	2461.16	0.416	1.02	0.73

1	**2**	82.81	20.70	83.05	15.89	1066.57	0.00	733.29	24.43	0.113	0.19	0.13
1	**3**	1442.14	360.54	1460.94	764.36	385.26	0.00	2214.64	1969.53	0.651	6.63	1.93
1	**4**	86.58	21.64	87.25	524.86	1321.34	0.00	610.26	391.10	0.142	0.34	0.17
2	**1**	722.90	180.73	723.53	1419.09	85.44	0.00	2265.08	2198.65	0.319	0.64	0.48
2	**2**	138.52	34.63	138.83	41.32	767.66	0.00	864.04	136.66	0.160	0.27	0.20
2	**3**	1456.77	364.19	1467.87	632.71	273.77	0.00	2167.50	1961.22	0.672	4.90	2.13
2	**4**	159.60	39.90	161.90	399.01	1342.63	0.00	590.63	378.19	0.270	0.96	0.38
3	**1**	764.36	191.09	764.91	1442.14	27.89	0.00	2529.98	2321.65	0.302	0.58	0.44
3	**3**	1419.09	354.77	1426.38	722.90	69.90	0.00	2427.85	2331.67	0.585	3.27	1.45
3	**4**	79.05	19.76	79.16	105.41	1390.88	0.00	1534.78	937.98	0.052	0.08	0.06

Queueing Delay Results

Queueing Delay results: (8:00 AM-8:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	10.63	0.71	2.477	A	A
1	**2**	1.87	0.12	5.623	A	A
1	**3**	25.31	1.69	4.481	A	A
1	**4**	2.32	0.15	6.677	A	A
2	**1**	6.94	0.46	2.365	A	A
2	**2**	2.81	0.19	5.022	A	A
2	**3**	29.24	1.95	5.041	A	A
2	**4**	5.26	0.35	8.302	A	A
3	**1**	6.46	0.43	2.072	A	A
3	**3**	19.96	1.33	3.532	A	A
3	**4**	0.80	0.05	2.485	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	14.77	0.98	2.887	A	A
1	**2**	2.73	0.18	6.848	A	A
1	**3**	48.81	3.25	7.491	A	A
1	**4**	3.69	0.25	8.931	A	A
2	**1**	9.26	0.62	2.629	A	A
2	**2**	3.90	0.26	5.819	A	A
2	**3**	58.97	3.93	8.923	A	A
2	**4**	9.48	0.63	12.746	B	B
3	**1**	8.48	0.57	2.272	A	A
3	**3**	32.39	2.16	4.874	A	A
3	**4**	1.11	0.07	2.867	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	23.06	1.54	3.721	A	A
1	**2**	4.69	0.31	9.739	A	A

1	**3**	145.06	9.67	21.010	C	C
1	**4**	6.67	0.44	13.474	B	B
2	**1**	13.20	0.88	3.080	A	A
2	**2**	5.99	0.40	7.368	A	A
2	**3**	286.21	19.08	39.154	E	D
2	**4**	25.15	1.68	29.998	D	C
3	**1**	11.87	0.79	2.608	A	A
3	**3**	60.16	4.01	8.015	A	A
3	**4**	1.62	0.11	3.431	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	23.80	1.59	3.739	A	A
1	**2**	4.89	0.33	9.796	A	A
1	**3**	227.62	15.17	31.979	D	C
1	**4**	7.52	0.50	14.852	B	B
2	**1**	13.52	0.90	3.095	A	A
2	**2**	6.20	0.41	7.420	A	A
2	**3**	573.09	38.21	73.684	F	E
2	**4**	31.87	2.12	36.447	E	D
3	**1**	12.10	0.81	2.613	A	A
3	**3**	69.85	4.66	8.912	A	A
3	**4**	1.68	0.11	3.519	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	15.57	1.04	2.903	A	A
1	**2**	2.95	0.20	6.890	A	A
1	**3**	122.37	8.16	15.442	C	B
1	**4**	5.29	0.35	11.640	B	B
2	**1**	9.72	0.65	2.647	A	A
2	**2**	4.18	0.28	5.869	A	A
2	**3**	224.61	14.97	26.038	D	C
2	**4**	15.74	1.05	18.282	C	B
3	**1**	8.82	0.59	2.278	A	A
3	**3**	51.71	3.45	6.397	A	A
3	**4**	1.26	0.08	3.144	A	A

Queueing Delay results: (9:15 AM-9:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	**1**	11.12	0.74	2.491	A	A
1	**2**	2.01	0.13	5.648	A	A
1	**3**	31.41	2.09	4.991	A	A
1	**4**	2.64	0.18	7.031	A	A
2	**1**	7.30	0.49	2.384	A	A

2	**2**	3.00	0.20	5.066	A	A
2	**3**	33.72	2.25	5.328	A	A
2	**4**	6.02	0.40	8.608	A	A
3	**1**	6.72	0.45	2.082	A	A
3	**3**	22.53	1.50	3.691	A	A
3	**4**	0.84	0.06	2.524	A	A

Overview: Standard Roundabout Geometry

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
1	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
1	**2**	3.50	4.25	6.81	30.00	60.00	30.00	False	0.483	1248.557
1	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
1	**4**	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622
2	**1**	7.37	8.00	4.05	30.00	60.64	39.51	False	0.656	2321.138
2	**2**	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
2	**3**	7.47	8.00	3.89	30.00	60.71	37.92	False	0.662	2348.681
2	**4**	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
3	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
3	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
3	**4**	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107

Overview: Time Segment Results

Time Segment Results

Time Segment	Roundabout	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	**1**	**1**	1051.73	2529.15	0.416	0.00	0.00	0.72	10.63	(0.00)	2.477
1	**1**	**2**	82.81	735.36	0.113	0.00	0.00	0.13	1.87	(0.00)	5.623
1	**1**	**3**	1410.44	2215.91	0.637	0.00	0.00	1.76	25.31	(0.00)	4.481
1	**1**	**4**	86.58	635.31	0.136	0.00	0.00	0.16	2.32	(0.00)	6.677
1	**2**	**1**	717.81	2266.30	0.317	0.00	0.00	0.47	6.94	(0.00)	2.365
1	**2**	**2**	138.52	868.18	0.160	0.00	0.00	0.19	2.81	(0.00)	5.022
1	**2**	**3**	1456.77	2169.19	0.672	0.00	0.00	2.05	29.24	(0.00)	5.041
1	**2**	**4**	159.60	598.99	0.266	0.00	0.00	0.37	5.26	(0.00)	8.302
1	**3**	**1**	761.18	2530.06	0.301	0.00	0.00	0.44	6.46	(0.02)	2.072
1	**3**	**3**	1399.60	2428.19	0.576	0.00	0.00	1.38	19.96	(0.02)	3.532
1	**3**	**4**	79.05	1556.06	0.051	0.00	0.00	0.05	0.80	(0.02)	2.485
2	**1**	**1**	1255.87	2525.17	0.497	0.00	0.72	1.00	14.77	(0.00)	2.887
2	**1**	**2**	98.89	634.59	0.156	0.00	0.13	0.19	2.73	(0.00)	6.848

2	**1**	**3**	1688.44	2164.90	0.780	0.00	1.76	3.49	48.81	(0.00)	7.491
2	**1**	**4**	103.38	513.75	0.201	0.00	0.16	0.25	3.69	(0.00)	8.931
2	**2**	**1**	860.19	2255.48	0.381	0.00	0.47	0.63	9.26	(0.00)	2.629
2	**2**	**2**	165.41	795.84	0.208	0.00	0.19	0.27	3.90	(0.00)	5.819
2	**2**	**3**	1739.53	2133.33	0.815	0.00	2.05	4.28	58.97	(0.00)	8.923
2	**2**	**4**	190.58	476.29	0.400	0.00	0.37	0.67	9.48	(0.00)	12.746
2	**3**	**1**	910.68	2526.30	0.360	0.00	0.44	0.57	8.48	(0.02)	2.272
2	**3**	**3**	1672.40	2418.88	0.691	0.00	1.38	2.25	32.39	(0.02)	4.874
2	**3**	**4**	94.39	1374.89	0.069	0.00	0.05	0.07	1.11	(0.02)	2.867
3	**1**	**1**	1538.13	2519.94	0.610	0.00	1.00	1.58	23.06	(0.00)	3.721
3	**1**	**2**	121.11	497.10	0.244	0.00	0.19	0.32	4.69	(0.00)	9.739
3	**1**	**3**	1982.56	2095.53	0.946	0.00	3.49	12.31	145.06	(0.00)	21.010
3	**1**	**4**	126.62	397.41	0.319	0.00	0.25	0.47	6.67	(0.00)	13.474
3	**2**	**1**	1052.57	2242.29	0.469	0.00	0.63	0.90	13.20	(0.00)	3.080
3	**2**	**2**	202.59	699.60	0.290	0.00	0.27	0.41	5.99	(0.00)	7.368
3	**2**	**3**	2130.47	2085.24	1.022	0.00	4.28	29.71	286.21	(0.00)	39.154
3	**2**	**4**	233.42	346.22	0.674	0.00	0.67	1.92	25.15	(0.00)	29.998
3	**3**	**1**	1114.57	2521.17	0.442	0.00	0.57	0.80	11.87	(0.02)	2.608
3	**3**	**3**	1964.84	2406.30	0.817	0.00	2.25	4.34	60.16	(0.02)	8.015
3	**3**	**4**	115.61	1185.32	0.098	0.00	0.07	0.11	1.62	(0.02)	3.431
4	**1**	**1**	1538.13	2519.76	0.610	0.00	1.58	1.59	23.80	(0.00)	3.739
4	**1**	**2**	121.11	495.93	0.244	0.00	0.32	0.33	4.89	(0.00)	9.796
4	**1**	**3**	2022.18	2094.75	0.965	0.00	12.31	17.27	227.62	(0.00)	31.979
4	**1**	**4**	126.62	373.44	0.339	0.00	0.47	0.51	7.52	(0.00)	14.852
4	**2**	**1**	1055.07	2240.99	0.471	0.00	0.90	0.90	13.52	(0.00)	3.095
4	**2**	**2**	202.59	697.37	0.291	0.00	0.41	0.41	6.20	(0.00)	7.420
4	**2**	**3**	2130.47	2084.41	1.022	0.00	29.71	46.24	573.09	(0.00)	73.684
4	**2**	**4**	233.42	330.86	0.705	0.00	1.92	2.24	31.87	(0.00)	36.447
4	**3**	**1**	1116.37	2521.14	0.443	0.00	0.80	0.81	12.10	(0.02)	2.613
4	**3**	**3**	1998.90	2406.13	0.831	0.00	4.34	4.80	69.85	(0.02)	8.912
4	**3**	**4**	115.61	1158.59	0.100	0.00	0.11	0.11	1.68	(0.02)	3.519
5	**1**	**1**	1255.87	2524.78	0.497	0.00	1.59	1.02	15.57	(0.00)	2.903
5	**1**	**2**	98.89	632.84	0.156	0.00	0.33	0.19	2.95	(0.00)	6.890
5	**1**	**3**	1853.86	2163.75	0.857	0.00	17.27	6.63	122.37	(0.00)	15.442
5	**1**	**4**	103.38	420.27	0.246	0.00	0.51	0.34	5.29	(0.00)	11.640
5	**2**	**1**	864.04	2252.62	0.384	0.00	0.90	0.64	9.72	(0.00)	2.647
5	**2**	**2**	165.41	792.30	0.209	0.00	0.41	0.27	4.18	(0.00)	5.869
5	**2**	**3**	1739.53	2132.05	0.816	0.00	46.24	4.90	224.61	(0.00)	26.038
5	**2**	**4**	190.58	401.18	0.475	0.00	2.24	0.96	15.74	(0.00)	18.282
5	**3**	**1**	913.38	2526.26	0.362	0.00	0.81	0.58	8.82	(0.02)	2.278
5	**3**	**3**	1832.30	2418.62	0.758	0.00	4.80	3.27	51.71	(0.02)	6.397
5	**3**	**4**	94.39	1263.15	0.075	0.00	0.11	0.08	1.26	(0.02)	3.144
6	**1**	**1**	1051.73	2528.82	0.416	0.00	1.02	0.73	11.12	(0.00)	2.491
6	**1**	**2**	82.81	733.29	0.113	0.00	0.19	0.13	2.01	(0.00)	5.648
6	**1**	**3**	1442.14	2214.64	0.651	0.00	6.63	1.93	31.41	(0.00)	4.991
6	**1**	**4**	86.58	610.26	0.142	0.00	0.34	0.17	2.64	(0.00)	7.031
6	**2**	**1**	722.90	2265.08	0.319	0.00	0.64	0.48	7.30	(0.00)	2.384

6	**2**	**2**	138.52	864.04	0.160	0.00	0.27	0.20	3.00	(0.00)	5.066
6	**2**	**3**	1456.77	2167.50	0.672	0.00	4.90	2.13	33.72	(0.00)	5.328
6	**2**	**4**	159.60	590.63	0.270	0.00	0.96	0.38	6.02	(0.00)	8.608
6	**3**	**1**	764.36	2529.98	0.302	0.00	0.58	0.44	6.72	(0.02)	2.082
6	**3**	**3**	1419.09	2427.85	0.585	0.00	3.27	1.45	22.53	(0.02)	3.691
6	**3**	**4**	79.05	1534.78	0.052	0.00	0.08	0.06	0.84	(0.02)	2.524

Roundabout 2 - Arm 2	0.11	6.05	0.10	A
Roundabout 2 - Arm 3	0.59	2.62	0.37	A
Roundabout 2 - Arm 4	0.39	5.90	0.28	A
Roundabout 3 - Arm 1	0.78	2.55	0.43	A
Roundabout 3 - Arm 3	0.52	2.25	0.34	A
Roundabout 3 - Arm 4	0.05	4.54	0.05	A
	2031 Two_Lane with RT By-pass - 2031 AM			
Roundabout 1 - Arm 1	1.59	3.74	0.61	A
Roundabout 1 - Arm 2	0.33	9.80	0.24	A
Roundabout 1 - Arm 3	17.27	31.98	0.97	D
Roundabout 1 - Arm 4	0.51	14.85	0.34	B
Roundabout 2 - Arm 1	0.90	3.10	0.47	A
Roundabout 2 - Arm 2	0.41	7.42	0.29	A
Roundabout 2 - Arm 3	46.24	73.68	1.02	F
Roundabout 2 - Arm 4	2.24	36.45	0.71	E
Roundabout 3 - Arm 1	0.81	2.61	0.44	A
Roundabout 3 - Arm 3	4.80	8.91	0.83	A
Roundabout 3 - Arm 4	0.11	3.52	0.10	A
	2031 Two_Lane with RT By-pass - 2031 PM			
Roundabout 1 - Arm 1	3.17	6.40	0.76	A
Roundabout 1 - Arm 2	0.18	13.04	0.15	B
Roundabout 1 - Arm 3	1.60	3.99	0.61	A
Roundabout 1 - Arm 4	7.01	52.87	0.90	F
Roundabout 2 - Arm 1	5.59	11.61	0.85	B
Roundabout 2 - Arm 2	0.46	17.83	0.32	C
Roundabout 2 - Arm 3	1.38	4.09	0.58	A
Roundabout 2 - Arm 4	3.07	21.61	0.76	C
Roundabout 3 - Arm 1	2.59	5.28	0.72	A
Roundabout 3 - Arm 3	1.23	3.35	0.55	A
Roundabout 3 - Arm 4	0.20	2.72	0.16	A

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle.

2021 AM - runs from 08:00:00 to 09:30:00
2021 PM - runs from 08:00:00 to 09:30:00
2031 AM - runs from 08:00:00 to 09:30:00
2031 PM - runs from 08:00:00 to 09:30:00

File summary

File Description

Title	(untitled)
Location	
Site Number	
Date	1/15/2014
Version	

Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	HMMG\rif43211
Description	

Analysis Options

RFC Threshold	Vehicle Length (m)	Do Queue Variations
0.85	5.75	False

Sorting and Display

Show Arm Names	Arm Grouping	Sorting Direction	Sorting Type	Data Matrix Style	Time Style
False	Order	Ascending	Numerical	By Destination	Absolute Time

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

A4 - 2031 Two_Lane with RT By-pass - D6 - 2031 PM,

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Description	Include In Report	Use Specific Demand Set	Demand Set	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
2031 Two_Lane with RT By-pass		True	False	(D1)	False	100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Locked	Run Automatically	Use Relationship	Relationship	Start Time (HH:mm)	Finish Time (HH:mm)	Time Period Length (min)	Time Segment Length (min)	Traffic Profile Type
2031 PM,	2031 PM			False	True	False		08:00	09:30	90	15	Varies by Arm

Roundabout Network

Roundabout Type(s)

Roundabout	ID	Name	Arm Order	Roundabout Type	Grade Separated	Large Roundabout	Do Geometric Delay
1	1	Mayfield Rd_Heritage Rd	1,2,3,4	Standard	False	False	False
2	2	Mayfield Rd_Winston Churchill Blvd	1,2,3,4	Standard	False	False	False
3	3	Mayfield Rd_Sandalwood Parkway extension	1,3,4	Standard	False	False	False

Roundabout Network Options

Driving Side	Lighting	Road Surface	In London
Right	Normal/unknown	((Mini-roundabouts only))	((Mini-roundabouts only))

Arms

Arms

ID	Name	Description
1	Mayfield Rd WB	
2	Heritage Rd NB	
3	Mayfield Rd EB	
4	Heritage Rd SB	
1	Mayfield Rd WB	
2	Winston Churchill Rd SB	
3	Mayfield Rd EB	
4	Winston Churchill Bv NB	
1	Mayfield Rd WB	
3	Mayfield Rd EB	
4	Sandalwood Parkway extension NB	

Capacity Options

Roundabout	Arm	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)	Assume Flat Start Profile	Initial Queue (PCE)
1	**1**	0.00	3700.00	False	0.00
1	**2**	0.00	1850.00	False	0.00
1	**3**	0.00	3700.00	False	0.00
1	**4**	0.00	1850.00	False	0.00
2	**1**	0.00	3700.00	False	0.00
2	**2**	0.00	1850.00	False	0.00
2	**3**	0.00	3700.00	False	0.00
2	**4**	0.00	1850.00	False	0.00
3	**1**	0.00	99999.00	False	0.00
3	**3**	0.00	99999.00	False	0.00
3	**4**	0.00	99999.00	False	0.00

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
1	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False

1	**2**	3.50	4.25	6.81	30.00	60.00	30.00	False
1	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
1	**4**	3.50	4.25	6.82	30.00	60.00	30.00	False
2	**1**	7.37	8.00	4.05	30.00	60.64	39.51	False
2	**2**	3.50	4.25	6.85	30.00	60.00	34.63	False
2	**3**	7.47	8.00	3.89	30.00	60.71	37.92	False
2	**4**	3.50	4.25	6.85	30.00	60.00	34.63	False
3	**1**	8.00	8.00	0.00	30.57	64.15	19.99	False
3	**3**	7.00	8.00	10.12	31.40	64.19	19.93	False
3	**4**	7.00	8.00	10.12	31.40	64.19	19.93	False

Mini Roundabout Geometry

Roundabout	Arm	Approach road half-width (m)	Minimum approach road half-width (m)	Entry width (m)	Effective flare length (m)	Distance to next arm (m)	Entry corner kerb line distance (m)	Gradient over 50m (%)	Kerbed central island
1	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
1	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**2**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
2	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**1**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**3**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)
3	**4**	(3.00)	(3.00)	(3.00)	(0.00)	(5.00)	(2.00)	(0.00)	(False)

Large Roundabout Data

Roundabout	Arm	Circulating flow (PCE/hr)	Entry-to-exit separation (m)
1	**1**	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)

Pedestrian Crossings

Roundabout	Arm	Crossing Type
1	**1**	None
1	**2**	None
1	**3**	None
1	**4**	None

2	**1**	None
2	**2**	None
2	**3**	None
2	**4**	None
3	**1**	None
3	**3**	None
3	**4**	None

Unsignalled Pedestrian Crossing Crossings

Roundabout	Arm	Space between crossing and intersection entry (PCE)	Vehicles queueing on exit (PCE)	Central Refuge	Crossing Data Type	Crossing length (m)	Crossing time (s)	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)
1	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
1	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**2**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
2	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**1**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**3**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
3	**4**	(0.00)	(0.00)	(False)	(Distance)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Signalled Pedestrian Crossing/ Adaptive Pedestrian Crossing Crossings

Roundabout	Arm	Yellow time preceding red (s)	Yellow time regarded as green (s)	Time from traffic red start to walk start (s)	Time period walk shown (s)	Clearance Period (s)	Traffic minimum green (s)	Space between crossing and intersection entry (PCE)
1	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
1	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**2**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
2	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**1**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**3**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)
3	**4**	(3.00)	(2.90)	(1.00)	(6.00)	(6.00)	(7.00)	(0.00)

Arm Slope/ Intercept and Capacity

Slope and Intercept used in model

Roundabout	Arm	Enter Directly	Slope	Intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
1	**1**	False	((calculated))	((calculated))	0.688	2549.182

1	2	False	((calculated))	((calculated))	0.483	1248.557
1	3	False	((calculated))	((calculated))	0.676	2475.107
1	4	False	((calculated))	((calculated))	0.483	1248.622
2	1	False	((calculated))	((calculated))	0.656	2321.138
2	2	False	((calculated))	((calculated))	0.476	1229.075
2	3	False	((calculated))	((calculated))	0.662	2348.681
2	4	False	((calculated))	((calculated))	0.476	1229.075
3	1	False	((calculated))	((calculated))	0.688	2549.182
3	3	False	((calculated))	((calculated))	0.676	2475.107
3	4	False	((calculated))	((calculated))	0.676	2475.107

The slope and intercept shown above include any corrections and adjustments.

Traffic Flows

Demand Set Data Options

Default Vehicle Mix	Vehicle Mix Varies Over Time	Vehicle Mix Varies Over Turn	Vehicle Mix Varies Over Entry	Vehicle Mix Source	PCE Factor for a Truck (PCE)	Default Turning Proportions	Estimate from entry/exit counts	Turning Proportions Vary Over Time	Turning Proportions Vary Over Turn	Turning Proportions Vary Over Entry
False	False	True	True	Truck Percentages	2.00	False	False	False	True	True

Entry Flows

General Flows Data

Roundabout	Arm	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)	PHF
1	1	ONE HOUR	True	1642.00	100.000	N/A
1	2	ONE HOUR	True	45.00	100.000	N/A
1	3	Linked Arm	False		N/A	N/A
1	4	ONE HOUR	True	466.00	100.000	N/A
2	1	Linked Arm	False		N/A	N/A
2	2	ONE HOUR	True	86.00	100.000	N/A
2	3	ONE HOUR	True	1105.00	100.000	N/A
2	4	ONE HOUR	True	482.00	100.000	N/A
3	1	Linked Arm	False		N/A	N/A
3	3	Linked Arm	False		N/A	N/A
3	4	ONE HOUR	True	240.00	100.000	N/A

Direct/Resultant Flows

Direct Flows Data

Time Segment	Roundabout	Arm	Direct Demand Entry Flow (PCE/hr)	DirectDemandEntryFlowInPCE (PCE/hr)	Direct Demand Exit Flow (PCE/hr)	Direct Demand Pedestrian Flow (Ped/hr)

1	**1**	**1**	1236.18	1236.18	N/A	N/A
1	**1**	**2**	33.88	33.88	N/A	N/A
1	**1**	**3**	0.00	0.00	N/A	N/A
1	**1**	**4**	350.83	350.83	N/A	N/A
1	**2**	**1**	0.00	0.00	N/A	N/A
1	**2**	**2**	64.75	64.75	N/A	N/A
1	**2**	**3**	831.90	831.90	N/A	N/A
1	**2**	**4**	362.87	362.87	N/A	N/A
1	**3**	**1**	0.00	0.00	N/A	N/A
1	**3**	**3**	0.00	0.00	N/A	N/A
1	**3**	**4**	180.68	180.68	N/A	N/A
2	**1**	**1**	1476.12	1476.12	N/A	N/A
2	**1**	**2**	40.45	40.45	N/A	N/A
2	**1**	**3**	0.00	0.00	N/A	N/A
2	**1**	**4**	418.92	418.92	N/A	N/A
2	**2**	**1**	0.00	0.00	N/A	N/A
2	**2**	**2**	77.31	77.31	N/A	N/A
2	**2**	**3**	993.37	993.37	N/A	N/A
2	**2**	**4**	433.31	433.31	N/A	N/A
2	**3**	**1**	0.00	0.00	N/A	N/A
2	**3**	**3**	0.00	0.00	N/A	N/A
2	**3**	**4**	215.76	215.76	N/A	N/A
3	**1**	**1**	1807.88	1807.88	N/A	N/A
3	**1**	**2**	49.55	49.55	N/A	N/A
3	**1**	**3**	0.00	0.00	N/A	N/A
3	**1**	**4**	513.08	513.08	N/A	N/A
3	**2**	**1**	0.00	0.00	N/A	N/A
3	**2**	**2**	94.69	94.69	N/A	N/A
3	**2**	**3**	1216.63	1216.63	N/A	N/A
3	**2**	**4**	530.69	530.69	N/A	N/A
3	**3**	**1**	0.00	0.00	N/A	N/A
3	**3**	**3**	0.00	0.00	N/A	N/A
3	**3**	**4**	264.24	264.24	N/A	N/A
4	**1**	**1**	1807.88	1807.88	N/A	N/A
4	**1**	**2**	49.55	49.55	N/A	N/A
4	**1**	**3**	0.00	0.00	N/A	N/A
4	**1**	**4**	513.08	513.08	N/A	N/A
4	**2**	**1**	0.00	0.00	N/A	N/A
4	**2**	**2**	94.69	94.69	N/A	N/A
4	**2**	**3**	1216.63	1216.63	N/A	N/A
4	**2**	**4**	530.69	530.69	N/A	N/A
4	**3**	**1**	0.00	0.00	N/A	N/A
4	**3**	**3**	0.00	0.00	N/A	N/A
4	**3**	**4**	264.24	264.24	N/A	N/A
5	**1**	**1**	1476.12	1476.12	N/A	N/A
5	**1**	**2**	40.45	40.45	N/A	N/A
5	**1**	**3**	0.00	0.00	N/A	N/A

5	1	4	418.92	418.92	N/A	N/A
5	2	1	0.00	0.00	N/A	N/A
5	2	2	77.31	77.31	N/A	N/A
5	2	3	993.37	993.37	N/A	N/A
5	2	4	433.31	433.31	N/A	N/A
5	3	1	0.00	0.00	N/A	N/A
5	3	3	0.00	0.00	N/A	N/A
5	3	4	215.76	215.76	N/A	N/A
6	1	1	1236.18	1236.18	N/A	N/A
6	1	2	33.88	33.88	N/A	N/A
6	1	3	0.00	0.00	N/A	N/A
6	1	4	350.83	350.83	N/A	N/A
6	2	1	0.00	0.00	N/A	N/A
6	2	2	64.75	64.75	N/A	N/A
6	2	3	831.90	831.90	N/A	N/A
6	2	4	362.87	362.87	N/A	N/A
6	3	1	0.00	0.00	N/A	N/A
6	3	3	0.00	0.00	N/A	N/A
6	3	4	180.68	180.68	N/A	N/A

Turning Proportions

Turning Counts or Proportions (PCE/hr) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.000	16.000	1521.000	105.000
	2	11.000	0.000	6.000	28.000
	3	1277.000	15.000	0.000	54.000
	4	257.000	109.000	100.000	0.000

Turning Proportions (PCE) - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.93	0.06
	2	0.24	0.00	0.13	0.62
	3	0.95	0.01	0.00	0.04
	4	0.55	0.23	0.21	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.000	11.000	1379.000	272.000
	2	6.000	0.000	30.000	50.000
	3	973.000	34.000	0.000	98.000
	4	223.000	106.000	153.000	0.000

Turning Proportions (PCE) - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	0.00	0.01	0.83	0.16
	2	0.07	0.00	0.35	0.58
	3	0.88	0.03	0.00	0.09
	4	0.46	0.22	0.32	0.00

Turning Counts or Proportions (PCE/hr) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.000	1557.000	77.000
	3	1141.000	0.000	41.000
	4	156.000	84.000	0.000

Turning Proportions (PCE) - Roundabout 3 (for whole period)

		To		
		1	3	4
From	1	0.00	0.95	0.05
	3	0.97	0.00	0.03
	4	0.65	0.35	0.00

Vehicle Mix

Average PCE Per Vehicle - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020
	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 1 (for whole period)

		To			
		1	2	3	4
From	1	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 2 (for whole period)

		To			
		1	2	3	4
From	1	1.020	1.020	1.020	1.020

	2	1.020	1.020	1.020	1.020
	3	1.020	1.020	1.020	1.020
	4	1.020	1.020	1.020	1.020

Truck Percentages - Roundabout 2 (for whole period)

		To			
		1	**2**	**3**	**4**
From	**1**	2.000	2.000	2.000	2.000
	2	2.000	2.000	2.000	2.000
	3	2.000	2.000	2.000	2.000
	4	2.000	2.000	2.000	2.000

Average PCE Per Vehicle - Roundabout 3 (for whole period)

		To		
		1	**3**	**4**
From	**1**	1.020	1.020	1.020
	3	1.020	1.020	1.020
	4	1.020	1.020	1.020

Truck Percentages - Roundabout 3 (for whole period)

		To		
		1	**3**	**4**
From	**1**	2.000	2.000	2.000
	3	2.000	2.000	2.000
	4	2.000	2.000	2.000

Results

Results Summary

Roundabout	Arm	Max RFC	Max Delay (s)	Max Queue (PCE)	Max LOS	Total Demand (PCE/hr)	Total Arrivals (PCE)	Total Queueing Delay (PCE-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (PCE-min/min)	Inclusive Queueing Total Delay (PCE-min)	Inclusive Queueing Average Delay (s)	Slope	Intercept (PCE/hr)
1	1	0.76	6.40	3.17	A	1506.73	2260.09	171.39	4.55	1.90	171.41	4.55	0.688	2549.182
1	2	0.15	13.04	0.18	B	41.29	61.94	9.63	9.33	0.11	9.64	9.33	0.483	1248.557
1	3	0.61	3.99	1.60	A	1206.84	1810.26	98.38	3.26	1.09	98.39	3.26	0.676	2475.107
1	4	0.90	52.87	7.01	F	427.61	641.41	243.55	22.78	2.71	243.58	22.78	0.483	1248.622
2	1	0.85	11.61	5.59	B	1498.29	2247.44	259.61	6.93	2.88	259.64	6.93	0.656	2321.138
2	2	0.32	17.83	0.46	C	78.92	118.37	22.80	11.56	0.25	22.80	11.56	0.476	1229.075

2	**3**	0.58	4.09	1.38	A	1013.97	1520.95	85.45	3.37	0.95	85.46	3.37	0.662	2348.681
2	**4**	0.76	21.61	3.07	C	442.29	663.44	143.55	12.98	1.60	143.57	12.98	0.476	1229.075
3	**1**	0.72	5.28	2.59	A	1492.18	2238.27	147.79	3.96	1.64	147.80	3.96	0.688	2549.182
3	**3**	0.55	3.35	1.23	A	1102.37	1653.56	78.78	2.86	0.88	78.78	2.86	0.676	2475.107
3	**4**	0.16	2.72	0.20	A	220.23	330.34	13.43	2.44	0.15	13.43	2.44	0.676	2475.107

Main Results

Main results: (8:00 AM-8:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1236.18	309.05	1232.00	1131.73	166.85	0.00	2434.32	2482.61	0.508	0.00	1.05
1	**2**	33.88	8.47	33.65	104.26	1294.59	0.00	623.13	44.55	0.054	0.00	0.06
1	**3**	984.96	246.24	982.14	1220.30	107.94	0.00	2402.13	2341.68	0.410	0.00	0.71
1	**4**	350.83	87.71	347.62	139.12	950.96	0.00	789.19	157.44	0.445	0.00	0.80
2	**1**	1222.21	305.55	1217.04	901.36	218.95	0.00	2177.49	2161.06	0.561	0.00	1.29
2	**2**	64.75	16.19	64.26	112.74	1323.26	0.00	599.84	157.40	0.108	0.00	0.12
2	**3**	831.90	207.98	829.41	1146.49	241.02	0.00	2189.18	2046.80	0.380	0.00	0.62
2	**4**	362.87	90.72	359.98	310.10	760.34	0.00	867.52	336.88	0.418	0.00	0.72
3	**1**	1220.30	305.07	1216.45	984.96	63.09	0.00	2505.75	2330.35	0.487	0.00	0.96
3	**3**	901.36	225.34	898.98	1222.21	57.32	0.00	2436.35	2400.87	0.370	0.00	0.60
3	**4**	180.68	45.17	180.25	88.51	867.80	0.00	1888.42	908.26	0.096	0.00	0.11

Main results: (8:15 AM-8:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1476.12	369.03	1473.94	1358.52	199.81	0.00	2411.64	2482.61	0.612	1.05	1.59
1	**2**	40.45	10.11	40.33	124.86	1548.89	0.00	500.27	44.55	0.081	0.06	0.09
1	**3**	1180.74	295.19	1179.60	1460.01	129.21	0.00	2387.75	2341.68	0.495	0.71	0.99
1	**4**	418.92	104.73	416.19	166.67	1142.13	0.00	696.84	157.44	0.601	0.80	1.49
2	**1**	1464.92	366.23	1461.51	1078.84	262.37	0.00	2149.00	2161.06	0.682	1.29	2.15
2	**2**	77.31	19.33	77.02	135.09	1588.79	0.00	473.57	157.40	0.163	0.12	0.20
2	**3**	993.37	248.34	992.40	1376.47	289.34	0.00	2157.20	2046.80	0.460	0.62	0.87
2	**4**	433.31	108.33	431.45	371.98	909.76	0.00	796.47	336.88	0.544	0.72	1.19
3	**1**	1460.01	365.00	1458.17	1180.74	75.47	0.00	2497.23	2330.35	0.585	0.96	1.42
3	**3**	1078.84	269.71	1077.98	1464.92	68.71	0.00	2428.65	2400.87	0.444	0.60	0.81
3	**4**	215.76	53.94	215.62	106.11	1040.59	0.00	1771.60	908.26	0.122	0.11	0.14

Main results: (8:30 AM-8:45 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	**1**	1807.88	451.97	1801.82	1651.76	238.23	0.00	2385.19	2482.61	0.758	1.59	3.11

1	2	49.55	12.39	49.21	149.48	1890.56	0.00	335.21	44.55	0.148	0.09	0.17
1	3	1442.69	360.67	1440.37	1781.91	157.86	0.00	2368.38	2341.68	0.609	0.99	1.57
1	4	513.08	128.27	495.38	203.62	1394.61	0.00	574.86	157.44	0.893	1.49	5.91
2	1	1786.11	446.53	1773.88	1318.36	318.78	0.00	2112.00	2161.06	0.846	2.15	5.20
2	2	94.69	23.67	93.74	164.28	1928.38	0.00	312.09	157.40	0.303	0.20	0.43
2	3	1216.63	304.16	1214.63	1670.77	351.35	0.00	2116.16	2046.80	0.575	0.87	1.37
2	4	530.69	132.67	523.70	452.53	1113.44	0.00	699.61	336.88	0.759	1.19	2.94
3	1	1781.91	445.48	1777.46	1442.69	92.40	0.00	2485.57	2330.35	0.717	1.42	2.53
3	3	1318.36	329.59	1316.76	1786.11	83.76	0.00	2418.48	2400.87	0.545	0.81	1.21
3	4	264.24	66.06	264.01	129.43	1271.08	0.00	1615.77	908.26	0.164	0.14	0.20

Main results: (8:45 AM-9:00 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	1807.88	451.97	1807.64	1667.23	244.29	0.00	2381.02	2482.61	0.759	3.11	3.17
1	2	49.55	12.39	49.53	152.74	1899.18	0.00	331.04	44.55	0.150	0.17	0.18
1	3	1448.95	362.24	1448.85	1790.20	158.52	0.00	2367.94	2341.68	0.612	1.57	1.60
1	4	513.08	128.27	508.69	204.54	1402.83	0.00	570.88	157.44	0.899	5.91	7.01
2	1	1798.10	449.52	1796.54	1323.14	322.31	0.00	2109.68	2161.06	0.852	5.20	5.59
2	2	94.69	23.67	94.58	165.92	1952.94	0.00	300.41	157.40	0.315	0.43	0.46
2	3	1216.63	304.16	1216.59	1691.91	355.61	0.00	2113.35	2046.80	0.576	1.37	1.38
2	4	530.69	132.67	530.16	456.90	1115.29	0.00	698.73	336.88	0.760	2.94	3.07
3	1	1790.20	447.55	1789.96	1448.95	92.48	0.00	2485.52	2330.35	0.720	2.53	2.59
3	3	1323.14	330.78	1323.08	1798.10	84.35	0.00	2418.08	2400.87	0.547	1.21	1.23
3	4	264.24	66.06	264.24	130.24	1277.19	0.00	1611.64	908.26	0.164	0.20	0.20

Main results: (9:00 AM-9:15 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	1476.12	369.03	1482.23	1384.06	210.81	0.00	2404.06	2482.61	0.614	3.17	1.64
1	2	40.45	10.11	40.80	130.75	1562.29	0.00	493.80	44.55	0.082	0.18	0.09
1	3	1190.01	297.50	1192.32	1472.95	130.14	0.00	2387.12	2341.68	0.499	1.60	1.02
1	4	418.92	104.73	440.42	168.00	1154.45	0.00	690.88	157.44	0.606	7.01	1.63
2	1	1483.37	370.84	1496.42	1085.76	267.37	0.00	2145.72	2161.06	0.691	5.59	2.33
2	2	77.31	19.33	78.31	137.42	1626.36	0.00	455.71	157.40	0.170	0.46	0.21
2	3	993.37	248.34	995.36	1408.78	295.89	0.00	2152.87	2046.80	0.461	1.38	0.88
2	4	433.31	108.33	440.58	378.70	912.54	0.00	795.14	336.88	0.545	3.07	1.25
3	1	1472.95	368.24	1477.39	1190.01	75.59	0.00	2497.14	2330.35	0.590	2.59	1.48
3	3	1085.76	271.44	1087.34	1483.37	69.62	0.00	2428.04	2400.87	0.447	1.23	0.83
3	4	215.76	53.94	215.98	107.34	1049.62	0.00	1765.49	908.26	0.122	0.20	0.14

Main results: (9:15 AM-9:30 AM)

Roundabout	Arm	Demand (PCE/hr)	Arrivals (PCE)	Entry Flow (PCE/hr)	Exit Flow (PCE/hr)	Circulating Flow (PCE/hr)	Pedestrian Demand (Ped/hr)	Capacity (PCE/hr)	Saturation Capacity (PCE/hr)	RFC	Start Queue (PCE)	End Queue (PCE)
1	1	1236.18	309.05	1238.50	1147.44	169.85	0.00	2432.26	2482.61	0.508	1.64	1.06

1	2	33.88	8.47	34.01	105.96	1302.40	0.00	619.36	44.55	0.055	0.09	0.06
1	3	993.71	248.43	994.90	1227.73	108.67	0.00	2401.64	2341.68	0.414	1.02	0.72
1	4	350.83	87.71	353.99	140.27	963.29	0.00	783.24	157.44	0.448	1.63	0.84
2	1	1235.05	308.76	1238.96	906.77	221.70	0.00	2175.69	2161.06	0.568	2.33	1.35
2	2	64.75	16.19	65.08	114.07	1346.59	0.00	588.75	157.40	0.110	0.21	0.13
2	3	831.90	207.98	832.90	1166.52	245.14	0.00	2186.45	2046.80	0.380	0.88	0.63
2	4	362.87	90.72	364.90	314.47	763.57	0.00	865.98	336.88	0.419	1.25	0.75
3	1	1227.73	306.93	1229.71	993.71	63.29	0.00	2505.62	2330.35	0.490	1.48	0.99
3	3	906.77	226.69	907.66	1235.05	57.95	0.00	2435.93	2400.87	0.372	0.83	0.61
3	4	180.68	45.17	180.82	89.43	876.17	0.00	1882.75	908.26	0.096	0.14	0.11

Queueing Delay Results

Queueing Delay results: (8:00 AM-8:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	15.27	1.02	3.044	A	A
1	2	0.85	0.06	6.224	A	A
1	3	10.37	0.69	2.580	A	A
1	4	11.45	0.76	8.258	A	A
2	1	18.74	1.25	3.803	A	A
2	2	1.78	0.12	6.850	A	A
2	3	9.14	0.61	2.696	A	A
2	4	10.38	0.69	7.195	A	A
3	1	14.09	0.94	2.840	A	A
3	3	8.78	0.59	2.386	A	A
3	4	1.59	0.11	2.149	A	A

Queueing Delay results: (8:15 AM-8:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	23.21	1.55	3.906	A	A
1	2	1.30	0.09	7.982	A	A
1	3	14.59	0.97	3.036	A	A
1	4	20.87	1.39	12.956	B	B
2	1	30.88	2.06	5.314	A	A
2	2	2.86	0.19	9.253	A	A
2	3	12.74	0.85	3.149	A	A
2	4	16.99	1.13	10.008	B	B
3	1	20.81	1.39	3.528	A	A
3	3	11.97	0.80	2.717	A	A
3	4	2.09	0.14	2.359	A	A

Queueing Delay results: (8:30 AM-8:45 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	43.97	2.93	6.230	A	A
1	2	2.50	0.17	12.823	B	B

1	3	22.90	1.53	3.947	A	A
1	4	69.26	4.62	39.710	E	D
2	1	70.08	4.67	10.496	B	B
2	2	6.12	0.41	16.746	C	B
2	3	19.91	1.33	4.064	A	A
2	4	39.06	2.60	20.118	C	C
3	1	36.31	2.42	5.152	A	A
3	3	17.78	1.19	3.329	A	A
3	4	2.94	0.20	2.716	A	A

Queueing Delay results: (8:45 AM-9:00 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	47.16	3.14	6.398	A	A
1	2	2.65	0.18	13.043	B	B
1	3	23.82	1.59	3.995	A	A
1	4	98.12	6.54	52.869	F	D
2	1	81.75	5.45	11.611	B	B
2	2	6.78	0.45	17.825	C	B
2	3	20.58	1.37	4.094	A	A
2	4	45.26	3.02	21.606	C	C
3	1	38.57	2.57	5.276	A	A
3	3	18.32	1.22	3.352	A	A
3	4	2.99	0.20	2.724	A	A

Queueing Delay results: (9:00 AM-9:15 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	25.49	1.70	4.009	A	A
1	2	1.43	0.10	8.113	A	A
1	3	15.66	1.04	3.078	A	A
1	4	30.62	2.04	15.824	C	B
2	1	37.24	2.48	5.766	A	A
2	2	3.31	0.22	9.756	A	A
2	3	13.49	0.90	3.177	A	A
2	4	20.24	1.35	10.558	B	B
3	1	22.90	1.53	3.615	A	A
3	3	12.68	0.85	2.741	A	A
3	4	2.16	0.14	2.369	A	A

Queueing Delay results: (9:15 AM-9:30 AM)

Roundabout	Arm	Queueing Total Delay (PCE-min)	Queueing Rate Of Delay (PCE-min/min)	Average Delay Per Arriving Vehicle (s)	Unsignalised Level Of Service	Signalised Level Of Service
1	1	16.29	1.09	3.083	A	A
1	2	0.91	0.06	6.273	A	A
1	3	11.03	0.74	2.611	A	A
1	4	13.23	0.88	8.615	A	A
2	1	20.93	1.40	3.937	A	A

2	2	1.96	0.13	7.015	A	A
2	3	9.60	0.64	2.714	A	A
2	4	11.63	0.78	7.356	A	A
3	1	15.10	1.01	2.881	A	A
3	3	9.24	0.62	2.403	A	A
3	4	1.64	0.11	2.159	A	A

Overview: Standard Roundabout Geometry

Standard Geometry

Roundabout	Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only	Final Slope	Final Intercept (PCE/hr)
1	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
1	2	3.50	4.25	6.81	30.00	60.00	30.00	False	0.483	1248.557
1	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
1	4	3.50	4.25	6.82	30.00	60.00	30.00	False	0.483	1248.622
2	1	7.37	8.00	4.05	30.00	60.64	39.51	False	0.656	2321.138
2	2	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
2	3	7.47	8.00	3.89	30.00	60.71	37.92	False	0.662	2348.681
2	4	3.50	4.25	6.85	30.00	60.00	34.63	False	0.476	1229.075
3	1	8.00	8.00	0.00	30.57	64.15	19.99	False	0.688	2549.182
3	3	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107
3	4	7.00	8.00	10.12	31.40	64.19	19.93	False	0.676	2475.107

Overview: Time Segment Results

Time Segment Results

Time Segment	Roundabout	Arm	Demand (PCE/hr)	Capacity (PCE/hr)	RFC	Pedestrian Demand (Ped/hr)	Start Queue (PCE)	End Queue (PCE)	Queueing Total Delay (PCE-min)	Geometric Total Delay (PCE-min)	Average Delay Per Arriving Vehicle (s)
1	1	1	1236.18	2434.32	0.508	0.00	0.00	1.05	15.27	(0.00)	3.044
1	1	2	33.88	623.13	0.054	0.00	0.00	0.06	0.85	(0.00)	6.224
1	1	3	984.96	2402.13	0.410	0.00	0.00	0.71	10.37	(0.00)	2.580
1	1	4	350.83	789.19	0.445	0.00	0.00	0.80	11.45	(0.00)	8.258
1	2	1	1222.21	2177.49	0.561	0.00	0.00	1.29	18.74	(0.00)	3.803
1	2	2	64.75	599.84	0.108	0.00	0.00	0.12	1.78	(0.00)	6.850
1	2	3	831.90	2189.18	0.380	0.00	0.00	0.62	9.14	(0.00)	2.696
1	2	4	362.87	867.52	0.418	0.00	0.00	0.72	10.38	(0.00)	7.195
1	3	1	1220.30	2505.75	0.487	0.00	0.00	0.96	14.09	(0.02)	2.840
1	3	3	901.36	2436.35	0.370	0.00	0.00	0.60	8.78	(0.02)	2.386
1	3	4	180.68	1888.42	0.096	0.00	0.00	0.11	1.59	(0.02)	2.149
2	1	1	1476.12	2411.64	0.612	0.00	1.05	1.59	23.21	(0.00)	3.906
2	1	2	40.45	500.27	0.081	0.00	0.06	0.09	1.30	(0.00)	7.982

2	**1**	**3**	1180.74	2387.75	0.495	0.00	0.71	0.99	14.59	(0.00)	3.036
2	**1**	**4**	418.92	696.84	0.601	0.00	0.80	1.49	20.87	(0.00)	12.956
2	**2**	**1**	1464.92	2149.00	0.682	0.00	1.29	2.15	30.88	(0.00)	5.314
2	**2**	**2**	77.31	473.57	0.163	0.00	0.12	0.20	2.86	(0.00)	9.253
2	**2**	**3**	993.37	2157.20	0.460	0.00	0.62	0.87	12.74	(0.00)	3.149
2	**2**	**4**	433.31	796.47	0.544	0.00	0.72	1.19	16.99	(0.00)	10.008
2	**3**	**1**	1460.01	2497.23	0.585	0.00	0.96	1.42	20.81	(0.02)	3.528
2	**3**	**3**	1078.84	2428.65	0.444	0.00	0.60	0.81	11.97	(0.02)	2.717
2	**3**	**4**	215.76	1771.60	0.122	0.00	0.11	0.14	2.09	(0.02)	2.359
3	**1**	**1**	1807.88	2385.19	0.758	0.00	1.59	3.11	43.97	(0.00)	6.230
3	**1**	**2**	49.55	335.21	0.148	0.00	0.09	0.17	2.50	(0.00)	12.823
3	**1**	**3**	1442.69	2368.38	0.609	0.00	0.99	1.57	22.90	(0.00)	3.947
3	**1**	**4**	513.08	574.86	0.893	0.00	1.49	5.91	69.26	(0.00)	39.710
3	**2**	**1**	1786.11	2112.00	0.846	0.00	2.15	5.20	70.08	(0.00)	10.496
3	**2**	**2**	94.69	312.09	0.303	0.00	0.20	0.43	6.12	(0.00)	16.746
3	**2**	**3**	1216.63	2116.16	0.575	0.00	0.87	1.37	19.91	(0.00)	4.064
3	**2**	**4**	530.69	699.61	0.759	0.00	1.19	2.94	39.06	(0.00)	20.118
3	**3**	**1**	1781.91	2485.57	0.717	0.00	1.42	2.53	36.31	(0.02)	5.152
3	**3**	**3**	1318.36	2418.48	0.545	0.00	0.81	1.21	17.78	(0.02)	3.329
3	**3**	**4**	264.24	1615.77	0.164	0.00	0.14	0.20	2.94	(0.02)	2.716
4	**1**	**1**	1807.88	2381.02	0.759	0.00	3.11	3.17	47.16	(0.00)	6.398
4	**1**	**2**	49.55	331.04	0.150	0.00	0.17	0.18	2.65	(0.00)	13.043
4	**1**	**3**	1448.95	2367.94	0.612	0.00	1.57	1.60	23.82	(0.00)	3.995
4	**1**	**4**	513.08	570.88	0.899	0.00	5.91	7.01	98.12	(0.00)	52.869
4	**2**	**1**	1798.10	2109.68	0.852	0.00	5.20	5.59	81.75	(0.00)	11.611
4	**2**	**2**	94.69	300.41	0.315	0.00	0.43	0.46	6.78	(0.00)	17.825
4	**2**	**3**	1216.63	2113.35	0.576	0.00	1.37	1.38	20.58	(0.00)	4.094
4	**2**	**4**	530.69	698.73	0.760	0.00	2.94	3.07	45.26	(0.00)	21.606
4	**3**	**1**	1790.20	2485.52	0.720	0.00	2.53	2.59	38.57	(0.02)	5.276
4	**3**	**3**	1323.14	2418.08	0.547	0.00	1.21	1.23	18.32	(0.02)	3.352
4	**3**	**4**	264.24	1611.64	0.164	0.00	0.20	0.20	2.99	(0.02)	2.724
5	**1**	**1**	1476.12	2404.06	0.614	0.00	3.17	1.64	25.49	(0.00)	4.009
5	**1**	**2**	40.45	493.80	0.082	0.00	0.18	0.09	1.43	(0.00)	8.113
5	**1**	**3**	1190.01	2387.12	0.499	0.00	1.60	1.02	15.66	(0.00)	3.078
5	**1**	**4**	418.92	690.88	0.606	0.00	7.01	1.63	30.62	(0.00)	15.824
5	**2**	**1**	1483.37	2145.72	0.691	0.00	5.59	2.33	37.24	(0.00)	5.766
5	**2**	**2**	77.31	455.71	0.170	0.00	0.46	0.21	3.31	(0.00)	9.756
5	**2**	**3**	993.37	2152.87	0.461	0.00	1.38	0.88	13.49	(0.00)	3.177
5	**2**	**4**	433.31	795.14	0.545	0.00	3.07	1.25	20.24	(0.00)	10.558
5	**3**	**1**	1472.95	2497.14	0.590	0.00	2.59	1.48	22.90	(0.02)	3.615
5	**3**	**3**	1085.76	2428.04	0.447	0.00	1.23	0.83	12.68	(0.02)	2.741
5	**3**	**4**	215.76	1765.49	0.122	0.00	0.20	0.14	2.16	(0.02)	2.369
6	**1**	**1**	1236.18	2432.26	0.508	0.00	1.64	1.06	16.29	(0.00)	3.083
6	**1**	**2**	33.88	619.36	0.055	0.00	0.09	0.06	0.91	(0.00)	6.273
6	**1**	**3**	993.71	2401.64	0.414	0.00	1.02	0.72	11.03	(0.00)	2.611
6	**1**	**4**	350.83	783.24	0.448	0.00	1.63	0.84	13.23	(0.00)	8.615
6	**2**	**1**	1235.05	2175.69	0.568	0.00	2.33	1.35	20.93	(0.00)	3.937

6	**2**	**2**	64.75	588.75	0.110	0.00	0.21	0.13	1.96	(0.00)	7.015
6	**2**	**3**	831.90	2186.45	0.380	0.00	0.88	0.63	9.60	(0.00)	2.714
6	**2**	**4**	362.87	865.98	0.419	0.00	1.25	0.75	11.63	(0.00)	7.356
6	**3**	**1**	1227.73	2505.62	0.490	0.00	1.48	0.99	15.10	(0.02)	2.881
6	**3**	**3**	906.77	2435.93	0.372	0.00	0.83	0.61	9.24	(0.02)	2.403
6	**3**	**4**	180.68	1882.75	0.096	0.00	0.14	0.11	1.64	(0.02)	2.159

Appendix J

Queuing Analysis Report

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	11	1228	89	507	29	18	49	13	102	19
v/c Ratio	0.02	0.46	0.32	0.19	0.18	0.08	0.21	0.07	0.44	0.10
Control Delay	4.1	5.8	8.3	4.2	44.8	42.3	14.0	42.2	50.5	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.1	5.8	8.3	4.2	44.8	42.3	14.0	42.2	50.5	7.7
Queue Length 50th (m)	0.5	38.2	4.6	12.2	5.1	3.1	0.0	2.3	18.6	0.0
Queue Length 95th (m)	1.9	57.4	13.3	19.8	12.9	9.2	9.6	7.5	33.5	3.7
Internal Link Dist (m)		208.0		495.3		1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0		30.0		30.0	30.0		30.0
Base Capacity (vph)	490	2680	282	2610	301	408	397	326	428	332
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.46	0.32	0.19	0.10	0.04	0.12	0.04	0.24	0.06

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	1209	255	595	9	8	40	6	66	8
v/c Ratio	0.00	0.74	0.68	0.27	0.03	0.02	0.09	0.02	0.17	0.02
Control Delay	8.0	28.4	25.3	9.0	38.9	38.6	0.5	38.7	40.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	28.4	25.3	9.0	38.9	38.6	0.5	38.7	40.3	0.1
Queue Length 50th (m)	0.1	102.7	23.6	22.5	1.5	1.3	0.0	1.0	11.3	0.0
Queue Length 95th (m)	0.6	138.8	48.4	41.7	5.8	5.4	0.0	4.5	23.6	0.0
Internal Link Dist (m)		893.8		1350.2		1343.2			1318.7	
Turn Bay Length (m)	30.0		30.0		30.0		30.0	30.0		30.0
Base Capacity (vph)	477	1637	459	2215	282	394	425	296	379	417
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.74	0.56	0.27	0.03	0.02	0.09	0.02	0.17	0.02

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	72	1074	139	685	25	154	76	584
v/c Ratio	0.20	0.60	0.45	0.30	0.31	0.21	0.28	0.73
Control Delay	19.2	22.4	12.5	9.3	47.6	24.0	39.1	44.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	22.4	12.5	9.3	47.6	24.0	39.1	44.2
Queue Length 50th (m)	7.9	80.5	9.8	29.7	4.3	9.0	13.1	55.8
Queue Length 95th (m)	18.6	113.1	18.6	42.5	12.3	16.9	25.6	73.6
Internal Link Dist (m)		1350.2		1354.5		1166.3		302.7
Turn Bay Length (m)	35.0		30.0		80.0		78.0	
Base Capacity (vph)	362	1784	348	2267	96	848	319	943
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.60	0.40	0.30	0.26	0.18	0.24	0.62

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	18	1246	47	805	37	131	30	76
v/c Ratio	0.04	0.47	0.17	0.31	0.30	0.29	0.20	0.19
Control Delay	3.8	5.6	5.7	4.6	48.3	16.9	44.4	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.8	5.6	5.7	4.6	48.3	16.9	44.4	29.8
Queue Length 50th (m)	0.7	37.5	2.0	20.5	6.4	3.5	5.1	4.5
Queue Length 95th (m)	2.5	54.7	6.1	30.8	15.6	11.4	13.1	10.7
Internal Link Dist (m)		1354.5		1159.0		1208.0		192.9
Turn Bay Length (m)	30.0		35.1		80.0		80.0	
Base Capacity (vph)	497	2659	270	2566	278	888	340	881
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.47	0.17	0.31	0.13	0.15	0.09	0.09

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	5	1431	208	764	51	68	167	15	97
v/c Ratio	0.01	0.72	0.61	0.31	0.31	0.29	0.50	0.09	0.43
Control Delay	12.6	20.2	20.5	4.7	49.1	47.0	12.2	43.6	47.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	20.2	20.5	4.7	49.1	47.0	12.2	43.6	47.5
Queue Length 50th (m)	0.4	99.3	12.8	20.1	9.4	12.4	0.0	2.7	16.7
Queue Length 95th (m)	2.2	146.8	36.6	31.6	20.1	24.6	17.1	8.4	31.5
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			30.0	
Base Capacity (vph)	401	2001	401	2498	282	407	453	290	380
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.72	0.52	0.31	0.18	0.17	0.37	0.05	0.26

Intersection Summary

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1189	14	594	6	11
v/c Ratio	0.68	0.10	0.34	0.01	0.02
Control Delay	15.5	10.6	11.1	20.2	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.5	10.6	11.1	20.2	11.6
Queue Length 50th (m)	52.8	0.8	21.1	0.5	0.0
Queue Length 95th (m)	69.3	3.4	29.5	3.1	3.4
Internal Link Dist (m)	495.3		893.8	440.2	
Turn Bay Length (m)		30.0		30.0	
Base Capacity (vph)	3575	292	3579	549	499
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.33	0.05	0.17	0.01	0.02

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	23	717	146	864	68	72	79	5	34	22
v/c Ratio	0.05	0.30	0.29	0.34	0.35	0.28	0.29	0.03	0.13	0.09
Control Delay	4.6	5.2	6.7	5.5	40.1	37.3	11.2	33.2	34.6	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	5.2	6.7	5.5	40.1	37.3	11.2	33.2	34.6	9.0
Queue Length 50th (m)	0.9	17.6	6.9	22.4	9.8	10.3	0.0	0.7	4.8	0.0
Queue Length 95th (m)	3.2	27.9	16.2	34.4	21.0	21.3	10.7	3.5	12.2	4.2
Internal Link Dist (m)		208.0		495.3		1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0		30.0		30.0	30.0		30.0
Base Capacity (vph)	436	2403	509	2533	651	861	723	513	869	749
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.30	0.29	0.34	0.10	0.08	0.11	0.01	0.04	0.03

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	10	795	54	958	48	77	141	8	20	5
v/c Ratio	0.03	0.33	0.11	0.38	0.25	0.30	0.42	0.05	0.08	0.02
Control Delay	4.3	5.3	4.9	5.6	37.5	37.9	10.3	33.8	34.0	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.3	5.3	4.9	5.6	37.5	37.9	10.3	33.8	34.0	0.2
Queue Length 50th (m)	0.4	20.4	2.2	25.8	6.8	11.0	0.0	1.1	2.8	0.0
Queue Length 95th (m)	1.8	31.1	6.1	38.5	16.0	22.6	14.2	4.7	8.4	0.0
Internal Link Dist (m)		893.8		1350.2		1343.2			1318.7	
Turn Bay Length (m)	30.0		30.0		30.0		30.0	30.0		30.0
Base Capacity (vph)	391	2383	476	2520	675	881	820	562	856	789
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.33	0.11	0.38	0.07	0.09	0.17	0.01	0.02	0.01

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	113	845	72	945	42	548	34	205
v/c Ratio	0.36	0.38	0.21	0.42	0.19	0.68	0.27	0.26
Control Delay	14.0	9.8	10.9	10.2	32.4	35.8	36.9	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.0	9.8	10.9	10.2	32.4	35.8	36.9	21.9
Queue Length 50th (m)	8.5	33.7	4.8	38.9	6.0	42.2	5.0	10.7
Queue Length 95th (m)	23.4	54.4	13.7	62.4	14.3	57.9	13.1	19.2
Internal Link Dist (m)		1350.2		1354.5		1166.3		302.7
Turn Bay Length (m)	35.0		30.0		80.0		78.0	
Base Capacity (vph)	311	2243	339	2250	418	1471	238	1465
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.38	0.21	0.42	0.10	0.37	0.14	0.14

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	31	1061	102	1102	36	155	27	78
v/c Ratio	0.12	0.42	0.29	0.44	0.20	0.31	0.16	0.16
Control Delay	5.3	5.7	7.2	5.8	37.2	19.7	36.5	26.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.3	5.7	7.2	5.8	37.2	19.7	36.5	26.9
Queue Length 50th (m)	1.3	29.8	4.8	31.5	5.1	5.6	3.8	4.2
Queue Length 95th (m)	3.9	39.4	11.6	41.6	13.1	13.6	10.6	10.0
Internal Link Dist (m)		1354.5		1159.0		1208.0		192.9
Turn Bay Length (m)	30.0		35.0		80.0		80.0	
Base Capacity (vph)	256	2503	347	2495	642	1592	597	1675
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.42	0.29	0.44	0.06	0.10	0.05	0.05

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	41	1081	294	1190	136	192	181	25	130
v/c Ratio	0.18	0.63	0.67	0.49	0.62	0.55	0.42	0.14	0.38
Control Delay	23.0	24.3	19.0	9.1	54.3	47.2	8.5	38.8	37.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	24.3	19.0	9.1	54.3	47.2	8.5	38.8	37.2
Queue Length 50th (m)	4.4	79.3	18.0	50.2	25.2	35.1	0.0	4.2	19.8
Queue Length 95th (m)	14.1	127.5	51.0	81.9	43.6	55.2	15.9	11.1	35.7
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			15.0	
Base Capacity (vph)	226	1714	525	2431	319	504	544	256	486
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.63	0.56	0.49	0.43	0.38	0.33	0.10	0.27

Intersection Summary

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	735	13	985	13	25
v/c Ratio	0.48	0.05	0.65	0.02	0.04
Control Delay	14.3	10.8	16.7	16.0	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.3	10.8	16.7	16.0	7.5
Queue Length 50th (m)	29.3	0.8	43.2	0.9	0.0
Queue Length 95th (m)	40.6	3.3	58.3	4.4	4.4
Internal Link Dist (m)	495.3		893.8	440.2	
Turn Bay Length (m)		30.0		30.0	
Base Capacity (vph)	3575	622	3579	638	587
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.21	0.02	0.28	0.02	0.04

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	17	1736	182	196	718	8	66	29	117	17	142	25
v/c Ratio	0.05	0.86	0.20	0.78	0.30	0.01	0.42	0.11	0.37	0.09	0.53	0.09
Control Delay	5.8	26.4	6.6	49.1	8.2	0.0	52.3	42.6	13.9	42.3	52.3	0.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.8	26.4	6.6	49.1	8.2	0.0	52.3	42.6	13.9	42.3	52.3	0.7
Queue Length 50th (m)	0.8	147.3	7.6	25.0	21.0	0.0	12.4	5.2	2.1	3.0	27.1	0.0
Queue Length 95th (m)	2.9	200.7	19.0	#60.7	48.7	0.0	25.0	12.8	16.6	9.1	45.1	0.0
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	368	2030	930	260	2395	1164	233	375	413	296	394	358
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.86	0.20	0.75	0.30	0.01	0.28	0.08	0.28	0.06	0.36	0.07

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	2	1741	193	412	978	7	25	12	78	8	91	11
v/c Ratio	0.00	0.92	0.21	1.41	0.42	0.01	0.09	0.02	0.18	0.03	0.12	0.03
Control Delay	6.0	34.3	3.9	233.0	9.4	0.0	39.2	37.6	0.9	38.0	38.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	34.3	3.9	233.0	9.4	0.0	39.2	37.6	0.9	38.0	38.9	0.1
Queue Length 50th (m)	0.1	173.6	3.3	~107.4	40.3	0.0	4.4	1.1	0.0	1.4	8.4	0.0
Queue Length 95th (m)	0.8	#210.0	13.3	#164.3	72.7	0.0	11.4	3.5	0.0	5.3	15.1	0.0
Internal Link Dist (m)		893.8			1158.7			1343.2			179.3	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	421	1901	905	293	2332	931	282	772	433	304	742	425
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.92	0.21	1.41	0.42	0.01	0.09	0.02	0.18	0.03	0.12	0.03

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	107	1737	229	1135	44	127	89	99	587	191
v/c Ratio	0.37	0.72	0.82	0.39	0.79	0.21	0.21	0.41	0.84	0.43
Control Delay	12.3	26.6	54.2	14.1	116.8	40.9	1.1	47.6	58.2	12.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	26.6	54.2	14.1	116.8	40.9	1.1	47.6	58.2	12.9
Queue Length 50th (m)	7.1	108.4	35.1	46.3	9.1	12.1	0.0	18.8	64.7	5.5
Queue Length 95th (m)	12.5	125.3	#68.9	55.1	#29.4	20.3	0.0	34.5	#88.2	24.1
Internal Link Dist (m)		147.0		1354.5		1166.3			302.7	
Turn Bay Length (m)	35.0		30.0		80.0		30.0	78.0		34.8
Base Capacity (vph)	293	2425	299	2895	57	615	435	245	709	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.72	0.77	0.39	0.77	0.21	0.20	0.40	0.83	0.43

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	19	1951	62	1335	40	44	101	36	57	30
v/c Ratio	0.07	0.51	0.53	0.36	0.31	0.10	0.47	0.21	0.13	0.15
Control Delay	4.7	6.0	26.6	4.9	49.4	42.0	37.2	45.4	42.5	14.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	6.0	26.6	4.9	49.4	42.0	37.2	45.4	42.5	14.8
Queue Length 50th (m)	0.8	43.2	3.9	25.0	7.2	4.0	12.3	6.4	5.2	0.0
Queue Length 95th (m)	3.1	64.1	#27.7	38.1	16.7	8.8	27.5	15.2	10.6	7.1
Internal Link Dist (m)		1354.5		1159.0		1208.0			192.9	
Turn Bay Length (m)	30.0		35.0		80.0		30.0	80.0		30.0
Base Capacity (vph)	269	3828	117	3710	245	837	372	320	837	337
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.51	0.53	0.36	0.16	0.05	0.27	0.11	0.07	0.09

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	7	2138	292	1297	58	79	201	20	124
v/c Ratio	0.03	0.81	0.82	0.37	0.35	0.31	0.53	0.11	0.51
Control Delay	15.4	25.1	48.9	5.4	49.5	46.6	11.4	43.3	50.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	25.1	48.9	5.4	49.5	46.6	11.4	43.3	50.2
Queue Length 50th (m)	0.7	126.4	41.1	27.5	10.7	14.5	0.0	3.6	22.3
Queue Length 95th (m)	3.1	160.8	#82.0	40.5	22.3	27.4	18.4	10.1	39.1
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			30.0	
Base Capacity (vph)	205	2655	384	3550	262	402	477	283	375
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.81	0.76	0.37	0.22	0.20	0.42	0.07	0.33

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1841	47	87	865	37	68
v/c Ratio	0.83	0.05	0.44	0.34	0.14	0.23
Control Delay	21.0	5.7	19.1	5.7	47.5	13.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	5.7	19.1	5.7	47.5	13.3
Queue Length 50th (m)	151.3	2.0	4.3	28.0	7.2	0.0
Queue Length 95th (m)	182.3	6.2	17.3	35.0	16.6	11.9
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	2509	1129	198	2880	267	297
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.04	0.44	0.30	0.14	0.23

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	34	973	98	272	1379	11	153	106	223	6	50	30
v/c Ratio	0.17	0.42	0.09	0.78	0.56	0.01	0.61	0.31	0.59	0.03	0.15	0.10
Control Delay	9.8	8.5	2.6	31.9	10.2	0.3	50.1	39.3	22.6	34.2	36.2	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.8	8.5	2.6	31.9	10.2	0.3	50.1	39.3	22.6	34.2	36.2	11.0
Queue Length 50th (m)	2.0	37.5	1.1	30.9	62.1	0.0	27.0	17.6	14.9	1.0	8.1	0.0
Queue Length 95th (m)	7.6	64.0	7.0	#96.6	103.1	0.3	45.4	31.3	36.4	4.0	17.3	6.3
Internal Link Dist (m)		208.0			495.3			1114.1			1377.7	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	204	2335	1086	348	2448	954	428	575	546	332	580	511
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.42	0.09	0.78	0.56	0.01	0.36	0.18	0.41	0.02	0.09	0.06

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	15	1277	54	105	1521	16	100	109	257	11	28	6
v/c Ratio	0.09	0.55	0.05	0.43	0.62	0.01	0.39	0.17	0.73	0.05	0.05	0.02
Control Delay	8.5	10.0	3.3	15.7	11.0	0.9	44.4	38.5	41.7	37.0	36.6	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	10.0	3.3	15.7	11.0	0.9	44.4	38.5	41.7	37.0	36.6	0.2
Queue Length 50th (m)	0.9	59.9	0.9	8.3	77.4	0.0	17.9	9.8	33.9	1.9	2.4	0.0
Queue Length 95th (m)	3.8	92.7	5.1	25.1	118.2	1.0	32.4	16.8	59.2	6.4	6.1	0.0
Internal Link Dist (m)		893.8			1158.4			1343.2			179.3	
Turn Bay Length (m)	30.0		30.0	30.0		30.0	30.0		30.0	30.0		30.0
Base Capacity (vph)	169	2326	1141	242	2461	1140	359	899	461	292	874	439
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.55	0.05	0.43	0.62	0.01	0.28	0.12	0.56	0.04	0.03	0.01

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	167	1572	127	1512	78	512	255	40	182	83
v/c Ratio	0.63	0.62	0.56	0.60	0.35	0.63	0.54	0.31	0.23	0.20
Control Delay	26.4	21.9	24.3	22.6	40.4	42.5	16.2	42.0	35.4	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	21.9	24.3	22.6	40.4	42.5	16.2	42.0	35.4	6.2
Queue Length 50th (m)	11.9	80.4	8.9	78.8	13.3	49.3	12.4	6.7	15.8	0.0
Queue Length 95th (m)	35.3	108.1	26.5	105.5	26.0	64.9	34.5	16.1	24.5	8.6
Internal Link Dist (m)		145.5		1354.5		1166.3			302.7	
Turn Bay Length (m)	35.0		30.0		80.0		30.0	78.0		34.8
Base Capacity (vph)	280	2554	233	2501	293	1059	558	172	1039	513
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.62	0.55	0.60	0.27	0.48	0.46	0.23	0.18	0.16

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	36	1902	125	1733	39	87	89	33	63	22
v/c Ratio	0.20	0.66	0.48	0.52	0.23	0.19	0.33	0.20	0.14	0.08
Control Delay	7.2	16.2	19.3	10.0	43.7	40.8	11.2	43.1	40.2	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.2	16.2	19.3	10.0	43.7	40.8	11.2	43.1	40.2	0.5
Queue Length 50th (m)	1.4	78.4	6.5	60.8	6.5	7.5	0.0	5.5	5.4	0.0
Queue Length 95th (m)	3.7	101.5	22.4	74.8	15.5	14.1	11.3	13.7	11.1	0.0
Internal Link Dist (m)		1354.5		1159.0		1208.0			192.9	
Turn Bay Length (m)	30.0		35.0		80.0		30.0	80.0		30.0
Base Capacity (vph)	180	2864	293	3315	430	1147	545	421	1147	572
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.66	0.43	0.52	0.09	0.08	0.16	0.08	0.05	0.04

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	61	1919	378	1835	153	251	212	33	159
v/c Ratio	0.63	0.85	0.89	0.52	0.81	0.73	0.47	0.27	0.47
Control Delay	59.4	34.2	56.7	8.8	77.4	58.7	9.1	47.8	43.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.4	34.2	56.7	8.8	77.4	58.7	9.1	47.8	43.6
Queue Length 50th (m)	10.3	137.8	64.3	62.5	31.6	50.9	0.0	6.1	27.4
Queue Length 95th (m)	#32.3	158.1	#111.4	71.7	#61.4	76.9	18.3	15.3	46.8
Internal Link Dist (m)		149.1		738.5		1176.0			965.4
Turn Bay Length (m)	80.0		30.0		30.0			30.0	
Base Capacity (vph)	97	2246	449	3537	207	376	477	132	367
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.85	0.84	0.52	0.74	0.67	0.44	0.25	0.43

Intersection Summary

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

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1141	41	77	1557	84	156
v/c Ratio	0.54	0.04	0.35	0.73	0.18	0.31
Control Delay	12.1	2.9	14.3	15.8	33.7	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	2.9	14.3	15.8	33.7	12.7
Queue Length 50th (m)	54.8	0.4	6.1	90.2	10.9	4.6
Queue Length 95th (m)	67.1	3.5	14.3	109.1	28.1	22.9
Internal Link Dist (m)	495.3			893.8	440.2	
Turn Bay Length (m)		30.0	30.0		30.0	
Base Capacity (vph)	3100	1391	318	3100	460	501
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.03	0.24	0.50	0.18	0.31

Intersection Summary

E

GEOTECHNICAL

THURBER

GEOTECHNICAL INVESTIGATION

MAYFIELD ROAD CLASS EA STUDY

WINSTON CHURCHILL BOULEVARD TO CHINGUACOUSY ROAD
BRAMPTON / CALEDON, REGION OF PEEL

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THURBER

REPORT APPENDICES

1 INTRODUCTION

This report presents the results of a geotechnical investigation carried out by Thurber Engineering Ltd. (Thurber) for the widening of Mayfield Road between Winston Churchill Boulevard and Chinguacousy Road, located on the border of the City of Brampton and the Town of Caledon. The work was undertaken by Thurber Engineering Ltd. (Thurber) for Hatch Mott MacDonald as part of a Schedule 'C' Class Environmental Assessment (EA) for the Regional Municipality of Peel (Peel Region).

The purpose of this investigation was to obtain existing pavement condition and subsurface information along proposed widening area and based on the findings, to provide pavement and geotechnical recommendations for the rehabilitation of the existing roadway and construction in the widening area, as well as storm sewer installation.

This report presents the results of the geotechnical investigation conducted for all pavement work, data analysis, and preparation of pavement design recommendations included in this assignment. It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2 PROJECT AND SITE DESCRIPTION

2.1 Background

It is understood that Peel Region is undertaking an Environmental Assessment (EA) study phase to improve the functional capacity of the above noted section of Mayfield Road. The project includes widening of Mayfield Road from 2 to 4 lanes from Winston Churchill Boulevard to west of Mississauga Road, and from 2 to 6 lanes from west of Mississauga Road to Chinguacousy Road. Roundabout intersections are being considered at Winston Churchill Boulevard, a new arterial road (Sandalwood Parkway), and Heritage Road.

In preparation for the widening of Mayfield Road, realignment of existing roadways and profile adjustments will be required. Furthermore, it is understood that a number of non-structural culverts will be required.

2.2 Physiography

The Quaternary geologic mapping (OGS Map 2223, Brampton Area, 2005) indicates that the geologic conditions within the area consist of low-relief plains of Halton Till: a silt to silty clay till, with occasional zones of glacial lacustrine clay upslope. The till is of variable thickness and overlies Middle-Ordovician bedrock consisting of shale, limestone, dolostone, and siltstone of the Queenston Formation (Map 2197, 1970).

The study area is located within a physiographic region known as the South Slope: the southern slope of the Oak Ridges Moraine. The South Slope is gently sloped and faintly drumlinized, although no drumlins are present within the study area. An esker is located south of Mayfield Road 4.3 km east of its intersection with Chinguacousy Road, between Kennedy Road and Heart Lake Road. Recently, agriculture and road construction activities in the area have resulted in placement of anthropogenic (fill) deposits in some areas.

The topography within the study area is gently undulating from a ground surface elevation of approximately 256 m to 267 m above sea level, with a gradual downwards slope towards Lake Ontario.

2.3 Existing Conditions

Mayfield Road currently comprises a two-lane rural cross section, constructed as a flexible pavement, with partially paved shoulders. The posted speed limit within the project area is 80 km/hr, and is orientated in the east-west direction. For the purposes of the pavement investigation, project stationing was established with Station 0+000 at the western project limits (260 m west of Winston Churchill Boulevard) and extends 5.8 km to Chinguacousy Road.

Typical pavement condition of the roadway is shown on the photographs provided in Appendix A

3 PAVEMENT INVESTIGATION METHODOLOGY

A field investigation was carried out in October 2013 and comprised of deflection testing, pavement coring, borehole drilling, and laboratory testing on recovered samples of granular base/subbase and subgrade soil. A plan of borehole (and pavement core) locations is appended in Appendix B

Pavement cores were extracted prior to drilling selected boreholes within the existing asphalt surface. Cores were taken on approximately 500 m intervals staggered in both directions, for a total of 12 cores. Three additional cores were taken from side roads; Heritage Road, Mississauga Road and Creditview Road. All cores were labelled and returned to Thurber's Oakville office for visual logging and photographing. Pavement core logs and typical photographs are provided in Appendix C.

A total of 38 boreholes were drilled along the existing pavement to a depth 1.5 m. An additional 16 boreholes were drilled to a depth of 4.4 m, and 4 boreholes where advanced to depths of 6.3 to 6.7 m. These deeper boreholes were advanced through the existing gravel shoulders, and 11 monitoring wells were installed. Upon completion, all boreholes were backfilled with auger cuttings, or bentonite hole-plug.

The field investigation was carried out under the full-time supervision of Thurber technical staff. All boreholes were logged in the field. Soil samples were identified, placed in labelled containers and transported back to Thurber's laboratory for further examination and testing.

Boreholes logs for the shallow boreholes (1.5 m depth) are presented in tabular format, and logs for deeper boreholes are provided on separate record of borehole sheets. All borehole logs are provided in Appendix D.

Geotechnical laboratory testing consisted of natural moisture content determinations, visual classification and description of all soil samples. Grain size distribution and particle size analyses were carried out on selected samples of the pavement granular materials and subgrade soils. Results of the geotechnical laboratory testing are summarized in the Borehole logs and provided in detail in Appendix E.

Falling Weight Deflectometer (FWD) testing of Mayfield Road was completed on 100 m intervals throughout the project limits, with test locations staggered by direction. The testing was completed by Applied Research Associates Inc. (ARA), on October 25, 2013, with the analysis of the collected data by Thurber. Further details of the FWD testing are provided in the ensuing sections, with the results of the analysis provided in Appendix F.

4 PAVEMENT EVALUATION

4.1 Existing Pavement Condition

A pavement condition assessment was completed along Mayfield Road on October 10, 2013. The assessment considered the existing pavement to be in very good condition, with very few surface distresses. The predominant pavement distress on Mayfield Road includes few longitudinal cracks of slight severity, with all visible cracks previously sealed. Typical photographs of the general condition on Mayfield Road at the time of the pavement condition assessment are provided in Appendix A.

4.2 Existing Pavement Structure

4.2.1 Asphalt

The asphalt thickness on Mayfield Road typically varied from 180 to 250 mm, although asphalt thicknesses varied from a low of 150 mm to 300 mm. For the extracted pavement cores, visual observation assessed that the asphalt on Mayfield Road demonstrated they were paved from Winston Churchill Boulevard to Station 2+960 with two lifts of asphalt over an asphalt stabilized base. In this area the asphalt overlay varied in thickness from 90 to 125 mm, with the thickness of the asphalt stabilized base ranging from 100 to 150 mm. It is noted that two core samples did not recover the full thickness of the stabilized layer.

Pavement cores from the remaining section of Mayfield Road were paved with asphalt (full thickness) in four or five lifts. Delamination between asphalt layers were observed in two core samples, with the depth to the delamination at 90 and 160 mm.

The asphalt thicknesses on Heritage Road was found to comprise of 40 mm of asphalt over an 80 mm asphalt stabilized base layer, for a total thickness of 120 mm. For Mississauga Road and Creditview Road, the pavement cores were 230 and 190 mm thick, respectively, and paved in four lifts.

4.2.2 Granular Base/Subbase

Underlying the asphalt surface, the pavement structure on Mayfield Road comprised a granular base/subbase, which consisted primarily of gravelly sand some silt. A separate layer of granular subbase was not distinguishable. The granular base/subbase thicknesses generally varied from 300 to 550 mm, however thicknesses varying from 160 to 780 mm were observed. In the roadway shoulders, the granular thickness typically ranged from 480 to 760 mm; however, at Station 4+360, the observed granular thickness was 180 mm.

Grain size analysis was completed on selected samples of granular base/subbase material that indicate that the material generally conforms to OPSS Granular B, Type I gradation specifications, although most samples indicated a gradation curve that was slightly finer than OPSS Granular A specification. However, most of the samples exceeded the specified percent passing on the 75 µm sieve size. This is common for samples collected from existing roadways, and could be the result of construction activities (i.e. compaction efforts), or the drilling operation. To confirm the suitability of the reuse of existing granular base material, more laboratory testing is required during construction. Moisture contents in the retrieved samples ranged from 4 to 6 percent.

4.2.3 Subgrade Soil

Subgrade soils underneath the Mayfield Road pavement structure comprised silty sandy clay trace gravel. In general, the upper 0.7 to 1.8 m of silty sandy clay was typically firm to stiff with SPT N-value, ranging from 3 to 9 blows/0.3 m, and may represent embankment fill material and/or the upper softened portion of the native till. Below this level, the silty sandy clay was generally stiff to hard with typical N-values of 10 to 35 blows/0.3 m.

Laboratory testing on selected samples indicated this soil to have a low to moderate susceptibility to frost heaves, with a low potential for soil erodibility. Moisture conditions of the subgrade soils were typically found to vary from dry to moist, with moisture content for the subgrade soil typically 10 to 25 percent, generally higher in the upper softened zone.

The subgrade soils were determined to have a low susceptibility to frost heaving as defined in the *MTO Pavement Design and Rehabilitation Manual*. Soil erodibility was determined using the *Wischmeier Nomograph*, with typical K-values for these soils less than 0.15, indicating a low potential for soil erodibility.

Silty sand was encountered below the silty sandy clay in four boreholes (Boreholes 13-33, 13-36, 13-39 and 13-53) at depths of 3.8 to 5.6 m. The silty sand was typically dense to very dense with SPT N-values of 45 to 50 blows/ 0.3 m. An N-value of 10 blows/ 0.3 m (compact) was recorded in BH 13-53.

4.3 Groundwater Levels

Groundwater depth data was collected from the open boreholes, piezometers and monitoring wells installed during the geotechnical investigation. The water level depth readings are measured below the ground surface at the location of each borehole, with the results summarized in Table 1.

Table 1. Ground Water Level Measurements

Borehole No.	Station	Direction	Reading Date	Water Level (m)
13-22	2+435	WB	Mar 27/14	3.5
13-29	3+110	EB	Oct 28/14	2.1
13-33	3+460	WB	Oct 8/13	3.8
13-47	4+835	EB	Oct 7/13	6.3
13-53	5+360	EB	Oct 11/13	5.9

The water level readings indicate that the groundwater level ranges from approximately 2.1 to 6.3 m deep. The water-table is expected to vary seasonally and with significant precipitation events.

Ice was also noted in the upper 0.3 m below the ground surface in several piezometers that were frozen at the time of reading in March 2014. The ice may be indicative of perched groundwater within the granular fill above the silty clay till. Upon subsequent site visits, most of the piezometers and monitoring wells installed in the road shoulders could not be located, and were possibly destroyed due to construction activities and shoulder grading work occurring along Mayfield Road during this time.

4.4 Falling Weight Deflection Testing

The structural adequacy of Mayfield Road between Winston Churchill Boulevard and Chinguacousy Road was evaluated by Falling Weight Deflectometer (FWD) pavement load/deflection testing. The FWD tests were completed on 100 m intervals, staggered by direction. At each test location, a series of four load applications was applied to the pavement surface. The first application was a "seating" load to ensure the FWD load plate was firmly resting on the pavement surface. The next three loads were approximately 30, 40, and 65 kN. Pavement surface deflections under the load were measured by sensors (velocity transducers) placed at fixed spacing from the load plate in accordance with SHRP testing protocols. Asphalt thickness from the pavement cores and base/subbase thickness from subsoil investigation were used in the analysis of the FWD data.

The analysis of the FWD deflection data was completed in accordance with the procedures outlined in the AASHTO Guide for Design of Pavement Structures (1993). The parameters calculated as part of this analysis include:

Normalized Deflection: The deflection (D_0) measured at the centre of the load plate is a good indicator of overall pavement strength. The deflection at this location is a function of the pavement layer stiffness and the support capacity of the subgrade soil. Because deflection is a function of load and because of slight variations in measured load at each test point, a linear extrapolation of the measured deflection is made to adjust deflections at all test locations to a “standard” load level of 40 kN.

Materials Characterization: The pavement thickness data from the boreholes was used in conjunction with the FWD results to estimate the stiffness (strength) of the existing pavement. Pavement layer stiffness back-calculation uses closed form models to estimate layer elastic modulus values, given the layer thickness and FWD data.

The procedure as outlined in the AASHTO 1993 Guide for Design of Pavement Structures, Part III, Chapter 5, was used to determine the properties of the as-constructed flexible pavements. The resultant data includes the composite elastic pavement modulus (E_p) for the combination of all bound layers above the subgrade (e.g., the asphalt concrete and granular bases), and the subgrade elastic modulus (E_s). The subgrade resilient modulus (M_R) is determined by reducing the value of E_s by a conversion factor of 3.

Effective Structural Number: Based on the back-calculated pavement moduli, the effective structural number (SN_{Eff}) of the existing pavement was calculated using the 1993 AASHTO Guide for Design of Pavement Structures procedure.

The detailed results of the pavement load/deflection testing and data analysis are presented in Appendix F, and summarized in Table 2. Results of the normalized deflection data for both direction of travel are illustrated in Figure 1.

Table 2. Summary of FWD Test Results

Direction	D_0 (μm)		M_R (MPa)		E_P (MPa)		SN_{Eff} (cm)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
EB	234	77	54	8	972	519	14.7	25
WB	254	85	48	8	883	396	14.3	22

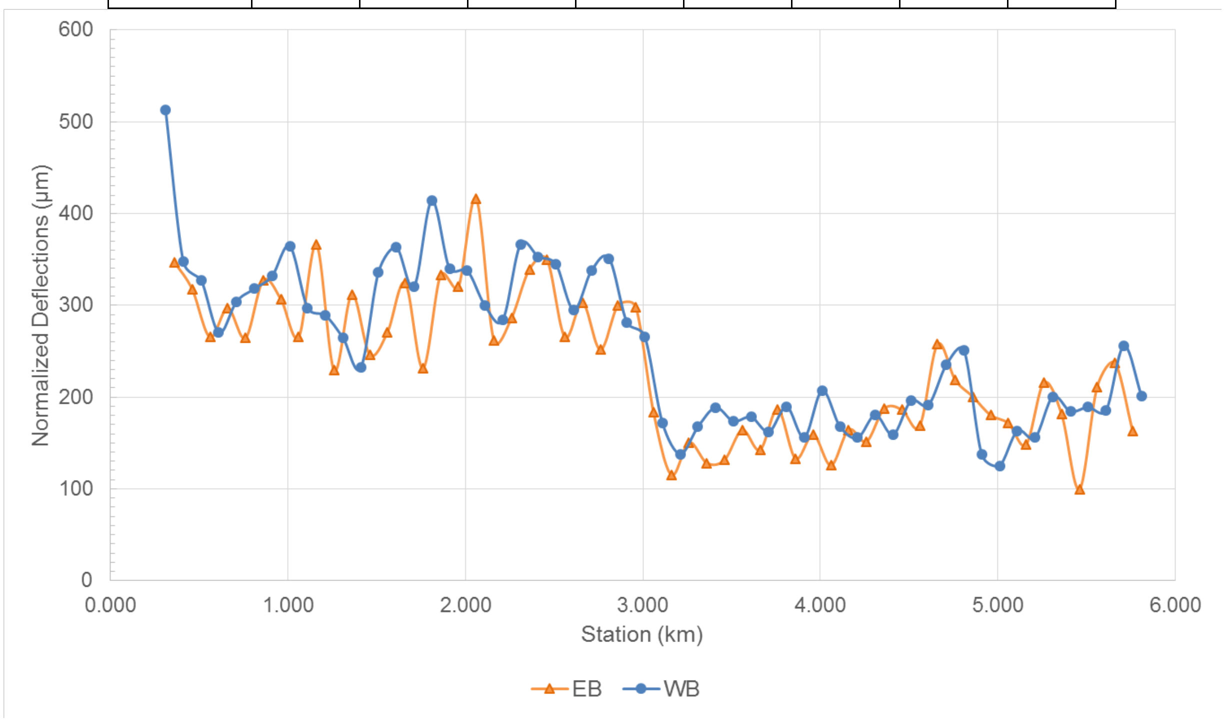

Figure 1. Normalized Deflections along Mayfield Road

The normalized deflections along Mayfield Road indicate that the existing pavement has higher deflections from the western project limits (Station 0+000) to Station 3+000, with a reduction in deflection values from Station 3+000 to the eastern project limits. As lower deflection values are indicative of higher pavement strength, it is expected that Mayfield Road from Winston Churchill Boulevard to Mississauga Road is weaker than the adjacent pavement section from Mississauga Road to Chinguacousy Road.

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The overall average subgrade strength along Mayfield Road varied from 48 MPa for the EB lane and 54 MPa for the WB lane. Localized subgrade strengths typically varied to values as low as 35 MPa, although a subgrade strength of 31 MPa was found at Station 0+410 in the WB lane.

5 PAVEMENT EVALUATION AND DESIGN

The pavement design analysis is based on the subsurface soil and groundwater conditions encountered during the investigation, supplemented by FWD test results, and traffic data provided by others.

5.1 Traffic Analysis

Traffic information used for this investigation was provided by HMM in a technical memo entitled *"AADT Volumes for Mayfield Road Prepared for the Mayfield Road Class EA- Chinguacousy Road to Winston Churchill Boulevard"* dated May 8, 2015. Traffic data used in the traffic analysis undertaken by HMM was provided by Peel Region between May 19 - 21, 2012. The provided traffic volumes were forecasted to 2018 traffic volumes when construction is expected to be commence. A growth rate of 5 percent was used to estimate the forecasted 2018 traffic data, while a 4 percent growth rate was applied thereafter.

A summary of the two-way collected 2012 and forecasted 2018 Average Annual Daily Traffic (AADT) are provided in Table 3.

Table 3. Mayfield Road Traffic Information

Segments	2012 AADT	2018 AADT
Winston Churchill Boulevard - Heritage Road	7,870	10,547
Heritage Road - Mississauga Road	8,470	11,351
Mississauga Road- Creditview Road	8,870	11,887
Creditview Road -Chinguacousy Road	9,570	12,825

For the purposes of developing 20-year pavement designs, the section of roadway with the highest traffic volume (Creditview Road and Chinguacousy Road) was used for design purposes. From information provided in the traffic memo, the average commercial truck traffic used in the traffic analysis is 6.0 percent.

In consideration of the three roundabout intersections proposed along Mayfield Road, the traffic analysis needed to include the traffic volumes along Mayfield Road and the cross roads. As Winston Churchill Boulevard was observed to have the highest traffic volumes of the three locations, the traffic volumes for this roadway were used for the traffic analysis. Information provided in the traffic memo indicate that 2012 traffic volumes on Winston Churchill Boulevard were 3,370. Using the same traffic assumptions as for Mayfield Road, it is estimated that the 2018 AADT for Winston Churchill Boulevard will be 4,516.

5.2 ESALs Calculations

The traffic data was used to determine the pavement damage caused by the anticipated traffic volumes. Using axle load equivalency factors, the different axle loads and axle groups are converted to a standard axle load known as an Equivalent Single Axle Loads (ESALs). The ESALs calculation was completed in accordance with the MTO *Procedures for Estimating Traffic Loads for Pavement Designs*, with an average truck factor of 2.5. The 20-year design ESALs calculated for the new 6-lane roadway platform of Mayfield Road is 7.3 million. For the roundabout intersection at Winston Churchill Boulevard, it is understood that the intersection will comprise of 2-lanes, which will yield some 11.1 million ESALs.

5.3 AASHTO Pavement Design

The pavement design analysis was carried out using the methodology outlined in the 1993 AASHTO "*Guide for the Design of Pavement Structures*", as modified by the Ministry's "*Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions*", and the MTO "*Pavement Design and Rehabilitation Manual*". This analysis was completed to determine the structural requirements for the new pavement structure for Mayfield Road.

The AASHTO procedure for the design of flexible pavements determines a required Structural Number that characterizes the structural capacity of the pavement layers, for a given set of inputs. The following design inputs were used in the AASHTO design analysis.

- Design period = 20 years
- Initial serviceability, (Pi) = 4.4
- Terminal serviceability (Pt) = 2.2
- Reliability level (R) = 90 percent
- Overall standard of deviation (So) = 0.44
- Mean soil resilient modulus (MR) = 35 MPa

It is noted that the results of the FWD testing indicated that the subgrade strengths on the existing pavement within the project area were generally competent, with the back-calculated resilient modulus typically greater than 45 MPa. However, as localized test points were found to have lower subgrade strength, and that moderately frost susceptible soils were encountered within the project limits, a subgrade strength of 35 MPa was used as the subgrade strength in the design analysis.

Based on the design input parameters and the calculated design ESALs, a required design structural number (SN_{Des}) of 127 mm is required for a 20-year design of the new pavement on Mayfield Road. For the new roundabout intersection of Mayfield Road and Winston Churchill Boulevard, the required 20-year SN_{Des} is 134 mm.

The details of the pavement design analysis from the AASHTO DARWin 3.0 software is provided in Appendix G.

5.4 New Flexible Pavement Design

Based on the above structural requirements, site considerations, and input from the design team, the following pavement structures will be required in all new alignment areas for Mayfield Road.

160 mm	Hot Mix Asphalt
150 mm	Granular Base
500 mm	Granular Subbase

In the area of the roundabout intersection at Winston Churchill Boulevard, the following pavement structure will meet the design requirements.

170 mm	Hot Mix Asphalt
150 mm	Granular Base
500 mm	Granular Subbase

5.5 Pavement Rehabilitations

The existing pavement on Mayfield Road was evaluated to determine its functional and structural capacity of supporting the anticipated future traffic volumes for the new Mayfield Road roadway. The understanding of these requirements is critical for the development of future rehabilitation strategies.

5.5.1 Functional Requirements

A road's functional capacity is a measure of how well the pavement serves the user. This serviceability index is often referred to as 'Ride Comfort', and is a reflection of the pavement condition at a particular time during the service life of the pavement. Pavement distresses that impact a pavement's functional ability to serve the travelling public include: transverse cracking; potholes; ravelling; as well as heave and swells.

The pavement on Mayfield Road was considered to be in very good condition at the time of the pavement evaluation, with only few slight severity cracks, previously sealed. In consideration of the good functional condition of the existing pavement, rehabilitation treatments for the improvement of the overall rideability are not required at the present time. However, it is noted that deterioration of the existing pavement is to be expected until the start of construction.

5.5.2 Structural Requirements

The structural capacity of a pavement is the physical condition of the roadway that adversely affects the load-carrying capability of the pavement structure. The structural assessment of Mayfield Road was completed using FWD load/deflection testing.

FWD testing is an effective non-destructive tool that quantifies the structural capacity of the existing pavement structure. To determine the structural adequacy of the pavement, the SN_{Eff} (as determined by the FWD testing) is compared to the design structural number (SN_{Des}) calculated in Section 5.3.

The back-calculated SN_{Eff} values for the existing pavement from the FWD testing were compared with the required SN_{Des} (127 mm) in Figure 2, with detailed comparison of FWD results provided in Appendix F.

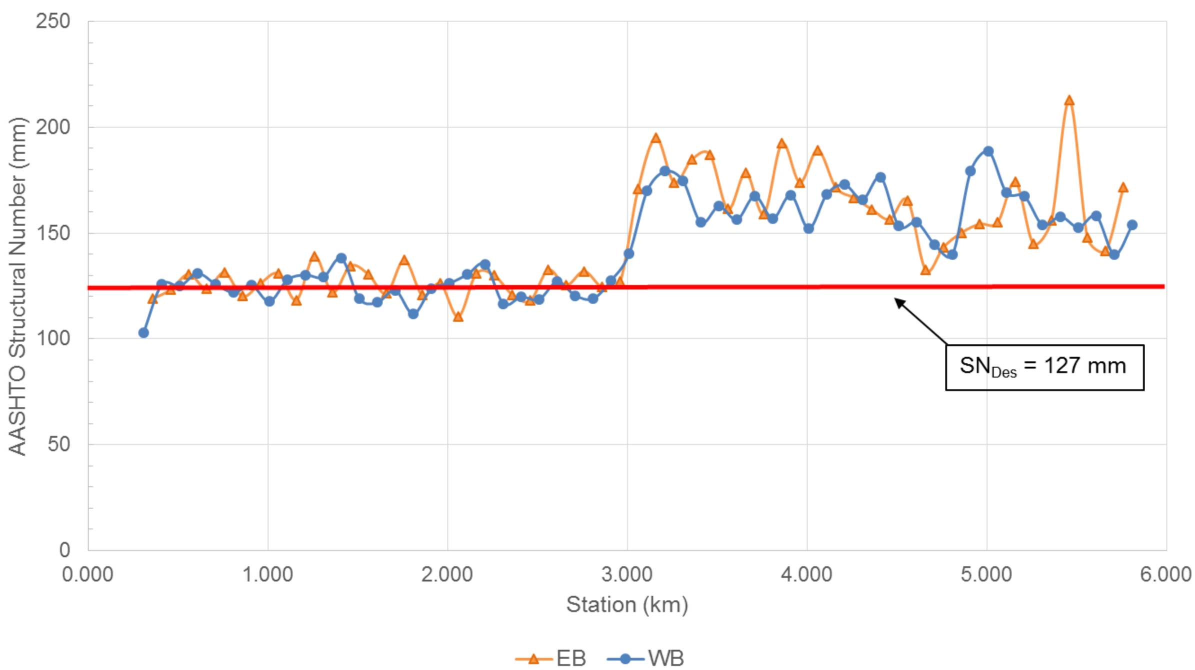

Figure 2. Structural Testing Comparison Plot

The results of the FWD analysis indicates that the structural capacity of the existing pavement on Mayfield Road from Winston Churchill Boulevard (Station 0+260) to Mississauga Road (Station

3+000) was near the design requirement of 127 mm, although most of the test points were slightly below. East of Mississauga Road (Station 3+000 to 5+800), Mayfield Road was found to be adequate to support the anticipated traffic volumes over a 20-year design period.

The location of the change in structural pavement strength for Mayfield Road appears to correlate to the type of pavement materials used in the construction of the existing pavement. In the area with reduced structural strength, the existing asphalt was observed to contain a layer of asphalt stabilized base, while east of Mississauga Road the pavement cores observed asphalt material for the full depth of the sample.

In consideration of the existing structural capacity of Mayfield Road, any pavement rehabilitation strategy considered will need to include strengthening for the existing pavement from the western project limit to Station 3+000. The strengthening should comprise of an additional 50 mm of new asphalt material.

It is noted that as construction of the new pavement for Mayfield Road is not expected to begin for several years, additional structural deterioration can be expected, which will continue to reduce the structural capacity of the pavement.

5.5.3 Pavement Rehabilitation Alternatives

The results of the functional and structural analysis found the existing condition of Mayfield Road to generally be adequate to support the anticipate traffic volumes over a 20-year design, although structural overlay of 50 mm will be required from Station 0+000 to 3+000.

However, it is understood that the construction of the new 6-lane pavement platform on Mayfield Road will require: grade adjustments; installation of storm sewers; culvert replacements and installations; construction of a roundabout intersection; and extensive pavement widening with slight realignment of the existing platform. Each of these operations will likely require cutting tie-in's and transitions into the existing pavement reducing the structural capacity of the in-place pavement, increasing the functional distresses, and further reducing the remaining service life of the existing pavement. Furthermore, as construction of the new roadway platform is not expected for several years, the in-place pavement will continue to deteriorate and may exhibit additional distresses that the current strengthening strategy would not address.

In consideration of all these factors, attempting to salvage the existing pavement is not considered a feasible strategy for the construction of the new 6-lane pavement platform for Mayfield Road. For these reasons, it is recommended that the existing pavement structure on Mayfield Road be reconstructed to provide a uniform pavement platform throughout the project limits. Construction of a new pavement structure will: eliminate the potential of reflective cracking at all distress and sewer trench cut locations; provide a consistent pavement thickness for improved subsurface drainage; and improve constructability of the new pavement by permitting grading and shaping of the new platform with granular material instead of costly asphalt material.

6 PAVEMENT RECOMMENDATIONS

The recommendations for reconstruction and widening of Mayfield Road are provided in the ensuing sections. The recommendations provided in this section were developed based on provided information, and the results of the completed field investigation.

6.1 Mayfield Road Pavement Reconstruction and Widening

The recommended new pavement structure for Mayfield Road should consist of:

50 mm	HL1
110 mm	HDBC (2 lifts)
150 mm	Granular ‘A’ Base
500 mm	Granular ‘B’, Type I Subbase

Reconstruction of the existing pavement structure should include full-depth removal of the existing asphalt surface; followed by the removal of the underlying granular material to subgrade level. The exposed subgrade should be graded, and shaped, with a 3 percent crossfall to provide subsurface drainage.

In all pavement widening areas, the surficial topsoil should be removed with the underlying subgrade shaped, graded, and compacted as required for the construction of the new pavement structure. All new ditches should be constructed prior to the placement of pavement materials.

6.2 Roundabout Intersection

The recommended new pavement structure for the roundabout intersection considered at the intersection of Mayfield Road and Winston Churchill Boulevard should consist of:

50 mm	HL1
120 mm	HDBC (2 lifts)
150 mm	Granular ‘A’ Base
500 mm	Granular ‘B’, Type I Subbase

6.3 New Pavement Materials

6.3.1 Asphalt Materials

All Hot Mix Asphalt (HMA) material should meet the requirements of OPSS 310, and Peel Region Specifications. All asphalt lifts should be placed and compacted to levels between 92 and 96.5 percent of the Marshall Maximum Relative Density (MRD). The recommended asphalt cement grade for all mixes should be PG 64-28, and shall conform to OPSS.MUNI.1101. Aggregates for the asphalt mixes should be in accordance with OPSS.MUNI.1003.

Should the Region consider using Superpave asphalt mixes for this project, the recommended HL1 material should be substituted with a Superpave 12.5FC1 asphalt mix, and the HDBC asphalt material should be replaced with a Superpave 19 asphalt materials. As the 20-year design ESALs for Mayfield was estimated to be 7.3 million, a Traffic Category C designation should be used in preparing all Superpave asphalt mix designs.

6.3.2 New Granular Material

All new granular subbase material should consist of OPSS Granular B Type I, while the granular base material should consist of OPSS Granular A. All new granular material should meet the requirements of OPSS.MUNI.1010, and be compacted to 100 percent of the Standard Proctor Maximum Dry Density (SPMDD) within 2 percent of Optimum Moisture Content (OMC). All granular material should be compacted in accordance with the requirements of OPSS 501, and should be carried the entire width of the roadway platform to maintain appropriate drainage.

6.4 Existing Pavement Materials

6.4.1 Existing Asphalt Material

The existing asphalt from Mayfield Road should be removed full-depth. The removal of this material can be completed by either milling the existing asphalt, or pulverizing the asphalt with the underlying granular base/subbase to produce a 50/50 blend. In either approach, the existing asphalt material can be recycled into new granular material or used a Reclaimed Asphalt Pavement (RAP) in new Hot Mix Asphalt (HMA). It is important that appropriate blending ratios are adhere to as specified in the applicable OPSS.

It is noted that the existing asphalt thicknesses on Mayfield Road exceeded 200 mm (typically the upper limit for pulverizing), and that a variable asphalt stabilized base layer was observed, which could complicate the pulverizing operation, should a contractor choose this method of removal for the asphalt surface. The contractor should select an appropriate method of removing the existing asphalt with the thickness observed in the borehole logs.

6.4.2 Existing Granular Base/Subbase

The existing granular base/subbase material was found to generally meet the OPSS Gradation requirements for Granular B, Type I, but had slightly elevated fines in some samples. Existing granular material can be reused as granular subbase in new pavement widening areas, subject to confirmation for suitability of this material during construction. Alternatively, the existing granular material can be reused as embankment fill material prior to the construction of the new pavement structure.

6.5 Transition Treatments

Smooth transitions are required in all areas where the new pavement meets the existing asphalt surface. All longitudinal and transverse joints should meet the requirements of OPSS 310. All longitudinal joints should be staggered between the asphalt lifts. The staggering of the longitudinal joints should be accomplished by offsetting the paving edge in the upper asphalt course by a minimum of 150 mm.

At the paving limits, the transverse tie-in should be trimmed to a depth of the surface course, full width, to provide a straight clean vertical surface so that the new asphalt material can be placed flush with the top of the existing pavement surface. At all transverse tie-ins to existing pavements, the top lift of asphalt should extend a minimum of 5 m in length beyond the transverse joint in the upper binder lift.

6.6 Pavement Drainage

The new pavement structure should be constructed to provide positive cross lateral drainage at the top of subgrade, as well as at the pavement surface. The top of subgrade should be sloped at a minimum 3 percent grade, while the pavement surface should be constructed with a minimum 2 percent crossfall.

Should curb and gutters be considered in the design of the new pavement platform, they should be constructed in accordance with OPSD 600.040, and Peel Region standards. Subdrains should be included and conform to Regional standards. Drainage ditches in rural areas (if required) should be constructed in accordance with OPSD 200.010, and be suitable to provide drainage of the subgrade.

6.7 New Alignment Subgrade Preparation

In all areas of pavement widening, the surficial vegetation and topsoil should be removed, until firm bottom is encountered. The underlying subgrade soils should be graded as required to accommodate the new pavement platform. The exposed subgrade should be compacted and proof-rolled with a heavy roller and examined to identify areas of unstable subgrade. Any soft/wet areas identified should be subexcavated and replaced with approved material within 2 percent of Optimum Moisture Content (OMC), and compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

The silty sandy clay subgrade soils are susceptible to softening when exposed to excessive moisture or disturbance. Accordingly, appropriate drainage should be provided to maintain a reasonable dry subgrade and construction traffic should not be allowed on any wet areas. Construction traffic on the approved subgrade should also be avoided without adequate granular cover.

Depending upon prevailing weather conditions, the upper 300 to 600 mm of clay and till may be wet and softer than the underlying material. Further, wet soils should be anticipated in the area of existing creeks, culverts, and ditches. A contingency should be made in the construction contract for additional subexcavation or alternatively scarifying, moisture conditioning, and re-compaction of any upper wet zones of soil.

6.8 Storm Sewer Installation

It is understood that new storm sewers will be installed along Mayfield as part of the roadway improvements. Excavations for open cut installation of sewers will primarily extend through the existing roadway pavement structure and into native sandy silty clay till deposits. Use of a hydraulic excavator should be suitable for trench excavation within these materials. Provision should be made for handling and removal of possible obstructions in the fill and cobbles or boulders in the till soils.

All temporary excavations must be carried out in accordance with the current Occupational Health and Safety Act (OHSA) of Ontario and local regulations. In general, the pavement structure and subgrade soils are classified as Type 3 soils.

Where space restrictions preclude excavation of inclined slopes, sewer installation may be carried out using a trench box or temporary shoring. If the trench depth exceeds 6 m, the support system must be designed specifically for this project.

The design of all members of the support system should include the effects of surcharge loads such as those imposed by construction equipment and highway traffic. Soil should not be stockpiled within a horizontal distance from the excavation wall equal to the depth of excavation.

Groundwater was measured at depths of 2.1 to 6.3 m in the boreholes. Considering the observations during drilling and the consistency of the soils on site, dewatering of shallow excavations should generally be feasible using sumps and pumps. However, concentrated seepage and instability of the trench walls and base may be experienced if fractures or preferential seepage zones are encountered in the clay till below the groundwater level. Further, localized zones of perched water may be encountered in the fill and at the culvert locations. Additional sumps may be required dependent on the conditions at a particular location.

Prior to placement of the pipe bedding, the base of the trench should be maintained in a dry condition, free of loose or disturbed material. The pipe must be placed on a uniformly competent subgrade. Pipe bedding materials, compaction and cover should follow OPSD 802.030 to 803.034, and/or Peel Region specifications.

In areas where a less competent subgrade is encountered, it may be necessary to increase the sewer bedding thickness. Any excessively soft, loose or compressible materials at the pipe subgrade should be subexcavated and replaced with OPS Granular A material compacted to at least 95 percent of SPMDD.

Trench backfill materials should be placed and compacted as per OPSS 401. Where the sewer trench is located beneath the roadway, OPSS Granular A or B material, or unshrinkable fill should be employed as backfill.

Where the sewer trench is located outside of the roadway, the portion of the trench above the pipe cover can be backfilled with excavated till provided it is unfrozen and free of organics, debris and other deleterious materials. The placement moisture content should be within about 2 percent of the OMC for efficient compaction, and the till must be adequately broken down and compacted in the trench.

6.9 Pipe Culvert Installation

It is understood that improvements along Mayfield Road will include lengthening and replacement of CSP pipes with HDPE, with the construction of three new structural culverts at Natural Heritage System crossings. The borehole information along proposed alignments indicate the subgrade typically consist of sandy silty clay trace gravel. Prior to culvert installation, all surface vegetation, topsoil, organic deposits, disturbed material or otherwise loose/soft soils must be stripped from the culvert subgrade. The structures must be placed on a uniformly competent subgrade. Bedding materials, compaction, and cover should follow the OPSD 802 and 803 requirements. In areas where a less competent subgrade is encountered, it may be necessary to increase the bedding thickness.

The depth of frost penetration at this site is 1.2 m. Frost treatment should be provided for the culvert in accordance with OPSD's noted above. All temporary excavations must be carried out in accordance with the current Occupational Health and Safety Act (OHSA) of Ontario and local regulations. In general, the subgrade is classified as a Type 3 soil.

Erosion protection must be provided at the culvert inlet and outlet areas. Vegetation cover, riprap, or other protective measures should be established to protect against surficial erosion and seepage-induced material loss. Design of the scour and erosion protection measures must be consider hydrologic/hydraulic concerns and should be carried out by specialists experienced in these fields.

Installation of a concrete cut-off wall or clay seal at the culvert inlet is recommended to minimize the potential for seepage through the granular bedding and backfill material and avoid consequent erosion of these materials. The clay seal should have a minimum thickness of 0.5 m, extend laterally the width of the granular backfill material, and extend from the base of the bedding to above the high water level. The material used for the clay seal should conform to the requirements of OPSS 1205.

Should the design consider structural culverts (non-CSP) at any locations, a supplemental foundation investigation is required during detailed design to establish foundation design recommendations for each structural culvert.

6.10 Construction Inspection and Testing

It is recommended that geotechnical inspection and testing by qualified personnel be provided during construction. The inspection and testing should include observation and inspection of sewer trench and pavement subgrade conditions, compaction testing of backfill and pavement materials, as well as concrete and asphalt testing.

7 CLOSURE

Full time supervision of the field activities including obtaining utility clearances and direction of the drilling operations was provided by experienced Thurber personnel, while pavement coring, drilling and sampling equipment was supplied and operated by Malone's Soil Samples Company of Caledon, Ontario. The FWD testing and analysis for this investigation was completed by Applied Research Associates Inc., with the pavement structure information provided by Thurber.

The analysis presented in this report is based on design inputs and alignment stationing provided by HMM and Peel Region. The provided information was supplemented by a field investigation program and Thurber's experience with the project area and similar projects of this type.

We note any changes in materials, or construction procedures, may have a significant impact on assumptions made for the purposes of developing the recommended pavement designs. It is strongly suggested that all materials and construction practices be completed in accordance with Peel Region and Ontario standards and specifications.

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5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

APPENDIX A

PHOTOGRAPHS OF TYPICAL SITE CONDITIONS

Client: Hatch Mott MacDonald
File No. 19-1605-148

Date: January 27, 2016

THURBER

Appendix A
Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Photographs of Typical Conditions

Typical Photograph #1
Mayfield Road – Station 0+360 (Looking Easterly)

Typical Photograph #2
Mayfield Road – Station 0+760 (Looking Westerly)

Typical Photograph #3
Mayfield Road – Station 1+260 (Looking Easterly)

Typical Photograph #4
Mayfield Road – Station 1+845 (Looking Westerly)

Appendix A
Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Photographs of Typical Conditions

Typical Photograph #5
Mayfield Road – Station 2+285 (Looking Easterly)

Typical Photograph #6
Mayfield Road – Station 2+760 (Looking Westerly)

Typical Photograph #7
Mayfield Road – Station 3+310 (Looking Easterly)

Typical Photograph #8
Mayfield Road – Station 3+760 (Looking Westerly)

Typical Photograph #9
Mayfield Road – Station 4+260 (Looking Easterly)

Typical Photograph #10
Mayfield Road – Station 4+760 (Looking Westerly)

Appendix A
Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Photographs of Typical Conditions

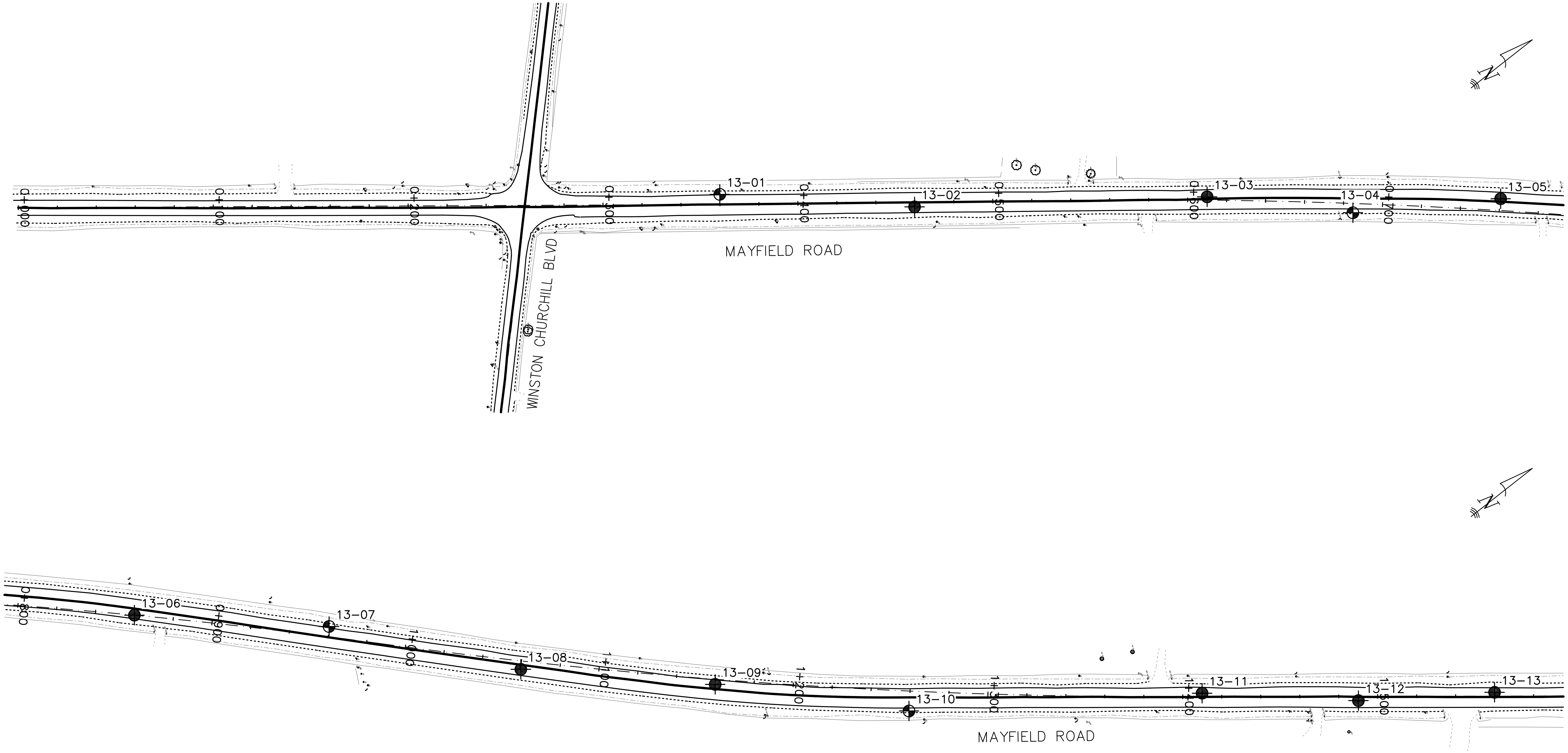
Typical Photograph #11
Mayfield Road – Station 5+260 (Looking Easterly)

Typical Photograph #12
Mayfield Road – Station 5+885 (Looking Westerly)

THURBER

APPENDIX B

BOREHOLE LOCATION PLAN



LEGEND

- APPROXIMATE FOUNDATION BOREHOLE LOCATION
- APPROXIMATE PAVEMENT BOREHOLE LOCATION

40 0 40 80m

SCALE 1:2000

HATCH MOTT MACDONALD

AUGUSTFIELD ROAD
WINSTON CHURCHILL BOULEVARD
TO CHINGUACOUSY ROAD
CLASS ENVIRONMENTAL ASSESSMENT

BOREHOLE LOCATION PLAN

JOB# 19-1605-148

THURBER ENGINEERING LTD.

ENGINEER :	DRAWN :	APPROVED :
MEF	MFA	PKC
DATE :	SCALE :	DRAWING No.
AUGUST 2015	1:2000	19-1605-148-1

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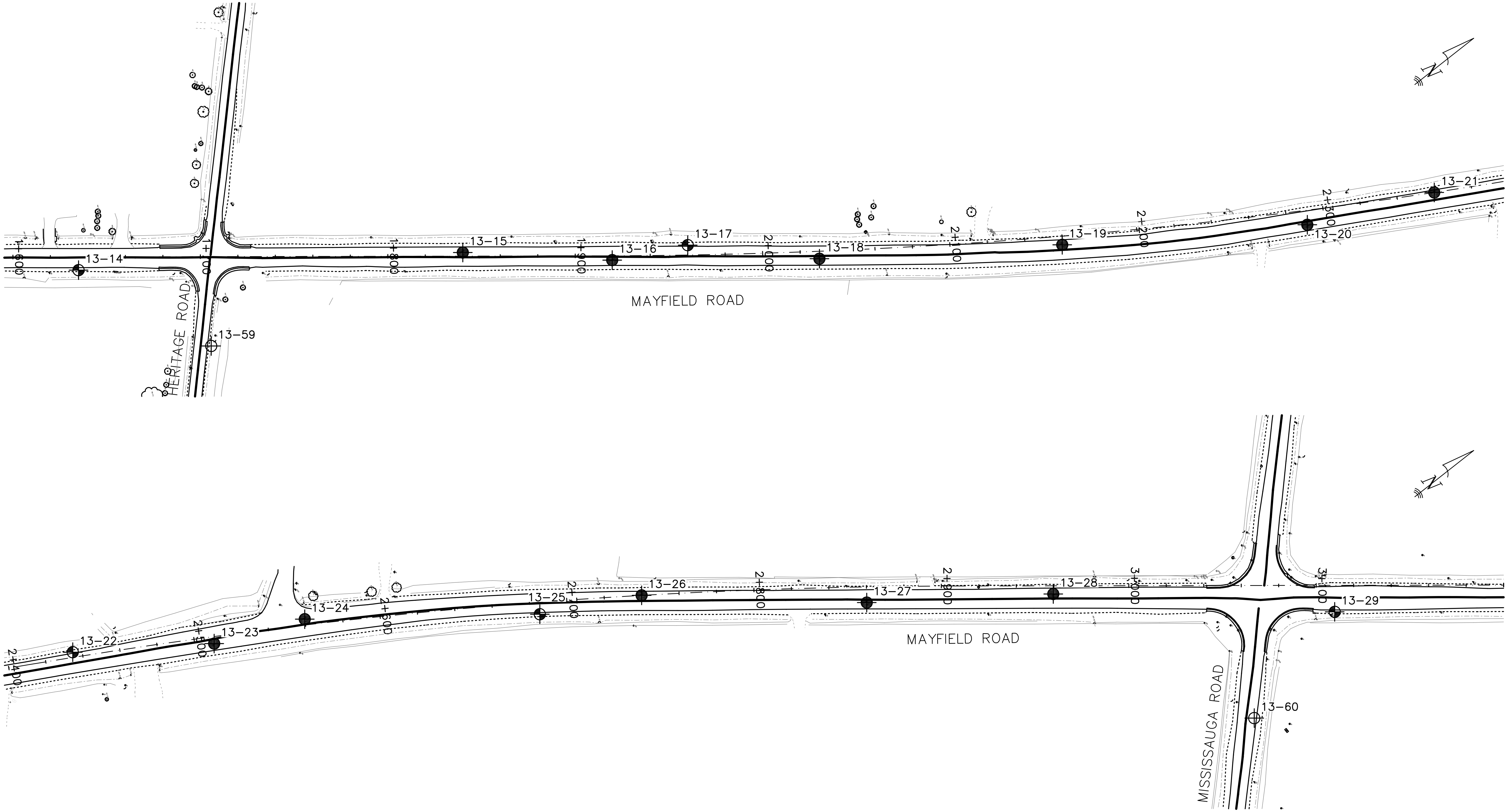

LEGEND

- APPROXIMATE FOUNDATION BOREHOLE LOCATION
- APPROXIMATE PAVEMENT BOREHOLE LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

40 0 40 80m
SCALE 1:2000

HATCH MOTT MACDONALD

AUGUSTFIELD ROAD
WINSTON CHURCHILL BOULEVARD
TO CHINGUACOUSY ROAD
CLASS ENVIRONMENTAL ASSESSMENT
BOREHOLE LOCATION PLAN
JOB# 19-1605-148

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MEF	MFA	PKC
DATE:	SCALE:	DRAWING No.
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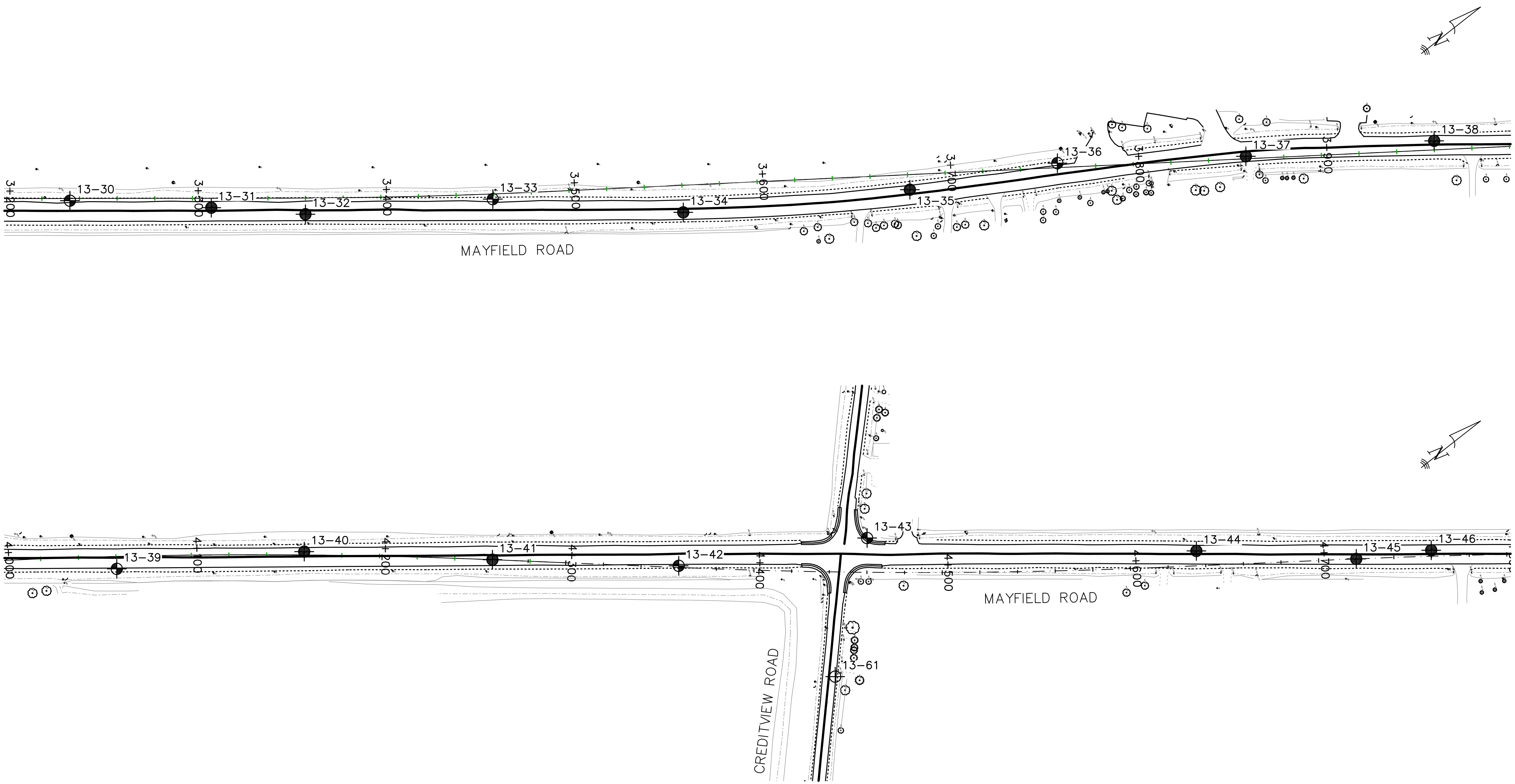

LEGEND

- APPROXIMATE FOUNDATION BOREHOLE LOCATION
- APPROXIMATE PAVEMENT BOREHOLE LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

40 0 40 80m
SCALE 1:2000

HATCH MOTT MACDONALD

AUGUSTFIELD ROAD
WINSTON CHURCHILL BOULEVARD
TO CHINGUACOUSY ROAD
CLASS ENVIRONMENTAL ASSESSMENT
BOREHOLE LOCATION PLAN

JOB# 19-1605-148

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MEF	MFA	PKC
DATE:	SCALE:	DRAWING No.
AUGUST 2015	1:2000	19-1605-148-3

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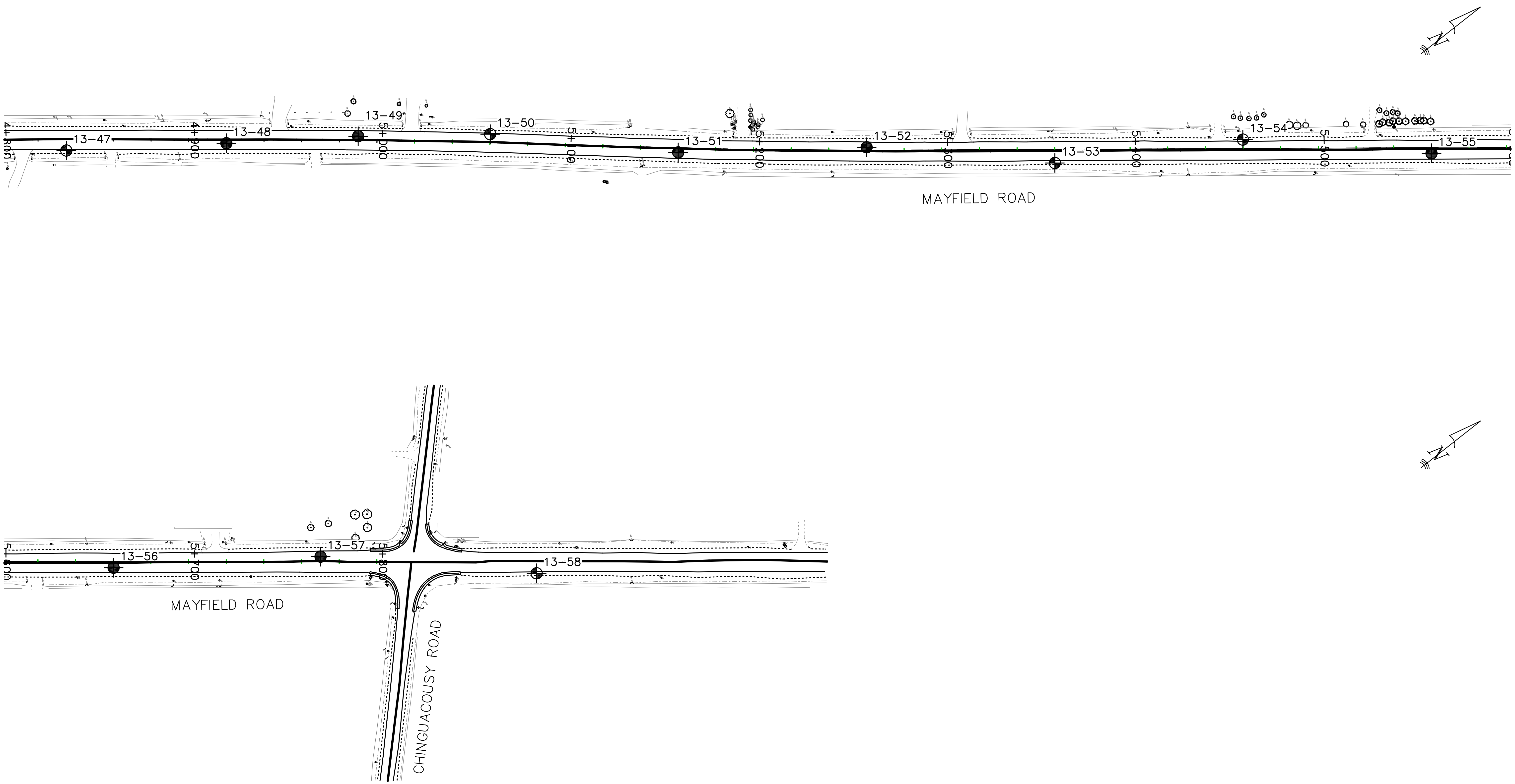

LEGEND

- APPROXIMATE FOUNDATION BOREHOLE LOCATION
- APPROXIMATE PAVEMENT BOREHOLE LOCATION

40 0 40 80m
SCALE 1:2000

HATCH MOTT MACDONALD

AUGUSTFIELD ROAD
WINSTON CHURCHILL BOULEVARD
TO CHINGUACOUSY ROAD
CLASS ENVIRONMENTAL ASSESSMENT
BOREHOLE LOCATION PLAN

JOB# 19-1605-148

THURBER ENGINEERING LTD.

ENGINEER:	DRAWN:	APPROVED:
MEF	MFA	SMS
DATE:	SCALE:	DRAWING No.
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PLOTDATE: Aug 11, 2015 - 8:23 AM

THURBER

APPENDIX C

PAVEMENT CORE LOGS AND TYPICAL PHOTOGRAPHS

THURBER

Appendix C
Mayfield Road Class EA Study
Winston Churchill Blvd to Chinguacousy Road

Pavement Core Logs

Facility: **Mayfield Road**

Station	Direction	Asphalt Layer Thickness (mm)							Comments
		Surface	Binder	Binder	AC Stabilization	Binder	Binder	Total	
0+460	EB	35	65		150			250	
0+610	WB	45	75		130			250	
1+410	WB	45	70		95*			210	Stabilized Layer Crumbled (95 mm recovered)
1+485	EB	45	75		30*			150	Stabilized Layer Crumbled (30 mm recovered)
2+285	EB	45	55		130			230	
2+360	WB	60	60		100			220	
2+860	EB	45	45		130			220	
2+960	WB	45	80		105			230	
4+760	WB	40	50	40		30	80	240	Delamination at depth of 160 mm
4+910	EB	30	60	60		70		220	Delamination at depth of 90 mm
5+660	EB	50	60	50		60	60	280	
5+760	WB	40	55	25		60		180	

Note: * asphalt layers not fully recovered

Facility: **Heritage Road**

Station	Direction	Asphalt Layer Thickness (mm)					Comments
		Surface	Binder	Binder	AC Stabilization	Total	
0-030	NB Lane	20	20		80	120	Stabilized Layer Crumbled (80 mm recovered)

Note: Pavement core location was taken 30 m south of the intersection with Mayfield Road.

Facility: **Mississauga Road**

Station	Direction	Asphalt Layer Thickness (mm)					Comments
		Surface	Binder	Binder	Binder	Total	
0-030	NB Lane	60	40	40	90	230	

Note: Pavement core location was taken 30 m south of the intersection with Mayfield Road.

Facility: **Creditview Road**

Station	Direction	Asphalt Layer Thickness (mm)					Comments
		Surface	Binder	Binder	Binder	Total	
0-030	NB Lane	40	40	30	80	190	Delamination at depth of 110 mm

Note: Pavement core location was taken 30 m south of the intersection with Mayfield Road.

Appendix C
Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Pavement Core Photographs

Pavement Core Photo #1

Mayfield Road
Station 0+610
Westbound Lane

Layer	Thickness (mm)
Surface	45
Binder	75
AC Stabilization	130
Total	**250**

Pavement Core Photo #2

Mayfield Road
Station 1+485
Eastbound Lane

Layer	Thickness (mm)
Surface	45
Binder	75
AC Stabilization	*30**
Total	**150**

Note: Core Recovery was only 30 mm

Pavement Core Photo #3

Mayfield Road
Station 2+860
Eastbound Lane

Layer	Thickness (mm)
Surface	45
Binder	45
AC Stabilization	130
Total	**220**

THURBER

Appendix C
Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Pavement Core Photographs

Pavement Core Photo #4

Mayfield Road
Station 4+760
Westbound Lane

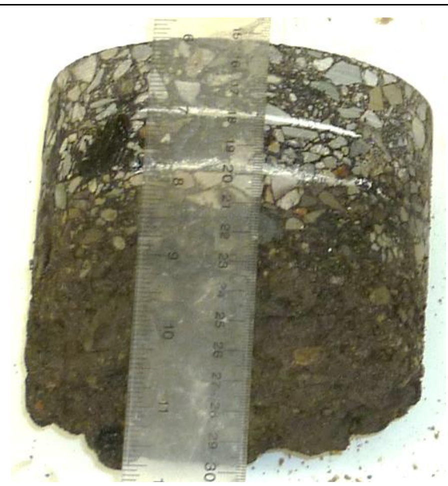
Layer	Thickness (mm)
Surface	40
Binder	50
Binder	40
Binder	30
Binder	80
Total	**240**

Note: Delamination at depth of 160 mm

Pavement Core Photo #5

Mayfield Road
Station 5+760
Westbound Lane

Layer	Thickness (mm)
Surface	40
Binder	55
Binder	25
Binder	60
Total	**180**



Pavement Core Photo #6

Heritage Road
30 m South of Mayfield Road
Northbound Lane

Layer	Thickness (mm)
Surface	20
Binder	20
AC Stabilization	*80**
Total	**120**

Note: Core Recovery was only 80 mm

Pavement Core Photo #7

Mississauga Road
30 m South of Mayfield Road
Northbound Lane

Layer	Thickness (mm)
Surface	60
Binder	40
Binder	40
Binder	90
Total	**230**

Pavement Core Photo #8

Creditview Road
Northbound Lane
30 m South of Mayfield Road

Layer	Thickness (mm)
Surface	40
Binder	40
Binder	30
Binder	80
Total	**190**

Note: Delamination at depth of 110 mm

THURBER

APPENDIX D

PAVEMENT AND FOUNDATION BOREHOLE LOGS

THURBER

Appendix D
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Borehole Logs

Mayfield Road

Station 00+460 EB Lane BH 13-02

0 - 250 Asphalt
250 - 620 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 4%
Percent Passing 4.75 mm = 57%
75 µm = 10%
Frost Susceptibility = LSFH
Soil Erodibility = 0.09
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 17%

Station 00+610 WB Lane BH 13-03

0 - 250 Asphalt
250 - 550 Brown Gravelly Sand Some Silt Moist
w @ 0.3 m = 5%
550 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 17%

Station 00+760 WB Lane BH 13-05

0 - 250 Asphalt
250 - 550 Brown Gravelly Sand Some Silt Moist
550 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 00+860 EB Lane BH 13-06

0 - 250 Asphalt
250 - 570 Brown Gravelly Sand Some Silt Moist
570 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 01+060 EB Lane BH 13-08

0 - 250 Asphalt
250 - 580 Brown Gravelly Sand Some Silt Moist
580 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 01+160 WB Lane BH 13-09

0 - 220 Asphalt
220 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 01+410 WB Lane BH 13-11

0 - 230 Asphalt
230 - 600 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 5%
Percent Passing 4.75 mm = 65%
75 µm = 16%
Frost Susceptibility = LSFH
Soil Erodibility = 0.09
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 13%
Percent Passing 4.75 mm = 98%
75 µm = 73%
5 µm = 50%
Frost Susceptibility = LSFH
Soil Erodibility = 0.05

Station 01+485 EB Lane BH 13-12

0 - 220 Asphalt
220 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
W @ 1.5 m = 25%

Station 01+560 WB Lane BH 13-13

0 - 230 Asphalt
230 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 01+845 WB Lane BH 13-15

0 - 200 Asphalt
200 - 620 Brown Gravelly Sand Some Silt Moist
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 01+910 EB Lane BH 13-16

0 - 250 Asphalt
250 - 620 Brown Gravelly Sand Some Silt Moist
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+035 EB Lane BH 13-18

0 - 250 Asphalt
250 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+160 WB Lane BH 13-19

0 - 230 Asphalt
230 - 580 Brown Gravelly Sand Some Silt Moist
580 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+285 EB Lane BH 13-20

0 - 230 Asphalt
230 - 620 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 4%
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
W @ 1.5 m = 13%

THURBER

Appendix D
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road

Borehole Logs

Station 02+360 WB Lane BH 13-21

0 - 220 Asphalt
220 - 530 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 5%
Percent Passing 4.75 mm = 74%
75 µm = 17%
Frost Susceptibility = LSFH
Soil Erodibility = 0.15
530 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 17%

Station 02+510 EB Lane BH 13-23

0 - 250 Asphalt
250 - 630 Brown Gravelly Sand Some Silt Moist
630 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+560 WB Lane BH 13-24

0 - 250 Asphalt
250 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+760 WB Lane e BH 13-26

0 - 250 Asphalt
250 - 630 Brown Gravelly Sand Some Silt Moist
630 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 02+860 EB Lane BH 13-27

0 - 220 Asphalt
220 - 640 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 5%
Percent Passing 4.75 mm = 68%
75 µm = 15%
Frost Susceptibility = LSFH
Soil Erodibility = 0.08
640 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 19%

Station 02+960 WB Lane BH 13-28

0 - 230 Asphalt
230 - 620 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 5%
Percent Passing 4.75 mm = 68%
75 µm = 19%
Frost Susceptibility = LSFH
Soil Erodibility = 0. 16
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 13%

Station 03+310 WB Lane BH 13-31

0 - 260 Asphalt
260 - 620 Brown Gravelly Sand Some Silt Moist
620 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 03+385 EB Lane BH 13-32

0 - 260 Asphalt
260 - 630 Brown Gravelly Sand Some Silt Moist
630 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 03+560 EB Lane BH 13-34

0 - 180 Asphalt
180 - 900 Brown Gravelly Sand Some Silt Moist
900 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 03+660 WB Lane BH 13-35

0 - 180 Asphalt
180 - 960 Brown Gravelly Sand Some Silt Moist
960 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 03+860 EB Lane BH 13-37

0 - 150 Asphalt
150 - 560 Brown Gravelly Sand Some Silt Moist
560 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 03+960 WB Lane BH 13-38

0 - 220 Asphalt
220 - 600 Brown Gravelly Sand Some Silt Moist
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 04+160 WB Lane BH 13-40

0 - 170 Asphalt
170 - 520 Brown Gravelly Sand Some Silt Moist
520 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 04+260 EB Lane BH 13-41

0 - 280 Asphalt
280 - 800 Brown Gravelly Sand Some Silt Moist
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 04+635 WB Lane BH 13-44

0 - 220 Asphalt
220 - 560 Brown Gravelly Sand Some Silt Moist
560 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

.

THURBER

Appendix D
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road

Borehole Logs

Station 4+710 EB Lane BH 13-45

0 - 280 Asphalt
280 - 440 Brown Gravelly Sand Some Silt Moist
440 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 4+760 WB Lane BH 13-46

0 - 260 Asphalt
260 - 600 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 7%
Percent Passing 4.75 mm = 42%
75 µm = 8%
Frost Susceptibility = LSFH
Soil Erodibility = 0. 03
600 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 13%

Station 4+910 EB Lane BH 13-48

0 - 220 Asphalt
220 - 800 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 7%
Percent Passing 4.75 mm = 40%
75 µm = 3%
Frost Susceptibility = LSFH
Soil Erodibility = 0. 25
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 13%

Station 4+985 WB Lane BH 13-49

0 - 280 Asphalt
280 - 800 Brown Gravelly Sand Some Silt Moist
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 5+160 EB Lane BH 13-50

0 - 160 Asphalt
160 - 800 Brown Gravelly Sand Some Silt Moist
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 5+260 WB Lane BH 13-52

0 - 260 Asphalt
260 - 900 Brown Gravelly Sand Some Silt Moist
900 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 5+560 EB Lane BH 13-55

0 - 280 Asphalt
280 - 480 Brown Gravelly Sand Some Silt Moist
480 - 800 Brown Sandy Gravel With Silt Moist
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 5+660 EB Lane BH 13-56

0 - 300 Asphalt
300 - 500 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 9%
Percent Passing 4.75 mm = 61%
75 µm = 14%
Frost Susceptibility = LSFH
Soil Erodibility = 0.12
500 - 800 Brown Sandy Gravel With Silt Moist
Percent Passing 4.75 mm = 57%
75 µm = 25%
Frost Susceptibility = LSFH
Soil Erodibility = 0.16
800 - 1500 Brown Silty Sandy Clay Trace Gravel Moist

Station 5+760 WB Lane BH 13-57

0 - 180 Asphalt Moist
180 - 470 Brown Gravelly Sand Some Silt Moist
w @ 0.4 m = 4%
Percent Passing 4.75 mm = 67%
75 µm = 14%
Frost Susceptibility = LSFH
Soil Erodibility = 0.07
470 - 1500 Brown Silty Sandy Clay Trace Gravel Moist
w @ 1.5 m = 20%

RECORD OF BOREHOLE 13-01

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 0+360 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 836 446.8 E 589 626.0

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	265.10						
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			○	
1		**CLAY**, silty, some sand, trace gravel, trace organics, firm, brown: (TILL)	264.34 / 0.76	1	SS	6		○	Bentonite
2				2	SS	7		○	
		CLAY, silty, sandy, trace gravel, firm to very stiff, brown: (TILL)	262.97 / 2.13	3	SS	18		○	Filter Sand
3				4	SS	26		○	Slotted Screen
4				5	SS	27	Grain Size Analysis: Gr 3%/ Sa 22%/ Si 37%/ Cl 38%	○	
		END OF BOREHOLE AT 4.42m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.	260.68 / 4.42						

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	0.10 (frozen)	-
Oct28/2014	destroyed	

Chart headers: SHEAR STRENGTH: Cu, KPa — nat V - ✚, Q - ✖, rem V - ●, Cpen ▲; 40, 80, 120, 160. WATER CONTENT, PERCENT — wp, w, wl; 10, 20, 30, 40. DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20, 40, 60, 80, 100. ADDITIONAL LAB. TESTING. STRATA PLOT.

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION   WATER LEVEL IN PIEZOMETER March 27, 2014

LOGGED : JG
CHECKED : MEF

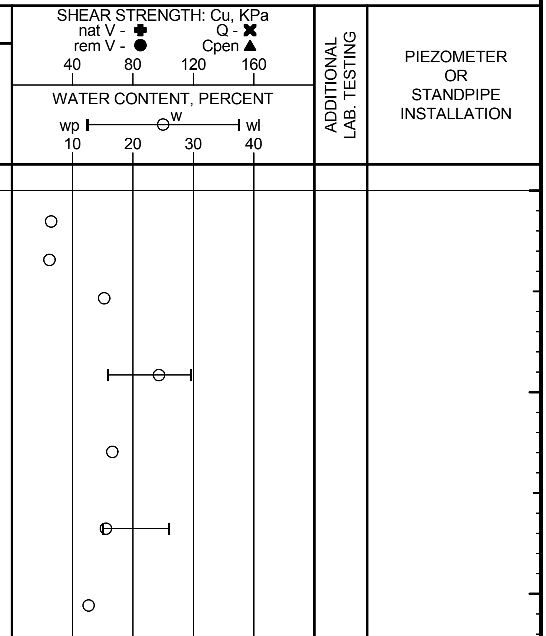
THURBER

RECORD OF BOREHOLE 13-04

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 0+685 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 836 696.3 E 589 834.2

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE	263.70				
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, compact, brown, moist: (FILL)	0.00	1	SS	16	Grain Size Analysis: Gr 31%/ Sa 50%/ Si & Cl 19%
1		**CLAY**, silty, sandy, trace gravel, trace organics, firm, brown: (TILL)(CL)	262.94 / 0.76	2	SS	4	
2				3	SS	5	Grain Size Analysis: Gr 0%/ Sa 20%/ Si 48%/ Cl 32%
		CLAY, silty, sandy, trace gravel, very stiff, brown: (TILL)(CL)	261.41 / 2.29	4	SS	16	
3				5	SS	23	Grain Size Analysis: Gr 2%/ Sa 28%/ Si 52%/ Cl 18%
4				6	SS	24	
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.	259.28 / 4.42				



GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

THURBER2S 5148.GPJ 3/10/15

RECORD OF BOREHOLE 13-07

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 0+960 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013

N 4 836 904.6 E 590 013.6

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	263.80					
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS		Grain Size Analysis: Gr 32%/ Sa 55%/ Si & Cl 13%	
		CLAY, silty, sandy, firm, brown: (TILL)	263.32 0.48	1	SS	6	Grain Size Analysis: Gr 0%/ Sa 20%/ Si 40%/ Cl 40%	Bentonite
2		**CLAY**, silty, sandy, trace gravel, very stiff to hard, brown: (TILL)	262.35 1.45	2	SS	18		
3				3	SS	22		Filter Sand
				4	SS	36		Slotted Screen
4				5	SS	26		
		END OF BOREHOLE AT 4.42m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.	259.38 4.42					

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	0.10 (frozen)	-
Oct28/2014	dry at 0.90 (blocked)	

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp w wl — 10 20 30 40

ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION

WATER LEVEL IN PIEZOMETER March 27, 2014

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-10

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 1+260 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013

N 4 837 111.7 E 590 231.7

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT, PERCENT (plotted)
	Solid Stem Augers	GROUND SURFACE	263.30					
		GRANLAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			○
		CLAY, silty, sandy, trace organics, firm, brown: (TILL)	262.54 0.76	2	SS	5		○
1				3	SS	6	Grain Size Analysis: Gr 0%/ Sa 21%/ Si 48%/ Cl 31%	○
2		**CLAY**, silty, sandy, trace gravel, very stiff, brown: (TILL)	261.01 2.29	4	SS	16		○
3				5	SS	23		○
4				6	SS	24		○
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.	258.88 4.42					

Legend: SHEAR STRENGTH: Cu, KPa — nat V - ✚, rem V - ●, Q - ✖, Cpen ▲ (40, 80, 120, 160); DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100); WATER CONTENT, PERCENT — wp, w, wl (10, 20, 30, 40); STRATA PLOT; ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION   WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-14

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 1+635 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 837 407.3 E 590 463.2

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	262.30					
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
1		**CLAY**, silty, sandy, trace organics, firm, brown: (TILL)	261.70 / 0.60	1	SS	6		Bentonite
2				2	SS	4	Grain Size Analysis: Gr 0%/ Sa 26%/ Si 41%/ Cl 33%	
		CLAY, silty, sandy, trace gravel, very stiff, brown: (TILL)	260.01 / 2.29	3	SS	14	Grain Size Analysis: Gr 0%/ Sa 26%/ Si 40%/ Cl 34%	Filter Sand
3				4	SS	21		
4			257.88	5	SS	22		Slotted Screen
		END OF BOREHOLE AT 4.42m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.	4.42					

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	0.30 (frozen)	-
Oct28/2014	destroyed	

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ w ○ ⊣ wl — 10 20 30 40

DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION

WATER LEVEL IN PIEZOMETER March 27, 2014

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-17

PROJECT : Mayfield Road - Class Environmental Assessment

LOCATION : Station 1+960 WB Shoulder

STARTED : October 8, 2013

COMPLETED : October 8, 2013

N 4 837 671.0 E 590 653.6

Project No. 19-1605-148

SHEET 1 OF 1

DATUM Geodetic

BORING METHOD: Solid Stem Augers

DEPTH SCALE (metres)	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	COMMENTS
	GROUND SURFACE	262.00				
	GRANULAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS		
	CLAY, silty, sandy, trace organics, firm, brown: (TILL)	261.49 / 0.51				
1			1	SS	5	
			2	SS	4	
2	**CLAY**, silty, sandy, trace gravel, very stiff, brown: (TILL)	259.87 / 2.13				
			3	SS	8	
3			4	SS	29	
4			5	SS	26	Grain Size Analysis: Gr 4%/ Sa 16%/ Si 39%/ Cl 41%
	END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.	257.58 / 4.42				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ w ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION

WATER LEVEL IN PIEZOMETER

LOGGED : JG

CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-22

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 2+435 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 838 068.4 E 590 911.7

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	263.20						
0	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS				Bentonite
0.63		**CLAY**, silty, sandy, firm, brown: (TILL)	262.57 / 0.63	1	SS	8			
1.37		**CLAY**, silty, sandy, trace gravel, very stiff to firm, brown: (TILL)(CL)	261.83 / 1.37	2	SS	19			
				3	SS	18			Filter Sand
				4	SS	16			
				5	SS	11			Slotted Screen
				6	SS	6	Grain Size Analysis: Gr 2%/ Sa 28%/ Si 43%/ Cl 27%		
				7	SS	15			
6.71		END OF BOREHOLE AT 6.71m.	256.49 / 6.71						

END OF BOREHOLE AT 6.71m.
Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	3.50	-
Oct28/2014	destroyed	

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ (40, 80, 120, 160)
DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100)
WATER CONTENT, PERCENT — wp, w, wl (10, 20, 30, 40)
ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION
WATER LEVEL IN PIEZOMETER March 27, 2014

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-25

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 2+685 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 838 276.8 E 591 049.8

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT (%)
		GROUND SURFACE	263.40					
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
			262.79					
		CLAY, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)	0.61					
1				1	SS	11	Grain Size Analysis: Gr 1%/ Sa 27%/ Si 38%/ Cl 34%	
2				2	SS	21		
				3	SS	32	Grain Size Analysis: Gr 0%/ Sa 26%/ Si 35%/ Cl 39%	
3				4	SS	27		
4				5	SS	27		
			258.98					
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.	4.42					

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ w ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

∇ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-29

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 3+110 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 838 611.0 E 591 310.9

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
GROUND SURFACE	264.40					
GRANULAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
CLAY, silty, sandy, trace gravel, trace organics, firm, brown: (TILL)	263.79 / 0.61	1	SS	5	Grain Size Analysis: Gr 2%/ Sa 26%/ Si 51%/ Cl 21%	Bentonite
		2	SS	3	Grain Size Analysis: Gr 0%/ Sa 26%/ Si 56%/ Cl 18%	
CLAY, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)	262.19 / 2.21	3	SS	12		Filter Sand
		4	SS	20		
		5	SS	23		Slotted Screen
END OF BOREHOLE AT 4.42m.	259.98 / 4.42					

Boring method: Solid Stem Augers

END OF BOREHOLE AT 4.42m.
Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	0.10 (frozen)	-
Oct28/2014	2.10	-

Column headings: DEPTH SCALE (metres); BORING METHOD; SOIL PROFILE; STRATA PLOT; SAMPLES; COMMENTS — DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100); SHEAR STRENGTH: Cu, KPa — nat V - ✚, Q - ✖, rem V - ●, Cpen ▲ (40, 80, 120, 160); WATER CONTENT, PERCENT — wp, w, wl (10, 20, 30, 40); ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION
WATER LEVEL IN PIEZOMETER October 28, 2014

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-30

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 3+235 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 838 717.4 E 591 377.9

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT, PERCENT	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	264.50						
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS				Cuttings
		CLAY, silty, sandy, firm, brown: (TILL)	263.99 0.51	1	SS	5			
		CLAY, silty, sandy, trace gravel, very stiff, brown: (TILL)	263.05 1.45	2	SS	15	Grain Size Analysis: Gr 2%/ Sa 26%/ Si 39%/ Cl 33%		Bentonite
				3	SS	22			Filter Sand
				4	SS	28			Slotted Screen
		becoming hard		5	SS	70			
		END OF BOREHOLE AT 4.42m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.	260.08 4.42						

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	0.00 (frozen)	-
Oct28/2014	destroyed	

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ (40, 80, 120, 160)
DYNAMIC CONE PENETRATION RESISTANCE PLOT (20, 40, 60, 80, 100)
WATER CONTENT, PERCENT: wp w wl (10, 20, 30, 40)
ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION
WATER LEVEL IN PIEZOMETER March 27, 2014

LOGGED : JG
CHECKED : MEF

THURBER

THURBER2S 5148.GPJ 3/10/15

RECORD OF BOREHOLE 13-33

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 3+460 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 838 894.5 E 591 516.0

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

Boring method: Solid Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
GROUND SURFACE	264.70					
GRANULAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
CLAY, silty, sandy, trace organics, firm, brown: (TILL)	264.14 / 0.56	1	SS	6		Bentonite
CLAY, silty, sandy, trace gravel, stiff, brown: (TILL)(CL)	263.18 / 1.52	2	SS	14		
		3	SS	15		Filter Sand
		4	SS	14	Grain Size Analysis: Gr 6%/ Sa 25%/ Si 42%/ Cl 27%	
becoming hard		5	SS	68	Grain Size Analysis: Gr 5%/ Sa 32%/ Si 39%/ Cl 24%	
SAND, silty, trace gravel, very dense, brown, moist	260.20 / 4.50	6	SS	98		Slotted Screen
	258.45 / 6.25	7	SS	50/ 0.150		

END OF BOREHOLE AT 6.25m UPON REFUSAL.
WATER LEVEL AT 3.80m IN OPEN HOLE.
Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	destroyed	

Column headings: DEPTH SCALE (metres); BORING METHOD; SOIL PROFILE; STRATA PLOT; SAMPLES; DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100; SHEAR STRENGTH: Cu, KPa nat V - rem V - Q - Cpen 40 80 120 160; WATER CONTENT, PERCENT wp w wl 10 20 30 40; ADDITIONAL LAB. TESTING

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION October 8, 2013
WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-36

PROJECT : Mayfield Road - Class Environmental Assessment
Project No. 19-1605-148
LOCATION : Station 3+760 WB Shoulder
STARTED : October 8, 0213
SHEET 1 OF 1
COMPLETED : October 8, 2013
N 4 839 142.0 E 591 686.3
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT, PERCENT (w)
		GROUND SURFACE	264.80					
	Solid Stem Augers	**ASPHALT:** (225mm)	264.57 0.00					
		GRANULAR, gravely sand, crushed, brown, moist: (FILL)	264.27 0.23	1	GS		Grain Size Analysis: Gr 30%/ Sa 46%/ Si & Cl 24%	○
1		**CLAY**, silty, sandy, trace gravel, partially granular, stiff, brown: (FILL)	0.53	1	SS	9		○
2		**CLAY**, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)	263.28 1.52	2	SS	13		○
				3	SS	17		○
3				4	SS	27		○
4		**SAND**, silty, trace gravel, dense, brown, moist	260.99 3.81	5	SS	45	Grain Size Analysis: Gr 1%/ Sa 77%/ Si & Cl 22%	○
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.15m, THEN ASPHALT PATCH TO SURFACE.	260.38 4.42					

Column headings also include: SOIL PROFILE; STRATA PLOT; SAMPLES; DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH: Cu, KPa — nat V - ✚, Q - ✖, rem V - ●, Cpen ▲ (40 80 120 160); WATER CONTENT, PERCENT — wp, w, wl (10 20 30 40); ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION   WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-39

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 4+060 EB Shoulder
STARTED : October 17, 2013
COMPLETED : October 17, 2013
N 4 839 380.9 E 591 868.6

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

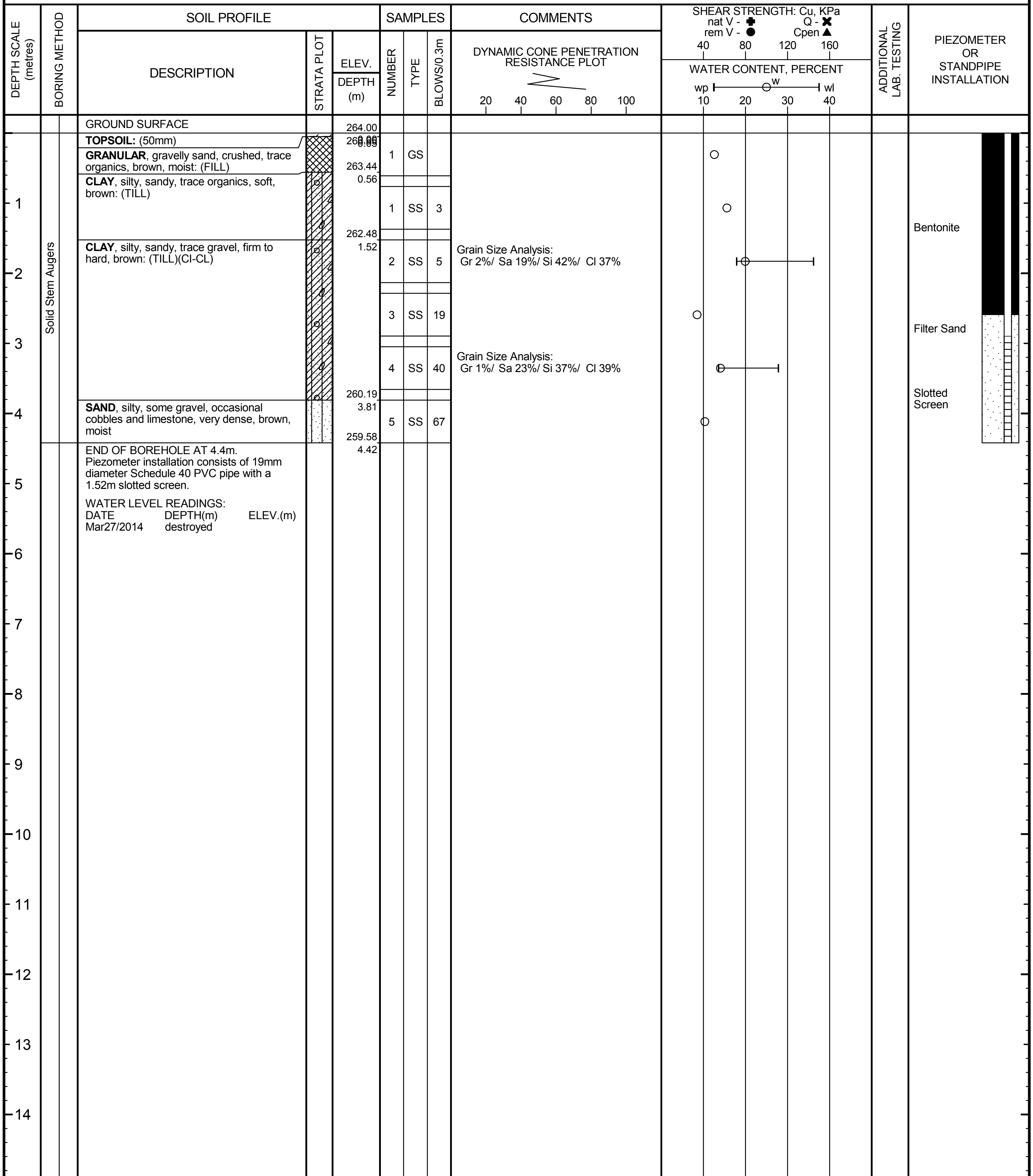
BORING METHOD: Solid Stem Augers

DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
GROUND SURFACE	264.00					
TOPSOIL: (50mm)	263.95 0.05					Bentonite
GRANULAR, gravelly sand, crushed, trace organics, brown, moist: (FILL)	263.44 0.56	1	GS			
CLAY, silty, sandy, trace organics, soft, brown: (TILL)	262.48 1.52	1	SS	3		
CLAY, silty, sandy, trace gravel, firm to hard, brown: (TILL)(CI-CL)	260.19 3.81	2	SS	5	Grain Size Analysis: Gr 2%/ Sa 19%/ Si 42%/ Cl 37%	
		3	SS	19		Filter Sand
		4	SS	40	Grain Size Analysis: Gr 1%/ Sa 23%/ Si 37%/ Cl 39%	Slotted Screen
SAND, silty, some gravel, occasional cobbles and limestone, very dense, brown, moist	259.58 4.42	5	SS	67		

END OF BOREHOLE AT 4.4m.
Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	destroyed	



GROUNDWATER ELEVATIONS
WATER LEVEL UPON COMPLETION
WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-42

PROJECT : Mayfield Road - Class Environmental Assessment

LOCATION : Station 4+360 EB Shoulder

STARTED : October 7, 2013

COMPLETED : October 7, 2013

N 4 839 616.5 E 592 051.8

Project No. 19-1605-148

SHEET 1 OF 1

DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE – DESCRIPTION	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE	261.70				
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	261.52				
		CLAY, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)	0.18	1	GS		
1				1	SS	9	
2				2	SS	18	
				3	SS	24	Grain Size Analysis: Gr 1%/ Sa 26%/ Si 45%/ Cl 28%
3				4	SS	19	
4			257.28	5	SS	15	
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, THEN CUTTINGS TO SURFACE.	4.42				

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ o w ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN PIEZOMETER

LOGGED : JG

CHECKED : MEF

THURBER

THURBER2S 5148.GPJ 3/10/15

RECORD OF BOREHOLE 13-43

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 4+460 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 839 704.2 E 592 102.0

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE	261.00				
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS		Grain Size Analysis: Gr 39%/ Sa 50%/ Si & Cl 11%
		CLAY, silty, sandy, trace organics, firm, brown, moist: (TILL)(CL)	260.49 0.51				
1				1	SS	8	Grain Size Analysis: Gr 0%/ Sa 25%/ Si 62%/ Cl 13%
2				2	SS	5	
		CLAY, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)(CL)	258.71 2.29	3	SS	11	
3				4	SS	21	Grain Size Analysis: Gr 3%/ Sa 20%/ Si 59%/ Cl 18%
4				5	SS	29	
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, THEN CUTTINGS TO SURFACE.	256.58 4.42				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ w ○ ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

THURBER2S 5148.GPJ 3/10/15

RECORD OF BOREHOLE 13-47

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 4+835 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 839 990.1 E 592 344.7

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

BORING METHOD: Solid Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	PIEZOMETER OR STANDPIPE INSTALLATION
GROUND SURFACE	258.20					
GRANULAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			Bentonite
CLAY, silty, sandy, trace organics, stiff to firm, brown: (TILL)	257.44 / 0.76	1	SS	9		
		2	SS	7	Grain Size Analysis: Gr 0%/ Sa 18%/ Si 41%/ Cl 41%	
CLAY, silty, sandy, trace gravel, stiff to hard, brown: (TILL)	255.99 / 2.21	3	SS	14		
		4	SS	30		Filter Sand
		5	SS	35		
		6	SS	10		Slotted Screen
		7	SS	10	Grain Size Analysis: Gr 0%/ Sa 33%/ Si 41%/ Cl 26%	
END OF BOREHOLE AT 6.71m. WATER LEVEL AT 6.30m IN OPEN HOLE. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.	251.49 / 6.71					

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	destroyed	

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION October 7, 2013

WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-50

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 5+060 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013
N 4 840 172.4 E 592 477.0

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT (%)
		GROUND SURFACE	257.30					
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
		CLAY, silty, sandy, trace gravel, firm to very stiff, brown: (TILL)	256.77 / 0.53	1	SS	6		
				2	SS	7		
				3	SS	21	Grain Size Analysis: Gr 3%/ Sa 27%/ Si 40%/ Cl 30%	
				4	SS	27		
			252.88 / 4.42	5	SS	23		
		END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, THEN CUTTINGS TO SURFACE.						

Depth scale: 1 – 14 m

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

DYNAMIC CONE PENETRATION RESISTANCE PLOT — 20 40 60 80 100

WATER CONTENT, PERCENT — wp ⊢ w ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-53

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 5+360 EB Shoulder
STARTED : October 11, 2013
COMPLETED : October 11, 2013
N 4 840 398.7 E 592 674.5

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS	WATER CONTENT (%)	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	256.50						
	Solid Stem Augers	**GRANULAR**, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS				Bentonite
		CLAY, silty, sandy, trace gravel, stiff to very stiff, brown: (TILL)	255.99 / 0.51	1	SS	14			
1				2	SS	16			
2				3	SS	19			
3				4	SS	24	Grain Size Analysis: Gr 4%/ Sa 23%/ Si 40%/ Cl 33%		Filter Sand
4				5	SS	15			
5				6	SS	8			Slotted Screen
		SAND, silty, trace gravel, compact, brown, moist	250.86 / 5.64						
6				7	SS	10			
		END OF BOREHOLE AT 6.71m.	249.79 / 6.71						

END OF BOREHOLE AT 6.71m.
WATER LEVEL AT 5.90m IN OPEN HOLE.
Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	destroyed	

Chart headings: SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲; 40 80 120 160); WATER CONTENT, PERCENT (wp, w, wl; 10 20 30 40); DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); ADDITIONAL LAB. TESTING; STRATA PLOT.

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION October 11, 2013
WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-54

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 5+460 WB Shoulder
STARTED : October 8, 2013
COMPLETED : October 8, 2013

N 4 840 484.8 E 592 726.4

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

Boring method: Solid Stem Augers

Description	Elev. / Depth (m)	Sample Number	Type	Blows/0.3m	Comments	Water content (%)
GROUND SURFACE	256.60					
GRANULAR, gravelly sand, crushed, brown, moist: (FILL)	0.00	1	GS			
CLAY, silty, sandy, trace gravel, firm to stiff, brown: (TILL)	256.09 / 0.51	1	SS	7	Grain Size Analysis: Gr 0%/ Sa 32%/ Si 40%/ Cl 28%	
		2	SS	10		
		3	SS	13		
		4	SS	15		
		5	SS	12		
END OF BOREHOLE AT 4.42m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.30m, THEN CUTTINGS TO SURFACE.	252.18 / 4.42					

Column headings: DEPTH SCALE (metres); BORING METHOD; SOIL PROFILE: DESCRIPTION, STRATA PLOT, ELEV. DEPTH (m); SAMPLES: NUMBER, TYPE, BLOWS/0.3m; COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100; SHEAR STRENGTH: Cu, KPa nat V - ✚ Q - ✖ rem V - ● Cpen ▲ 40 80 120 160; WATER CONTENT, PERCENT wp ⊢ o w ⊣ wl 10 20 30 40; ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

GROUNDWATER ELEVATIONS

WATER LEVEL UPON COMPLETION   WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

RECORD OF BOREHOLE 13-58

PROJECT : Mayfield Road - Class Environmental Assessment
LOCATION : Station 5+885 EB Shoulder
STARTED : October 7, 2013
COMPLETED : October 7, 2013
N 4 840 812.4 E 592 997.3

Project No. 19-1605-148
SHEET 1 OF 1
DATUM Geodetic

Boring method: Solid Stem Augers

Description	Elev. (m) / Depth (m)	Sample Number	Type	Blows/0.3m	Comments	Piezometer or Standpipe Installation
GROUND SURFACE	256.30					
GRANULAR, sand and gravel, crushed, brown, moist: (FILL)	0.00	1	GS		Grain Size Analysis: Gr 53%/ Sa 39%/ Si & Cl 8%	Bentonite
CLAY, silty, sandy, trace organics, firm, brown: (TILL)	255.72 / 0.58	1	SS	6		
CLAY, silty, sandy, trace gravel, stiff to hard, brown: (TILL)	254.78 / 1.52	2	SS	10	Grain Size Analysis: Gr 0%/ Sa 17%/ Si 41%/ Cl 42%	
		3	SS	18		Filter Sand
		4	SS	29		Slotted Screen
		5	SS	32		
END OF BOREHOLE AT 4.42m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.	251.88 / 4.42					

WATER LEVEL READINGS:

DATE	DEPTH(m)	ELEV.(m)
Mar27/2014	destroyed	

Depth scale (metres): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa — nat V - ✚ Q - ✖ rem V - ● Cpen ▲ — 40 80 120 160

WATER CONTENT, PERCENT — wp ⊢ w ⊣ wl — 10 20 30 40

ADDITIONAL LAB. TESTING

GROUNDWATER ELEVATIONS
▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN PIEZOMETER

LOGGED : JG
CHECKED : MEF

THURBER

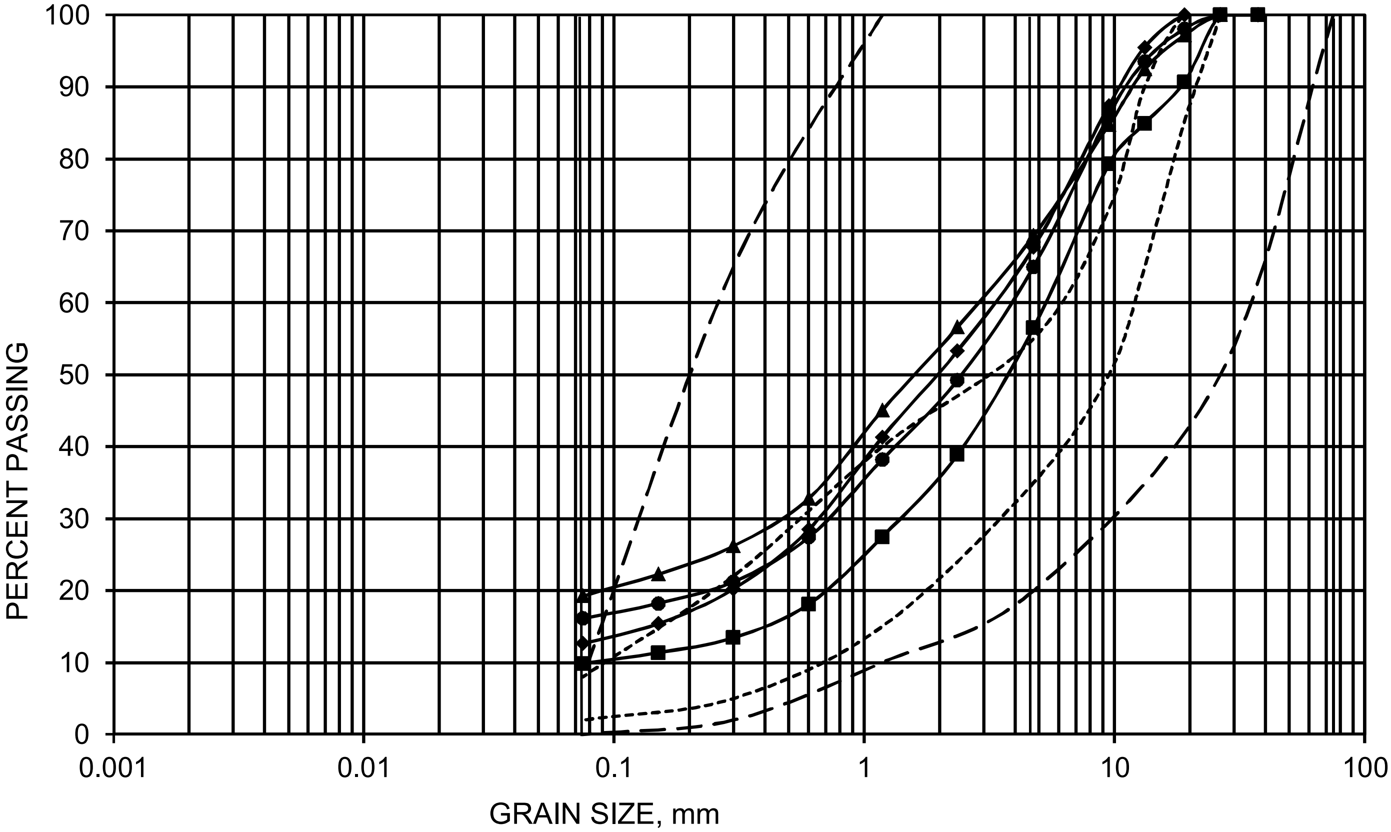
THURBER2S 5148.GPJ 3/10/15

THURBER

APPENDIX E

GEOTECHNICAL LABORATORY TEST RESULTS

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Grain Size Distribution



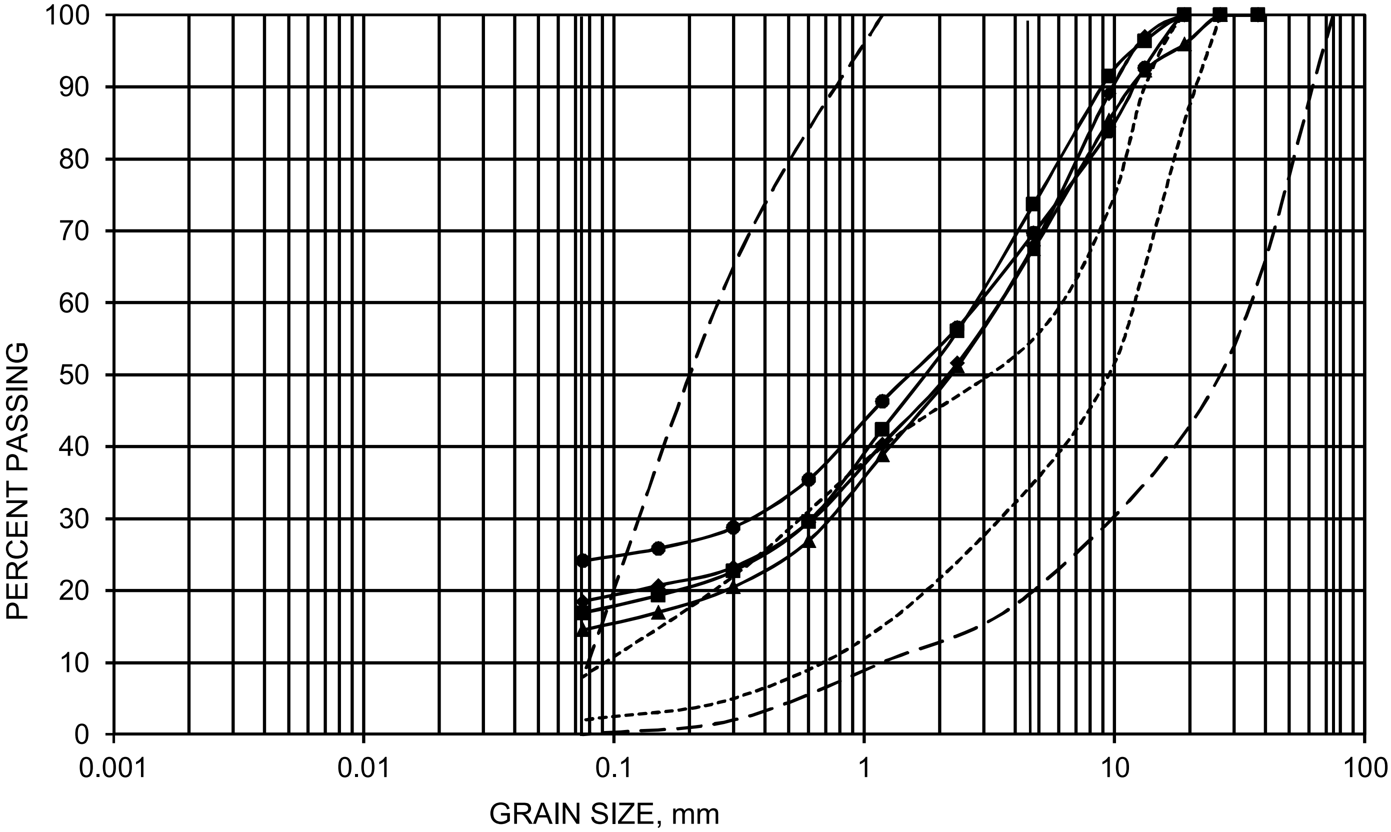
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- Granular B - OPSS Specification Limits
- Granular A - OPSS Specification Limits
- 0+460 EB 250 - 620 mm
- 0+685 EB 0 - 610 mm
- 0+960 WB 0 - 480 mm
- 1+410 WB 230 - 600 mm

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Grain Size Distribution



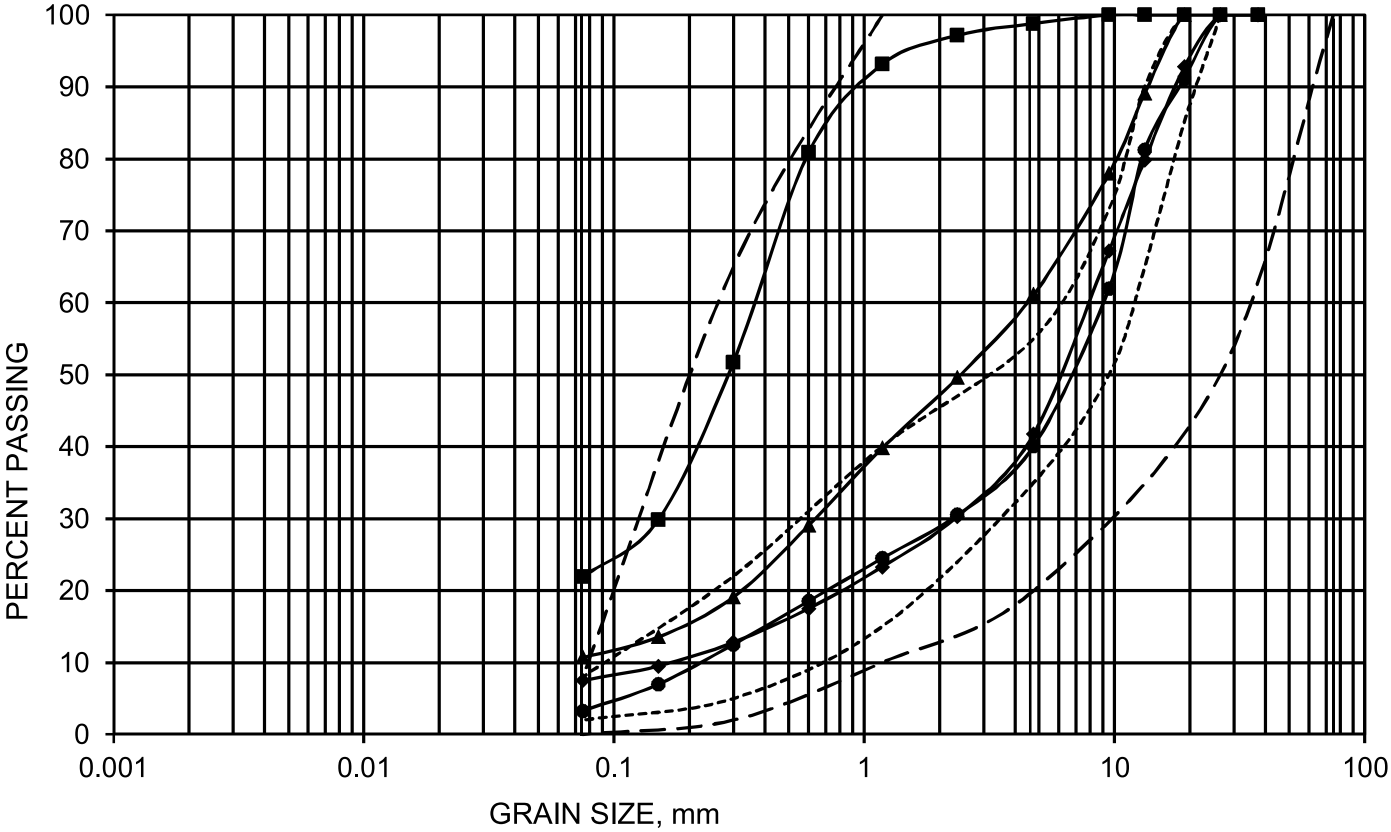
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- Granular B - OPSS Specification Limits
- Granular A - OPSS Specification Limits
- 2+360 WB 220 - 530 mm
- 2+860 EB 220 - 640 mm
- 2+960 WB 230 - 620 mm
- 3+760 WB 225 - 530 mm

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Grain Size Distribution



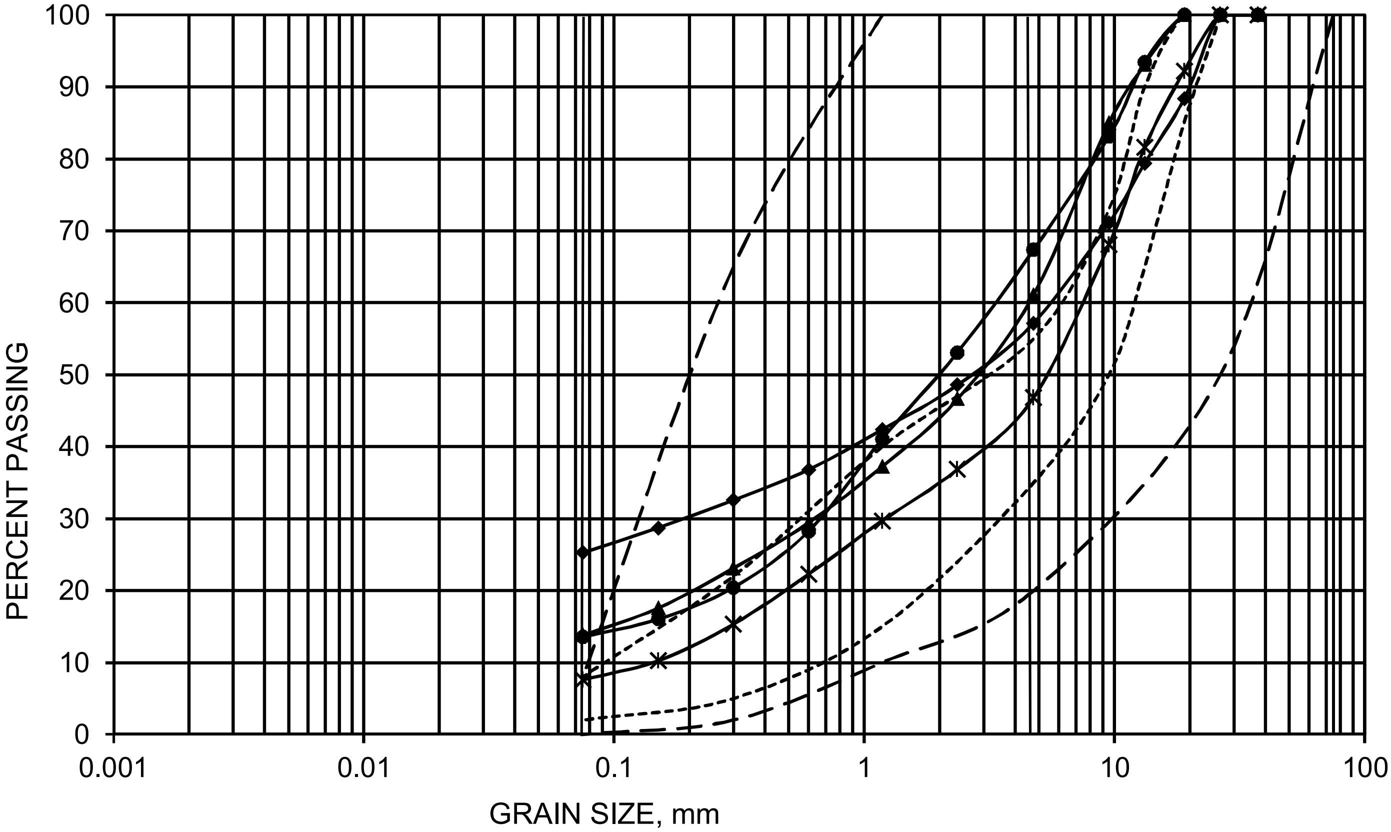
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- Granular B - OPSS Specification Limits
- Granular A - OPSS Specification Limits
- 3+760 WB 3.8 - 4.4 m
- 4+460 WB 0 - 510 mm
- 4+760 WB 260 - 600 mm
- 4+910 EB 220 - 800 mm

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Grain Size Distribution



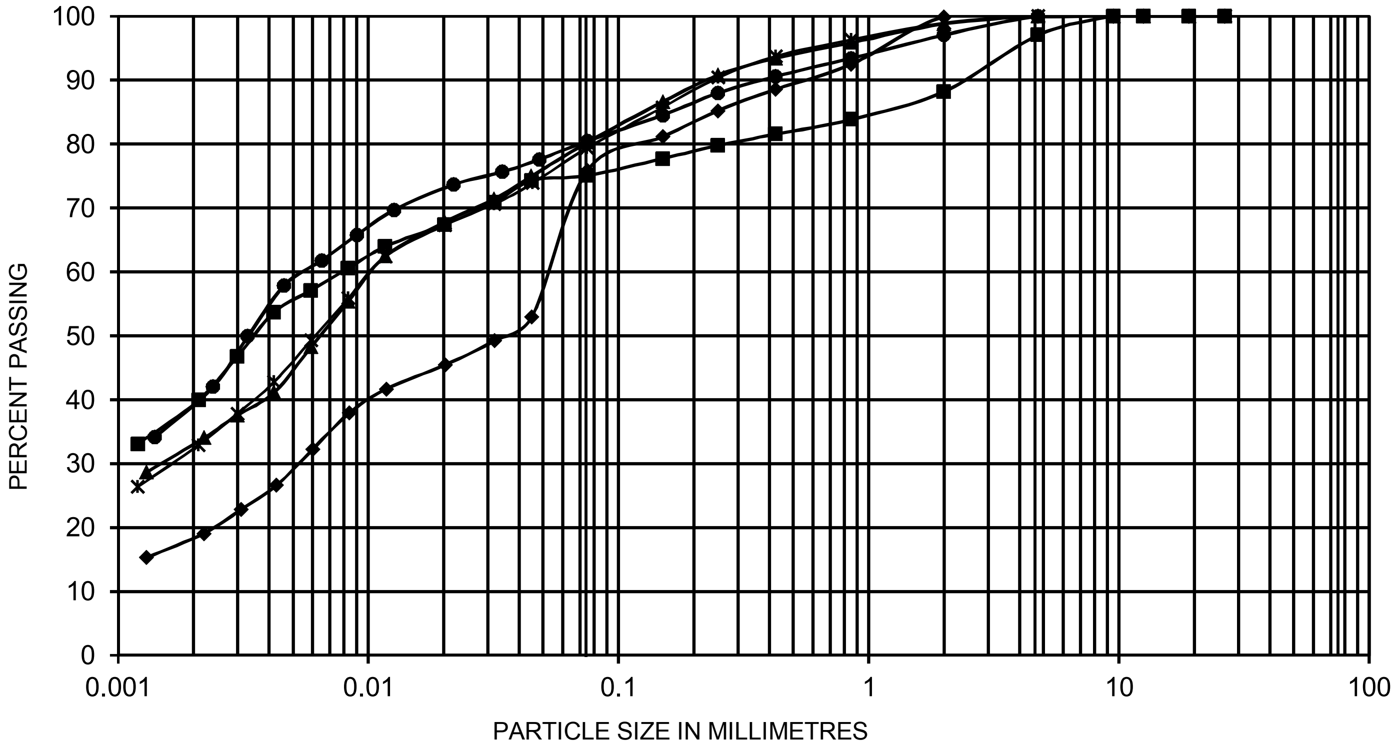
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- Granular B - OPSS Specification Limits
- Granular A - OPSS Specification Limits
- 5+660 EB 300 - 500 mm
- 5+660 EB 500 - 800 mm
- 5+760 WB 180 - 470 mm
- 5+885 EB 0 - 580 mm

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Blvd to Chinguacousy Rd
Particle Size Distribution



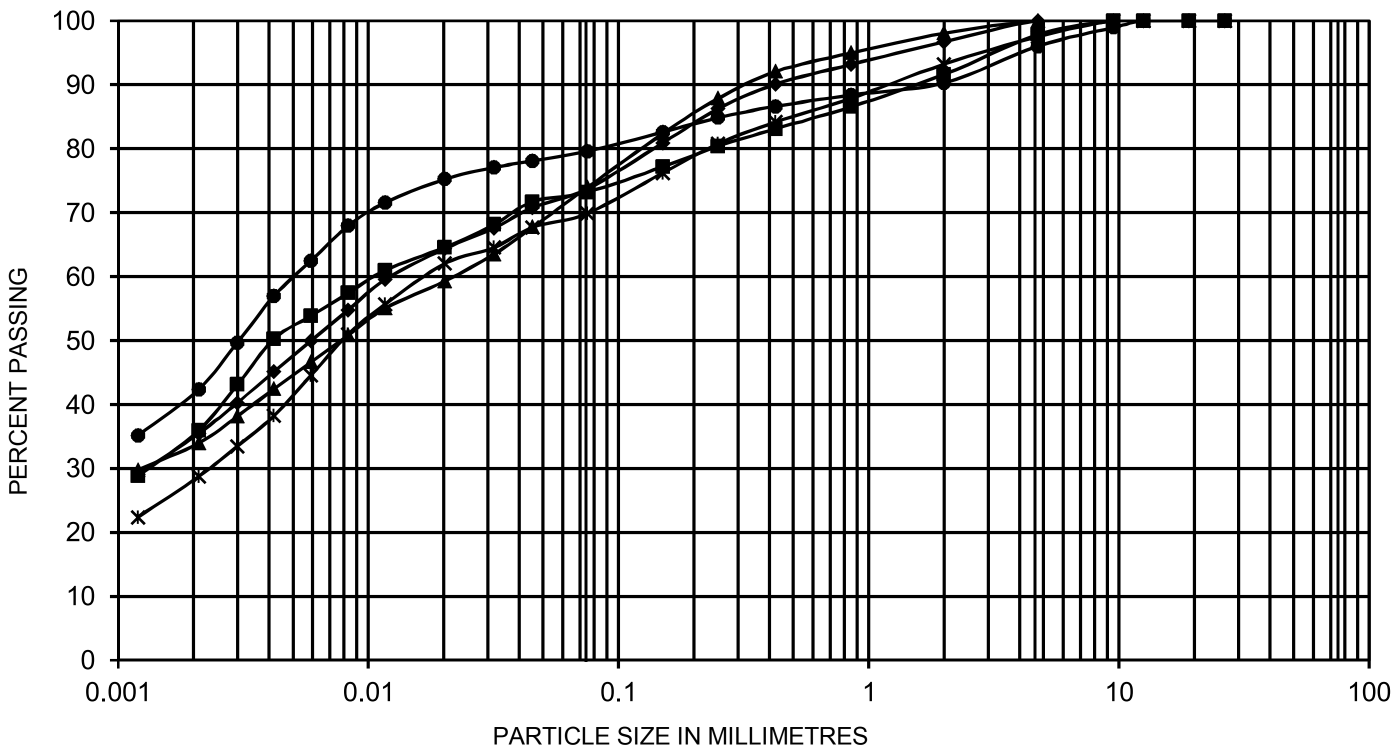
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 0+360 WB 3.8 - 4.4 m
- 0+685 EB 1.5 - 2.1 m
- 0+685 EB 3.0 - 3.7 m
- 0+960 WB 0.8 - 1.4 m
- 1+260 EB 1.5 - 2.1 m

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Particle Size Distribution



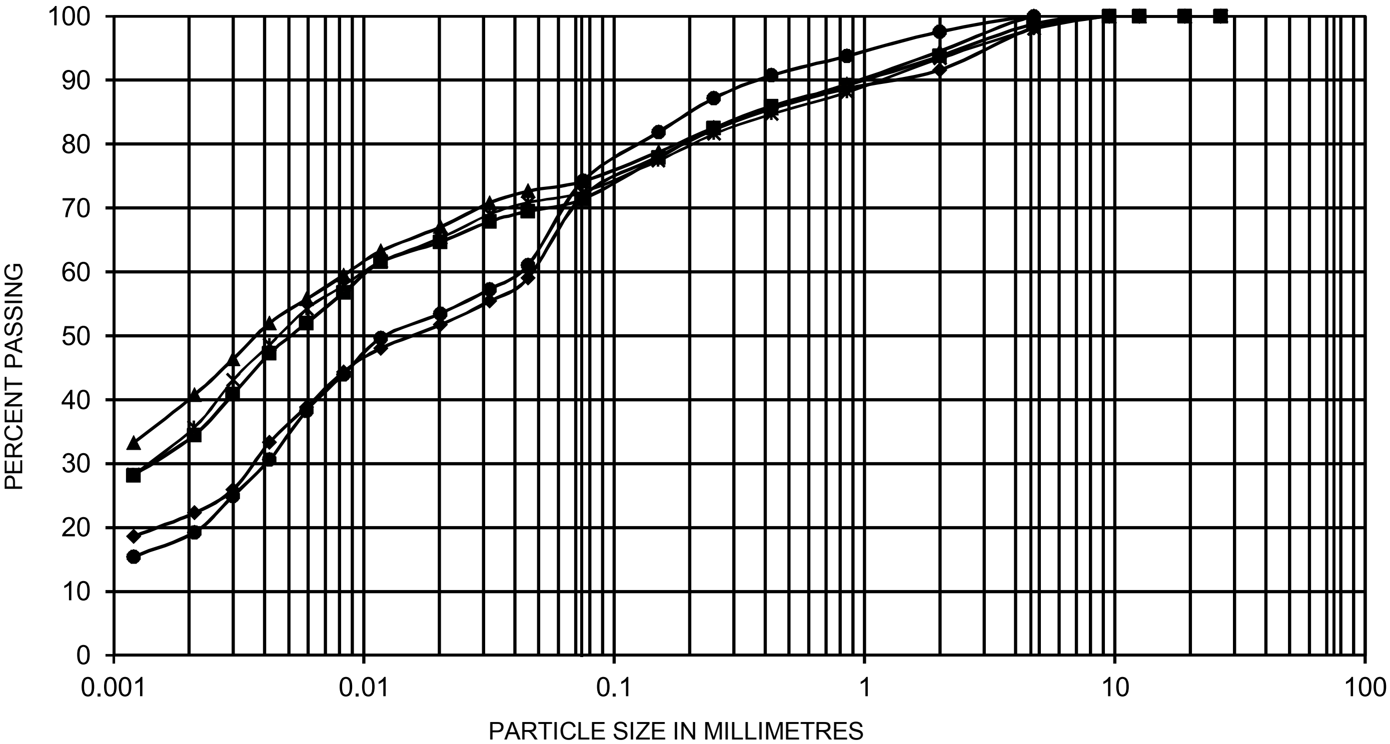
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 1+410 WB 0.6 - 1.5 m
- 1+635 EB 1.5 - 2.1 m
- 1+635 EB 2.3 - 2.9 m
- 1+960 WB 3.8 - 4.4 m
- 2+435 WB 4.6 - 5.2 m

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Particle Size Distribution



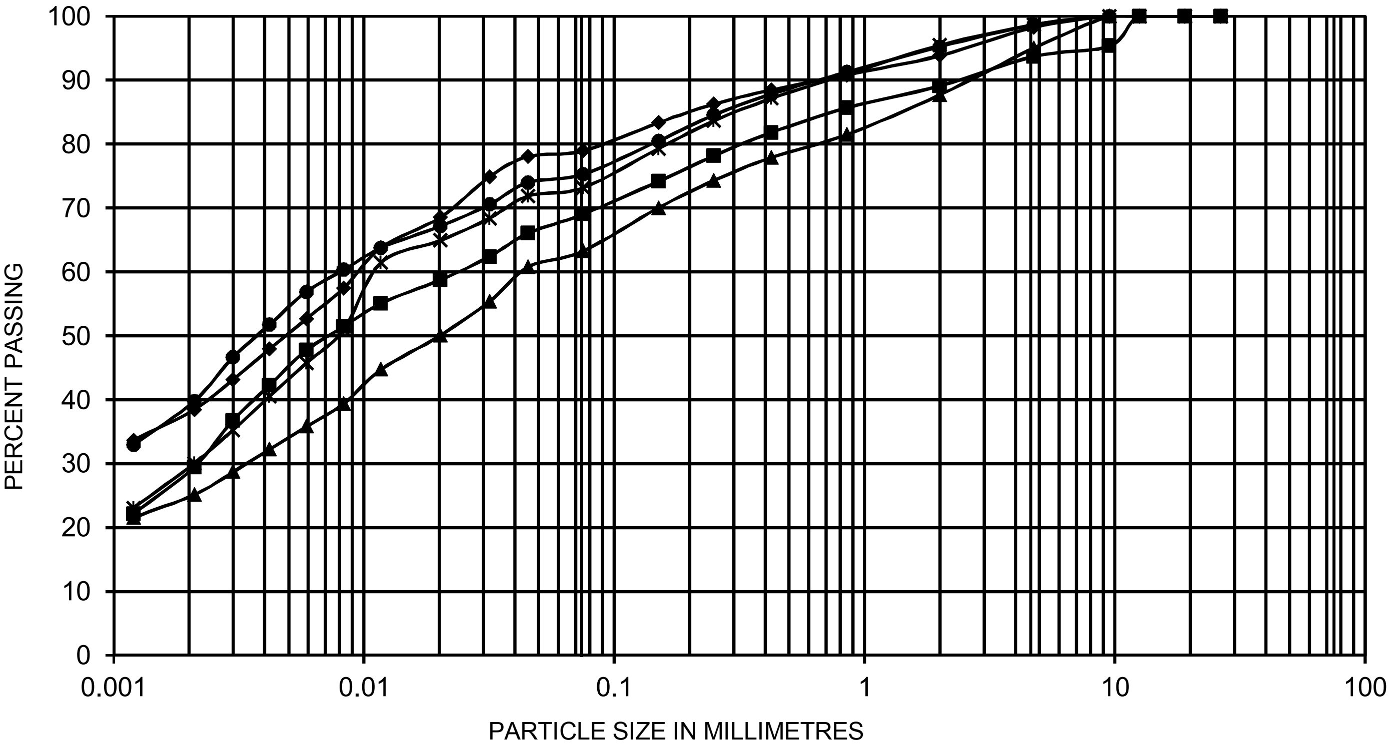
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 2+685 EB 0.8 - 1.4 m
- 2+685 EB 2.3 - 2.9 m
- 3+110 EB 0.8 - 1.4 m
- 3+110 EB 1.5 - 2.1 m
- 3+235 WB 1.5 - 2.1 m

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Particle Size Distribution



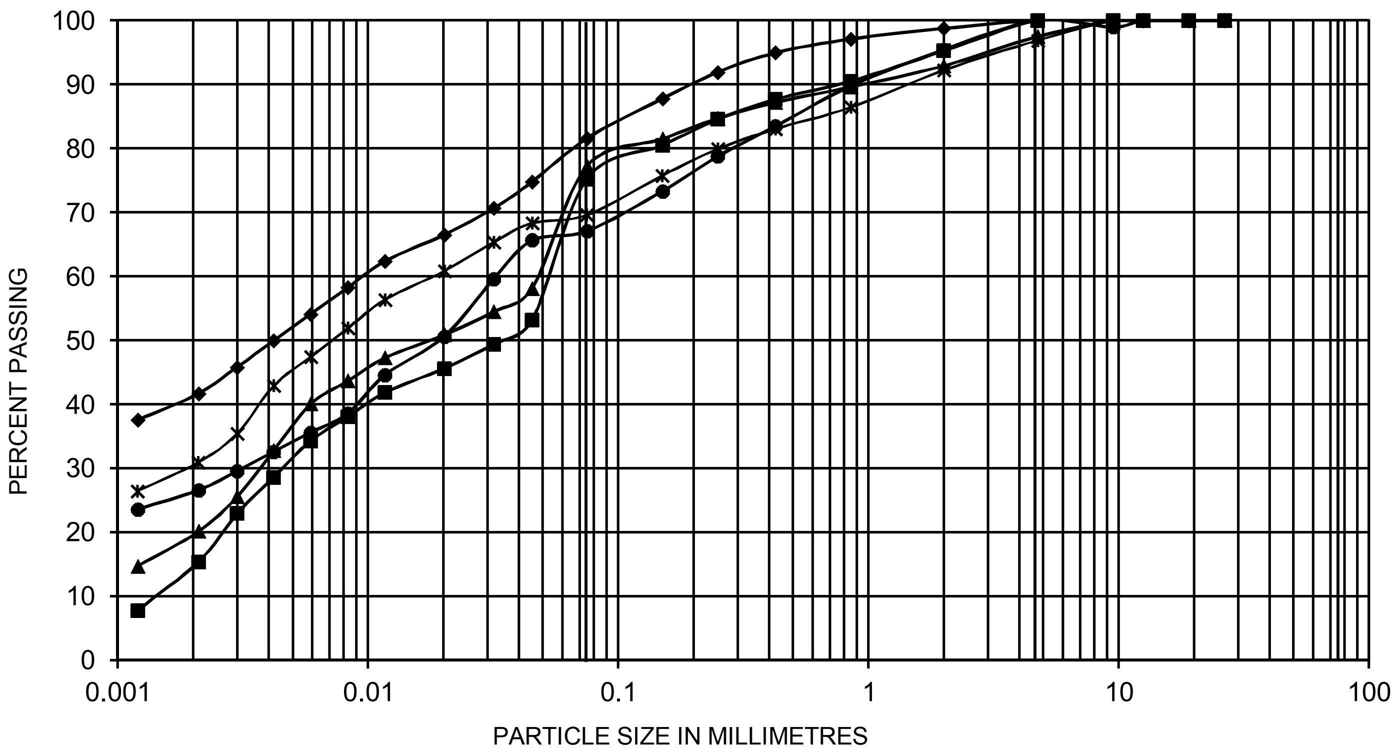
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 3+460 WB 3.0 - 3.7 m
- 3+460 WB 3.8 - 4.4 m
- 4+060 EB 1.5 - 2.1 m
- 4+060 EB 3.0 - 3.7 m
- 4+360 EB 2.3 - 2.9 m

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Particle Size Distribution



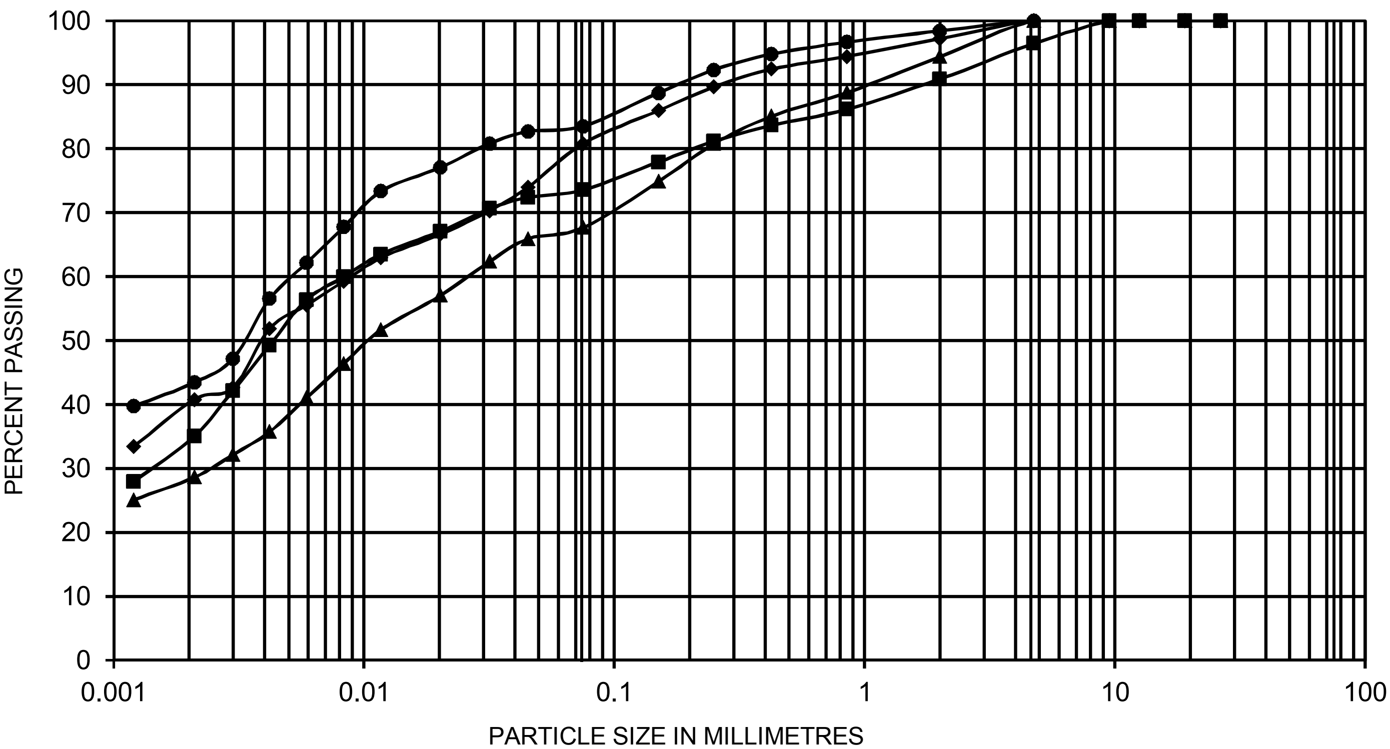
SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 4+460 WB 0.8 - 1.4 m
- 4+460 WB 3.0 - 3.7 m
- 4+835 EB 1.5 - 2.1 m
- 4+835 EB 6.1 - 6.7 m
- 5+060 WB 2.3 - 2.9 m

THURBER

Appendix E
Mayfield Road Class EA
Winston Churchill Boulevard to Chinguacousy Road
Particle Size Distribution



SILT and Clay	FINE	MEDIUM	COARSE	FINE	COARSE	Cob Size
FINE GRAINED	SAND			GRAVEL		

Legend

- 5+360 EB 3.0 - 3.7 m
- 5+460 WB 0.8 - 1.4 m
- 5+660 EB 0.8 - 1.5 m
- 5+885 EB 1.5 - 2.1 m

THURBER

THURBER

APPENDIX F

FALLING WEIGHT DEFLECTOMETER TEST RESULTS

Appendix F
MAYFIELD ROAD CLASS EA STUDY
Mayfield Road - Winston Churchill Blvd to Chinguacousy Rd
Falling Weight Deflectometer Test Results

Station	Direction	Normalized Deflections (µm)	M_R (MPa)	E_p (MPa)	SN_{Eff} (mm)	SN_{Des} (mm)	SN_{ol} (mm)	Asphalt Strengthening (mm)
0.360	EB	347	46	475	119	127	8	19
0.460	EB	317	48	528	123	127	4	9
0.560	EB	265	58	629	131	127	-	-
0.660	EB	297	60	534	124	127	3	8
0.760	EB	264	57	640	131	127	-	-
0.860	EB	327	53	489	120	127	7	16
0.960	EB	307	45	568	126	127	1	2
1.060	EB	265	57	634	131	127	-	-
1.160	EB	366	39	468	118	127	9	20
1.260	EB	229	61	761	139	127	-	-
1.360	EB	312	56	511	122	127	5	12
1.460	EB	246	60	687	135	127	-	-
1.560	EB	270	55	627	131	127	-	-
1.660	EB	325	50	505	121	127	6	13
1.760	EB	231	65	731	137	127	-	-
1.860	EB	333	48	496	121	127	6	15
1.960	EB	320	40	565	126	127	1	2
2.060	EB	416	43	381	111	127	16	39
2.160	EB	262	60	632	131	127	-	-
2.260	EB	286	47	619	130	127	-	-
2.360	EB	339	44	499	121	127	6	14
2.460	EB	350	48	464	118	127	9	21
2.560	EB	265	52	657	133	127	-	-
2.660	EB	303	50	555	125	127	2	4
2.760	EB	252	65	649	132	127	-	-
2.860	EB	300	54	545	125	127	2	6
2.960	EB	298	48	575	127	127	-	-
3.060	EB	183	37	1,405	171	127	-	-
3.160	EB	115	65	2,091	195	127	-	-
3.260	EB	151	56	1,487	174	127	-	-
3.360	EB	128	64	1,781	185	127	-	-
3.460	EB	131	56	1,846	187	127	-	-
3.560	EB	164	67	1,184	161	127	-	-
3.660	EB	142	57	1,606	179	127	-	-
3.760	EB	187	50	1,136	159	127	-	-
3.860	EB	133	49	2,006	192	127	-	-
3.960	EB	159	49	1,485	174	127	-	-
4.060	EB	126	60	1,908	189	127	-	-
4.160	EB	164	48	1,425	172	127	-	-
4.260	EB	152	69	1,307	167	127	-	-
4.360	EB	187	46	1,182	161	127	-	-
4.460	EB	186	55	1,082	157	127	-	-
4.560	EB	169	53	1,279	166	127	-	-
4.660	EB	257	58	657	133	127	-	-
4.760	EB	219	57	832	143	127	-	-
4.860	EB	200	56	956	150	127	-	-
4.960	EB	180	66	1,036	154	127	-	-
5.060	EB	171	75	1,050	155	127	-	-
5.160	EB	148	58	1,491	174	127	-	-
5.260	EB	216	56	856	145	127	-	-
5.360	EB	181	60	1,074	156	127	-	-
5.460	EB	99	64	2,718	213	127	-	-
5.560	EB	211	53	913	148	127	-	-
5.660	EB	237	49	797	141	127	-	-
5.760	EB	163	49	1,424	172	127	-	-

Appendix F
MAYFIELD ROAD CLASS EA STUDY
Mayfield Road - Winston Churchill Blvd to Chinguacousy Rd
Falling Weight Deflectometer Test Results

Station	Direction	Normalized Deflections (µm)	M_R (MPa)	Ep (MPa)	SN_{Eff} (mm)	SN_{Des} (mm)	SNol (mm)	Asphalt Strengthening (mm)
0.310	WB	513	35	309	103	127	24	57
0.410	WB	347	31	559	126	127	1	3
0.510	WB	328	39	550	125	127	2	5
0.610	WB	270	54	633	131	127	-	-
0.710	WB	304	48	563	126	127	1	3
0.810	WB	318	52	511	122	127	5	12
0.910	WB	332	37	554	125	127	2	4
1.010	WB	364	42	460	118	127	9	22
1.110	WB	297	46	590	128	127	-	-
1.210	WB	289	44	623	130	127	-	-
1.310	WB	264	65	608	129	127	-	-
1.410	WB	232	62	742	138	127	-	-
1.510	WB	336	52	474	119	127	8	19
1.610	WB	363	44	454	117	127	10	23
1.710	WB	320	48	524	123	127	4	10
1.810	WB	414	40	394	112	127	15	36
1.910	WB	340	37	533	124	127	3	8
2.010	WB	338	33	567	126	127	1	2
2.110	WB	300	39	626	130	127	-	-
2.210	WB	284	37	697	135	127	-	-
2.310	WB	367	44	448	117	127	10	25
2.410	WB	353	41	485	120	127	7	17
2.510	WB	345	48	472	119	127	8	20
2.610	WB	295	51	573	127	127	-	-
2.710	WB	338	46	494	121	127	6	15
2.810	WB	351	44	476	119	127	8	19
2.910	WB	281	57	586	128	127	-	-
3.010	WB	266	36	776	140	127	-	-
3.110	WB	172	44	1,381	170	127	-	-
3.210	WB	138	61	1,621	179	127	-	-
3.310	WB	167	42	1,502	175	127	-	-
3.410	WB	189	56	1,050	155	127	-	-
3.510	WB	174	54	1,212	163	127	-	-
3.610	WB	178	63	1,078	156	127	-	-
3.710	WB	162	56	1,325	168	127	-	-
3.810	WB	189	51	1,090	157	127	-	-
3.910	WB	156	61	1,336	168	127	-	-
4.010	WB	207	47	994	152	127	-	-
4.110	WB	168	49	1,346	168	127	-	-
4.210	WB	156	53	1,455	173	127	-	-
4.310	WB	181	44	1,288	166	127	-	-
4.410	WB	159	46	1,546	176	127	-	-
4.510	WB	196	53	1,017	153	127	-	-
4.610	WB	192	53	1,052	155	127	-	-
4.710	WB	235	43	854	145	127	-	-
4.810	WB	251	44	772	140	127	-	-
4.910	WB	137	62	1,622	179	127	-	-
5.010	WB	125	61	1,892	189	127	-	-
5.110	WB	163	52	1,362	169	127	-	-
5.210	WB	156	63	1,324	167	127	-	-
5.310	WB	200	49	1,028	154	127	-	-
5.410	WB	184	53	1,110	158	127	-	-
5.510	WB	189	60	1,004	153	127	-	-
5.610	WB	185	53	1,112	158	127	-	-
5.710	WB	256	41	771	140	127	-	-
5.810	WB	201	48	1,026	154	127	-	-

APPENDIX G

DARWIN PAVEMENT DESIGN ANALYSIS

1997 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare Computer Software Product

Thurber Engineering Ltd.

Flexible Structural Design Module

Mayfield Road Class EA Study
Winston Churchill Boulevard to Chinguacousy Road
Flexible Pavement Design

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	7,323,245
Initial Serviceability	4.4
Terminal Serviceability	2.2
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	35,000 kPa
Stage Construction	1
Calculated Design Structural Number	127 mm

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	12,825
Number of Lanes in Design Direction	3
Percent of All Trucks in Design Lane	70 %
Percent Trucks in Design Direction	50 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	6 %
Average Initial Truck Factor (ESALs/truck)	2.5
Annual Truck Factor Growth Rate	0 %
Annual Truck Volume Growth Rate	4 %
Growth	Compound
Total Calculated Cumulative ESALs	7,323,245

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(mm)	Width (m)	Calculated SN (mm)
1	HMA	0.42	1	160	3.6	67
2	Granular A	0.14	1	150	3.6	21
3	Granular B	0.09	1	500	3.6	45
Total	-	-	-	810	-	133

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(mm)	Min Thickness (Di)(mm)	Elastic Modulus (kPa)	Width (m)	Calculated Thickness (mm)	Calculated SN (mm)
1	HMA	0.42	1	-	100	2,750,000	3.6	155	65
2	Granular A	0.14	1	150	-	250,000	3.6	150	21
3	Granular B	0.09	1	-	300	150,000	3.6	455	41
Total	-	-	-	-	-	-	-	760	127

1997 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare Computer Software Product

Thurber Engineering Ltd.

Flexible Structural Design Module

Mayfield Road Class EA Study
Roundabout Intersection Design
Mayfield Road and Winston Churchill Boulevard
Flexible Pavement Design

Flexible Structural Design

80-kN ESALs Over Initial Performance Period	11,142,916
Initial Serviceability	4.4
Terminal Serviceability	2.2
Reliability Level	90 %
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	35,000 kPa
Stage Construction	1
Calculated Design Structural Number	134 mm

Simple ESAL Calculation

Performance Period (years)	20
Two-Way Traffic (ADT)	17,075
Number of Lanes in Design Direction	2
Percent of All Trucks in Design Lane	80 %
Percent Trucks in Design Direction	50 %
Percent Heavy Trucks (of ADT) FHWA Class 5 or Greater	6 %
Average Initial Truck Factor (ESALs/truck)	2.5
Annual Truck Factor Growth Rate	0 %
Annual Truck Volume Growth Rate	4 %
Growth	Compound
Total Calculated Cumulative ESALs	11,142,916

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(mm)	Width (m)	Calculated SN (mm)
1	HMA	0.42	1	165	3.6	69
2	Granular A	0.14	1	150	3.6	21
3	Granular B	0.09	1	500	3.6	45
Total	-	-	-	815	-	135

Layered Thickness Design

Thickness precision Actual

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di)(mm)	Min Thickness (Di)(mm)	Elastic Modulus (kPa)	Width (m)	Calculated Thickness (mm)	Calculated SN (mm)
1	HMA	0.42	1	-	100	2,750,000	3.6	165	69
2	Granular A	0.14	1	150	-	250,000	3.6	150	21
3	Granular B	0.09	1	-	300	150,000	3.6	484	44
Total	-	-	-	-	-	-	-	799	134

F

DRAINAGE AND STORM WATER MANAGEMENT

Alloa Reservoir

Alloa Reservoir Storm Overflow Assessment Scenario

Flow Scenario					Pond Elevation	Pond Storage Used	Peak Pond Outflow	Max Adjacent Land Flow to Outfall	Max Outflow at Mayfield Outfall	Consequence	Mitigation Measures
Storm Event	Overflow Condition			Relative Likelihood							
	Overflow Start Time	Duration / Response Time [hr]	Flow Rate [cms]		[m]	[m3]	[cms]	[cms]	[cms]		
24-hr, 100-yr	N/A	0	0	High	265.17	1,302	0.035	0.85	**0.70**	- No overtopping of pond; - Flow attenuation provided within conveyance on-site swales; - Downstream CWP adequate to convey flows; - Minimal risk of downstream flooding;	N/A
24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	2	1.99	Low	266.3	16,028	0.338	0.85	**0.87**		
24-hr, 100-yr	2 hrs before storm	2	1.99	Low	266.24	15,037	0.236	0.85	**0.92**		
24-hr, 100-yr	11th hour of Storm (i.e., near peak - t = 11 hr)	2	1.99	Moderate-High	266.66	20,601	1.248	0.85	**2.10**	- No overtopping of pond; - Potential spill from on-site conveyance swales due to undersized culvert crossing; - Downstream CWP *inadequate*	- Consider outlet control re-design (e.g., adjust spillway weir) to reduce outflows from pond and use more storage volume within pond; - Consider *emergency spillway* for pond overflows discharging to Etobicoke creek. Water quality and quantity transfer concerns should be consulted with TRCA keeping in mind this is an emergency situation;
24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	6	1.99	Low	266.75	23,084	1.940	0.85	**2.79**		
24-hr, 100-yr	2 hrs before Storm	6	1.99	Low	266.75	23,112	1.949	0.85	**2.80**		
24-hr, 100-yr	2 hrs before Storm	12	1.99	Low	266.76	23,261	1.994	0.85	**2.85**		
24-hr, 100-yr	11th hour of Storm (i.e., near peak - t = 11 hr)	6	1.99	Moderate	266.76	23,295	2.004	0.85	**2.86**		

24-hr, 100-yr	2 hrs before Storm	14	1.99	Low	266.8	24,055	2.233	0.85	**3.08**	- Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;	- Consider new spillway from pond to a new retention pond to be located at the existing school site to the South-West corner of the site; *- Any design considerations should be based on **acceptable overflow duration or operation response time** required to shut off overflow pumps to pond during emergency situation.*
6-hr, July 2013	N/A	0	0	Moderate-High	265.29	2,979	0.077	1.72	**1.71**	- For comparative purposes only with extreme single day event, NOT AN ACTUAL DESIGN CRITERIA; - No overtopping of pond, however inadequate capacity in swales to convey runoff from school site; - Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;	N/A
6-hr, July 2014	1st hr of Storm (i.e., near peak - t = 2)	2	1.99	Moderate	266.44	18,199	0.688	1.72	**1.78**		
6-hr, July 2014	6th hr of Storm (i.e., near peak - t = 6)	6	1.99	Moderate-Low	266.76	23,308	2.008	1.72	**3.73**		

Top of Pond Elevation [m]	Maximum Pond Storage [m3]	Downstream 900 mm Clean Water Pipe Capacity [cms]
267.5	**36,969**	**1.28**

Pre-Development Flow 100-yr Flow Rate [cms]
1.08

Note: Hydrologic modelling flows extracted from sensitivity runs for overflows PCSWMM model for Alloa Reservoir created by R.J.BURNSIDE AND ASSOCIATES LTD (APRIL 17, 2013)

Brock, Liz

From: Smith, Neal
Sent: April 19, 2016 3:26 PM
To: Brock, Liz
Subject: FW: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)
Attachments: 10-1960 - Alloa Rservoir and PS_Drawing - Proposed TRCA Spillway Location.pdf; 10-1960 - Mayfield Rd EA - Alloa Site Overflow Impact Calculations- New TRCA Spillway.pdf

FYI

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Turner, William
Sent: April 19, 2016 3:04 PM
To: Annette Maher; Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Kilis, Jakub
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Annette,

See attached PDF's, concerning the request from our Road Section to move the Alloa Reservoir Emergency Spillway Weir to a location on the north side of the proposed SWM Pond so that if a scenario occurs that an Overflow Event along with an Extreme Storm happens the SWM Pond will flow into the TRCA Lands to the North and not the Mayfield Road and development to the south.

In Item 2 below from the TRCA…my consultant is preparing sketch on an aerial map, showing the proposed location and dimension of the spillway….the pond itself won't change just the location of the spillway.

Thanks for your help on this.

William Turner
Project Manager

Water Division
Region of Peel

Cell 416-435-3999
Phone 791-7800 ext 7837
Fax 416-791-1442

From: Annette Maher [mailto:AMaher@trca.on.ca]
Sent: April 4, 2016 11:28 AM
To: Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Turner, William; Kilis, Jakub
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Neal,

Thank you for sending in the excerpt from the Mayfield Road (Chinguacousy to Winston Churchill) draft ESR pertaining to the Alloa Reservoir for our staff to review. Although we agree in principle with the need for a spillway into Etobicoke Creek under emergency circumstances for greater than 100-yr event storms, approval of this spillway is subject to completion of appropriate design and studies at the detailed design stage.

There are still outstanding questions (provided in the March 15, 2016 email) that need to be addressed before our staff are able to provide you with our approval of concept for the emergency spillway for the Mayfield ESR. Can you please let us know:

1. How much water (volume and peak flow) will enter Etobicoke Creek under existing and proposed emergency (when the emergency spillway is in use) conditions. This information is required for our staff to assess potential downstream flood risk when the emergency spillway is in use.

2. Please provide us with an aerial image illustrating the location and approximate dimensions of the emergency spillway, as well as the new detention pond and associated spillway.

3.

Once you are able to provide us with a response to the above two questions, our staff will be able to confirm if we are able to provide approval of concept for the emergency spillway.

Thank you and please do not hesitate to contact me if you have any questions.
Annette

Annette Maher, M.A.Sc.
Planner II
Environmental Assessment Planning
Planning and Development
Toronto and Region Conservation Authority
☎416.661.6600 x5798 | ✉amaher@trca.on.ca

Office Location & Courier Address: 101 Exchange Avenue | Concord ON L4K 5R6
Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

Brock, Liz

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Sent: April 19, 2016 3:26 PM
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Attachments: 10-1960 - Alloa Rservoir and PS_Drawing - Proposed TRCA Spillway Location.pdf; 10-1960 - Mayfield Rd EA - Alloa Site Overflow Impact Calculations- New TRCA Spillway.pdf

FYI

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Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Turner, William
Sent: April 19, 2016 3:04 PM
To: Annette Maher; Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Kilis, Jakub
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

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In Item 2 below from the TRCA…my consultant is preparing sketch on an aerial map, showing the proposed location and dimension of the spillway….the pond itself won't change just the location of the spillway.

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To: Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Turner, William; Kilis, Jakub
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There are still outstanding questions (provided in the March 15, 2016 email) that need to be addressed before our staff are able to provide you with our approval of concept for the emergency spillway for the Mayfield ESR. Can you please let us know:

1. How much water (volume and peak flow) will enter Etobicoke Creek under existing and proposed emergency (when the emergency spillway is in use) conditions. This information is required for our staff to assess potential downstream flood risk when the emergency spillway is in use.

2. Please provide us with an aerial image illustrating the location and approximate dimensions of the emergency spillway, as well as the new detention pond and associated spillway.

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Once you are able to provide us with a response to the above two questions, our staff will be able to confirm if we are able to provide approval of concept for the emergency spillway.

Thank you and please do not hesitate to contact me if you have any questions.
Annette

Annette Maher, M.A.Sc.
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☎416.661.6600 x5798 | ✉amaher@trca.on.ca

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Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: Annette Maher <AMaher@trca.on.ca>,
Cc: Sharon Lingertat <SLingertat@trca.on.ca>, "Turner, William" <William.Turner@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>
Date: 03/30/2016 02:27 PM
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Good afternoon Annette

Please see the wording we have in the draft ESR. We would like to send out the draft ESR for review and I wanted to make sure you are ok with the wording.

Following is the excerpt from the ESR main document.

Alloa Pumping Station

Concurrent with the environmental assessment study the design for a new water distribution pumping station was completed. The pumping station is located just north and east of Mississauga Road with an access road beside the current location of Alloa Public School. Stormwater management for the pumping station site is managed by a storm pond designed to accommodate the overland water flow plus water from the 100 year storm event. As staff reviewed the stormwater plans for Mayfield Road concern arose on how to deal with the additional release of water from the pumping station in the event of a power failure and storm event in size similar to the July 8, 2013 event (greater than the 100 year storm). In the worst case scenario of a catastrophic storm event, the pond is assumed to fail. Discussion occurred on how this flow could be directed. Staff from Water and Transportation agreed that the best solution would be to provide a spillway to the north, away from development to the south that would outlet into Etobicoke Creek. This solution will be confirmed with the Toronto Regional Conservation Authority (TRCA) in detailed design as Etobicoke Creek is under their jurisdiction. *The Region of Peel Water group will work with TRCA to complete the detailed design and construction of the spillway.*

See for the Alloa Reservoir Storm Overflow Assessment Scenario attached.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
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10 Peel Centre Drive, Suite B, 4th Floor
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Phone: 905-791-7800 ext 7866
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Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Smith, Neal
Sent: March 15, 2016 10:37 AM

To: 'Annette Maher'
Cc: Sharon Lingertat; Turner, William; Nemeth, John; 'Alexander, Melissa'
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Annette

As we discussed, the Mayfield Road EA and the Alloa stormwater reports where completed using the 100 year storm event and everything has been designed using that event. In light of the July 2013 storm, we had our consultant run the model using that event (memo you received) which identified a concern under that scenario. Being there is new subdivision being constructed south of the Alloa site, we were asked to look at ways to mitigate that scenario and reduce the risk of damage should that an event of that magnitude should ever happen again.

I have copied the William Turner , Project Manager for the Alloa project, he can provide information on where the spillway would be best placed.

I have also attached a link for you to download the stormwater report (Drainage and SWM Study - v95) for the Mayfield Road EA.

https://efts.peelregion.ca/OpenKM/login.jsp

User name: PeelEA
Password: environment

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
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10 Peel Centre Drive, Suite B, 4th Floor
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Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Annette Maher [mailto:AMaher@trca.on.ca]
Sent: March 15, 2016 9:43 AM
To: Smith, Neal
Cc: Sharon Lingertat
Subject: Re: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Neal,

Thank you for sending in the Alloa Pumping Station Memo to our staff for our review. At this point in time, our staff will require more information regarding the proposal before we are able to provide an approval of concept. Please note that in general, TRCA staff does not prefer water to flow across watersheds or jurisdictions.

Please provide a response to the following:
1. Please clarify why and in what situation the emergency spillway that is proposed to discharge towards Etobicoke Creek will be required. How frequently and at what volume and flow will the emergency spillway and the new detention

pond be required?
2. Please provide a map/figure that shows the general location of the the emergency spillway and discharge to Etobicoke Creek, as well as the location of the new spillway towards the new detention pond.
3. Please confirm if the culvert under Mayfield Road from the Alloa site will have the capacity to accommodate up to 100-yr controlled peak flows coming from the SWM pond. Sizing?
4. Please note that TRCA staff requires the 100-yr 12-hr storm event be used for SWM design purposes, and not the 24-hr event. Please estimate the uncontrolled 100 yr peak flow using 100 yr 12 hr design storm and apply the greater of the two for sizing emergency spillway.
5. As July 8, 2013 storm is a rear event, TRCA appreciates that the analysis includes July 2013 storm event hydrograph. We understand that July 8, 2013 storm is not the basis for design of SWM infrastructure, but it is an excellent scenario to evaluate the effect of possible combined flows during extreme storm events and emergency reservoir overflows. Please provide the sizing of the emergency spillway using the actual July 2013 storm event hydrograph and emergency reservoir overflows.

We will provide you with more comments and our study requirements for the design once we have a better idea of the general concept of the emergency spillway, the direction and quantity of flows, etc. A permit from TRCA may be required depending on the location of the new emergency spillway and pond.

Thank you,
Annette

Annette Maher, M.A.Sc.
Planner II
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Planning and Development
Toronto and Region Conservation Authority
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Office Location & Courier Address: 101 Exchange Avenue | Concord ON L4K 5R6
Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

From: Sharon Lingertat/MTRCA
To: Annette Maher/TRCA@MTRCA,
Date: 03/11/2016 10:22 AM
Subject: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Sharon Lingertat, MCIP, RPP | Senior Planner, Environmental Assessment Planning | Toronto and Region Conservation Authority | **Office Location and Courier Address:** 101 Exchange Avenue, Concord, ON L4K 5R6 | **Mailing Address:** 5 Shoreham Drive, Downsview, ON M3N 1S4 |☎ 416-661-6600 ext. 5717 | ✉ slingertat@trca.on.ca | www.trca.on.ca

----- Forwarded by Sharon Lingertat/MTRCA on 03/11/2016 10:21 AM -----

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: "SLingertat@trca.on.ca" <SLingertat@trca.on.ca>,
Cc: "Alexander, Melissa" <Melissa.Alexander@hatchmott.com>, "Turner, William" <William.Turner@peelregion.ca>, "Brock, Liz" <Liz.Brock@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>

Date: 03/09/2016 09:41 AM
Subject: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Sharon

Further to our conversation, please find attached a copy of the memo supplied by Hatchmott MacDonald regarding the Alloa Pumping Station site (northside of Mayfield Road, east of Mississauga Road) overflow impact. Of the options presented, the emergency spillway option was the preferred option. CVC was involved and concurred that this was a viable option.

Please let me know if you require any further information. We are looking to file the ESR for the EA as soon as possible and would like include in the document TRCA's approval in concept with the design and construction to be completed as of the Alloa design.

Thanks

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Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
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10 Peel Centre Drive, Suite B, 4th Floor
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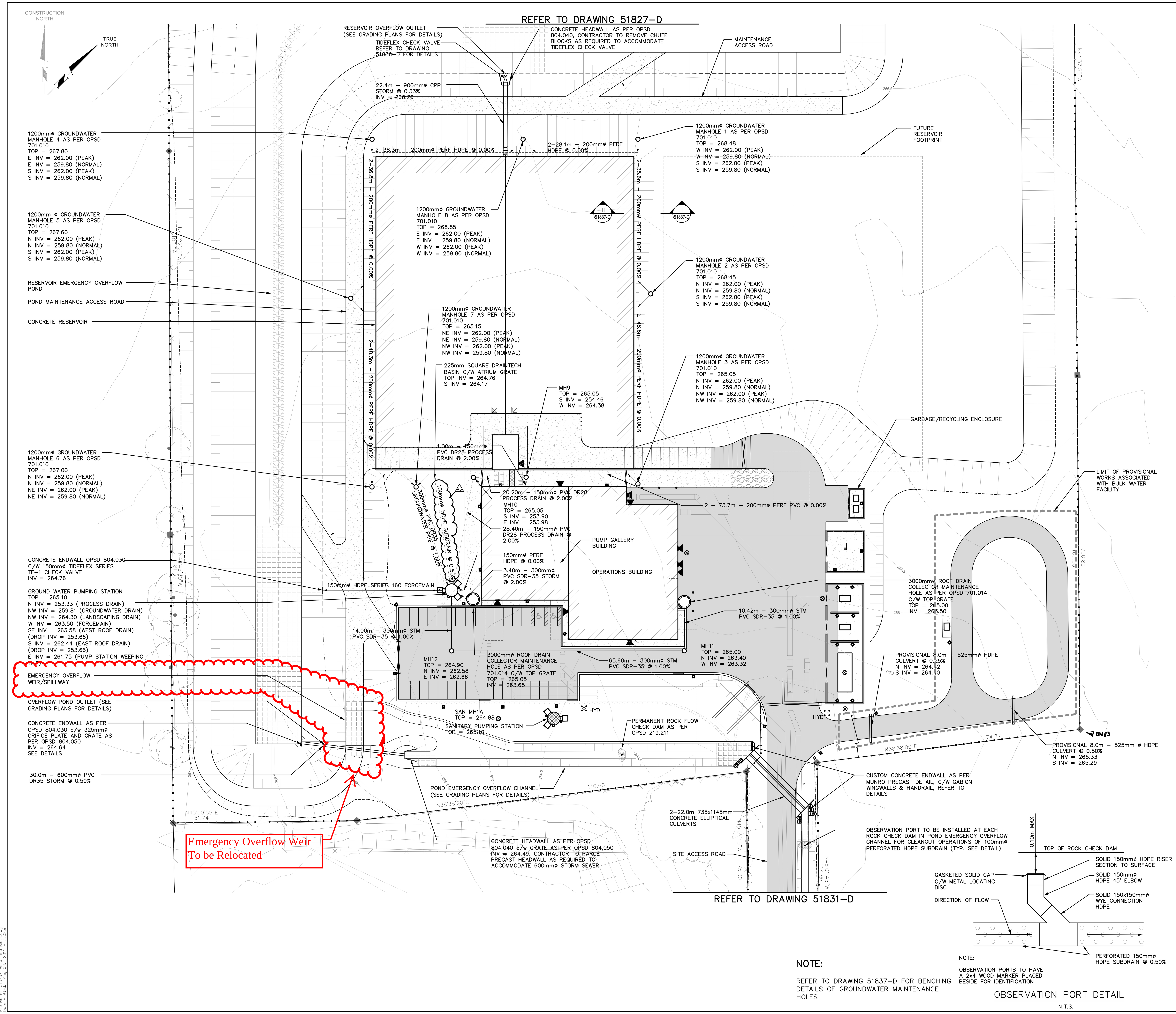
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

[attachment "314225 - Mayfield Rd EA - Alloa Site Overflow Impact.pdf" deleted by Annette Maher/TRCA]

[Forget previous vote[attachment "Alloa Reservoir Storm Overflow Assessment.pdf" deleted by Annette Maher/TRCA]]



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.
JUNE 2013	ISSUED FOR SITE PLAN APPROVAL, TOWN OF CALEDON	JABO
OCT. 2013	100% SUBMISSION	JABO
DEC. 2013	ISSUED FOR BUILDING PERMIT	JABO
FEB. 2014	ISSUED FOR MOE APPROVAL	JABO
MAY 2014	REISSUED FOR APPROVALS	JABO
NOV. 2014	ISSUED FOR TENDER	JABO
AUG. 2015	ISSUED FOR TENDER	JABO
NOV. 2015	ISSUED FOR CONSTRUCTION	JABO

LEGEND

- ASPHALT PARKING/DRIVING AREA
- CONCRETE ACCESS
- GRANULAR PARKING/DRIVING AREA
- 3:1 MAX SIDE SLOPING
- GRASSED DRAINAGE SWALE
- STORM MAINTENANCE HOLE
- SANITARY MAINTENANCE HOLE
- FIRE HYDRANT
- EXISTING CONTOUR
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CONTRACTOR LAYOUT NOTE
CONTRACTOR TO BE SUPPLIED BOTH CAD AND PDF COPIES OF ALL GENERAL SITE PLANS AND GRADING PLANS FOR CONSTRUCTION LAYOUT PURPOSES.

SURVEY BENCHMARKS

SITE BM#1 ELEV 266.930m
REGION OF PEEL BM#65 ON SOUTH FACE AT 1 FOOT WEST OF EAST ENTRANCE TO 1 STOREY BRICK SCHOOL (ALLOA PUBLIC SCHOOL) LOCATED ON THE NORTH SIDE OF MAYFIELD ROAD, APPROX 0.56 Km WEST OF CREDITVIEW ROAD.

BM#2 ELEV 263.275m
TOP OF SIB #9

BM#3 ELEV 266.640m
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MUNICIPAL ADDRESS

PART OF LOT 18, CONCESSION 4
PART OF PIN 14255-0269(LT)

PROPERTY OWNERS

REGIONAL MUNICIPALITY OF PEEL

1:500

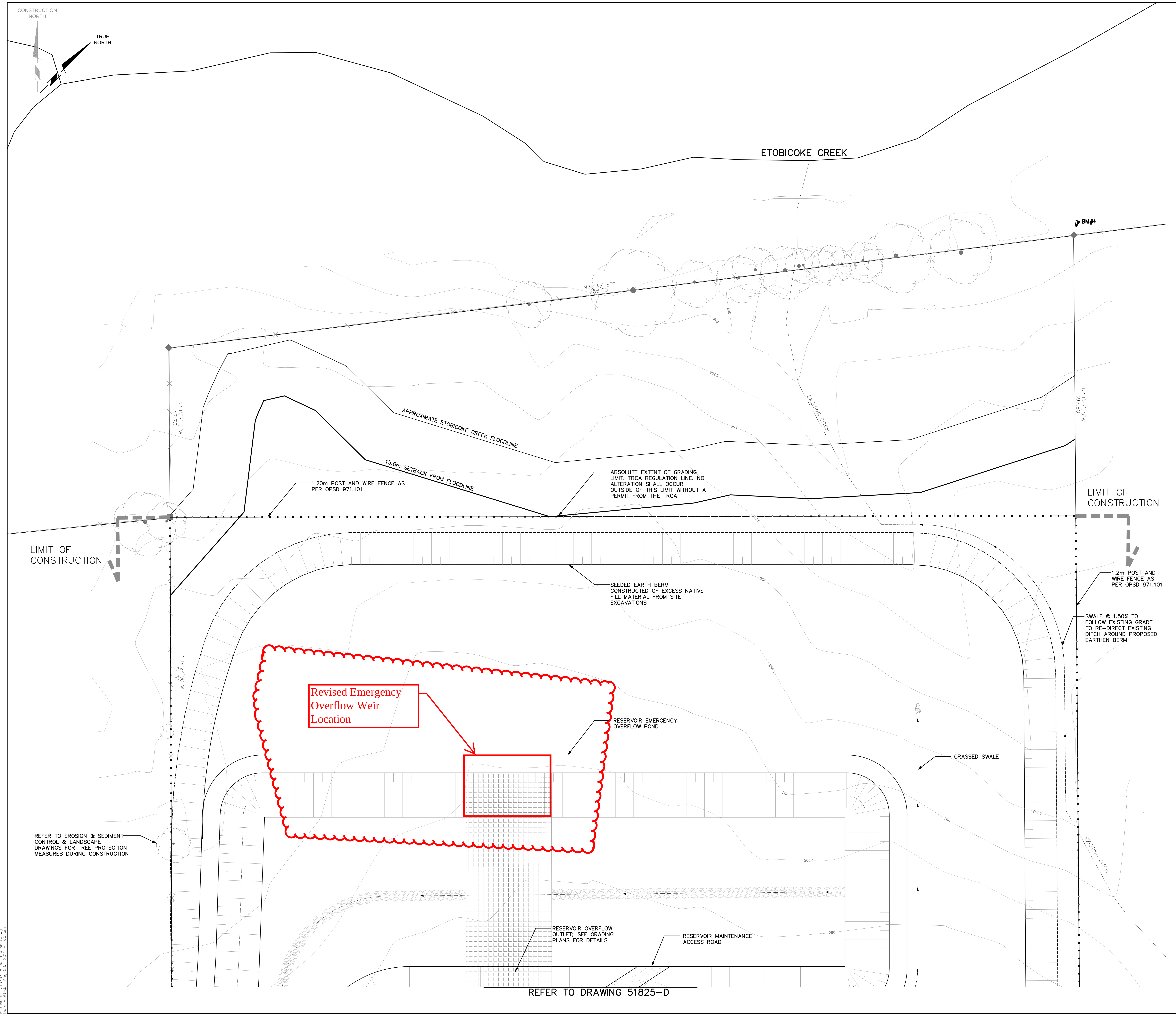
Seal

Seal

ALLOA RESERVOIR AND PUMPING STATION

STORM SEWER, SUB-SURFACE AND DRAINAGE PLAN

CAD Area .	Area C-19	Project No. 10-1960	
Checked by ----	Drawn by ----	Plan No. 51830-D	
Date NOV 2015	Sheet 9 of 179		



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ALLOA RESERVOIR AND PUMPING STATION

OVERALL SITE PLAN NORTH SITE LIMITS

CAD Area .	Area C–19	Project No. 10–1960	
Checked by ––––	Drawn by ––––	Plan No. 51827–D	
Date NOV 2015	Sheet 6 of 179		

Table 1 - Storm Runoff/Overflow Sensitivity Analysis from Alloa Reservoir and Pumping Station Site

Description	Flow Scenario (Input Variables)				Flow Simulation (PCSWMM Model Results)					Consequence
	Storm Event	Overflow Condition			Pond Elevation	Pond Storage Used	Peak Outflow from Pond	Peak Outflow from Adj Lands	Total Peak Outflow from Site	
		Overflow Start Time	Duration / Response Time [hr]	Flow Rate [cms]	[m]	[m3]	[cms]	[cms]	[cms]	
Original Design [1]	24-hr, 100-yr	N/A	0	0	265.17	1,302	0.035	0.85	**0.70**	- No overtopping of pond; - Flow attenutation provided within conveyance on-site swales; - Downstream CWP adequate to convey flows; - Minimal risk of downstream flooding;
	24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	2	1.99	266.3	16,028	0.338	0.85	**0.87**	
	24-hr, 100-yr	2 hrs before storm	2	1.99	266.24	15,037	0.236	0.85	**0.92**	
Overflows Coinciding with Storm Peak, Prolonged Overflows	24-hr, 100-yr	11th hour of Storm (i.e., near peak - t = 11 hr)	2	1.99	266.66	20,601	1.248	0.85	**2.10**	- No overtopping of pond; - Potential spill from on-site conveyance swales due to undersized culvert crossing; - Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;
	24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	6	1.99	266.75	23,084	1.940	0.85	**2.79**	
	24-hr, 100-yr	2 hrs before Storm	6	1.99	266.75	23,112	1.949	0.85	**2.80**	
	24-hr, 100-yr	2 hrs before Storm	12	1.99	266.76	23,261	1.994	0.85	**2.85**	
	24-hr, 100-yr	11th hour of Storm (i.e., near peak - t = 11 hr)	6	1.99	266.76	23,295	2.004	0.85	**2.86**	
	24-hr, 100-yr	2 hrs before Storm	14	1.99	266.8	24,055	2.233	0.85	**3.08**	
July 2013 Extreme Storm with Overflows	*6-hr, July 2013*	N/A	0	0	265.29	2,979	0.077	1.72	**1.71**	- No overtopping of pond, however inadequate capacity in swales to convey runoff from school site; - Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;
	6-hr, July 2013	1st hr of Storm (i.e., near peak - t = 2)	2	1.99	266.44	18,199	0.688	1.72	**2.41**	
	6-hr, July 2013	1st hr of Storm (i.e., near peak - t = 2)	6	1.99	266.76	23,308	2.008	1.72	**3.73**	

This would be the event we would use as our design scenario.
Extreme Storm and 2 Hour Emergency Overflow.

Top of Pond Elevation [m]	*Maximum Pond Storage [m3]*	*Pre-Dev 100-yr Flow [cms]*	*D/S 900 mm CWP Capacity [cms]*
267.5	**36,969**	**1.08**	**1.28**

Note:
Hydrologic modelling flows/elevations extracted from sensitivity runs for overflows based on PCSWMM model for Alloa Reservoir Site created by R.J.BURNSIDE AND ASSOCIATES LTD (APRIL 17, 2013)
1 - Scenario assessed in Burnside Alloa Reservoir Design Brief and SWM Report for Site Plan Approval Report(2013)

Volume and Peak Flow of Water Overtopping of the Emergency Spillway Weir.

Event Scenario Peak Flow 2.41 cms
Minus Downstream Discharge Restriction 1.28 cms
Peak Flow over Emergency Spillway Weir = 2.41 - 1.28 = **1.13 cms**

Peak Flow over Emergency Spillway Weir = 1.13 cms
Total Volume during Extreme Storm with Reservoir Overflow with 2 Hour Event;
1.13x60x60x2 = **8136 cubic metres**

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: Annette Maher <AMaher@trca.on.ca>,
Cc: Sharon Lingertat <SLingertat@trca.on.ca>, "Turner, William" <William.Turner@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>
Date: 03/30/2016 02:27 PM
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Good afternoon Annette

Please see the wording we have in the draft ESR. We would like to send out the draft ESR for review and I wanted to make sure you are ok with the wording.

Following is the excerpt from the ESR main document.

Alloa Pumping Station

Concurrent with the environmental assessment study the design for a new water distribution pumping station was completed. The pumping station is located just north and east of Mississauga Road with an access road beside the current location of Alloa Public School. Stormwater management for the pumping station site is managed by a storm pond designed to accommodate the overland water flow plus water from the 100 year storm event. As staff reviewed the stormwater plans for Mayfield Road concern arose on how to deal with the additional release of water from the pumping station in the event of a power failure and storm event in size similar to the July 8, 2013 event (greater than the 100 year storm). In the worst case scenario of a catastrophic storm event, the pond is assumed to fail. Discussion occurred on how this flow could be directed. Staff from Water and Transportation agreed that the best solution would be to provide a spillway to the north, away from development to the south that would outlet into Etobicoke Creek. This solution will be confirmed with the Toronto Regional Conservation Authority (TRCA) in detailed design as Etobicoke Creek is under their jurisdiction. *The Region of Peel Water group will work with TRCA to complete the detailed design and construction of the spillway.*

See for the Alloa Reservoir Storm Overflow Assessment Scenario attached.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Smith, Neal
Sent: March 15, 2016 10:37 AM

To: 'Annette Maher'
Cc: Sharon Lingertat; Turner, William; Nemeth, John; 'Alexander, Melissa'
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Annette

As we discussed, the Mayfield Road EA and the Alloa stormwater reports where completed using the 100 year storm event and everything has been designed using that event. In light of the July 2013 storm, we had our consultant run the model using that event (memo you received) which identified a concern under that scenario. Being there is new subdivision being constructed south of the Alloa site, we were asked to look at ways to mitigate that scenario and reduce the risk of damage should that an event of that magnitude should ever happen again.

I have copied the William Turner , Project Manager for the Alloa project, he can provide information on where the spillway would be best placed.

I have also attached a link for you to download the stormwater report (Drainage and SWM Study - v95) for the Mayfield Road EA.

https://efts.peelregion.ca/OpenKM/login.jsp

User name: PeelEA
Password: environment

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

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Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Annette Maher [mailto:AMaher@trca.on.ca]
Sent: March 15, 2016 9:43 AM
To: Smith, Neal
Cc: Sharon Lingertat
Subject: Re: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Neal,

Thank you for sending in the Alloa Pumping Station Memo to our staff for our review. At this point in time, our staff will require more information regarding the proposal before we are able to provide an approval of concept. Please note that in general, TRCA staff does not prefer water to flow across watersheds or jurisdictions.

Please provide a response to the following:
1. Please clarify why and in what situation the emergency spillway that is proposed to discharge towards Etobicoke Creek will be required. How frequently and at what volume and flow will the emergency spillway and the new detention

pond be required?
2. Please provide a map/figure that shows the general location of the the emergency spillway and discharge to Etobicoke Creek, as well as the location of the new spillway towards the new detention pond.
3. Please confirm if the culvert under Mayfield Road from the Alloa site will have the capacity to accommodate up to 100-yr controlled peak flows coming from the SWM pond. Sizing?
4. Please note that TRCA staff requires the 100-yr 12-hr storm event be used for SWM design purposes, and not the 24-hr event. Please estimate the uncontrolled 100 yr peak flow using 100 yr 12 hr design storm and apply the greater of the two for sizing emergency spillway.
5. As July 8, 2013 storm is a rear event, TRCA appreciates that the analysis includes July 2013 storm event hydrograph. We understand that July 8, 2013 storm is not the basis for design of SWM infrastructure, but it is an excellent scenario to evaluate the effect of possible combined flows during extreme storm events and emergency reservoir overflows. Please provide the sizing of the emergency spillway using the actual July 2013 storm event hydrograph and emergency reservoir overflows.

We will provide you with more comments and our study requirements for the design once we have a better idea of the general concept of the emergency spillway, the direction and quantity of flows, etc. A permit from TRCA may be required depending on the location of the new emergency spillway and pond.

Thank you,
Annette

Annette Maher, M.A.Sc.
Planner II
Environmental Assessment Planning
Planning and Development
Toronto and Region Conservation Authority
☎416.661.6600 x5798 | ✉amaher@trca.on.ca

Office Location & Courier Address: 101 Exchange Avenue | Concord ON L4K 5R6
Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

From: Sharon Lingertat/MTRCA
To: Annette Maher/TRCA@MTRCA,
Date: 03/11/2016 10:22 AM
Subject: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Sharon Lingertat, MCIP, RPP | Senior Planner, Environmental Assessment Planning | Toronto and Region Conservation Authority | **Office Location and Courier Address:** 101 Exchange Avenue, Concord, ON L4K 5R6 | **Mailing Address:** 5 Shoreham Drive, Downsview, ON M3N 1S4 |☎ 416-661-6600 ext. 5717 | ✉ slingertat@trca.on.ca | www.trca.on.ca

----- Forwarded by Sharon Lingertat/MTRCA on 03/11/2016 10:21 AM -----

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: "SLingertat@trca.on.ca" <SLingertat@trca.on.ca>,
Cc: "Alexander, Melissa" <Melissa.Alexander@hatchmott.com>, "Turner, William" <William.Turner@peelregion.ca>, "Brock, Liz" <Liz.Brock@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>

Date: 03/09/2016 09:41 AM
Subject: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Sharon

Further to our conversation, please find attached a copy of the memo supplied by Hatchmott MacDonald regarding the Alloa Pumping Station site (northside of Mayfield Road, east of Mississauga Road) overflow impact. Of the options presented, the emergency spillway option was the preferred option. CVC was involved and concurred that this was a viable option.

Please let me know if you require any further information. We are looking to file the ESR for the EA as soon as possible and would like include in the document TRCA's approval in concept with the design and construction to be completed as of the Alloa design.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
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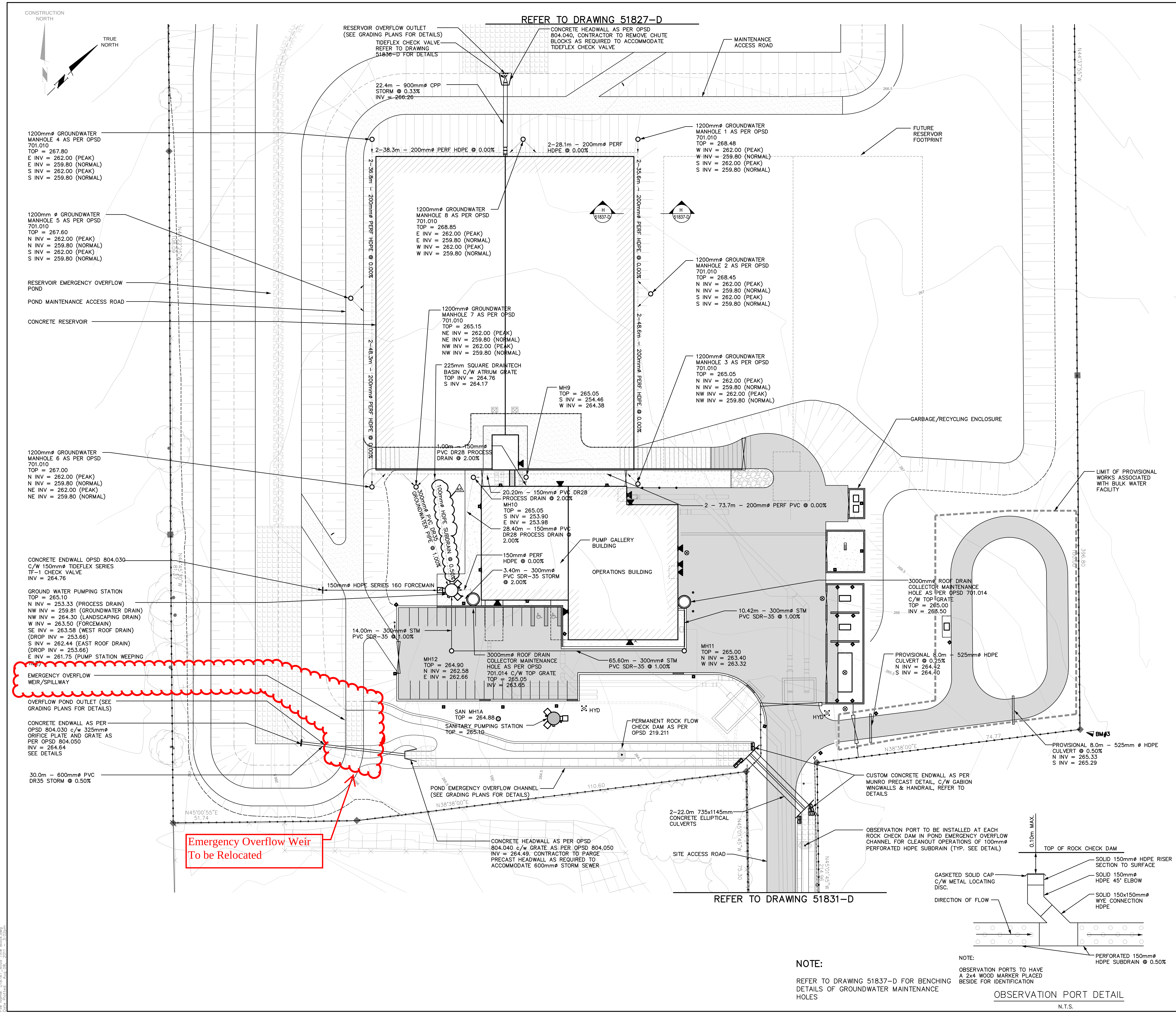
[attachment "314225 - Mayfield Rd EA - Alloa Site Overflow Impact.pdf" deleted by Annette Maher/TRCA]

Spam
Phish/Fraud
Not spam

Forget previous vote[attachment "Alloa Reservoir Storm Overflow Assessment.pdf" deleted by Annette Maher/TRCA]



NOTE:

REFER TO DRAWING 51837-D FOR BENCHING DETAILS OF GROUNDWATER MAINTENANCE HOLES

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ALLOA RESERVOIR AND PUMPING STATION

STORM SEWER, SUB-SURFACE AND DRAINAGE PLAN

CAD Area	.	Area	C-19	Project No.	10-1960
Checked by	----	Drawn by	----	Plan No.	51830-D
Date	NOV 2015	Sheet	9 of 179		

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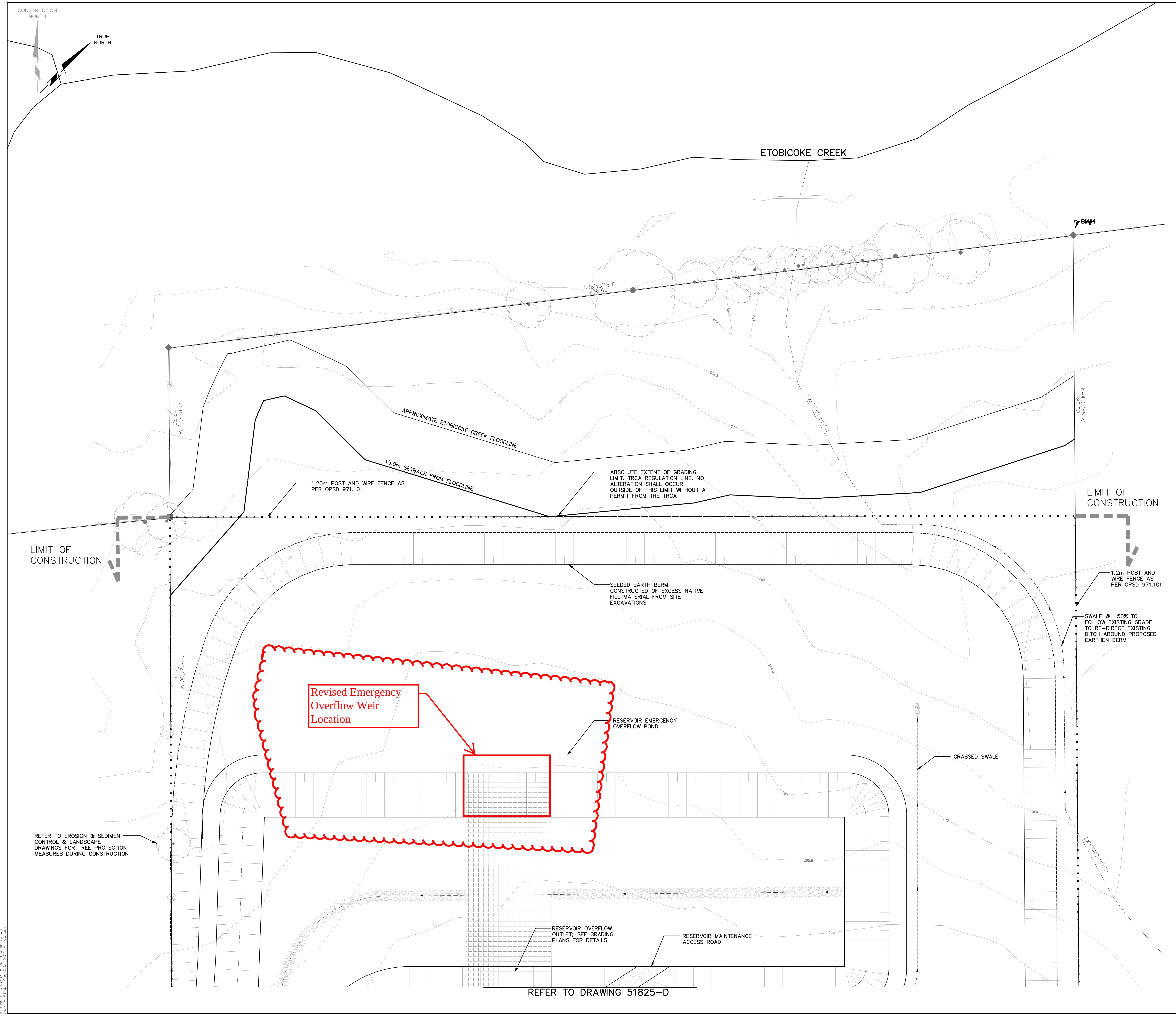
Date Plotted: Aug 06, 2021 - 3:20pm



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ALLOA RESERVOIR AND PUMPING STATION

OVERALL SITE PLAN NORTH SITE LIMITS

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Original Design [1]	24-hr, 100-yr	N/A	0	0	265.17	1,302	0.035	0.85	**0.70**	- No overtopping of pond; - Flow attenuation provided within conveyance on-site swales; - Downstream CWP adequate to convey flows; - Minimal risk of downstream flooding;
	24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	2	1.99	266.3	16,028	0.338	0.85	**0.87**	
	24-hr, 100-yr	2 hrs before storm	2	1.99	266.24	15,037	0.236	0.85	**0.92**	
Overflows Coinciding with Storm Peak, Prolonged Overflows	24-hr, 100-yr	11th hour of Storm (i.e., near peak - t = 11 hr)	2	1.99	266.66	20,601	1.248	0.85	**2.10**	- No overtopping of pond; - Potential spill from on-site conveyance swales due to undersized culvert crossing; - Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;
	24-hr, 100-yr	Beginning of Storm (i.e., t = 0 hr)	6	1.99	266.75	23,084	1.940	0.85	**2.79**	
	24-hr, 100-yr	2 hrs before Storm	6	1.99	266.75	23,112	1.949	0.85	**2.80**	
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July 2013 Extreme Storm with Overflows	*6-hr, July 2013*	N/A	0	0	265.29	2,979	0.077	1.72	**1.71**	- No overtopping of pond, however inadequate capacity in swales to convey runoff from school site; - Downstream CWP inadequate to convey flows; - Potential risk of road overtopping and downstream development flooding at Mayfield road outfall to Paradise Homes development;
	6-hr, July 2013	1st hr of Storm (i.e., near peak - t = 2)	2	1.99	266.44	18,199	0.688	1.72	**2.41**	
	6-hr, July 2013	1st hr of Storm (i.e., near peak - t = 2)	6	1.99	266.76	23,308	2.008	1.72	**3.73**	

This would be the event we would use as our design scenario.
Extreme Storm and 2 Hour Emergency Overflow.

Top of Pond Elevation [m]	*Maximum Pond Storage [m3]*	*Pre-Dev 100-yr Flow [cms]*	*D/S 900 mm CWP Capacity [cms]*
267.5	**36,969**	**1.08**	**1.28**

Note:
Hydrologic modelling flows/elevations extracted from sensitivity runs for overflows based on PCSWMM model for Alloa Reservoir Site created by R.J.BURNSIDE AND ASSOCIATES LTD (APRIL 17, 2013)
1 - Scenario assessed in Burnside Alloa Reservoir Design Brief and SWM Report for Site Plan Approval Report(2013)

Volume and Peak Flow of Water Overtopping of the Emergency Spillway Weir.

Event Scenario Peak Flow 2.41 cms
Minus Downstream Discharge Restriction 1.28 cms
Peak Flow over Emergency Spillway Weir = 2.41 - 1.28 = **1.13 cms**

Peak Flow over Emergency Spillway Weir = 1.13 cms
Total Volume during Extreme Storm with Reservoir Overflow with 2 Hour Event;
1.13x60x60x2 = **8136 cubic metres**

Brock, Liz

From: Smith, Neal
Sent: April 19, 2016 3:26 PM
To: Brock, Liz
Subject: FW: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)
Attachments: 10-1960 - Alloa Rservoir and PS_Drawing - Proposed TRCA Spillway Location.pdf; 10-1960 - Mayfield Rd EA - Alloa Site Overflow Impact Calculations- New TRCA Spillway.pdf

FYI

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Turner, William
Sent: April 19, 2016 3:04 PM
To: Annette Maher; Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Kilis, Jakub
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Annette,

See attached PDF's, concerning the request from our Road Section to move the Alloa Reservoir Emergency Spillway Weir to a location on the north side of the proposed SWM Pond so that if a scenario occurs that an Overflow Event along with an Extreme Storm happens the SWM Pond will flow into the TRCA Lands to the North and not the Mayfield Road and development to the south.

In Item 2 below from the TRCA…my consultant is preparing sketch on an aerial map, showing the proposed location and dimension of the spillway….the pond itself won't change just the location of the spillway.

Thanks for your help on this.

William Turner
Project Manager

Water Division
Region of Peel

Cell 416-435-3999
Phone 791-7800 ext 7837
Fax 416-791-1442

From: Annette Maher [mailto:AMaher@trca.on.ca]
Sent: April 4, 2016 11:28 AM
To: Smith, Neal
Cc: Nemeth, John; Sharon Lingertat; Turner, William; Kilis, Jakub
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Neal,

Thank you for sending in the excerpt from the Mayfield Road (Chinguacousy to Winston Churchill) draft ESR pertaining to the Alloa Reservoir for our staff to review. Although we agree in principle with the need for a spillway into Etobicoke Creek under emergency circumstances for greater than 100-yr event storms, approval of this spillway is subject to completion of appropriate design and studies at the detailed design stage.

There are still outstanding questions (provided in the March 15, 2016 email) that need to be addressed before our staff are able to provide you with our approval of concept for the emergency spillway for the Mayfield ESR. Can you please let us know:

1. How much water (volume and peak flow) will enter Etobicoke Creek under existing and proposed emergency (when the emergency spillway is in use) conditions. This information is required for our staff to assess potential downstream flood risk when the emergency spillway is in use.

2. Please provide us with an aerial image illustrating the location and approximate dimensions of the emergency spillway, as well as the new detention pond and associated spillway.

3.

Once you are able to provide us with a response to the above two questions, our staff will be able to confirm if we are able to provide approval of concept for the emergency spillway.

Thank you and please do not hesitate to contact me if you have any questions.
Annette

Annette Maher, M.A.Sc.
Planner II
Environmental Assessment Planning
Planning and Development
Toronto and Region Conservation Authority
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Office Location & Courier Address: 101 Exchange Avenue | Concord ON L4K 5R6
Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: Annette Maher <AMaher@trca.on.ca>,
Cc: Sharon Lingertat <SLingertat@trca.on.ca>, "Turner, William" <William.Turner@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>
Date: 03/30/2016 02:27 PM
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Good afternoon Annette

Please see the wording we have in the draft ESR. We would like to send out the draft ESR for review and I wanted to make sure you are ok with the wording.

Following is the excerpt from the ESR main document.

Alloa Pumping Station

Concurrent with the environmental assessment study the design for a new water distribution pumping station was completed. The pumping station is located just north and east of Mississauga Road with an access road beside the current location of Alloa Public School. Stormwater management for the pumping station site is managed by a storm pond designed to accommodate the overland water flow plus water from the 100 year storm event. As staff reviewed the stormwater plans for Mayfield Road concern arose on how to deal with the additional release of water from the pumping station in the event of a power failure and storm event in size similar to the July 8, 2013 event (greater than the 100 year storm). In the worst case scenario of a catastrophic storm event, the pond is assumed to fail. Discussion occurred on how this flow could be directed. Staff from Water and Transportation agreed that the best solution would be to provide a spillway to the north, away from development to the south that would outlet into Etobicoke Creek. This solution will be confirmed with the Toronto Regional Conservation Authority (TRCA) in detailed design as Etobicoke Creek is under their jurisdiction. *The Region of Peel Water group will work with TRCA to complete the detailed design and construction of the spillway.*

See for the Alloa Reservoir Storm Overflow Assessment Scenario attached.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

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Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Smith, Neal
Sent: March 15, 2016 10:37 AM

To: 'Annette Maher'
Cc: Sharon Lingertat; Turner, William; Nemeth, John; 'Alexander, Melissa'
Subject: RE: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Annette

As we discussed, the Mayfield Road EA and the Alloa stormwater reports where completed using the 100 year storm event and everything has been designed using that event. In light of the July 2013 storm, we had our consultant run the model using that event (memo you received) which identified a concern under that scenario. Being there is new subdivision being constructed south of the Alloa site, we were asked to look at ways to mitigate that scenario and reduce the risk of damage should that an event of that magnitude should ever happen again.

I have copied the William Turner , Project Manager for the Alloa project, he can provide information on where the spillway would be best placed.

I have also attached a link for you to download the stormwater report (Drainage and SWM Study - v95) for the Mayfield Road EA.

https://efts.peelregion.ca/OpenKM/login.jsp

User name: PeelEA
Password: environment

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
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Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Annette Maher [mailto:AMaher@trca.on.ca]
Sent: March 15, 2016 9:43 AM
To: Smith, Neal
Cc: Sharon Lingertat
Subject: Re: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Neal,

Thank you for sending in the Alloa Pumping Station Memo to our staff for our review. At this point in time, our staff will require more information regarding the proposal before we are able to provide an approval of concept. Please note that in general, TRCA staff does not prefer water to flow across watersheds or jurisdictions.

Please provide a response to the following:
1. Please clarify why and in what situation the emergency spillway that is proposed to discharge towards Etobicoke Creek will be required. How frequently and at what volume and flow will the emergency spillway and the new detention

pond be required?
2. Please provide a map/figure that shows the general location of the the emergency spillway and discharge to Etobicoke Creek, as well as the location of the new spillway towards the new detention pond.
3. Please confirm if the culvert under Mayfield Road from the Alloa site will have the capacity to accommodate up to 100-yr controlled peak flows coming from the SWM pond. Sizing?
4. Please note that TRCA staff requires the 100-yr 12-hr storm event be used for SWM design purposes, and not the 24-hr event. Please estimate the uncontrolled 100 yr peak flow using 100 yr 12 hr design storm and apply the greater of the two for sizing emergency spillway.
5. As July 8, 2013 storm is a rear event, TRCA appreciates that the analysis includes July 2013 storm event hydrograph. We understand that July 8, 2013 storm is not the basis for design of SWM infrastructure, but it is an excellent scenario to evaluate the effect of possible combined flows during extreme storm events and emergency reservoir overflows. Please provide the sizing of the emergency spillway using the actual July 2013 storm event hydrograph and emergency reservoir overflows.

We will provide you with more comments and our study requirements for the design once we have a better idea of the general concept of the emergency spillway, the direction and quantity of flows, etc. A permit from TRCA may be required depending on the location of the new emergency spillway and pond.

Thank you,
Annette

Annette Maher, M.A.Sc.
Planner II
Environmental Assessment Planning
Planning and Development
Toronto and Region Conservation Authority
☎416.661.6600 x5798 | ✉amaher@trca.on.ca

Office Location & Courier Address: 101 Exchange Avenue | Concord ON L4K 5R6
Mailing Address: 5 Shoreham Drive | Toronto ON M3N 1S4

From: Sharon Lingertat/MTRCA
To: Annette Maher/TRCA@MTRCA,
Date: 03/11/2016 10:22 AM
Subject: Fw: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Sharon Lingertat, MCIP, RPP | Senior Planner, Environmental Assessment Planning | Toronto and Region Conservation Authority | **Office Location and Courier Address:** 101 Exchange Avenue, Concord, ON L4K 5R6 | **Mailing Address:** 5 Shoreham Drive, Downsview, ON M3N 1S4 |☎ 416-661-6600 ext. 5717 | ✉ slingertat@trca.on.ca | www.trca.on.ca

----- Forwarded by Sharon Lingertat/MTRCA on 03/11/2016 10:21 AM -----

From: "Smith, Neal" <Neal.Smith@peelregion.ca>
To: "SLingertat@trca.on.ca" <SLingertat@trca.on.ca>,
Cc: "Alexander, Melissa" <Melissa.Alexander@hatchmott.com>, "Turner, William" <William.Turner@peelregion.ca>, "Brock, Liz" <Liz.Brock@peelregion.ca>, "Nemeth, John" <John.Nemeth@peelregion.ca>

Date: 03/09/2016 09:41 AM
Subject: Mayfield Road EA (Chinguacousy to WCB) and Alloa Pumping Station (northside of Mayfield Road, east of Mississauga Road)

Hi Sharon

Further to our conversation, please find attached a copy of the memo supplied by Hatchmott MacDonald regarding the Alloa Pumping Station site (northside of Mayfield Road, east of Mississauga Road) overflow impact. Of the options presented, the emergency spillway option was the preferred option. CVC was involved and concurred that this was a viable option.

Please let me know if you require any further information. We are looking to file the ESR for the EA as soon as possible and would like include in the document TRCA's approval in concept with the design and construction to be completed as of the Alloa design.

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
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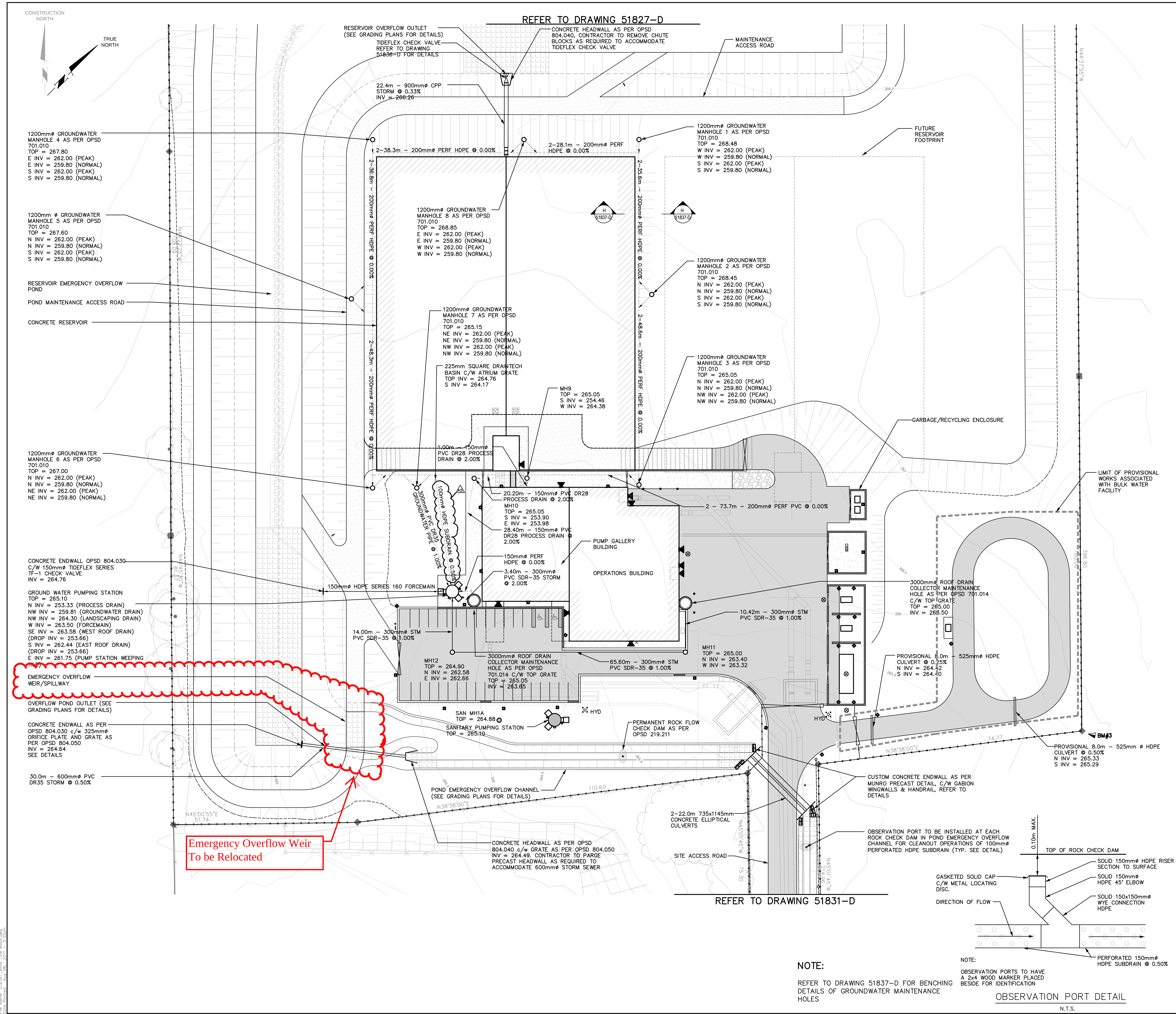
[attachment "314225 - Mayfield Rd EA - Alloa Site Overflow Impact.pdf" deleted by Annette Maher/TRCA]

Spam
Phish/Fraud
Not spam

Forget previous vote[attachment "Alloa Reservoir Storm Overflow Assessment.pdf" deleted by Annette Maher/TRCA]



SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN SEWERS			GAS MAINS		
STORM SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
TRANSIT			HYDRO ONE		
PARKS & REC.			CTV		
ONT. CLEAN WATER			COMMUNIC. CABLES		

REVISIONS

DATE	DETAILS	INIT.
JUNE 2013	ISSUED FOR SITE PLAN APPROVAL, TOWN OF CALEDON	JABO
OCT. 2013	100% SUBMISSION	JABO
DEC. 2013	ISSUED FOR BUILDING PERMIT	JABO
FEB. 2014	ISSUED FOR MOE APPROVAL	JABO
MAY 2014	REISSUED FOR APPROVALS	JABO
NOV. 2014	ISSUED FOR TENDER	JABO
AUG. 2015	ISSUED FOR TENDER	JABO
NOV. 2015	ISSUED FOR CONSTRUCTION	JABO

LEGEND

- ASPHALT PARKING/DRIVING AREA
- CONCRETE ACCESS
- GRANULAR PARKING/DRIVING AREA
- 3:1 MAX SIDE SLOPING
- GRASSED DRAINAGE SWALE
- STORM MAINTENANCE HOLE
- SANITARY MAINTENANCE HOLE
- FIRE HYDRANT
- EXISTING CONTOUR
- CONCRETE CABLE MAT
- CURB DEPRESSION
- POST AND WIRE FENCE
- CHAIN LINK FENCE
- GUIDE RAIL
- LIGHT STANDARD
- ARCHITECTURAL GATE
- OVERHEAD HYDRO
- GABION BASKET WINGWALL
- DOOR ACCESS LOCATION
- PERMANENT ROCK CHECK DAM
- ELECTRICAL HANDHOLE

CONTRACTOR LAYOUT NOTE
CONTRACTOR TO BE SUPPLIED BOTH CAD AND PDF COPIES OF ALL GENERAL SITE PLANS AND GRADING PLANS FOR CONSTRUCTION LAYOUT PURPOSES.

SURVEY BENCHMARKS

SITE BM#1 ELEV 266.930m
REGION OF PEEL BM#65 ON SOUTH FACE AT 1 FOOT WEST OF EAST ENTRANCE TO 1 STOREY BRICK SCHOOL (ALLOA PUBLIC SCHOOL) LOCATED ON THE NORTH SIDE OF MAYFIELD ROAD, APPROX 0.56 Km WEST OF CREDITVIEW ROAD.

BM#2 ELEV 263.275m
TOP OF SIB #9

BM#3 ELEV 266.640m
TOP OF IB #7

BM#4 ELEV 261.540m
TOP OF SIB #6

TOWN OF CALEDON NOTES:

1. LIGHTING FIXTURES SHALL BE INSTALLED IN SUCH A MANNER THAT ALL LIGHT EMITTED FROM THE FIXTURE, EITHER DIRECTLY FROM THE LAMP OR A DIFFUSING ELEMENT, OR INDIRECTLY BY REFLECTION OR REFRACTION FROM ANY PART OF THE FIXTURE IS PROJECTED BELOW THE LAMP AND ONTO THE LOT THE LIGHTING IS INTENDED TO SERVE.
2. THE MAXIMUM HEIGHT OF ALL LIGHTING FIXTURES IS 9.0m
3. MINIMUM DISTANCE OF LIGHTING FIXTURES FROM ANY LOT LINE IS 4.5m

MUNICIPAL ADDRESS

PART OF LOT 18, CONCESSION 4
PART OF PIN 14255–0269(LT)

PROPERTY OWNERS

REGIONAL MUNICIPALITY OF PEEL

0 5.0 10.0 20.0 30.0m
1:500

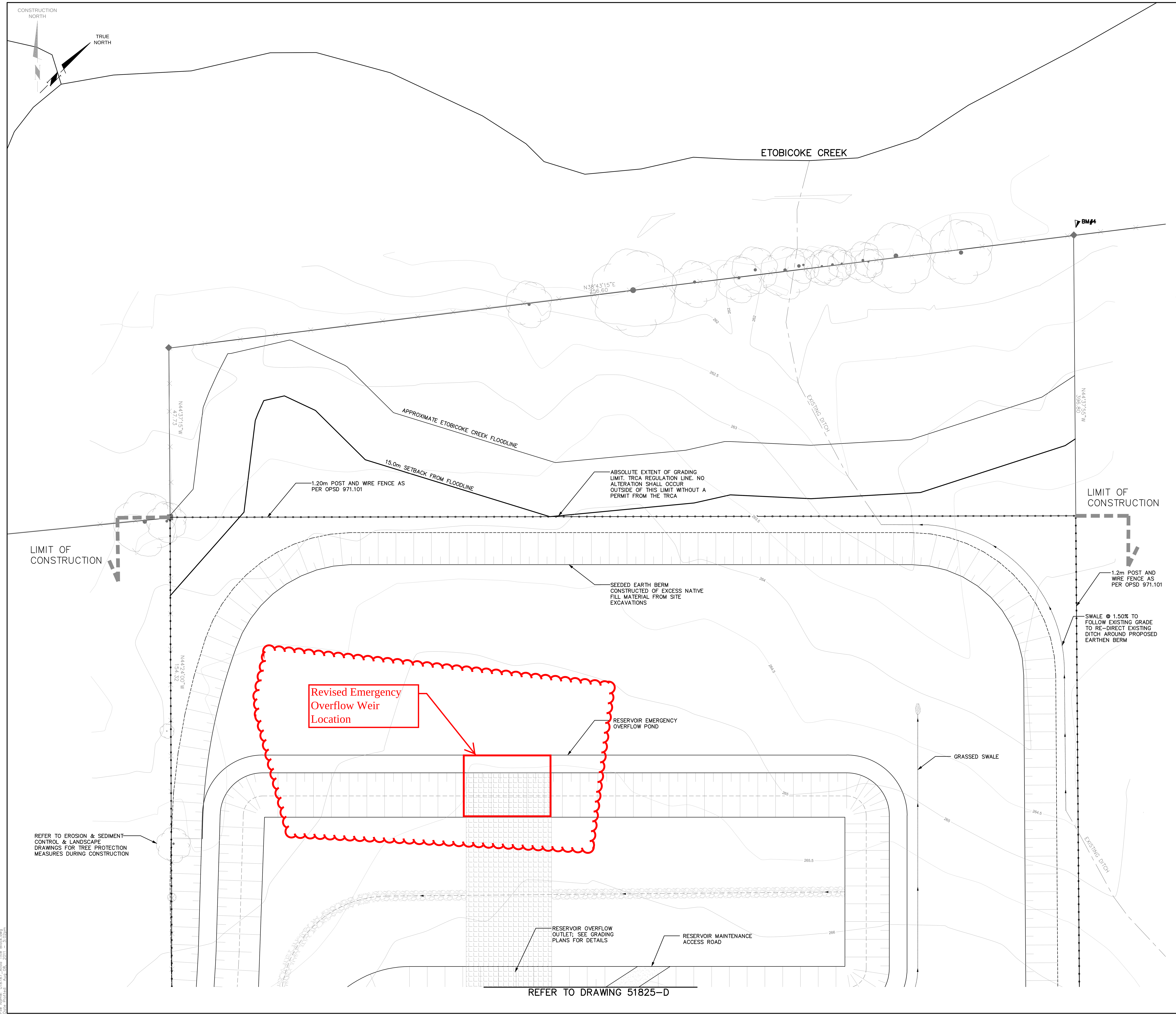
Seal

Seal

ALLOA RESERVOIR AND PUMPING STATION

STORM SEWER, SUB–SURFACE AND DRAINAGE PLAN

CAD Area	.	Area	C–19	Project No.	10–1960
Checked by	----	Drawn by	----		
Date	NOV 2015	Sheet	9 of 179	Plan No.	51830–D



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PART OF LOT 18, CONCESSION 4
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PROPERTY OWNERS

REGIONAL MUNICIPALITY OF PEEL

0 5.0 10.0 20.0 30.0m
1:500

Seal

Seal

ALLOA RESERVOIR AND PUMPING STATION

OVERALL SITE PLAN NORTH SITE LIMITS

CAD Area .	Area C-19	Project No. 10-1960
Checked by ----	Drawn by ----	Plan No. 51827-D
Date NOV 2015	Sheet 6 of 179	

Table 1 - Storm Runoff/Overflow Sensitivity Analysis from Alloa Reservoir and Pumping Station Site

Description	Flow Scenario (Input Variables)				Flow Simulation (PCSWMM Model Results)					Consequence
	Storm Event	Overflow Condition			Pond Elevation	Pond Storage Used	Peak Outflow from Pond	Peak Outflow from Adj Lands	Total Peak Outflow from Site	
		Overflow Start Time	Duration / Response Time [hr]	Flow Rate [cms]	[m]	[m3]	[cms]	[cms]	[cms]	
Original Design [1]	24-hr, 100-yr	N/A	0	0	265.17	1,302	0.035	0.85	**0.70**	- No overtopping of pond; - Flow attenutation provided within conveyance on-site swales; - Downstream CWP adequate to convey flows; - Minimal risk of downstream flooding;
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This would be the event we would use as our design scenario.
Extreme Storm and 2 Hour Emergency Overflow.

Top of Pond Elevation [m]	*Maximum Pond Storage [m3]*	*Pre-Dev 100-yr Flow [cms]*	*D/S 900 mm CWP Capacity [cms]*
267.5	**36,969**	**1.08**	**1.28**

Note:
Hydrologic modelling flows/elevations extracted from sensitivity runs for overflows based on PCSWMM model for Alloa Reservoir Site created by R.J.BURNSIDE AND ASSOCIATES LTD (APRIL 17, 2013)
1 - Scenario assessed in Burnside Alloa Reservoir Design Brief and SWM Report for Site Plan Approval Report(2013)

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Event Scenario Peak Flow 2.41 cms
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Peak Flow over Emergency Spillway Weir = 2.41 - 1.28 = **1.13 cms**

Peak Flow over Emergency Spillway Weir = 1.13 cms
Total Volume during Extreme Storm with Reservoir Overflow with 2 Hour Event;
1.13x60x60x2 = **8136 cubic metres**

Drainage & Stormwater Management Study

Brock, Liz

Subject:	FW: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA
Attachments:	Mayfield Road EA - MOECC Comments 2016.docx; RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

From: Smith, Neal
Sent: July 13, 2016 9:18 AM
To: 'Bell, Trevor (MOECC)'
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Trevor

Further to me phone message, I reviewed your comments and received a message from Melissa that the updated stormwater report (to include your comments) were not clearing revised in the ESR document. I have attached the comments we received from Hatch. If the changes are acceptable, we will add them to the section in the ESR so the match what's in the report (Appendix F).

Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
Cell: 905-872-6475
Fax: 905-791-1442
Toll free 1-888-919-7800 ext 7866
Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca

From: Bell, Trevor (MOECC) [mailto:Trevor.Bell@ontario.ca]
Sent: July 12, 2016 3:14 PM
To: Smith, Neal
Cc: Brock, Liz; Alexander, Melissa (melissa.alexander@hatch.com); Martin, Paul (MOECC); Dufresne, Tina (MOECC)
Subject: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Good afternoon,

Please find attached a letter from the Ministry of the Environment and Climate Change, Central Region Technical Support Section regarding the above noted project. Feel free to contact me directly with any questions or concerns you may have.

Sincerely,

Trevor Bell
Environmental Resource Planner and EA Coordinator
Technical Support Section | Central Region
Ministry of the Environment and Climate Change
5775 Yonge St., 8th Floor
Toronto, ON M2M 4J1
T: 416-326-3577
E: trevor.bell@ontario.ca

Mayfield Road EA – MOECC Comments – April 28, 2016

<table>
<tr><th>Comments – SWM – April 28, 2016</th><th>Response (Hatch) May 3, 2016</th></tr>
<tr><td>1. The report does not clearly indicate the kind of stormwater management (SWM) (quality/quantity) controls that currently exist (if any). The report is also not clear on the water quality control that would apply for the widened road. We recommend the ESR be revised to include a clear commitment to achieve enhanced level of treatment, as a minimum for an area equivalent to the additional impervious area created by the road widening. We also encourage the Region to explore the feasibility of providing enhanced level of treatment for runoff from the existing road surface area.</td><td>Page 15 of the SWM report states that there are presently no SWM control measures to manage runoff from the Mayfield Road study area. The existing study area is serviced by road side ditches that convey runoff to culvert outfall locations.

Table 4-6 Proposed Drainage Plan for Road ROW (page 25 of the SWM Report) and Section 4.6.2 Proposed SWM/LID Strategy (page 29 of the SWM report) has illustrated the proposed water quality control strategies for the Mayfield Roadway corridor. It can be summarized as follows:
<table>
<tr><th>Location</th><th>Proposed Cross-sections</th><th>Proposed Water Quality Control Measures</th></tr>
<tr><td>Winston Churchill Blvd to Heritage Rd</td><td>4-lane rural</td><td>Enhanced Grass Swale</td></tr>
<tr><td>Heritage Rd to Mississauga Rd</td><td>4-lane rural</td><td>Enhanced Grass Swale</td></tr>
<tr><td rowspan="2">Mississauga Rd to Creditview Rd</td><td>Interim – 5-lane mixed rural/urban</td><td><u>North Side:</u> Enhanced Grass Swale on the. <u>South Side:</u> Subsurface Infiltration Chamber + OGS Unit</td></tr>
<tr><td>Ultimate – 6-lane Urban</td><td>Subsurface Infiltration Chamber + OGS Unit</td></tr>
<tr><td rowspan="2">Creditview Rd to Chinguacousy Rd</td><td>Interim – 5-lane mixed rural/urban</td><td><u>North Side:</u> Enhanced Grass Swale on the. <u>South Side:</u> Subsurface Infiltration Chamber + OGS Unit</td></tr>
<tr><td>Ultimate - 6-lane</td><td>Subsurface Infiltration Chamber +</td></tr>
</table>
</td></tr>
</table>

Comments – SWM – April 28, 2016	Response (Hatch) May 3, 2016
	<table><tr><td></td><td>urban</td><td>*OGS Unit*</td></tr></table> **Action:** Revise the SWM report to clearly indicate the proposed SWM controls that would apply for the widened road. The Appendix will include OGS unit sizing details and projected pollutant removal efficiency.
2. The report indicates that water quality treatment will be through the use of swales and (yet unspecified) low impact development (LID) measures. We disagree that enhanced level of treatment can be achieved through the use of the swales alone. Whether LID measures are feasible or how a treatment train approach will be used to achieve the desired level of treatment is not described. We recommend the final design include a treatment train approach to satisfy the requirement to achieve the "enhanced" level of treatment.	A treatment train approach has been developed for <u>urban cross-sections</u> (between <u>Mississauga Rd. to Chinguacousy Rd,)</u> • **<u>Conveyance Controls:</u>** The Proposed subsurface infiltration chamber has been integrated into the proposed storm sewer system to collect, retain and infiltrate all rainfall events up to 10 year design storm for the entire ROW area. Under this design, the main-line storm sewer will be functioned as an overflow pipe to convey runoff volumes that is greater than the 10 year event (as shown in attached). • **<u>End-of-Pipe Controls:</u>** Oil-Grit-Separation unit is designed to treat the runoff prior to the release. For rural cross-section (between Winston Churchill Blvd. to Mississauga Rd.), the proposed SWM plan have only recommended enhanced grass swale as a primary water quality treatment measures. We agree that the use of swales along cannot achieve enhanced level of treatment as required by the MOECC. However, due to the proposed roadway configuration (i.e. rural cross-sections , no STM Sewers), poor native soil drainage condition and large storage volume requirement, a similar treatment train approach seems to be not feasible nor practical at this segment. By considering possibility of future subdivisions development (i.e. potential future development adjacent to Mayfield Road in the next few years) and cost-effectiveness, **<u>SWM pond</u>** is the most feasible water quality and quantity control measures to be implemented within this area. On page 32 of the SWM Report,

Comments – SWM – April 28, 2016	Response (Hatch) May 3, 2016
	Table 4-9 illustrated the storage volume required to detain 25 mm, 10 year and 100 year stormwater runoffs for sizing linear LID features purposes. In the revised report submission, Hatch will recommend future adjacent subdivision development plan to accommodate the calculated 100 year storage volume requirement as shown in Table 4-9. In the meantime, Hatch will update the SWM report to recommend the use of check dam and or low Grade Weir across the enhanced grassed swales between Winston Churchill Blvd. and Mississauga Rd. Such structures will promote pollutant settlements and reducing flow velocity, which ultimately improve the effectiveness of water quality treatment. **Action:** Revise the SWM report to include SWM ponds recommendations and design check dam as a temporary water quality treatment measures.
3. We understand the SWM system for the widened road will need to be approved through the Environmental Compliance Approval process and it may be prudent to hold early consultation with the Ministry's Environmental Approvals Branch (EAB) on whether the SWM design meets the criteria or not. Our recommendation to EAB will be to review the SWM proposal to ensure it meets the enhanced level of treatment.	Acknowledged – no action required.

Brock, Liz

From: Bell, Trevor (MOECC) <Trevor.Bell@ontario.ca>
Sent: July 13, 2016 4:24 PM
To: Smith, Neal
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Neal,

Our Water Unit is satisfied with the responses provided by your consultant. We are comfortable signing off on the Class EA now that our concerns have been adequately addressed.

Thanks,
Trevor

From: Bell, Trevor (MOECC)
Sent: July-13-16 9:34 AM
To: 'Smith, Neal'
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Neal, I got your voice mail and the email below. Thanks that is much appreciated – it's very helpful to have the changes identified in a table like that. I'll have one of our water specialists review the changes and get back to you ASAP.

-Trevor

From: Smith, Neal [mailto:neal.smith@peelregion.ca]
Sent: July-13-16 9:18 AM
To: Bell, Trevor (MOECC)
Subject: RE: Mayfield Road Improvements from Chinguacousy Rd to Winston Churchill Blvd Municipal Class EA

Hi Trevor

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Thanks

Neal Smith, C.E.T.
Project Manager, Transportation, Infrastructure Programming & Studies
Public Works
Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton Ontario, L6T 4B9

Phone: 905-791-7800 ext 7866
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Toll free 1-888-919-7800 ext 7866

Email: neal.smith@peelregion.ca
Web Site www.peelregion.ca
Please consider the environment before printing this e-mail

From: Bell, Trevor (MOECC) [mailto:Trevor.Bell@ontario.ca]
Sent: July 12, 2016 3:14 PM
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Good afternoon,

Please find attached a letter from the Ministry of the Environment and Climate Change, Central Region Technical Support Section regarding the above noted project. Feel free to contact me directly with any questions or concerns you may have.

Sincerely,

Trevor Bell
Environmental Resource Planner and EA Coordinator
Technical Support Section | Central Region
Ministry of the Environment and Climate Change
5775 Yonge St., 8th Floor
Toronto, ON M2M 4J1
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E: trevor.bell@ontario.ca

Final Report

Technical Study – Region of Peel Mayfield Road EA

Drainage and Stormwater Management Study

May 31, 2016

Final Report

Technical Study – Region of Peel Mayfield Road EA

Drainage and Stormwater Management Study

May 31, 2016

Hatch Mott MacDonald
15 Allstate Parkway, Suite 300
Markham, Ontario L3R 5B4
Canada
Tel: 905 943 9600
Fax: 905 940 5848

Final Report

Technical Study - Region of Peel Mayfield Road EA

Drainage and Stormwater Management Study

Issue and Revision Record					
Rev	**Date**	**Originator**	**Checker**	**Approver**	**Description**
V95	September 30, 2015	J. Zi	S. Hussain	R. Shamess	Draft Report for Review
V100	May 31, 2016	J. Zi	D. Jackson	R. Shamess	Final Submission

List of Contents and Appendices — Page

APPENDICES

FIGURES

TABLES

1 Introduction

1.1 Project Description

Hatch Mott MacDonald (HMM) was retained by the Regional Municipality of Peel to undertake a Schedule "C" Municipal Class Environmental Assessment (EA) for the proposed widening of Mayfield Road (Regional Road 14) from Chinguacousy Road to Winston Churchill Boulevard (Regional Road 19). The EA was undertaken to identify the long term improvements to the transportation network and their associated impacts to the cultural and natural environments for the horizon year of 2031 and beyond.

As part of the EA an analysis of the impacts to the drainage and stormwater management (SWM) systems as a result of the long-term transportation improvements was undertaken.

1.2 Project Background

Within the project study corridor (see **Figure 1-1**), existing Mayfield Road is a two-lane, 5.4 km long, east-west major arterial road with rural cross-sections under the jurisdiction of the Regional Municipality of Peel. It forms the boundary between the City of Brampton to the south and the Town of Caledon to the north.

The findings of the traffic analysis, undertaken as part of the EA, identified the proposed traffic improvement plan and include the following main components:

- Right-of-Way (ROW) expanding from 36 m to 50.5 m by 2031;
- Road widening:
  - Four (4) lane widening from Winston Churchill Boulevard to west of Mississauga Road;
  - Six (6) lane *ultimate condition* widening from west of Mississauga Road to Chinguacousy Road.
- 3-m wide multi-use path along both sides of the road from Mississauga Road to Chinguacousy Road

1.3 Purpose

The purpose of this report is to:

1. Evaluate the existing hydrologic conditions within the study area in regards to current drainage flow patterns;
2. Examine post development hydrologic conditions following the road widening and improvement of the Mayfield Road study corridor;
3. Assess hydrologic flows and hydraulic capacity at various culvert crossing locations along the existing and the proposed roadway alignment;
4. Review drainage and stormwater management (SWM) objectives and criteria for the study area;
5. Recommend options for drainage and SWM features to meet applicable water quantity and quality control, while accounting for local site restrictions and design criteria; and
6. Document the site specific SWM strategy along with the technical information necessary for the proper sizing of the SWM features.

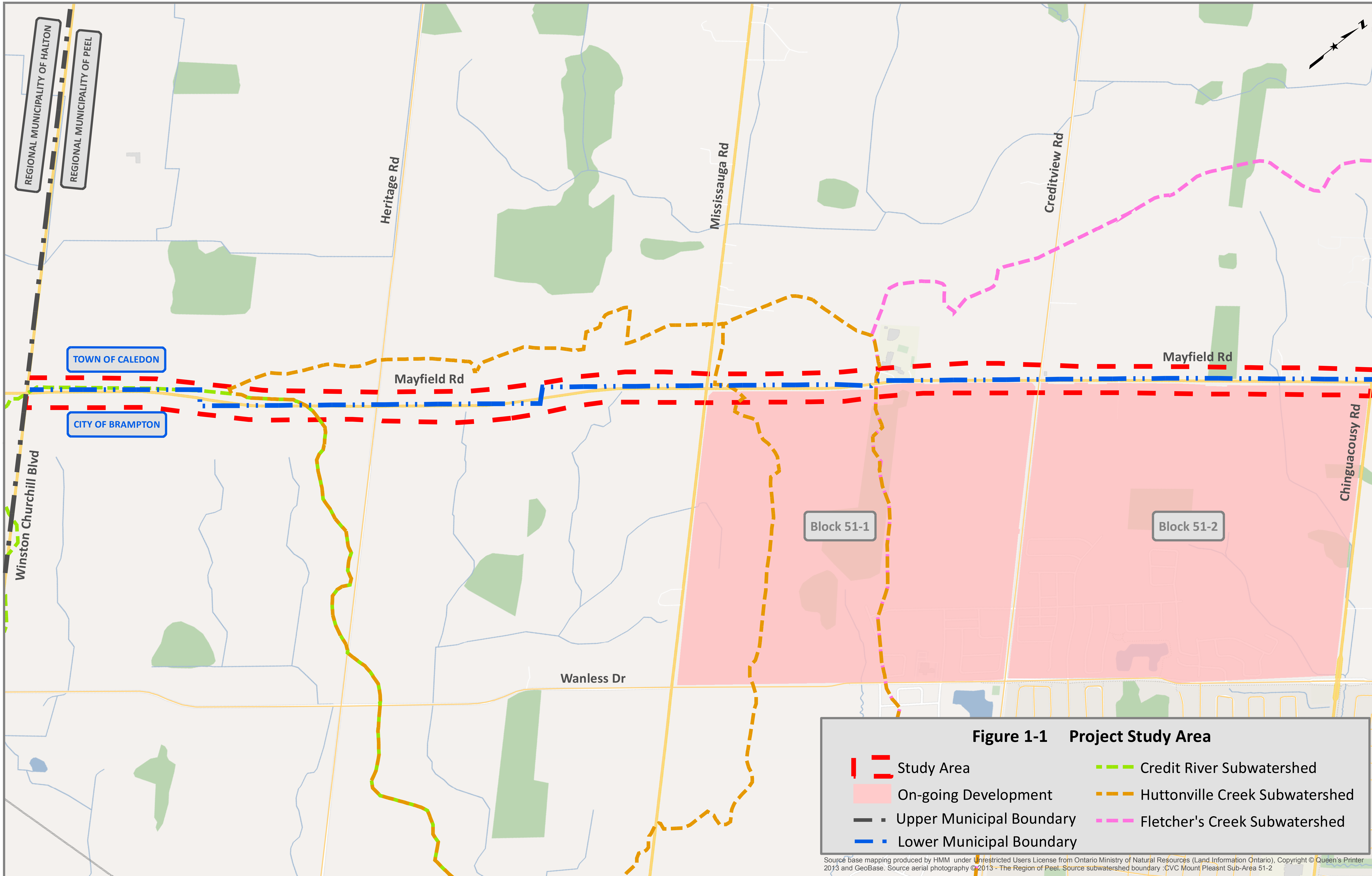


Figure 1-1 Project Study Area

2 Existing Conditions

2.1 Site Characterization

The study corridor (Figure 1-1) is under the jurisdiction of the Credit Valley Conservation (CVC) Authority, and falls within the headwaters of the Huttonville Creek and Fletcher's Creek watersheds. Western portions of the corridor near Winston Churchill Boulevard reside within the Credit River Subwatershed.

The study corridor currently presents a local ecosystem that is typically dominated by agricultural lands, undeveloped lands (open fields and grassland areas) to the north and south of the Mayfield Road ROW, as well as planned residential subdivisions developments (approved Block 51-1 between Mississauga Road and Creditview Road and planned Block 51-2 between Creditview Road and Chinguacousy Road) both south of the ROW.

2.2 Condition of Receiving Watercourses

No major fluvial watercourses exist in the subwatersheds located within the study corridor boundaries. The ditches/swales within these subwatersheds generally provide conveyance of surface water/tile drainage discharge during wet weather events, and are mostly dry with no runoff.

- The Huttonville Creek subwatershed features a series of poorly defined to well defined vegetated swales draining to the south of Mayfield Road.
- The Fletcher's Creek subwatershed features a meadow marsh community that drains via continuous drainage swales to the south of Mayfield Road.

2.3 Drainage Patterns and Outlets

The existing drainage system for the study corridor is depicted in **Figure 2-1** showing the general drainage patterns, delineated road ROW and external catchment boundaries and locations of existing culvert crossings.

The topography of the land adjacent to the road ROW is gently sloped with an average slope of 1.1%, creating a low internal drainage condition. Stormwater runoff from the study corridor is currently conveyed via overland sheet flow to low spots along the north sides of the ROW, eventually discharging to 19 culvert crossings/outfall locations.

Outlets along the roadway corridor were identified through the existing road profile and culvert crossing locations and verified through a field inspection completed by HMM in December 2014 (see **Appendix A**).

Based on the topographic conditions and outlet locations, the study area can be divided into:

- Road ROW catchments:
  - A total of nineteen (19) contributing catchment areas with higher impervious coverage up to 20%.
  - Typical land use includes pavement, gravel shoulder and exposed land.
  - Significant source of imperviousness due to large paved roadway surfaces.
- External catchments adjacent to the ROW:
  - A total of nineteen (19) contributing catchment areas consist of mostly pervious land use type
  - Typical land use includes agricultural, exposed land and grassland area.
  - Insignificant sources of imperviousness coverage from building roof areas and paved parking lots.

No existing stormwater quality and/or quantity control measures are located along the study corridor.

2.4 Soil and Groundwater Conditions

According to the geotechnical investigation provided by Thurber Engineering Ltd (August 2015), the study area subgrade soils consists primarily of *silty sandy clay* with low permeability providing imperfect natural drainage. The study area soils were therefore conservatively classified as Hydrologic Soil Group (HSG) C/D.

As per the geotechnical investigation, groundwater depth data was collected from the open boreholes and measured to be below the ground surface ranging from approximately 2.1 to 6.3 m deep. The water-table is expected to vary seasonally and with significant precipitation events.

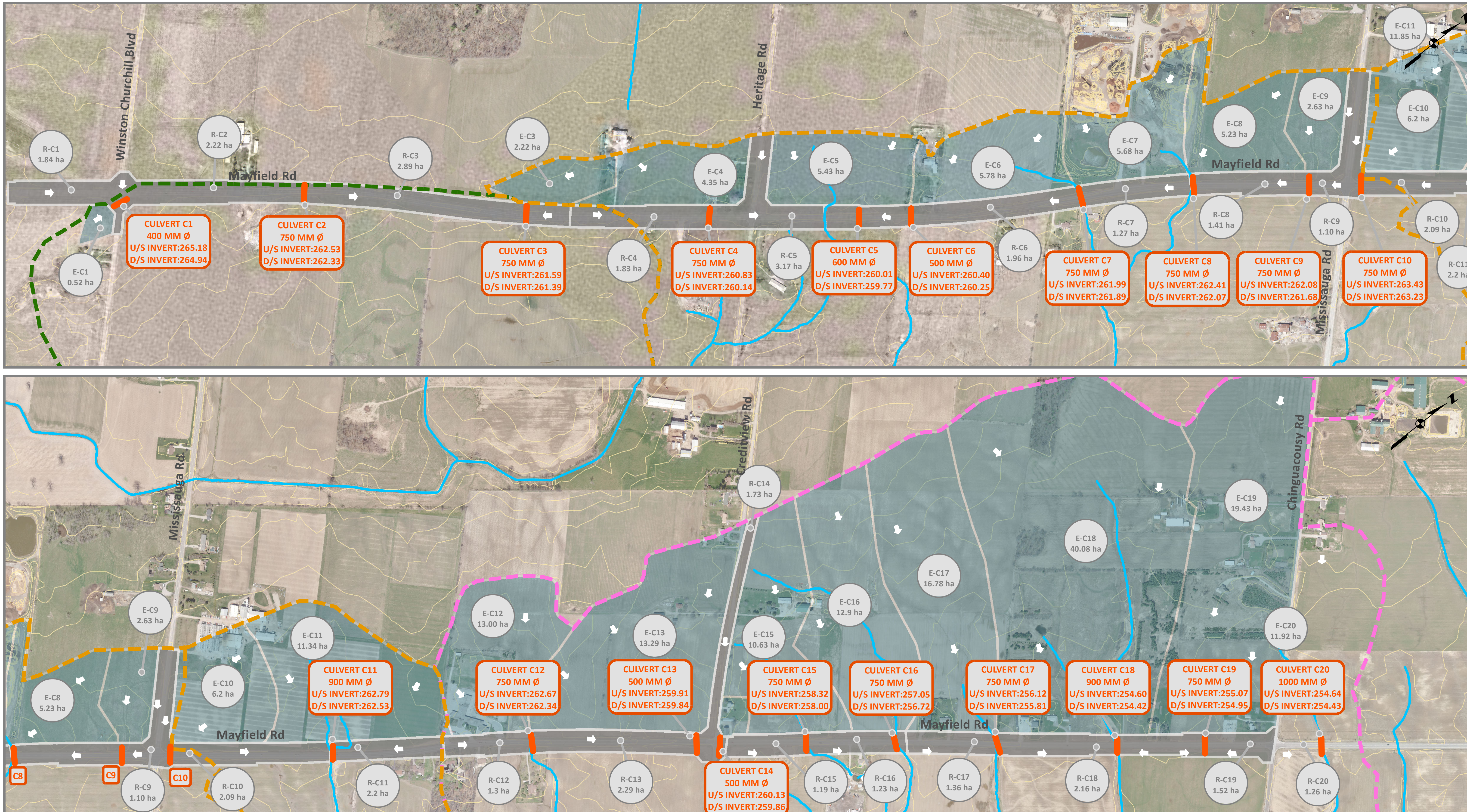


Figure 2-1 Existing Drainage Conditions - Mayfield Road EA

External Catchment Boundary | Existing Culverts | Credit River Subwatershed | Fletcher's Creek Subwatershed

ROW Catchment Boundary | Contours | Huttonville Creek Subwatershed | Watercouse

Hatch Mott MacDonald

0 250 500 Meters

Source base mapping produced by HMM under Unrestricted Users License from Ontario Ministry of Natural Resources (Land Information Ontario), Copyright © Queen's Printer 2013 and GeoBase. Source aerial photography © 2013 - The Region of Peel. CVC subwatershed boundary is drawn in for visual representation

2.5 Hydrologic and Hydraulic Assessment

Hydrologic modeling was conducted using the Visual Otthymo V3.0 model to determine existing peak runoff flows from the contributing road ROW and external catchments to outlets.

The 2- to 100-yr return period 24-hr Chicago design storm events was simulated using the City of Brampton IDF curves data, as applicable over the appropriate sub-catchment areas. Model parameters were based on:

- Catchment delineation, % imperviousness, slopes, flow length and subsequent hydrologic parameters (i.e., time of concentration) were determined through GIS based spatial analysis using acquired topographical data and aerial imagery.
- The runoff Curve Number (CN) was selected based on MTO Drainage Manual (1997) Design Chart 1.09 for Soil/Land Use Curve Numbers for HSG Group C/D.

Hydraulic analysis at each cross-road culvert outlet was conducted using the CulvertMaster v3.3 software in order to evaluate existing culvert conveyance characteristics. The existing culverts were evaluated based on MTO (2008) Highway Drainage Design Standards criteria:

- For rural/arterial collector roads the 100-yr design conveyance flow to be used for all cross-road culverts;
- The headwater depth to culvert diameter (HW/D) ratio to not exceed 1.5;
- A minimum freeboard of 1 m to be provided from the design water elevation to the edge of travelled road;

2.5.1 Runoff Estimation

Table 2-1 summarizes the hydrologic parameters selected for existing conditions across the study area used for peak runoff estimation.

TABLE 2-1 EXISTING CATCHMENT CHARACTERISTICS

Location	Outlet	Catchment ID	Area (ha)	Impervious -ness	CN	Time-to-Peak (hr)
Winston Churchill Blvd to Heritage Rd	C1	E-C1	0.52	0%	76	0.24
	C2	R-C2	3.91	16%	79	0.81
	C3	R-C3	2.81	14%	79	0.72
		E-C3	2.14	5%	77	0.4
	C4	E-C4	4.43	5%	77	0.39
		R-C4	1.9	13%	79	0.14
Heritage Rd to Mississauga Rd	C5	E-C5	5.43	0%	76	0.39
		R-C5	3.33	15%	79	0.15
	C6	E-C6	5.78	5%	77	0.47
		R-C6	1.93	14%	79	0.17
	C7	E-C7	5.62	2%	79	0.53
		R-C7	1.15	14%	79	0.15
	C8	E-C8	5.3	0%	79	0.51
		R-C8	1.59	13%	79	0.24
	C9	E-C9	2.63	0%	76	0.39
		R-C9	1.05	15%	79	0.17
Mississauga Rd to Creditview Rd	C10	E-C10	6.2	10%	78	0.47
		R-C10	2.1	20%	80	0.45
	C11	E-C11	11.9	10%	78	0.49
		R-C11	2.34	14%	79	0.48
	C12	E-C12	9.41	0%	76	0.54
		R-C12	1.01	13%	79	0.32
	C13	E-C13	16.32	2%	76	0.77
		E-C13(WE)	0.67	40%	85	0.21
		R-C13	2.27	13%	79	0.47
	C14	R-C14	1.9	15%	79	1.06
Creditview Rd to Chinguacousy Rd	C15	E-C15	9.96	2%	76	0.7
		R-C15	1.08	13%	79	0.31
	C16	E-C16	12.9	2%	76	0.75
		R-C16	1.24	13%	79	0.33
	C17	E-C17	15.84	2%	76	0.89
		R-C17	1.32	13%	79	0.41
	C18	E-C18	41.02	2%	76	0.93
		R-C18	1.63	13%	79	0.41
	C19	E-C19	24.83	2%	76	0.98
		R-C19	2.19	15%	79	0.33

Table 2-2 summarizes the Visual Otthymo modelled existing peak runoff from each contributing catchment under existing conditions for various design storms (i.e., 2- to 100-yr storm events).

TABLE 2-2 EXISTING CATCHMENT PEAK RUNOFF

Location	Outlet ID	Catchment ID	Area (ha)	Design Flow (cms)					
				2-yr	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-y*
Winston Churchill Blvd to Heritage Rd	C1	E-C1	0.52	0.016	0.028	0.035	0.05	0.058	0.067
	C2	R-C2	3.91	0.149	0.228	0.297	0.391	0.45	0.511
	C3	R-C3	2.81	0.098	0.152	0.198	0.266	0.315	0.402
		E-C3	2.14	0.05	0.087	0.11	0.155	0.182	0.209
	C4	E-C4	4.43	0.101	0.177	0.225	0.316	0.37	0.425
		R-C4	1.9	0.069	0.112	0.137	0.21	0.257	0.298
Heritage Rd to Mississauga Rd	C5	E-C5	5.43	0.117	0.208	0.264	0.373	0.438	0.506
		R-C5	3.33	0.131	0.211	0.256	0.384	0.456	0.521
	C6	E-C6	5.78	0.116	0.203	0.257	0.362	0.424	0.488
		R-C6	1.93	0.074	0.119	0.145	0.22	0.261	0.303
	C7	E-C7	5.62	0.115	0.199	0.25	0.348	0.405	0.464
		R-C7	1.15	0.045	0.072	0.087	0.132	0.157	0.181
	C8	E-C8	5.3	0.112	0.193	0.242	0.337	0.392	0.449
		R-C8	1.59	0.057	0.093	0.114	0.174	0.205	0.247
	C9	E-C9	2.63	0.057	0.101	0.128	0.181	0.212	0.245
		R-C9	1.05	0.055	0.109	0.136	0.186	0.217	0.25
Mississauga Rd to Creditview Rd	C10	E-C10	6.2	0.131	0.227	0.287	0.402	0.469	0.539
		R-C10	2.1	0.099	0.148	0.189	0.245	0.28	0.353
	C11	E-C11	11.9	0.245	0.425	0.536	0.749	0.875	1.004
		R-C11	2.34	0.089	0.143	0.174	0.263	0.314	0.364
	C12	E-C12	9.41	0.163	0.288	0.366	0.517	0.608	0.7
		R-C12	1.01	0.041	0.071	0.087	0.123	0.145	0.211
	C13	E-C13	16.32	0.221	0.392	0.498	0.706	0.827	0.953
		E-C13(WE)	0.67	0.034	0.056	0.068	0.092	0.106	0.12
		R-C13	2.27	0.09	0.138	0.192	0.271	0.32	0.37
	C14	R-C14	1.9	0.062	0.092	0.114	0.157	0.18	0.204
Creditview Rd to Chinguacousy Rd	C15	E-C15	9.96	0.144	0.255	0.325	0.46	0.539	0.621
		R-C15	1.08	0.044	0.077	0.097	0.133	0.198	0.229
	C16	E-C16	12.9	0.178	0.315	0.401	0.568	0.665	0.766
		R-C16	1.24	0.05	0.087	0.107	0.15	0.177	0.258
	C17	E-C17	15.84	0.194	0.344	0.437	0.62	0.727	0.837
		R-C17	1.32	0.049	0.08	0.11	0.154	0.182	0.211
	C18	E-C18	41.02	0.488	0.865	1.097	1.556	1.825	2.102
		R-C18	1.63	0.06	0.099	0.138	0.193	0.228	0.264
	C19	E-C19	24.83	0.285	0.505	0.64	0.909	1.066	1.227
		R-C19	2.19	0.089	0.143	0.195	0.267	0.309	0.352

Hydrologic modelling output for 100-year event is included in the **Appendix B**.

2.5.2 Culvert Crossings Evaluation

Based on the hydraulic analysis of existing culvert crossings along the Mayfield Drive study area and established culvert evaluation criteria, **Table 2-3** summarizes culvert hydraulic capacity results under the 100-yr design flow conditions.

TABLE 2-3 EXISTING CULVERT HYDRAULIC EVALUATION

Location	Culvert ID	Flow Pattern	Drainage Area (ha)	Dimension (mm)	100-yr Design Flow (cms)	H/D Ratio	Freeboard	Comment
						< 1.5?	*> 1m?*	
Winston Churchill Blvd to Heritage Rd	C1	West → East	0.52	300	0.067	Yes	No	Inadequate
	C2	North → South	3.91	750	0.511	Yes	No	Inadequate
	C3	North → South	5.03	450	0.58	No	No	Overtopping
	C4	North → South	6.33	600	0.665	No	No	Inadequate
Heritage Rd to Mississauga Rd	C5	North → South	8.76	525	0.952	No	No	Overtopping
	C6	North → South	7.71	450	0.673	No	No	Overtopping
	C7	North → South	6.77	600	0.549	No	No	Inadequate
	C8	North → South	6.89	600	0.585	No	No	Overtopping
	C9	North → South	3.68	450	0.373	No	No	Inadequate
Mississauga Rd to Creditview Rd	C10	North → South	8.30	600	0.735	No	No	Overtopping
	C11	North → South	14.24	750	1.199	No	No	Inadequate
	C12	North → South	10.42	600	0.758	No	No	Overtopping
	C13	North → South	19.26	500	1.075	No	No	Overtopping
	C14	North → South	1.90	450	0.204	No	No	Inadequate
Creditview Rd to Chinguacousy Rd	C15	North → South	11.04	600	0.705	No	No	Overtopping
	C16	North → South	14.14	600	0.813	No	No	Overtopping
	C17	North → South	17.16	2 * 600	0.88	No	No	Inadequate
	C18	North → South	42.65	750	2.153	No	No	Overtopping
	C19	North → South	27.02	600	1.291	No	No	Overtopping

Hydraulic analysis results (see **Appendix C**) indicate that:

- Nearly all existing road culvert crossings are inadequate to convey the 100-yr design flow. Eleven (11) out of nineteen (19) existing culvert crossings risk overtopping the existing edge of travelled road under 100-yr design flow. Upsizing of these culverts will need to be considered for the proposed drainage conditions.
- All culverts will need to be lengthened for the expanded width of the proposed Mayfield Road improvements.
- Consideration for entrance/driveway culverts will need to be taken into consideration during detailed design to ensure adequate hydraulic conveyance to meet Region of Peel standards.

3 Drainage and SWM Objectives

There are presently no SWM control measures to manage runoff from the Mayfield Road study area. Considerations for Drainage and SWM objectives are based on guidance provided by Ontario Ministry of the Environment's (MOE) Stormwater Management Planning and Design Manual (2003), supplemented by current guidance available from local municipalities, the Region of Peel and Credit Valley Conservation Authority (CVC) including the following overall objectives:

- Maintain existing watershed boundaries and drainage patterns.
- Manage post-development runoff from road ROW *within ROW infrastructure*, as feasible.
- Improve post-development runoff water quality prior to discharge.
- Improve conveyance for reduced flood risks, thus preventing damage to private and public properties.

3.1 Water Quantity and Balance Control

An increase in impervious surface along the study corridor road ROW is expected to increase post-development flows from the road catchments only, with no change to external catchment runoff rates. In order to manage the increase in runoff from road ROW catchments the following water quantity control objectives were determined:

- Consider opportunities for peak flow rate and volume reduction (i.e., post-to-pre as feasible) through the use of SWM/LID features within road ROW.
- Consider LID features designed to infiltrate at least the 5 mm rainfall event.

3.2 Water Quality Control

Due to the increase in impervious surface along the road ROW, an increased loading of suspended solids and hydrocarbons to stormwater runoff may be expected, as such the following objectives were determined:

- Consideration for providing enhanced Level 1 treatment through the long term removal of 80% Total Suspended Solids from all stormwater runoff prior to discharge.

3.3 Drainage Design Criteria

Detailed design of any drainage and stormwater management facilities within the ROW should follow relevant design criteria from the following sources:

- Design, Specifications & Procedures Manual (February 2010) – Public Works, Region of Peel,

- Engineering Design Procedures Manual (April 2013), City of Brampton,
- Subdivision Design Manual (2008), City of Brampton,
- Public Works & Engineering Development Standards, Policies and Guidelines (2009), Town of Caledon
- MTO Highway Drainage Design Standards (January 2008)
- MTO Drainage Management Manual (1997)
- Credit Valley Conservation (CVC) Stormwater Management Guidelines (1996) and Criteria (2012)

4 Proposed Conditions

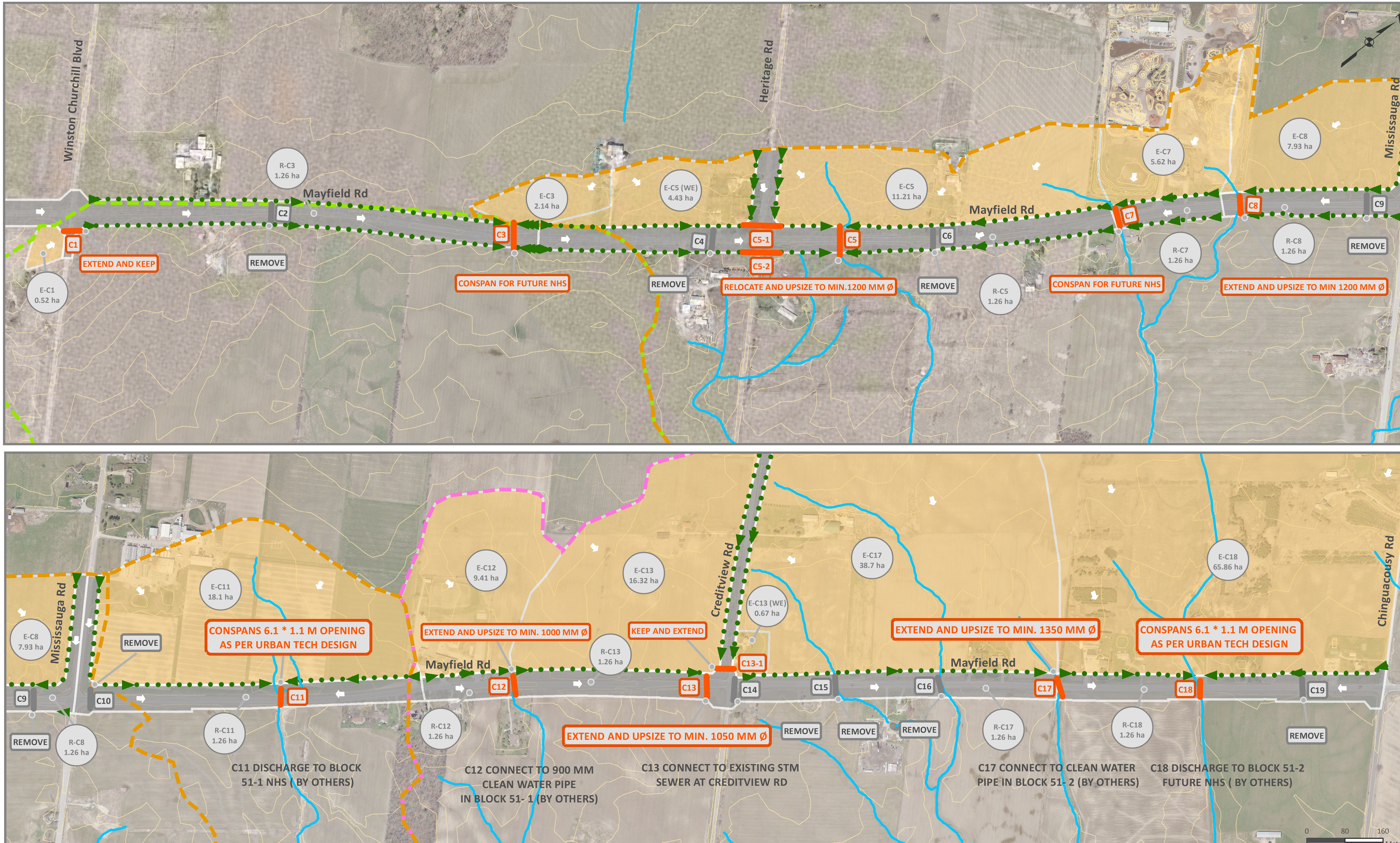
The proposed Mayfield Road ROW is to be widened from the existing rural 2 lane roadway to a rural 4 lane roadway between Winston Churchill Boulevard and Mississauga Road, and urbanized *ultimate* 6 lane roadway between Mississauga Road and Chingacousy Road, increasing the right-of-way from 36 m to an ultimate right-of-way of 50.5 m.

Figure 4-1 shows the proposed external and road sub-catchments and proposed consolidated drainage culvert crossings/outlets.

As shown in **Table 4-1**, post-development runoff from road ROW catchments is expected to increase due to the increased overall imperviousness coverage, with no change in external catchment runoff conditions.

TABLE 4-1 CHANGE IN RIGHT-OF-WAY CATCHMENT CHARACTERISTICS

Location	Catchment ID		Total Impervious Area (ha)		Percent Increase (%)
	Pre-Development	*Post-Development*	*Pre-Development*	*Post-Development*	
Winston Churchill Blvd to Heritage Rd	R-C2	R-C3	0.62	3.45	240%
	R-C3		0.39		
Heritage Rd to Mississauga Rd	R-C4	R-C5	0.26	3.95	295%
	R-C5		0.51		
	R-C6		0.27		
	R-C7	R-C7	0.16	0.63	295%
	R-C8	R-C8	0.21	1.35	272%
	R-C9		0.15		
Mississauga Rd to Creditview Rd	R-C10	R-C11	0.41	2.36	220%
	R-C11		0.33		
	R-C12	R-C12	0.13	0.52	293%
	R-C13	R-C13	0.29	1.30	352%
Creditview Rd to Chinguacousy Rd	R-C14	R-C17	0.29	3.27	277%
	R-C15		0.14		
	R-C16		0.16		
	R-C17		0.17		
	R-C18	R-C18	0.21		275%
	R-C19		0.32	1.99	



Mayfield Road EA

Figure 4-1 Proposed Major System Drainage Plan

Culvert
Culvert (Remove)
Ditch Flow
Contours
External Catchment
ROW Catchment
Credit River Subwatershed Boundary
Fletcher's Creek Subwatershed Boundary
Huttonville Creek Subwatershed Boundary

Hatch Mott MacDonald

4.1 Drainage Patterns

The proposed drainage conditions can be summarized as follows:

- Overland runoff to flow from north to south from adjacent external catchments, and flow into roadside ditches.
- Roadside ditches to also receive drainage from the increased impervious coverage of the widened Mayfield Road ROW.
- Roadside ditches to be enhanced to form a wider and deeper ditch design draining towards outlets via cross-road culverts.
- Cross-road culverts to be lengthened and upsized to accommodate future flows.
- The number of cross-road culvert outlet locations to be consolidated and reduced in order to accommodate planned outlets through future development south of the corridor.

4.2 Outlet Identification and Culvert Crossing Reductions

In order to identify appropriate locations for future culvert crossings/outlets for conveying external catchment drainage from the north, as well as road ROW drainage, approved and proposed development reports/drawings were reviewed for in order to understand future drainage outlet conditions:

- Major and minor drainage drawings of Creditview Road Sub-division, Block 51-1 – Phase 2, Region of Peel, April 2013; and,
- Major and minor drainage drawings of Mount Pleasant Sub-Area 51-2, Urbantech Consulting, March 2015;
- Alloa Reservoir Design Brief & SWM Report for Site Plan Approval, R.J. Burnside, June 2013.

Outlet consolidation was deemed feasible based on assumed road profiles, low points, natural drainage patterns and downstream connections within the study corridor.

Figure 4-1 shows the locations of the proposed culvert crossings/outlets for the widened road. The proposed design has identified nine (9) culvert crossings consolidated from the existing nineteen (19) cross-road culvert locations:

- Between *Winston Churchill Boulevard and Heritage Road*:
  - One (1) consolidated culvert crossing (C3) proposed, while maintaining overall flow patterns, draining low points within the ROW and continuing to drain external lands from the north.
  - No permanent, regulated watercourse identified.
  - No future outlet connections through new developments identified.

- Consideration for culvert upsizing for future animal passage requirements.

- Between *Heritage Road and Mississauga Road*:
  - Three (3) consolidated culvert crossings (C5, C7, C8) proposed, while maintaining overall flow patterns, draining low points within the ROW and continuing to drain external lands from the north.
  - Culverts to continue to feed headwater tributaries of Huttonville Creek.
  - No future outlet connections through new developments identified.
  - Consideration for culvert upsizing for future animal passage requirements at C7.
- Between *Mississauga Road and Creditview Road,*
  - Three (3) consolidated culvert crossings (C11, C12, C13) proposed, while maintaining overall flow patterns, draining low points within the ROW and continuing to drain external lands from the north.
  - Proposed culvert crossings/outlets were constrained to connect to conveyance provisions in place due to subdivision development at *Paradise Homes North West Inc* (Block 51-1).
  - Culvert C11 to convey road ROW and external catchment drainage through new Natural Heritage System (NHS) designated stream corridor in Block 51-1, while considering future animal passage requirements.
  - Culvert C12 to convey drainage from Alloa Reservoir and adjacent sites via downstream 900 mm Clean Water Pipe (CWP) through Block 51-1.
  - Culvert C13 to connect to existing storm sewer network flowing downstream along Creditview Road.
- Between *Creditview Road and Chinguacousy Road,*
  - Two (2) consolidated culvert crossings (C17, C18) proposed, while maintaining overall flow patterns, draining low points within the ROW and continuing to drain external lands from the north.
  - Proposed culvert crossings/outlets were constrained to connect to conveyance provisions in place due to subdivision development at *Mount Pleasant Sub-Area* (Block 51-2).
  - Culvert C17 to convey external catchment drainage through future CWP through Block 51-2. Road ROW drainage to outlet via new downstream storm sewers through Block 51-2.
  - Culvert C18 to convey road ROW and external catchment drainage through future Natural Heritage System (NHS) designated stream corridor in Block 51-2, while also considering future animal passage requirements.

4.3 Runoff Estimation

In order to design proposed drainage systems and SWM features for the widened Mayfield Road ROW, the post-development road ROW and external catchments were delineated based on proposed consolidated outlet locations.

Hydrologic parameters for the proposed road ROW and external catchments were adjusted based on new paved areas throughout the study area as shown in **Table 4-2** and used for hydrologic peak runoff estimation.

TABLE 4-2 PROPOSED CATCHMENT CHARACTERISTICS

Location	Outlet	Catchment	Area (ha)	Impervious-ness	CN	Time to Peak (hr)
Winston Churchill Blvd to Heritage Rd	C1	E-C1	0.52	0%	76	0.24
	C3	E-C3	2.14	5%	77	0.40
		R-C3	6.73	51%	87	1.02
	C5	E-C5	11.21	2%	76	0.69
		E-C5(WE)	4.43	5%	77	0.39
		R-C5	7.16	55%	88	0.49
Heritage Rd to Mississauga Rd	C7	E-C7	5.62	2%	79	0.53
		R-C7	1.15	55%	88	0.27
	C8	E-C8	7.93	0%	76	0.63
		R-C8	2.64	51%	87	0.37
Mississauga Rd to Creditview Rd	C11	E-C11	18.10	10%	78	0.49
		R-C11	4.44	53%	88	0.46
	C12	E-C12	9.41	10%	78	0.51
		R-C12	1.01	52%	87	0.22
	C13	E-C13	16.32	10%	78	0.72
		E-C13(WE)	0.67	40%	85	0.21
		R-C13	2.27	57%	89	0.31
Creditview Rd to Chinguacousy Rd	C17	E-C17	38.70	10%	76	0.84
		R-C17	5.54	59%	89	0.45
	C18	E-C18	65.86	10%	76	0.87
		R-C18	3.82	52%	87	0.40

Table 4-3 summarizes the Visual Otthymo modelled existing peak runoff from each contributing catchment under proposed conditions for various design storms (i.e., 2- to 100-yr storm events).

TABLE 4-3 PROPOSED CATCHMENT PEAK RUNOFF

Location	Outlet	Catchment ID	Area (ha)	Design Flow (cms)					
				2-yr	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-y*
Winston Churchill Blvd to Heritage Rd	C1	E-C1	0.52	0.016	0.028	0.035	0.05	0.058	0.067
	C3	E-C3	2.14	0.048	0.084	0.106	0.15	0.175	0.202
		R-C3	6.73	0.63	0.886	1.044	1.317	1.481	1.701
	C5	E-C5	11.21	0.164	0.29	0.369	0.522	0.612	0.705
		E-C5(WE)	4.43	0.101	0.177	0.225	0.316	0.37	0.425
		R-C5	7.16	0.818	1.157	1.356	1.757	1.974	2.192
Heritage Rd to Mississauga Rd	C7	E-C7	5.62	0.115	0.199	0.25	0.348	0.405	0.464
		R-C7	1.15	0.158	0.218	0.254	0.342	0.384	0.427
	C8	E-C8	7.93	0.123	0.219	0.278	0.393	0.461	0.531
		R-C8	2.64	0.303	0.425	0.497	0.646	0.725	0.804
Mississauga Rd to Creditview Rd	C11	E-C11	18.1	0.372	0.646	0.816	1.14	1.331	1.527
		R-C11	4.44	0.497	0.704	0.825	1.019	1.142	1.335
	C12	E-C12	9.41	0.188	0.327	0.413	0.578	0.675	0.774
		R-C12	1.01	0.127	0.182	0.212	0.288	0.324	0.36
	C13	E-C13	16.32	0.257	0.447	0.564	0.791	0.923	1.059
		E-C13(WE)	0.67	0.034	0.056	0.068	0.092	0.106	0.12
		R-C13	2.27	0.305	0.433	0.505	0.62	0.693	0.839
Creditview Rd to Chinguacousy Rd	C17	E-C17	38.7	0.493	0.874	1.11	1.575	1.847	2.127
		R-C17	5.54	0.726	0.996	1.21	1.491	1.669	1.848
	C18	E-C18	65.86	0.82	1.452	1.844	2.614	3.065	3.531
		R-C18	3.82	0.441	0.621	0.755	0.943	1.058	1.174

Hydrologic modelling output for the 100-year event is included in the **Appendix B**.

Table 4-4 summarizes the *increase* in 100-yr design flows from *road ROW* catchments under proposed conditions due to increased paved imperviousness as compared to existing conditions.

TABLE 4-4 COMPARISON OF EXISTING VS PROPOSED 100-YR RUNOFF FLOWS

Location	Catchment ID		Area (ha)	Increased Impervious-ness	100-yr flow (cms)		
	Existing	*Proposed*			*Existing*	*Proposed*	*Percent Increase*
Winston Churchill Blvd to Heritage Rd	R-C2, R-C3	R-C3	6.73	240%	0.913	1.701	86%
Heritage Rd to Mississauga Rd	R-C4, R-C5, R-C6	R-C5	7.16	295%	1.122	2.192	95%
	R-C7	R-C7	1.15	295%	0.181	0.427	136%
	R-C8, R-C9	R-C8	2.64	272%	0.497	0.804	62%
Mississauga Rd to Creditview Rd	R-C10, R-C11	R-C11	4.44	220%	0.717	1.335	86%
	R-C12	R-C12	1.01	293%	0.211	0.36	71%
	R-C13	R-C13	2.27	352%	0.37	0.839	127%
Creditview Rd to Chinguacousy Rd	R-C14, R-C15, R-C16, R-C17	R-C17	5.54	277%	0.902	1.848	105%
	R-C18, R-C19	R-C18	3.82	275%	0.616	1.174	91%

4.4 Proposed Culvert Crossing Analysis

Table 4-5 summarizes the proposed culvert crossing sizes required to allow the post-development 100-yr design flow from the proposed road and external catchments to be safely conveyed while providing adequate freeboard, as summarized from the hydraulic analysis conducted (see **Appendix C**) based on preliminary design inverts and road profiles available at the time of the study.

TABLE 4-5 PROPOSED CULVERTCROSSING SIZING

Location	Structure ID	Contributing Area (ha)	100-yr Design Flow (cms)	Dimension (mm)		Freeboard
				Pre-Development	*Post-Development*	> 1 m?
Winston Churchill Blvd to Heritage Rd	C3	9.39	1.835	450	1050 [a]	Yes
Heritage Rd to Mississauga Rd	C5	22.80	2.571	525	1200	Yes
	C7	6.77	0.588	600	1000 [a]	Yes
	C8	10.57	0.957	600	1200	Yes
Mississauga Rd to Creditview Rd	C11	22.54	1.91	750	6100 x 1100 [b]	Yes
	C12	10.42	0.833	600	1000	Yes
	C13	19.26	1.212	500	1050	Yes
Creditview Rd to Chinguacousy Rd	C17	44.24	2.343	600	1350	Yes
	C18	69.68	3.671	750	6100 x 1100 [b]	Yes

a – Consider box culvert structure (i.e., 6.1 m x 1.1 m) to allow for animal passage to potential future NHS

b – Conspan box culvert structure to meet animal passage requirements to NHS

4.5 Proposed Drainage Plan

In order to adequately convey road ROW drainage during minor and major storm events to the identified outlets **Table 4-6** summarizes the proposed minor and major drainage systems to be implemented along the study corridor. In general,

- Drainage from *rural* road cross-sections is to be conveyed via road-side grassed swales along the road ROW to outlets/culvert crossings for all minor and major flows.
- Drainage from *urban* curb & gutter road cross-sections is to be drained via catchbasin/storm sewer networks for the minor system flow (minimum 10-yr design flow), while major flows will follow the road system to outlets.

Figure 4-1 shows the major system flow path to outlets, while **Figure 4-2** describes the minor system design for the ultimate urban cross-section between Mississauga Road and Chinguacousy Roads. It should be noted that between Mississauga Road and Chinguacousy Road, even for the ultimate urban cross-section, a road-side ditch along the north-side will be required to direct and convey external drainage to culvert crossing outlets along the road ROW.

Table 4-7 summarizes the minor system storm sewer sizing required to convey the 10-yr flow for the ultimate condition urban cross-section between Mississauga Road and Chinguacousy Road.

TABLE 4-6 PROPOSED DRAINAGE PLAN FOR ROAD ROW

Location	Proposed Lane/ Cross-Section	Minor System	Major System
Winston Churchill Blvd to Heritage Rd	4-lane Rural	- All minor/major system flows to be directed to roadside enhanced grassed swales for conveyance and outlet to culverts C3	
Heritage Rd to Mississauga Rd	4-lane Rural	- All minor/major system flows to be directed to roadside enhanced grassed swales for conveyance and outlet to culverts C5, C7, and C8	
Mississauga Rd to Creditview Rd	*Interim* – 5-lane Rural/Urban	- *North Side:* Rural section where minor flows are directed to roadside grassed swales to outlets. - *South Side:* Urban curb & gutter, catchbasins to convey minor flows (10-yr) to stormsewers/LIDs.	- *North Side:* Rural section where major flows are directed to roadside grassed swales to outlets. - *South Side:* Major flows in excess of minor system capacity travel along road system to outlets.
	Ultimate – 6-lane Urban	- Curb & gutter, catchbasins to convey minor flows (10-yr) to stormsewers/LIDs.	- Major flows to be conveyed along road system to outlets.
Creditview Rd to Chinguacousy Rd	*Interim* - 5-lane Rural/Urban	- *North Side:* Rural section where minor flows are directed to roadside grassed swales to outlets. - *South Side:* Urban curb & gutter, catchbasins to convey minor flows (10-yr) to stormsewers/LIDs.	- *North Side:* Rural section where major flows are directed to roadside grassed swales to outlets. - *South Side:* Major flows in excess of minor system capacity travel along road system to outlets.
	Ultimate - 6-lane Urban	- Curb & gutter, catchbasins to convey minor flows (10-yr) to stormsewers/LIDs.	- Major flows to be conveyed along road system to outlets.

TABLE 4-7 PROPOSED MINOR SYSTEM STORM SEWER SIZING

Location	Sewershed Segment	Drainage Area (ha)	Pipe Sizing Range
Mississauga Rd to Creditview Rd	C11-A	1.647	375 to 600 mm Ø
	C11-B	1.171	375 to 525 mm Ø
	C12	0.73	375 mm Ø
	C13	0.198	375 to 525 mm Ø
Creditview Rd to Chinguacousy Rd	C17	2.83	375 to 750 mm Ø
	C18-A	1.14	375 to 525 mm Ø
	C18-B	0.68	375 to 450 mm Ø

Sewer were sized based on 10-yr design flow as per Region of Peel Public Works Design, Specification & Procedures Manual

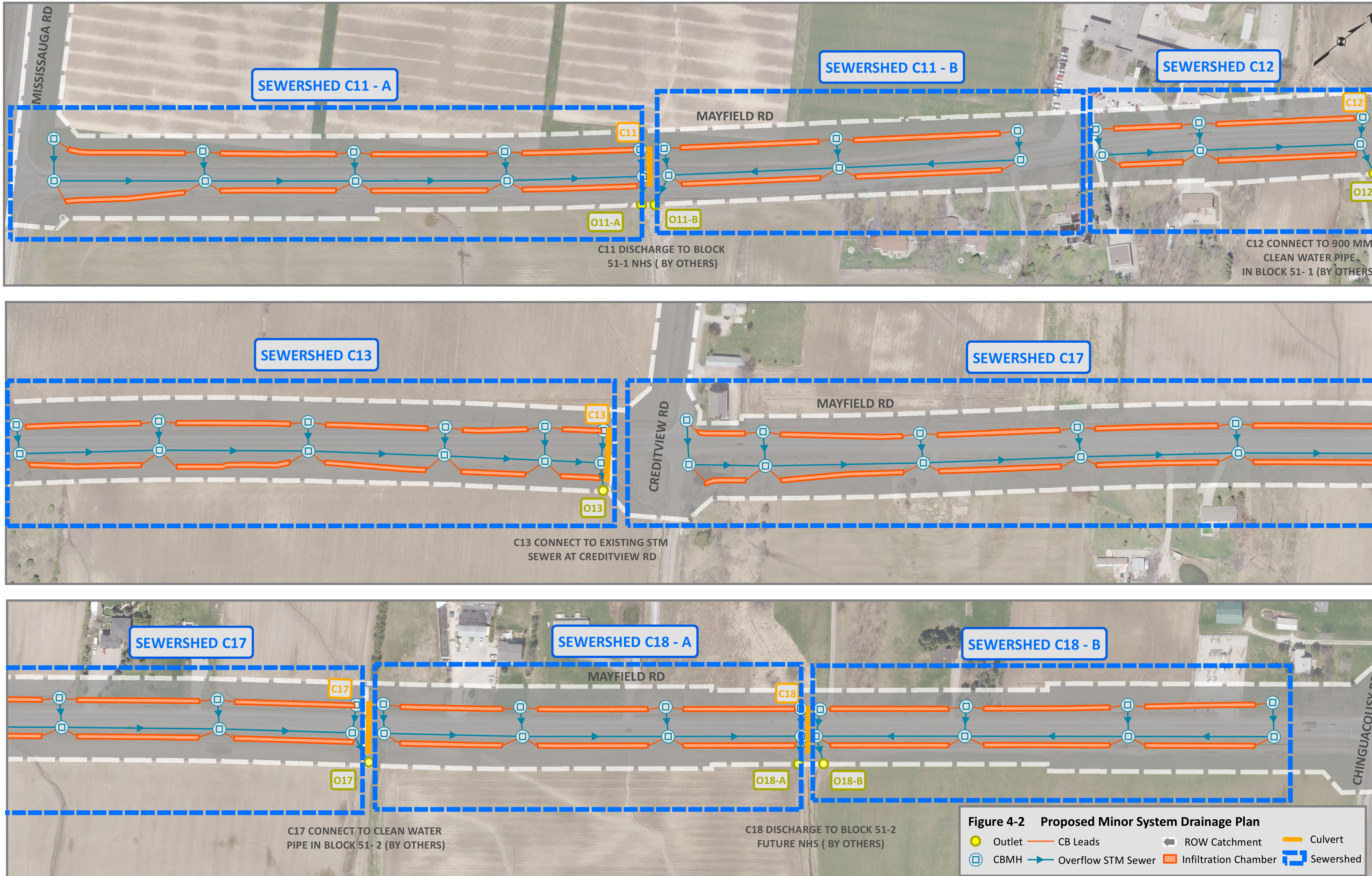


Figure 4-2 Proposed Minor System Drainage Plan

4.6 Proposed SWM Plan

In order to mitigate the quantity and quality impacts of the increased runoff from the widened road ROW, it should be recognized that the applicability of traditional SWM measures is limited due to the linear nature of the study corridor with multiple drainage outlets. In addition, surface space availability along the road ROW for SWM features is also limited.

4.6.1 SWM/LID Options Assessment

Table 4-8 presents traditional SWM measures and Low Impact Development (LID) options considered for the study corridor. The applicability of each option was assessed based on:

- Potential to manage stormwater runoff within road ROW and mitigate water quality and quantity impacts
- Availability of area (surface and sub-surface) within the road ROW
- Road cross-section type (i.e., rural vs urban)
- Connectivity with proposed drainage conveyance infrastructure and outlets
- Overall cost-effectiveness, operating and maintenance cost

The assessment of options concluded that water quantity control for post-to-pre peak flow reduction is not feasible due to the requirement of multiple, large scale infrastructure of end-of-pipe storage facilities (i.e., SWM pond, storage tanks) along the linear road ROW at each outlet.

Therefore, in order to meet drainage and SWM objectives for the proposed road widening, a *treatment train approach* through the implementation of SWM controls in combination with linear Low Impact Development (LID) features will be considered. LID features encourage runoff reduction through infiltration to provide water quantity and balance benefits, along with pollutant settling for water quality benefits.

TABLE 4-8 ASSESSMENT OF APPLICABLE ROAD ROW SWM/LID OPTIONS

SWM/LID Control Measures	Type of Control		Applicability to	
	Water Quantity	***Water Quality***	***Winston Churchill Blvd to Mississauga Rd***	***Mississauga Rd to Chinguacousy Rd***
SWM Pond/Wetland	Most Effective Peak Flow Reduction	Most Effective Pollutant Removal	Not feasible >> End-of pipe treatment, multiple outlets along ROW require several ponds, large footprint requirement beyond ROW, high cost and maintenance	Not feasible >> End-of pipe treatment, multiple outlets along ROW require several ponds, large footprint requirement beyond ROW, high cost and maintenance
Oversized Storage Pipe	Runoff Reduction	N/A	Not applicable >> No storm sewers	Limited feasibility >> Potential clearance and outlet connection issues, high cost and maintenance
Oil-Grit Separator	N/A	Moderately Effective, Requires Treatment Train	Not applicable >> No storm sewers	Recommended at each outlet from storm sewer
Pervious Pavement, Porous Asphalt	Runoff Reduction	Moderate Pollutant Removal	Recommended for use along multi-use path	Recommended for use along multi-use path
Enhanced Grassed Swales	Peak Flow Attenuation Only	Moderate Pollutant Removal	Recommended for drainage conveyance from rural cross-section	Recommended along north-side during interim conditions
Filter Strips	N/A	Pretreatment Only	Limited feasibility >> Limited space availability within ROW	Limited feasibility >> Limited space availability within ROW
Bioretention Swales	Peak Flow and Volume Reduction	Effective Pollutant Removal	Potentially Feasible >> If 4-lane is permanent, alternative to EGS	Not applicable >> Urban cross-section
Infiltration Trench	Peak Flow and Volume Reduction	Somewhat Effective Pollutant Removal with Potential for GW Contamination	Potentially Feasible >> If 4-lane is permanent, alternative to EGS	Not applicable >> Urban cross-section
Underground Detention (Infiltration Chambers, Perforated Pipe Exfiltration System)	Peak Flow and Volume Reduction	Effective Pollutant Removal	Not Feasible >> Chambers under road not recommended. Limited space availability within ROW.	Recommended under multi-use path connected to minor system

4.6.2 Proposed SWM/LID Strategy

Based on the assessment of applicable SWM/LID options above, the following SWM/LID measures (as shown in Table 4-9) are recommended to be implemented to treat, reduce and infiltrate road ROW runoff from design events within the corridor as much as feasibly possible in order to meet relevant water quality and quantity control:

- Between *Winston Churchill Blvd and Mississauga Road* for the 4-lane rural cross-section:
    - *Water quantity/balance* benefits to be achieved through the **wide enhanced grassed swales** (recommended to have 1.5 m wide flat bottoms, minimum 2.5:1 side slopes and maximum longitudinal slopes of 1%) to encourage peak flow attenuation prior to discharge, as well as temporary ponding during storm events.
        - If no further future widening of the road is planned, LID measures such as bio-swales with engineered filter soil media and sub-surface storage for runoff detention and infiltration can be considered as a permanent measure instead of enhanced grassed swales.
    - *Water quality* benefits to be achieved through wide enhanced grassed swales to encourage pollutant settling prior to discharge.
    - Additional water quality and quantity benefits can be achieved through the use of check dams and or low grade weirs across the enhanced grassed swales. Check dams and low grade weir structures will promote pollutant settlement and reduce flow velocity within the enhanced grass swales that ultimately improves the effectiveness of water quality treatment.
    - By considering the possibility of future subdivision developments, a **SWM pond** is the most feasible *water quality* and water *quantity* control measure to be recommended within this area.
- Between *Mississauga Road and Chinguacousy Road* for the ultimate condition 6-lane urban cross-section, a treatment train approach has been developed to include:
    - *Water quantity control* through the use of linear LID sub-surface **underground detention** (e.g., infiltration chambers, perforated pipe exfiltration galleries, etc.) connected to catchbasins and storm sewers drainage system (see **Figure 4-3** for typical schematic):
        - Catchbasins at curb & gutter to capture road ROW runoff from up to the 10-yr storm event and direct to –
        - Underground detention located under multi-use paths sized (see Section 4.6.3) for complete 10-yr event storage and infiltration.

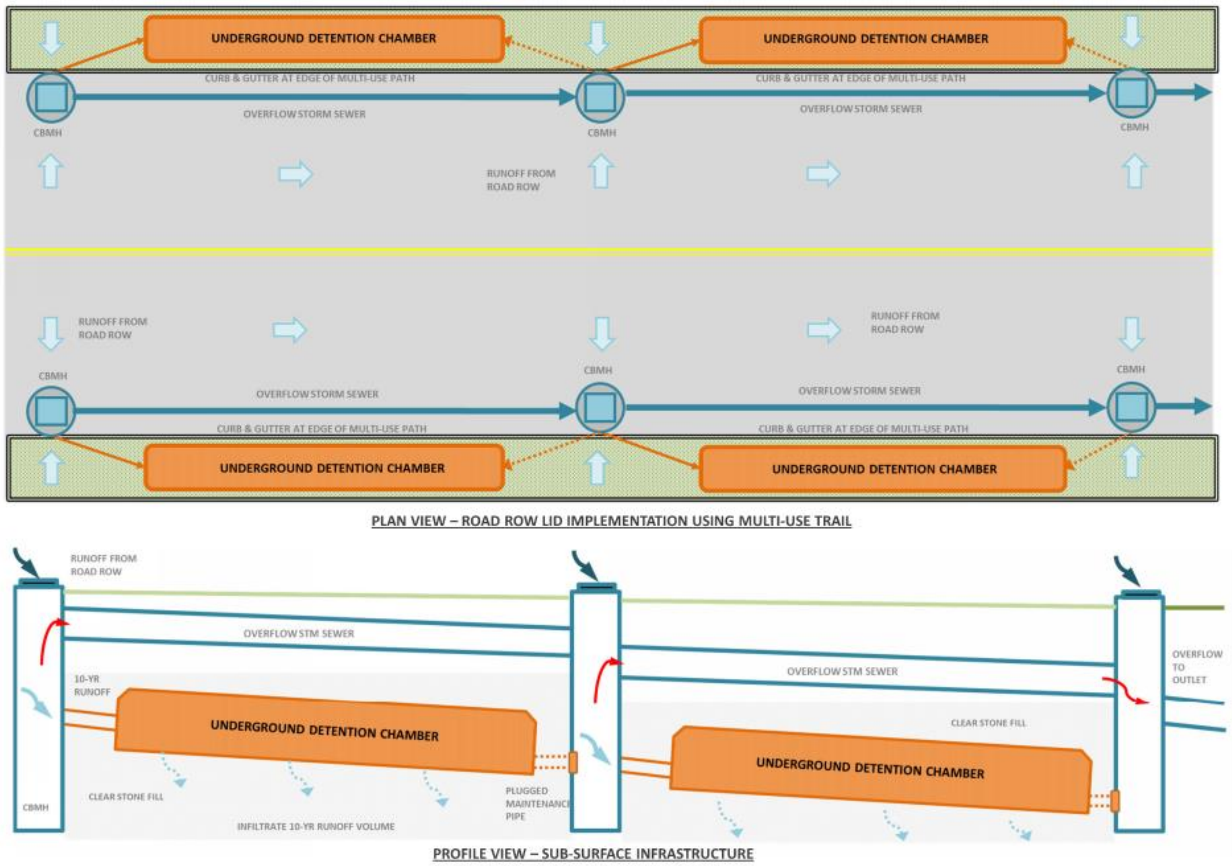
- Overflows from less frequent, larger storm events (> 10-yr) are expected to flow through storm sewers to outlets (i.e., culvert crossing/connections).

- *Water quality control* of runoff from paved surfaces is to be implemented through treatment train approach using:
  - Catchbasin inserts at curb & gutter prior to directing runoff to,
  - Sub-surface underground detention to encourage pollutant settling.
  - Any overflows from the underground detention and end-of-pipe *OGS* device prior to discharge to outlets.
- Additional water quantity and quality control may be provided for runoff from sewersheds C12, C13 and C17 by downstream SWM ponds in proposed Block 51-2.

TABLE 4-9 PROPOSED ROAD ROW SWM/LID CONTROL PLAN

Location	Proposed Cross-sections	Proposed Water Quality Control Measures
Winston Churchill Blvd to Heritage Rd	4-lane rural	Enhanced Grass Swale
Heritage Rd to Mississauga Rd	4-lane rural	Enhanced Grass Swale
Mississauga Rd to Creditview Rd	*Interim* – 5-lane mixed rural/urban	*North Side: Enhanced Grass Swale on the. South Side: Underground Detention Chamber + OGS Unit*
	Ultimate – 6-lane Urban	*Underground Detention Chamber + OGS Unit*
Creditview Rd to Chinguacousy Rd	*Interim – 5-lane mixed rural/urban*	*North Side: Enhanced Grass Swale on the. South Side: Underground Detention Chamber + OGS Unit*
	Ultimate - 6-lane urban	*Underground Detention Chamber + OGS Unit*

FIGURE 4-3 SCHEMATIC OF LINEAR LID FEATURE (UNDERGROUND DETENTION)



4.6.3 LID Design Considerations and Storage Requirements

For the purpose of this EA, the design of LID features along the road ROW considered the following:

- Underground detention to be provided via manufactured infiltration chambers (e.g., Stormtech, StormTank etc.) embedded within clearstone under multi-use path to maximize storage volume availability within footprint.
- Each underground detention chamber unit dimension assumed to be 40 m Long x 2 m Wide x 1.5 m Deep located between catchbasin-manholes.
- Underground detention chambers are to be connected to catchbasin-manholes at both inlet and outlet. The outlet is to be plugged to encourage complete infiltration of design flows and be available for operations/routine maintenance (i.e., flushing of chambers following sediment accumulation/clogging).

- Due to the low permeability of sandy-silty-clay subgrade soils along the study corridor, a very low exfiltration rate from the underground detention chambers is expected. As such stormwater detained in the chambers is expected to exfiltrate into subgrade soils over a prolonged period *following* a storm event, with no immediate outflow.
- Based on groundwater depths reported in the geotechnical investigation, LID features may feasibly be located at depths no greater than 2.5 below the ground surface in order to avoid groundwater seepage and storage loss.
- During detailed design, location-specific soil infiltration testing will be required to optimize underground detention chamber sizing. Additional boreholes at LID feature locations may be considered to understand shallow groundwater water levels that may impact the functionality of LIDs.
- At the detailed design stage, consideration for alternative LID configurations including perforated pipe exfiltration systems instead of underground detention, pretreatment via inlet biofiltration products (e.g., Filterra), etc. can also be explored at this stage. Implementation of engineered soils to compensate for the moderate to poor native soil drainage conditions may also be required.
- Discussions with the Region's operations staff will be required for understanding and developing regular maintenance procedures of LID features.

Table 4-10 summarizes the volumetric sizing requirements and total length of linear LID underground chambers required on a road ROW catchment basis, conservatively assuming the detention of the entire design storm runoff volume from impervious paved surfaces for the 25-mm quality, 10-yr and 100-yr storm events. No exfiltration/infiltration is assumed.

The table indicates that the implementation of linear LID underground chambers may feasibly manage, detain and infiltrate runoff from the 10-yr design storm. All runoff from storm events greater than the 10-yr return period is expected to discharge via overflow storm sewers to outlets.

TABLE 4-10 ROAD ROW LINEAR LID STORAGE AND LENGTH REQUIREMENT

Location	Road ROW Catch ID	Area (ha)	Avail. ROW Length (m)	Runoff Coef C	Storage Volume Required [a]			Total Length of LID Required [b]		
					25 mm	*10 y*	*100 y*	*25 mm*	*10 y*	*100 y*
Winston Churchill Blvd to Heritage Rd [c]	R-C3	3.43	1187	0.9	1514	5451	8177	240	800	1160
Heritage Rd to Mississauga Rd [c]	R-C5	3.94	1124	0.9	1611	5800	8699	280	920	1360
	R-C7	0.63	234	0.9	259	932	1397	40	160	240
	R-C8	1.35	358	0.9	594	2138	3208	120	320	480
Mississauga Rd to Creditview Rd [d]	R-C11	2.36	725	0.9	531	1912	2867	160	560	800
	R-C12	0.52	193	0.9	118	423	635	40	120	200
	R-C13	1.30	409	0.9	292	1053	1579	120	320	440
Creditview Rd to Chinguacousy Rd [d]	R-C17	3.27	730	0.9	735	2645	3967	240	760	1120
	R-C18	1.99	689	0.9	448	1614	2421	160	480	680

a - LID storage volume requirement based on total runoff depth over impervious surface

b - Each LID underground detention chamber assumed to be 40 m L x 2 m W x 1.5 m D with an overall void ratio of 0.6

c - Potential bioswale storage requirement for permanent LID feature, if no further lane widening is planned

d - Proposed underground detention chamber storage requirement

5 Conclusion

This report summarizes the Drainage and Stormwater Management of approximately 5.6 km of Mayfield Road from Winston Churchill Boulevard to Chinguacousy Road.

In order to provide adequate conveyance for drainage across the study corridor for road ROW and external catchments, as well as to connect to future development drainage infrastructure, the proposed drainage plan includes:

- Between *Winston Churchill Boulevard and Mississauga Road*
  - Enhanced grassed swales for drainage conveyance for the 4-lane rural road ROW cross-section, as well as external drainage;
  - Four (4) consolidated cross-culverts upsized to convey at least the 100-yr design flows to downstream ditches/swales, with the provision for further upsizing of two (2) of these culverts to meet future natural heritage systems (NHS)/animal passage access requirements.
- Between *Mississauga Road* and *Chinguacousy Road*
  - External drainage north of the road ROW to be collected via swales to culvert crossings.
  - Road ROW drainage for the 6-lane ultimate condition to be conveyed via curb & gutter to catchbasins discharging into sub-surface storm sewer systems eventually connecting to downstream development storm sewers or proposed NHS.
  - Five (5) consolidated cross-culverts upsized to convey at least the 100-yr design flows to downstream proposed development conveyance infrastructure within Block 51-1 and Block 51-2, with two (2) of these culverts further upsized to meet proposed NHS/animal passage access requirements.
- All downstream conveyance features (i.e., clean water pipes, channel dimensions) from proposed outlet culverts to be developed under future development plans should be adequately sized to convey the 100-yr flow at a minimum as estimated in this study.

The following SWM/LID measures are proposed to be implemented to treat, reduce and infiltrate road ROW runoff from design events within the corridor as much as feasibly possible in order to meet water quality and quantity control objectives:

- Between *Winston Churchill Blvd and Mississauga Road*:
  - *Water quantity/balance* benefits to be achieved through the wide enhanced grassed swales to encourage peak flow attenuation prior to discharge, as well as temporary ponding during storm events. If no further future widening of the road is planned, LID measures such as bio-swales with sub-surface storage can be considered as a permanent measure instead of enhanced grassed swales.

    - *Water quality* benefits to be achieved through wide enhanced grassed swales to encourage pollutant settling prior to discharge.

- Between *Mississauga Road and Chinguacousy Road* for the ultimate condition 6-lane urban cross-section:
    - Water quantity control through the use of linear LID sub-surface underground detention chambers located under multi-use paths designed to capture and detain road ROW runoff from impervious areas via catchbasins from the 10-yr storm event. Runoff from less frequent, larger events (> 10-yr) is expected to overflow through storm sewers to outlets (i.e., culvert crossing/downstream development sewer connections).
    - Water quality control of runoff from paved surfaces is to be implemented through treatment train approach using catchbasin inserts at curb & gutter prior to directing runoff to underground detention chambers to encourage pollutant settling. Any overflows from the underground detention will be treated via end-of-pipe OGS devices prior to discharge to suitable outlets.
    - Additional water quantity and quality control may be provided by proposed downstream SWM ponds in Block 51-2 for runoff from portions of road ROW sewersheds connected to downstream development storm sewers.

During the detailed design stage, all applicable Region, MOECC, CVC and TRCA standards for drainage system design should be followed. All hydraulic (i.e., HEC-RAS and CulvertMaster) models should be updated for evaluation based on final design of road profiles, bridge design and comprehensive survey data of the stream corridor and adjacent land topography.

At the detailed design stage, soil infiltration testing at proposed LID feature locations should be conducted in order to determine exfiltration rates from the underground detention chambers and optimize chamber sizing. Additional boreholes at LID feature locations may be considered to understand shallow groundwater water levels that may impact the functionality of LIDs. Erosion and sedimentation control measures must be implemented during construction.

Appendix A

Field Culvert Inspection Memo

A-1 Introduction

The Region of Peel has undertaken a Class C Environmental Assessment for Mayfield Road from Chinguacousy Road west to Winston Churchill Boulevard to evaluate alternative options for the widening and intersection improvements.

The Mayfield Road EA study corridor spans an approximate 5.6 km length between the borders of the Town of Caledon and the City of Brampton. The existing 36 m road right-of-way will expand to an ultimate 50.5 m ultimate right-of-way by 2031.

The study location features a series of approved residential developments over the short and long term, which includes drainage management strategies.

The existing culvert structures have been inspected from a physical perspective to aid in the future design of the Ultimate Mayfield Road condition.

A-2 Purpose

This technical memorandum provides field observations to enable a design basis and outlines the current culvert within the Mayfield Road EA drainage design.

The purpose of identifying the outlets of the Mayfield Road EA study area will provide a framework for the road design plan and profile of the ultimate 6 lane configuration.

The primary objective of this memo is to provide a summary of inspected functional conditions of existing culverts along the Mayfield road ROW.

A-3 Observations

The Mayfield Road inspection found 20 non-structural culverts (both HDPE and CSP in material type). The following table summarizes the culverts from the field work:

TABLE A-1 – CULVERT LOCATION ANALYSIS SUMMARY

Culvert #	Location	Size of Culvert [mm]	Classification and Erosion?	Comments
1	At Winston Churchill Boulevard and Mayfield Road intersection	300	Single intermittent flow culvert	Low flow channel, no clearly defined watercourse, inlet submerged (C1).
2	417m east of Winston Churchill Boulevard along Mayfield Road	750	Single intermittent flow culvert	No major comments at this location (C2).
3	517m west of Heritage Road along Mayfield Road	450	Single intermittent flow culvert	No major erosion of note at this location, 10% blockage located at the outlet of the culvert (C3).
4	100m west of Heritage Road along Mayfield Road	600	Single intermittent flow culvert	No major erosion noted at this location, substrate 25% or less at this location with no backwater (C4).
5	245m east of Heritage Road along Mayfield Road	525	Single intermittent flow culvert	Erosion at the outlet as a result of bank slumping and fill slope erosion. Inlet HDPE extension exposed by 750mm due to erosion around pipe (C5).
6	360m east of Heritage Road along Mayfield Road	450	Single intermittent flow culvert	No major erosion or concerns at this culvert (C6).
7	612m west of Mississauga Road along Mayfield Road	600	Single intermittent flow culvert	No major erosion or concerns at this culvert (C7).
8	357m west of Mississauga Road along Mayfield Road	600	Single intermittent flow culvert	No major erosion or concerns at this culvert (C8).
9	90m west of Mississauga Road along Mayfield Road	450	Single intermittent flow culvert	Outlet of the culvert broken and cracked as a result of compaction and settling over the culvert, lack of coverage potentially (C9).
10	At east side of the Mississauga Road	600	Single intermittent flow	~0.1m of bank slump erosion around the outlet of the culvert

Culvert #	Location	Size of Culvert [mm]	Classification and Erosion?	Comments
	and Mayfield Road intersection		culvert	(C10).
11	428m east of Mississauga Road along Mayfield Road	750	Single intermittent flow culvert	Inlet and Outlet erosion protection/ treatment. Some minor erosion along the road surface resulting in some ditch gullying (C11).
12	444m west of Creditview Road along Mayfield Road	600	Single intermittent flow culvert	
13	50m west of Creditview Road along Mayfield Road	-	-	Culvert 13 could not be located, potentially re-located or filed in due to the development and lot grading on the south side of Mayfield Road (C13).
14	At Creditview Road and Mayfield Road Intersection.	450	Single intermittent flow culvert	Minor ditch gullies at both the inlet and the outlet of the culvert (C14).
15	224m east of Creditview Road along Mayfield Road	600	Single intermittent flow culvert	Outlet is considerably damaged, erosion at the bank of the outlet, noted bank slump and till slope. Also noted scour (C15).
16	440m east of Creditview Road along Mayfield Road	600	Single intermittent flow culvert	Substrate, sand at the inlet due to erosion at the bank slump and ditch gullying (C16).
17	680m west of Chinguacousy Road along Mayfield Road	2x600	Double intermittent flow culvert	Double barrel culverts, inlet has two culverts beside each other while the outlet has the westerly culvert filled in and unprotected (C17).
18	383m west of Chinguacousy Road along Mayfield Road	750	Single intermittent flow culvert	Inlet, has a noted wetland area displayed some bank erosion. Outlet scours around the road due to erosion (C18).
19	171m west of Chinguacousy Road along Mayfield Road	600	Single intermittent flow culvert	Inlet, has a noted wetland area displayed some bank erosion. Outlet scours around the road due to erosion (C19).
20	117m east of Chinguacousy Road along Mayfield Road	750	Single intermittent flow culvert	Inlet, has a noted wetland area displayed some bank erosion. Outlet scours around the road due to erosion (C20).

A-4 Recommendations

The following notes are a list of specific recommendations as a result of the existing culvert inspection:

- Replace all CSP culverts located within the project area.
- Replace all damaged HDPE pipes, while ensuring that correct amount of coverage is featured at the culvert.
- Remove debris and potential blockages from all inlets and outlets.
- Stabilize the disturbed soil along the south side of the roadway to prevent further erosion around the outlets of the culverts.

A-5 Photo Documentation

Culvert photos with inspection observation comments are documented below.

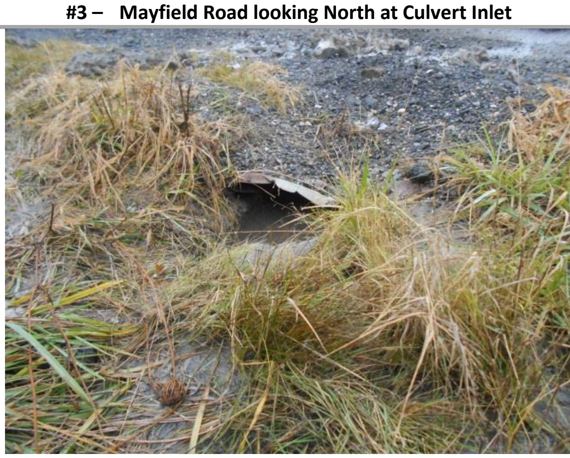
Culvert 1 (C1)

#1 – Winston Churchill Boulevard looking South

#2 – Winston Churchill Boulevard looking North.

#3 – Mayfield Road looking North at Culvert Inlet

#4 – Mayfield Road looking West at Outlet.



#5 – Inlet

#6 - Outlet

Comments:

Severly damaged, circular pipe damaged to form an elliptical pipe. Note rusted inlet and outlets. Damaged wires located within the ditch presenting a potential electrical hazard. Ponding as per Photo C1.1.

Culvert 2 (C2)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

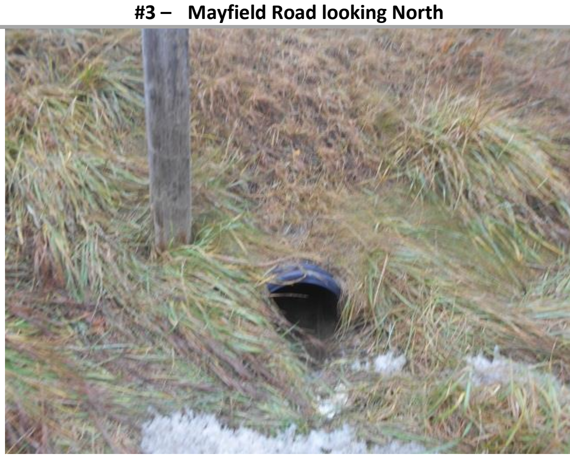
Culvert 3 (C3)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.



#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 4 (C4)

 **#1 – Mayfield Road looking West**	 **#2 – Mayfield Road looking East.**
 **#3 – Mayfield Road looking North**	 **#4 – Mayfield Road looking South.**
 **#5 – Inlet**	 **#6 - Outlet**

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands. Noted, 150mm CSP drainage pipe at the inlet as per C4.7.

Culvert 5 (C5)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

CSP cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 6 (C6)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land and residential grassed property to southern wetlands.

Culvert 7 (C7)

#1 – Mayfield Road looking West.

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North.

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 8 (C8)

#1 – Mayfield Road looking West.

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North.

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 9 (C9)

#1 – Mayfield Road looking West.

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North.

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 10 (C10)

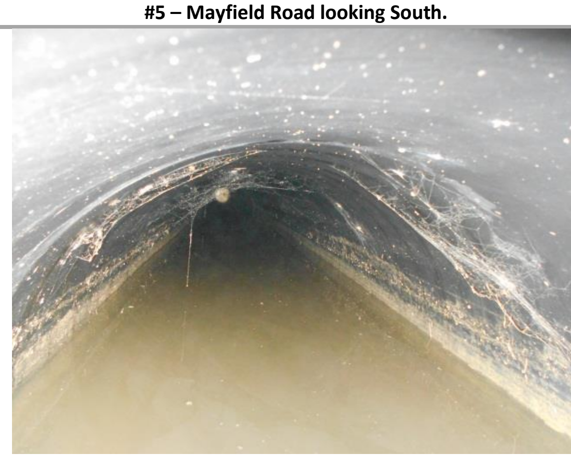
#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#4 – Mayfield Road looking North

#5 – Mayfield Road looking South.

#7 – Inlet



#8 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 11 (C11)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands. Rip-rap and erosion control protection around the inlet and outlets of the culvert.

Culvert 12 (C12)

#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 14 (C14)

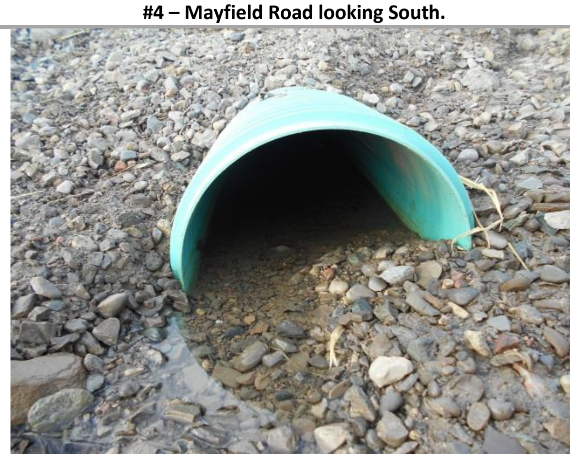
#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

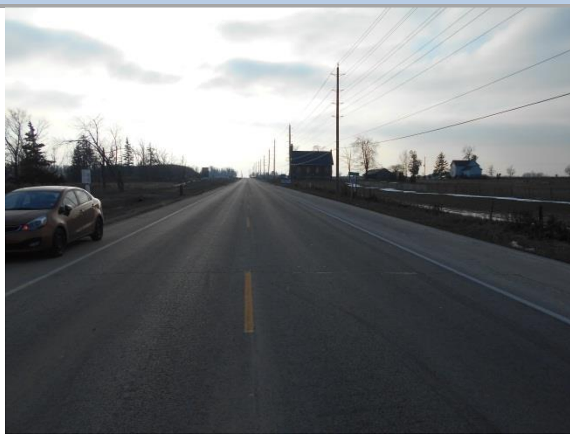


#6 - Outlet

Comments:

CSP culvert with a PVC extension, draining agricultural land and north to south ditches.

Culvert 15 (C15)



#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 16 (C16)

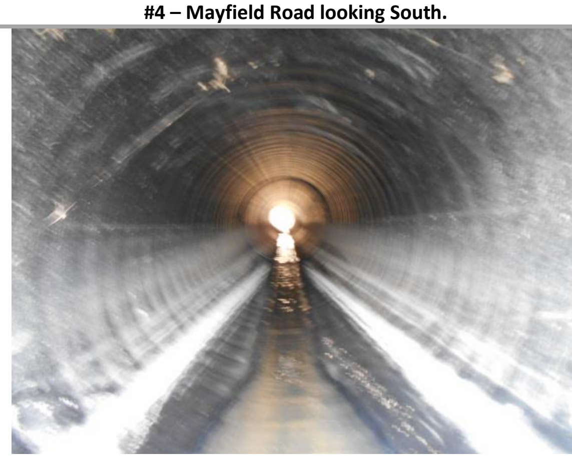
#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet



#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 17 (C17)

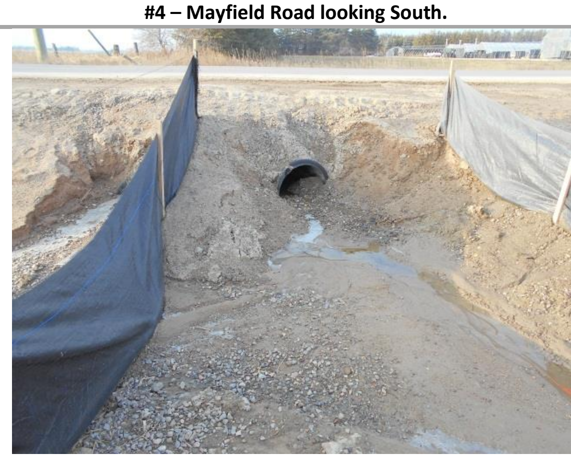
#1 – Mayfield Road looking West

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet



#6 - Outlet

Comments:

Double barrelled HDPE extension on the cross-road culvert, draining wetland area to the southern agricultural lands.

Culvert 18 (C18)

#1 – Mayfield Road looking West.

#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North.

#4 – Mayfield Road looking South.

#5 – Inlet

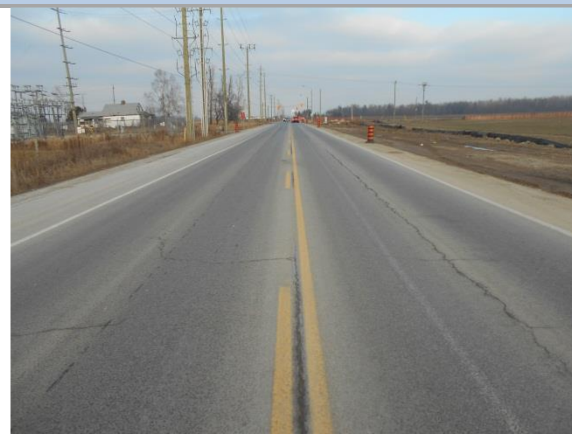
#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 19 (C19)

#1 – Mayfield Road looking West



#2 – Mayfield Road looking East.

#3 – Mayfield Road looking North

#4 – Mayfield Road looking South.

#5 – Inlet

#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Culvert 20 (C20)


#1 – Mayfield Road looking West


#2 – Mayfield Road looking East.


#3 – Mayfield Road looking North


#4 – Mayfield Road looking South.


#5 – Inlet


#6 - Outlet

Comments:

HDPE extension on the cross-road culvert, draining agricultural land to southern agricultural lands.

Appendix B

Hydrologic Modelling Output

Pre-Development VH Output

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=========================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                   *****  D E T A I L E D   O U T P U T *****


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DATE: 08/20/2015                           TIME: 09:57:39

USER:


COMMENTS: ____________________________________________________________


-----------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 851.000
| Ptotal=135.17 mm |                          B=   0.001
--------------------                          C=   0.690
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33

                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    1.77 |  6.17    4.88 | 12.17    4.40 | 18.17    2.38
                 0.33    1.80 |  6.33    5.21 | 12.33    4.28 | 18.33    2.36
                 0.50    1.83 |  6.50    5.61 | 12.50    4.17 | 18.50    2.33
                 0.67    1.86 |  6.67    6.10 | 12.67    4.07 | 18.67    2.31
                 0.83    1.89 |  6.83    6.70 | 12.83    3.97 | 18.83    2.28
                 1.00    1.92 |  7.00    7.48 | 13.00    3.88 | 19.00    2.26
                 1.17    1.95 |  7.17    8.52 | 13.17    3.80 | 19.17    2.23
                 1.33    1.98 |  7.33   10.01 | 13.33    3.71 | 19.33    2.21
                 1.50    2.02 |  7.50   12.37 | 13.50    3.64 | 19.50    2.19
                 1.67    2.06 |  7.67   16.85 | 13.67    3.56 | 19.67    2.17
                 1.83    2.09 |  7.83   31.09 | 13.83    3.49 | 19.83    2.15
                 2.00    2.13 |  8.00  173.74 | 14.00    3.43 | 20.00    2.13
                 2.17    2.18 |  8.17   38.06 | 14.17    3.36 | 20.17    2.11
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                 2.67    2.32 |  8.67   15.26 | 14.67    3.19 | 20.67    2.05
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  4.00     2.83 | 10.00    7.27 | 16.00    2.81 | 22.00    1.91
  4.17     2.91 | 10.17    6.88 | 16.17    2.77 | 22.17    1.90
  4.33     3.00 | 10.33    6.54 | 16.33    2.73 | 22.33    1.88
  4.50     3.10 | 10.50    6.24 | 16.50    2.70 | 22.50    1.87
  4.67     3.21 | 10.67    5.97 | 16.67    2.66 | 22.67    1.85
  4.83     3.33 | 10.83    5.73 | 16.83    2.63 | 22.83    1.84
  5.00     3.46 | 11.00    5.51 | 17.00    2.59 | 23.00    1.82
  5.17     3.60 | 11.17    5.31 | 17.17    2.56 | 23.17    1.81
  5.33     3.75 | 11.33    5.13 | 17.33    2.53 | 23.33    1.80
  5.50     3.92 | 11.50    4.96 | 17.50    2.50 | 23.50    1.78
  5.67     4.12 | 11.67    4.80 | 17.67    2.47 | 23.67    1.77
  5.83     4.34 | 11.83    4.66 | 17.83    2.44 | 23.83    1.76
  6.00     4.59 | 12.00    4.52 | 18.00    2.41 | 24.00    1.74
```

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-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD    (  0061)|   Area     (ha)=  11.90   Curve Number    (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    0.49

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

```
                          ---- TRANSFORMED HYETOGRAPH ----
  TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
   hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
 0.083     1.77 | 6.083     4.88 |12.083     4.40 | 18.08    2.38
 0.167     1.77 | 6.167     4.88 |12.167     4.40 | 18.17    2.38
 0.250     1.80 | 6.250     5.21 |12.250     4.28 | 18.25    2.36
 0.333     1.80 | 6.333     5.21 |12.333     4.28 | 18.33    2.36
 0.417     1.83 | 6.417     5.61 |12.417     4.17 | 18.42    2.33
 0.500     1.83 | 6.500     5.61 |12.500     4.17 | 18.50    2.33
 0.583     1.86 | 6.583     6.10 |12.583     4.07 | 18.58    2.31
 0.667     1.86 | 6.667     6.10 |12.667     4.07 | 18.67    2.31
 0.750     1.89 | 6.750     6.70 |12.750     3.97 | 18.75    2.28
 0.833     1.89 | 6.833     6.70 |12.833     3.97 | 18.83    2.28
 0.917     1.92 | 6.917     7.48 |12.917     3.88 | 18.92    2.26
 1.000     1.92 | 7.000     7.48 |13.000     3.88 | 19.00    2.26
 1.083     1.95 | 7.083     8.52 |13.083     3.80 | 19.08    2.23
 1.167     1.95 | 7.167     8.52 |13.167     3.80 | 19.17    2.23
 1.250     1.98 | 7.250    10.01 |13.250     3.71 | 19.25    2.21
 1.333     1.98 | 7.333    10.01 |13.333     3.71 | 19.33    2.21
 1.417     2.02 | 7.417    12.37 |13.417     3.64 | 19.42    2.19
 1.500     2.02 | 7.500    12.37 |13.500     3.64 | 19.50    2.19
 1.583     2.06 | 7.583    16.85 |13.583     3.56 | 19.58    2.17
 1.667     2.06 | 7.667    16.85 |13.667     3.56 | 19.67    2.17
 1.750     2.09 | 7.750    31.09 |13.750     3.49 | 19.75    2.15
 1.833     2.09 | 7.833    31.10 |13.833     3.49 | 19.83    2.15
 1.917     2.13 | 7.917   173.74 |13.917     3.43 | 19.92    2.13
 2.000     2.13 | 8.000   173.73 |14.000     3.43 | 20.00    2.13
 2.083     2.18 | 8.083    38.06 |14.083     3.36 | 20.08    2.11
 2.167     2.18 | 8.167    38.06 |14.167     3.36 | 20.17    2.11
 2.250     2.22 | 8.250    24.14 |14.250     3.30 | 20.25    2.09
 2.333     2.22 | 8.333    24.14 |14.333     3.30 | 20.33    2.09
 2.417     2.27 | 8.417    18.48 |14.417     3.24 | 20.42    2.07
 2.500     2.27 | 8.500    18.48 |14.500     3.24 | 20.50    2.07
 2.583     2.32 | 8.583    15.26 |14.583     3.19 | 20.58    2.05
 2.667     2.32 | 8.667    15.26 |14.667     3.19 | 20.67    2.05
 2.750     2.37 | 8.750    13.14 |14.750     3.13 | 20.75    2.03
 2.833     2.37 | 8.833    13.14 |14.833     3.13 | 20.83    2.03
 2.917     2.42 | 8.917    11.62 |14.917     3.08 | 20.92    2.01
 3.000     2.42 | 9.000    11.62 |15.000     3.08 | 21.00    2.01
 3.083     2.48 | 9.083    10.48 |15.083     3.03 | 21.08    1.99
 3.167     2.48 | 9.167    10.48 |15.167     3.03 | 21.17    1.99
 3.250     2.54 | 9.250     9.57 |15.250     2.98 | 21.25    1.98
 3.333     2.54 | 9.333     9.57 |15.333     2.98 | 21.33    1.98
 3.417     2.61 | 9.417     8.84 |15.417     2.94 | 21.42    1.96
 3.500     2.61 | 9.500     8.84 |15.500     2.94 | 21.50    1.96
 3.583     2.68 | 9.583     8.23 |15.583     2.89 | 21.58    1.94
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              3.667    2.68 | 9.667    8.23 |15.667    2.89 | 21.67    1.94
              3.750    2.75 | 9.750    7.71 |15.750    2.85 | 21.75    1.93
              3.833    2.75 | 9.833    7.71 |15.833    2.85 | 21.83    1.93
              3.917    2.83 | 9.917    7.27 |15.917    2.81 | 21.92    1.91
              4.000    2.83 |10.000    7.27 |16.000    2.81 | 22.00    1.91
              4.083    2.91 |10.083    6.88 |16.083    2.77 | 22.08    1.90
              4.167    2.91 |10.167    6.88 |16.167    2.77 | 22.17    1.90
              4.250    3.00 |10.250    6.54 |16.250    2.73 | 22.25    1.88
              4.333    3.00 |10.333    6.54 |16.333    2.73 | 22.33    1.88
              4.417    3.10 |10.417    6.24 |16.417    2.70 | 22.42    1.87
              4.500    3.10 |10.500    6.24 |16.500    2.70 | 22.50    1.87
              4.583    3.21 |10.583    5.97 |16.583    2.66 | 22.58    1.85
              4.667    3.21 |10.667    5.97 |16.667    2.66 | 22.67    1.85
              4.750    3.33 |10.750    5.73 |16.750    2.63 | 22.75    1.84
              4.833    3.33 |10.833    5.73 |16.833    2.63 | 22.83    1.84
              4.917    3.46 |10.917    5.51 |16.917    2.59 | 22.92    1.82
              5.000    3.46 |11.000    5.51 |17.000    2.59 | 23.00    1.82
              5.083    3.60 |11.083    5.31 |17.083    2.56 | 23.08    1.81
              5.167    3.60 |11.167    5.31 |17.167    2.56 | 23.17    1.81
              5.250    3.75 |11.250    5.13 |17.250    2.53 | 23.25    1.80
              5.333    3.75 |11.333    5.13 |17.333    2.53 | 23.33    1.80
              5.417    3.92 |11.417    4.96 |17.417    2.50 | 23.42    1.78
              5.500    3.92 |11.500    4.96 |17.500    2.50 | 23.50    1.78
              5.583    4.12 |11.583    4.80 |17.583    2.47 | 23.58    1.77
              5.667    4.12 |11.667    4.80 |17.667    2.47 | 23.67    1.77
              5.750    4.34 |11.750    4.66 |17.750    2.44 | 23.75    1.76
              5.833    4.34 |11.833    4.66 |17.833    2.44 | 23.83    1.76
              5.917    4.59 |11.917    4.52 |17.917    2.41 | 23.92    1.74
              6.000    4.59 |12.000    4.52 |18.000    2.41 | 24.00    1.74

     Unit Hyd Qpeak  (cms)=   0.928

     PEAK FLOW       (cms)=   1.004 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  84.215
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.623

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0041)|   Area    (ha)=   2.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  14.00   Dir. Conn.(%)=  14.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.33         2.01
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.71         0.71
     Length            (m)=     124.90        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.59 (ii)   11.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.09
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.33        0.364 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17         8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24        92.94
     TOTAL RAINFALL   (mm)=     135.17       135.17       135.17
     RUNOFF COEFFICIENT   =       0.99         0.64         0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0035)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0041):     2.34   0.364     8.17    92.94
      + ID2= 2 (  0061):    11.90   1.004     8.50    84.21
        ================================================
        ID = 3 (  0035):    14.24   1.199     8.33    85.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0084)|   Area    (ha)=  41.02   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.93

     Unit Hyd Qpeak  (cms)=   1.685

     PEAK FLOW       (cms)=   2.102 (i)
     TIME TO PEAK    (hrs)=   9.000
     RUNOFF VOLUME    (mm)=  80.366
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0059)|   Area    (ha)=   1.63
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.21         1.42
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     104.24        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.10 (ii)   10.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.24         0.264 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24         92.46
     TOTAL RAINFALL   (mm)=     135.17       135.17        135.17
     RUNOFF COEFFICIENT   =       0.99         0.64          0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0036)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0059):     1.63   0.264     8.17    92.46
      + ID2= 2 (  0084):    41.02   2.102     9.00    80.37
        ================================================
        ID = 3 (  0036):    42.65   2.153     9.00    80.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB              |
| NASHYD   (  0071)|   Area    (ha)=   2.63   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.39

     Unit Hyd Qpeak  (cms)=   0.258

     PEAK FLOW       (cms)=   0.245 (i)
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  80.355
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0050)|   Area    (ha)=   1.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.16         0.89
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       3.20         3.20
     Length            (m)=      83.67        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.30 (ii)    7.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.14
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.19          0.250 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     134.17        86.24          93.42
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0038)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0050):     1.05   0.250     8.00    93.42
      + ID2= 2 (  0071):     2.63   0.245     8.33    80.35
        ===================================================
        ID = 3 (  0038):     3.68   0.373     8.08    84.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0083)|   Area    (ha)=   5.43   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.39

     Unit Hyd Qpeak  (cms)=   0.532

     PEAK FLOW       (cms)=   0.506 (i)
```

```
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  80.355
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0073)|   Area    (ha)=   3.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         2.83
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.77         0.77
     Length            (m)=     149.00        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.81 (ii)   11.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.46           0.521 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.00
     RUNOFF VOLUME    (mm)=     134.16        86.24          93.42
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0043)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0073):     3.33   0.521     8.00    93.42
      + ID2= 2 (  0083):     5.43   0.506     8.33    80.36
        ===================================================
        ID = 3 (  0043):     8.76   0.952     8.17    85.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0052)|   Area    (ha)=   0.67   Curve Number   (CN)= 85.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.21

     Unit Hyd Qpeak  (cms)=   0.122

     PEAK FLOW       (cms)=   0.120 (i)
     TIME TO PEAK    (hrs)=   8.083
     RUNOFF VOLUME    (mm)=  97.697
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.723

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0057)|   Area    (ha)=  16.32   Curve Number   (CN)= 76.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.77

     Unit Hyd Qpeak  (cms)=   0.810

     PEAK FLOW       (cms)=   0.953 (i)
     TIME TO PEAK    (hrs)=   8.833
     RUNOFF VOLUME    (mm)=  80.365
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0046)|   Area    (ha)=   2.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.30         1.97
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       1.14         1.14
     Length            (m)=     123.02        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.23 (ii)   10.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.34           0.370 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17            8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24           92.47
     TOTAL RAINFALL   (mm)=     135.17       135.17          135.17
     RUNOFF COEFFICIENT   =       0.99         0.64            0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0044)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0046):     2.27   0.370     8.17    92.47
      + ID2= 2 (  0052):     0.67   0.120     8.08    97.70
        ====================================================
        ID = 3 (  0044):     2.94   0.489     8.17    93.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0044)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0044):     2.94   0.489     8.17    93.66
      + ID2= 2 (  0057):    16.32   0.953     8.83    80.37
        ====================================================
        ID = 1 (  0044):    19.26   1.075     8.67    82.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB              |
| NASHYD   (  0040)|   Area    (ha)=   5.78   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.47

     Unit Hyd Qpeak  (cms)=   0.470

     PEAK FLOW       (cms)=   0.488 (i)
     TIME TO PEAK    (hrs)=   8.417
     RUNOFF VOLUME    (mm)=  82.315
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0054)|   Area    (ha)=   1.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  14.00   Dir. Conn.(%)=  14.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         1.66
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.76         0.76
     Length            (m)=     113.43        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.40 (ii)   11.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.27          0.303 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24          92.94
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0045)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0040):     5.78   0.488     8.42    82.31
      + ID2= 2 (  0054):     1.93   0.303     8.17    92.94
        ==================================================
        ID = 3 (  0045):     7.71   0.673     8.17    84.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0076)|   Area    (ha)=   6.20   Curve Number   (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.47

     Unit Hyd Qpeak  (cms)=   0.504

     PEAK FLOW       (cms)=   0.539 (i)
     TIME TO PEAK    (hrs)=   8.417
     RUNOFF VOLUME    (mm)=  84.214
     TOTAL RAINFALL   (mm)= 135.166
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     RUNOFF COEFFICIENT   =    0.623

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0079)|   Area    (ha)=   2.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         1.68
     Dep. Storage     (mm)=       1.00         5.50
     Average Slope     (%)=       0.48         0.48
     Length            (m)=     118.32        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74        84.14
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.82 (ii)   14.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.08
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.25            0.353 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17             8.00
     RUNOFF VOLUME    (mm)=     134.17        87.04            96.46
     TOTAL RAINFALL   (mm)=     135.17       135.17           135.17
     RUNOFF COEFFICIENT   =       0.99         0.64             0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0047)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0076):     6.20   0.539     8.42    84.21
      + ID2= 2 (  0079):     2.10   0.353     8.00    96.46
        ===================================================
        ID = 3 (  0047):     8.30   0.735     8.33    87.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0077)|   Area    (ha)=  24.83   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.98

     Unit Hyd Qpeak  (cms)=   0.968

     PEAK FLOW       (cms)=   1.227 (i)
     TIME TO PEAK    (hrs)=   9.083
     RUNOFF VOLUME    (mm)=  80.366
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0074)|   Area    (ha)=   2.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       0.33         1.86
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.94         0.94
     Length            (m)=     120.83        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.34 (ii)   10.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.31          0.352 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.00
     RUNOFF VOLUME    (mm)=     134.17        86.24          93.42
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0055)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0074):     2.19   0.352     8.00    93.42
      + ID2= 2 (  0077):    24.83   1.227     9.08    80.37
        ====================================================
        ID = 3 (  0055):    27.02   1.291     9.08    81.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0053)|   Area    (ha)=   4.43   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.39

     Unit Hyd Qpeak  (cms)=   0.434

     PEAK FLOW       (cms)=   0.425 (i)
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  82.309
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0062)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.25         1.65
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.74         0.74
     Length            (m)=     112.55        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.41 (ii)   11.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
```

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                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.27           0.298 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17            8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24           92.47
     TOTAL RAINFALL   (mm)=     135.17       135.17          135.17
     RUNOFF COEFFICIENT   =       0.99         0.64            0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0058)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0053):     4.43   0.425     8.33    82.31
      + ID2= 2 (  0062):     1.90   0.298     8.17    92.47
        ====================================================
        ID = 3 (  0058):     6.33   0.665     8.17    85.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0064)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  15.00   Dir. Conn.(%)=  15.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         1.62
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.16         0.16
     Length            (m)=     112.55        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74        69.14
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       3.81 (ii)   21.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.25         0.05
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.18           0.204 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.33            8.33
     RUNOFF VOLUME    (mm)=     134.16        86.24           93.42
     TOTAL RAINFALL   (mm)=     135.17       135.17          135.17
     RUNOFF COEFFICIENT   =       0.99         0.64            0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0060)|   Area    (ha)=   5.62   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.405

     PEAK FLOW       (cms)=   0.464 (i)
     TIME TO PEAK    (hrs)=   8.500
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     RUNOFF VOLUME    (mm)=  86.234
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.638

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0049)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  14.00   Dir. Conn.(%)=  14.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.16         0.99
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.71         0.71
     Length            (m)=      87.56        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.10 (ii)   11.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.16          0.181 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24          92.94
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0066)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0049):      1.15   0.181     8.17    92.94
      + ID2= 2 (  0060):      5.62   0.464     8.50    86.23
        ===================================================
        ID = 3 (  0066):      6.77   0.549     8.42    87.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0072)|   Area     (ha)=   9.96   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.70

     Unit Hyd Qpeak  (cms)=   0.543

     PEAK FLOW       (cms)=   0.621 (i)
     TIME TO PEAK    (hrs)=   8.750
     RUNOFF VOLUME    (mm)=  80.365
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0037)|   Area    (ha)=   1.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
```

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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.14         0.94
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       1.38         1.38
     Length            (m)=      84.85        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.69 (ii)    9.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.12
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.18           0.229 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08            8.00
     RUNOFF VOLUME    (mm)=     134.17        86.24           92.46
     TOTAL RAINFALL   (mm)=     135.17       135.17          135.17
     RUNOFF COEFFICIENT   =       0.99         0.64            0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0067)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0037):     1.08   0.229     8.00    92.46
      + ID2= 2 (  0072):     9.96   0.621     8.75    80.36
        ============================================================
        ID = 3 (  0067):    11.04   0.664     8.67    81.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0051)|   Area    (ha)=  15.84   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.89

     Unit Hyd Qpeak  (cms)=   0.680

     PEAK FLOW       (cms)=   0.837 (i)
     TIME TO PEAK    (hrs)=   9.000
     RUNOFF VOLUME    (mm)=  80.366
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0065)|   Area    (ha)=   1.32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         1.15
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.84         0.84
     Length            (m)=      93.81        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.08 (ii)   10.88 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.09
                                                     *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.19       0.211 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17        8.17
     RUNOFF VOLUME    (mm)=     134.17        86.24       92.46
     TOTAL RAINFALL   (mm)=     135.17       135.17      135.17
     RUNOFF COEFFICIENT   =       0.99         0.64        0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0068)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0051):    15.84   0.837     9.00    80.37
      + ID2= 2 (  0065):     1.32   0.211     8.17    92.46
        ==================================================
        ID = 3 (  0068):    17.16   0.880     8.92    81.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0086)|   Area    (ha)=   9.41   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.54

     Unit Hyd Qpeak  (cms)=   0.666

     PEAK FLOW       (cms)=   0.700 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  80.363
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0080)|   Area    (ha)=   1.01
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.88
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       1.19         1.19
     Length            (m)=      82.06        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.73 (ii)    9.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.11
                                                     *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.17       0.211 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08        8.00
     RUNOFF VOLUME    (mm)=     134.17        86.24       92.46
     TOTAL RAINFALL   (mm)=     135.17       135.17      135.17
     RUNOFF COEFFICIENT   =       0.99         0.64        0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
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          YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0069)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0080):     1.01   0.211     8.00    92.46
      + ID2= 2 (  0086):     9.41   0.700     8.50    80.36
        ==================================================
        ID = 3 (  0069):    10.42   0.758     8.50    81.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0070)|   Area    (ha)=   0.52   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.24

     Unit Hyd Qpeak  (cms)=   0.083

     PEAK FLOW       (cms)=   0.067 (i)
     TIME TO PEAK    (hrs)=   8.167
     RUNOFF VOLUME    (mm)=  80.290
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0042)|   Area    (ha)=   5.30   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.51

     Unit Hyd Qpeak  (cms)=   0.397

     PEAK FLOW       (cms)=   0.449 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  86.234
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.638

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0082)|   Area    (ha)=   1.59
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.21         1.38
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.64         0.64
     Length            (m)=     102.96        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       110.43
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.38 (ii)   11.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.22         0.247 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.17
```

```
     RUNOFF VOLUME    (mm)=     134.17        86.24          92.46
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0075)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0042):     5.30   0.449     8.50    86.23
      + ID2= 2 (  0082):     1.59   0.247     8.17    92.46
        ===================================================
        ID = 3 (  0075):     6.89   0.585     8.33    87.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0078)|   Area    (ha)=   3.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  16.00   Dir. Conn.(%)=  16.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.63         3.28
     Dep. Storage     (mm)=       1.00         4.40
     Average Slope     (%)=       0.47         0.47
     Length            (m)=     161.45        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74        82.82
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.42 (ii)   15.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.26         0.07
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.45          0.511 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.25           8.00
     RUNOFF VOLUME    (mm)=     134.17        86.24          93.90
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0063)|   Area    (ha)=   2.22   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.212

     PEAK FLOW       (cms)=   0.209 (i)
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  82.310
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.609
```

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     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 0048)|   Area     (ha)=   2.81
|ID= 1 DT= 5.0 min |   Total Imp(%)=  14.00   Dir. Conn.(%)=  14.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.39        2.42
     Dep. Storage     (mm)=       1.00        4.40
     Average Slope     (%)=       0.46        0.46
     Length            (m)=     136.87       40.00
     Mannings n           =      0.013       0.250

     Max.Eff.Inten.(mm/hr)=     173.74       82.82
                over (min)        5.00       15.00
     Storage Coeff.  (min)=       3.12 (ii)   14.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00       15.00
     Unit Hyd. peak  (cms)=       0.27        0.08
                                                         *TOTALS*
     PEAK FLOW       (cms)=       0.18        0.35          0.402 (iii)
     TIME TO PEAK    (hrs)=       8.00        8.17           8.17
     RUNOFF VOLUME    (mm)=     134.17       86.24          92.94
     TOTAL RAINFALL   (mm)=     135.17      135.17         135.17
     RUNOFF COEFFICIENT   =       0.99        0.64           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0081)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0048):      2.81   0.402     8.17    92.94
      + ID2= 2 (  0063):      2.22   0.209     8.33    82.31
        ==================================================
        ID = 3 (  0081):      5.03   0.580     8.17    88.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0056)|   Area     (ha)=  12.90   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.75

     Unit Hyd Qpeak  (cms)=   0.657

     PEAK FLOW       (cms)=   0.766 (i)
     TIME TO PEAK    (hrs)=   8.833
     RUNOFF VOLUME    (mm)=  80.365
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0039)|   Area     (ha)=   1.24
|ID= 1 DT= 5.0 min |   Total Imp(%)=  13.00   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.16        1.08
```

```
     Dep. Storage     (mm)=       1.00          4.40
     Average Slope     (%)=       1.21          1.21
     Length            (m)=      90.92         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     173.74        110.43
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.83 (ii)     9.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.32          0.11
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.08          0.21          0.258 (iii)
     TIME TO PEAK    (hrs)=       8.00          8.08           8.00
     RUNOFF VOLUME    (mm)=     134.17         86.24          92.46
     TOTAL RAINFALL   (mm)=     135.17        135.17         135.17
     RUNOFF COEFFICIENT   =       0.99          0.64           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  79.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0085)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0039):     1.24   0.258     8.00    92.46
      + ID2= 2 (  0056):    12.90   0.766     8.83    80.37
        ==================================================
        ID = 3 (  0085):    14.14   0.813     8.75    81.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
```

Post-Development VH Output

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
```



```
                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\zi72040\AppData\Local\CEG\VO3\1c4fb4f8-61a1-4909-988a-8fbe9e51d5e5\aad9d071-e012-
469a-951b-cde4a313cfb1\scenari
  Summary filename: C:\Users\zi72040\AppData\Local\CEG\VO3\1c4fb4f8-61a1-4909-988a-8fbe9e51d5e5\aad9d071-e012-
469a-951b-cde4a313cfb1\scenari


DATE: 08/20/2015                           TIME: 09:57:31

USER:


COMMENTS: ____________________________________________________________


----------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 851.000
| Ptotal=135.17 mm |                          B=   0.001
--------------------                          C=   0.690
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  = 24.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =  0.33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	1.77	6.17	4.88	12.17	4.40	18.17	2.38
0.33	1.80	6.33	5.21	12.33	4.28	18.33	2.36
0.50	1.83	6.50	5.61	12.50	4.17	18.50	2.33
0.67	1.86	6.67	6.10	12.67	4.07	18.67	2.31
0.83	1.89	6.83	6.70	12.83	3.97	18.83	2.28
1.00	1.92	7.00	7.48	13.00	3.88	19.00	2.26
1.17	1.95	7.17	8.52	13.17	3.80	19.17	2.23
1.33	1.98	7.33	10.01	13.33	3.71	19.33	2.21
1.50	2.02	7.50	12.37	13.50	3.64	19.50	2.19
1.67	2.06	7.67	16.85	13.67	3.56	19.67	2.17
1.83	2.09	7.83	31.09	13.83	3.49	19.83	2.15
2.00	2.13	8.00	173.74	14.00	3.43	20.00	2.13
2.17	2.18	8.17	38.06	14.17	3.36	20.17	2.11
2.33	2.22	8.33	24.14	14.33	3.30	20.33	2.09
2.50	2.27	8.50	18.48	14.50	3.24	20.50	2.07
2.67	2.32	8.67	15.26	14.67	3.19	20.67	2.05
2.83	2.37	8.83	13.14	14.83	3.13	20.83	2.03
3.00	2.42	9.00	11.62	15.00	3.08	21.00	2.01

3.17	2.48	9.17	10.48	15.17	3.03	21.17	1.99
3.33	2.54	9.33	9.57	15.33	2.98	21.33	1.98
3.50	2.61	9.50	8.84	15.50	2.94	21.50	1.96
3.67	2.68	9.67	8.23	15.67	2.89	21.67	1.94
3.83	2.75	9.83	7.71	15.83	2.85	21.83	1.93
4.00	2.83	10.00	7.27	16.00	2.81	22.00	1.91
4.17	2.91	10.17	6.88	16.17	2.77	22.17	1.90
4.33	3.00	10.33	6.54	16.33	2.73	22.33	1.88
4.50	3.10	10.50	6.24	16.50	2.70	22.50	1.87
4.67	3.21	10.67	5.97	16.67	2.66	22.67	1.85
4.83	3.33	10.83	5.73	16.83	2.63	22.83	1.84
5.00	3.46	11.00	5.51	17.00	2.59	23.00	1.82
5.17	3.60	11.17	5.31	17.17	2.56	23.17	1.81
5.33	3.75	11.33	5.13	17.33	2.53	23.33	1.80
5.50	3.92	11.50	4.96	17.50	2.50	23.50	1.78
5.67	4.12	11.67	4.80	17.67	2.47	23.67	1.77
5.83	4.34	11.83	4.66	17.83	2.44	23.83	1.76
6.00	4.59	12.00	4.52	18.00	2.41	24.00	1.74

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-------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0001)|   Area     (ha)=   0.52   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.24

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	' TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.77	6.083	4.88	12.083	4.40	18.08	2.38
0.167	1.77	6.167	4.88	12.167	4.40	18.17	2.38
0.250	1.80	6.250	5.21	12.250	4.28	18.25	2.36
0.333	1.80	6.333	5.21	12.333	4.28	18.33	2.36
0.417	1.83	6.417	5.61	12.417	4.17	18.42	2.33
0.500	1.83	6.500	5.61	12.500	4.17	18.50	2.33
0.583	1.86	6.583	6.10	12.583	4.07	18.58	2.31
0.667	1.86	6.667	6.10	12.667	4.07	18.67	2.31
0.750	1.89	6.750	6.70	12.750	3.97	18.75	2.28
0.833	1.89	6.833	6.70	12.833	3.97	18.83	2.28
0.917	1.92	6.917	7.48	12.917	3.88	18.92	2.26
1.000	1.92	7.000	7.48	13.000	3.88	19.00	2.26
1.083	1.95	7.083	8.52	13.083	3.80	19.08	2.23
1.167	1.95	7.167	8.52	13.167	3.80	19.17	2.23
1.250	1.98	7.250	10.01	13.250	3.71	19.25	2.21
1.333	1.98	7.333	10.01	13.333	3.71	19.33	2.21
1.417	2.02	7.417	12.37	13.417	3.64	19.42	2.19
1.500	2.02	7.500	12.37	13.500	3.64	19.50	2.19
1.583	2.06	7.583	16.85	13.583	3.56	19.58	2.17
1.667	2.06	7.667	16.85	13.667	3.56	19.67	2.17
1.750	2.09	7.750	31.09	13.750	3.49	19.75	2.15
1.833	2.09	7.833	31.10	13.833	3.49	19.83	2.15
1.917	2.13	7.917	173.74	13.917	3.43	19.92	2.13
2.000	2.13	8.000	173.73	14.000	3.43	20.00	2.13
2.083	2.18	8.083	38.06	14.083	3.36	20.08	2.11
2.167	2.18	8.167	38.06	14.167	3.36	20.17	2.11
2.250	2.22	8.250	24.14	14.250	3.30	20.25	2.09
2.333	2.22	8.333	24.14	14.333	3.30	20.33	2.09
2.417	2.27	8.417	18.48	14.417	3.24	20.42	2.07
2.500	2.27	8.500	18.48	14.500	3.24	20.50	2.07
2.583	2.32	8.583	15.26	14.583	3.19	20.58	2.05
2.667	2.32	8.667	15.26	14.667	3.19	20.67	2.05
2.750	2.37	8.750	13.14	14.750	3.13	20.75	2.03
2.833	2.37	8.833	13.14	14.833	3.13	20.83	2.03
2.917	2.42	8.917	11.62	14.917	3.08	20.92	2.01
3.000	2.42	9.000	11.62	15.000	3.08	21.00	2.01
3.083	2.48	9.083	10.48	15.083	3.03	21.08	1.99
3.167	2.48	9.167	10.48	15.167	3.03	21.17	1.99
3.250	2.54	9.250	9.57	15.250	2.98	21.25	1.98
3.333	2.54	9.333	9.57	15.333	2.98	21.33	1.98
3.417	2.61	9.417	8.84	15.417	2.94	21.42	1.96
3.500	2.61	9.500	8.84	15.500	2.94	21.50	1.96
3.583	2.68	9.583	8.23	15.583	2.89	21.58	1.94

```
            3.667    2.68 | 9.667    8.23 |15.667    2.89 | 21.67    1.94
            3.750    2.75 | 9.750    7.71 |15.750    2.85 | 21.75    1.93
            3.833    2.75 | 9.833    7.71 |15.833    2.85 | 21.83    1.93
            3.917    2.83 | 9.917    7.27 |15.917    2.81 | 21.92    1.91
            4.000    2.83 |10.000    7.27 |16.000    2.81 | 22.00    1.91
            4.083    2.91 |10.083    6.88 |16.083    2.77 | 22.08    1.90
            4.167    2.91 |10.167    6.88 |16.167    2.77 | 22.17    1.90
            4.250    3.00 |10.250    6.54 |16.250    2.73 | 22.25    1.88
            4.333    3.00 |10.333    6.54 |16.333    2.73 | 22.33    1.88
            4.417    3.10 |10.417    6.24 |16.417    2.70 | 22.42    1.87
            4.500    3.10 |10.500    6.24 |16.500    2.70 | 22.50    1.87
            4.583    3.21 |10.583    5.97 |16.583    2.66 | 22.58    1.85
            4.667    3.21 |10.667    5.97 |16.667    2.66 | 22.67    1.85
            4.750    3.33 |10.750    5.73 |16.750    2.63 | 22.75    1.84
            4.833    3.33 |10.833    5.73 |16.833    2.63 | 22.83    1.84
            4.917    3.46 |10.917    5.51 |16.917    2.59 | 22.92    1.82
            5.000    3.46 |11.000    5.51 |17.000    2.59 | 23.00    1.82
            5.083    3.60 |11.083    5.31 |17.083    2.56 | 23.08    1.81
            5.167    3.60 |11.167    5.31 |17.167    2.56 | 23.17    1.81
            5.250    3.75 |11.250    5.13 |17.250    2.53 | 23.25    1.80
            5.333    3.75 |11.333    5.13 |17.333    2.53 | 23.33    1.80
            5.417    3.92 |11.417    4.96 |17.417    2.50 | 23.42    1.78
            5.500    3.92 |11.500    4.96 |17.500    2.50 | 23.50    1.78
            5.583    4.12 |11.583    4.80 |17.583    2.47 | 23.58    1.77
            5.667    4.12 |11.667    4.80 |17.667    2.47 | 23.67    1.77
            5.750    4.34 |11.750    4.66 |17.750    2.44 | 23.75    1.76
            5.833    4.34 |11.833    4.66 |17.833    2.44 | 23.83    1.76
            5.917    4.59 |11.917    4.52 |17.917    2.41 | 23.92    1.74
            6.000    4.59 |12.000    4.52 |18.000    2.41 | 24.00    1.74

     Unit Hyd Qpeak  (cms)=   0.083

     PEAK FLOW       (cms)=   0.067 (i)
     TIME TO PEAK    (hrs)=   8.167
     RUNOFF VOLUME    (mm)=  80.290
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)=   2.14   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.204

     PEAK FLOW       (cms)=   0.202 (i)
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  82.310
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0015)|   Area    (ha)=   6.73
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=  51.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.43          3.30
     Dep. Storage     (mm)=       1.00          1.50
     Average Slope     (%)=       0.18          0.18
     Length            (m)=     211.82         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     173.74        103.61
               over (min)       5.00         20.00
     Storage Coeff.  (min)=       5.38 (ii)    19.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.21          0.06
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       1.44         0.51          1.701 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.25           8.00
     RUNOFF VOLUME    (mm)=     134.17       104.10         119.43
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.77           0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  87.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0026)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):      0.52   0.067     8.17    80.29
      + ID2= 2 (  0015):      6.73   1.701     8.00   119.43
        ==================================================
        ID = 3 (  0026):      7.25   1.746     8.00   116.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0026)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0026):      7.25   1.746     8.00   116.63
      + ID2= 2 (  0002):      2.14   0.202     8.33    82.31
        ==================================================
        ID = 1 (  0026):      9.39   1.835     8.00   108.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0003)|   Area    (ha)=  11.21   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.69

     Unit Hyd Qpeak  (cms)=   0.621

     PEAK FLOW       (cms)=   0.705 (i)
     TIME TO PEAK    (hrs)=   8.750
     RUNOFF VOLUME    (mm)=  80.365
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=   4.43   Curve Number   (CN)= 77.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.39

     Unit Hyd Qpeak  (cms)=   0.434

     PEAK FLOW       (cms)=   0.425 (i)
     TIME TO PEAK    (hrs)=   8.333
     RUNOFF VOLUME    (mm)=  82.309
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.609

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
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```
| STANDHYD (  0016)|   Area    (ha)=   7.16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.94         3.22
     Dep. Storage     (mm)=       1.00         3.00
     Average Slope     (%)=       0.56         0.56
     Length            (m)=     218.48        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       141.17
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.90 (ii)   12.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.78         0.64       2.192 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17        8.00
     RUNOFF VOLUME    (mm)=     134.16       104.72      120.91
     TOTAL RAINFALL   (mm)=     135.17       135.17      135.17
     RUNOFF COEFFICIENT   =       0.99         0.77        0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  88.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0016):     7.16   2.192     8.00   120.91
      + ID2= 2 (  0003):    11.21   0.705     8.75    80.36
        ===================================================
        ID = 3 (  0027):    18.37   2.380     8.00    96.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0027)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0027):    18.37   2.380     8.00    96.17
      + ID2= 2 (  0004):     4.43   0.425     8.33    82.31
        ===================================================
        ID = 1 (  0027):    22.80   2.571     8.00    93.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area    (ha)=   5.62   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.53

     Unit Hyd Qpeak  (cms)=   0.405

     PEAK FLOW       (cms)=   0.464 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  86.234
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.638

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
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| STANDHYD (  0017)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.63         0.52
     Dep. Storage     (mm)=       1.00         3.00
     Average Slope     (%)=       1.50         1.50
     Length            (m)=      87.56        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       141.17
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.67 (ii)    8.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.13          0.427 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     134.17       104.72         120.91
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.77           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  88.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0028)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0017):     1.15   0.427     8.00   120.91
      + ID2= 2 (  0005):     5.62   0.464     8.50    86.23
        ==================================================
        ID = 3 (  0028):     6.77   0.588     8.00    92.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0006)|   Area    (ha)=   7.93   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.63

     Unit Hyd Qpeak  (cms)=   0.481

     PEAK FLOW       (cms)=   0.531 (i)
     TIME TO PEAK    (hrs)=   8.667
     RUNOFF VOLUME    (mm)=  80.364
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.595

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0018)|   Area    (ha)=   2.64
|ID= 1 DT= 5.0 min |   Total Imp(%)=  51.00   Dir. Conn.(%)=  51.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.35         1.29
     Dep. Storage     (mm)=       1.00         3.30
     Average Slope     (%)=       0.63         0.63
     Length            (m)=     132.66        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       137.47
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.79 (ii)   11.58 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                       *TOTALS*
     PEAK FLOW       (cms)=       0.63         0.26          0.804 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.00
     RUNOFF VOLUME    (mm)=     134.17       102.39        118.59
     TOTAL RAINFALL   (mm)=     135.17       135.17        135.17
     RUNOFF COEFFICIENT   =       0.99         0.76          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  87.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0018):     2.64   0.804     8.00   118.59
      + ID2= 2 (  0006):     7.93   0.531     8.67    80.36
        ===================================================
        ID = 3 (  0029):    10.57   0.957     8.00    89.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area    (ha)=  18.10   Curve Number   (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   1.411

     PEAK FLOW       (cms)=   1.527 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  84.215
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.623

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0019)|   Area    (ha)=   4.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  53.00   Dir. Conn.(%)=  53.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         2.09
     Dep. Storage     (mm)=       1.00         3.00
     Average Slope     (%)=       0.42         0.42
     Length            (m)=     172.05        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       141.17
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.68 (ii)   13.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.08
                                                       *TOTALS*
     PEAK FLOW       (cms)=       1.07         0.41          1.335 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.00
     RUNOFF VOLUME    (mm)=     134.17       104.72        120.32
     TOTAL RAINFALL   (mm)=     135.17       135.17        135.17
     RUNOFF COEFFICIENT   =       0.99         0.77          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  88.0    Ia = Dep. Storage  (Above)
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0030)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0019):      4.44   1.335     8.00   120.32
      + ID2= 2 (  0007):     18.10   1.527     8.50    84.21
        ==================================================
        ID = 3 (  0030):     22.54   1.910     8.33    91.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0008)|   Area    (ha)=   9.41   Curve Number   (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.51

     Unit Hyd Qpeak  (cms)=   0.705

     PEAK FLOW       (cms)=   0.774 (i)
     TIME TO PEAK    (hrs)=   8.500
     RUNOFF VOLUME    (mm)=  84.215
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.623

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0020)|   Area    (ha)=   1.01
|ID= 1 DT= 5.0 min |   Total Imp(%)=  52.00   Dir. Conn.(%)=  52.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.53         0.48
     Dep. Storage     (mm)=       1.00         3.30
     Average Slope     (%)=       1.21         1.21
     Length            (m)=      82.06        40.00
     Mannings n          =       0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       137.47
                over (min)       5.00        10.00
     Storage Coeff.  (min)=       1.72 (ii)    8.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.12
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.12          0.360 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     134.17       102.39         118.91
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.76           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  87.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0031)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0020):      1.01   0.360     8.00   118.91
      + ID2= 2 (  0008):      9.41   0.774     8.50    84.22
        ==================================================
```

```
    ID = 3 (  0031):    10.42   0.833     8.50    87.58

 NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0009)|   Area    (ha)=  16.32   Curve Number   (CN)= 78.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.70   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.72

     Unit Hyd Qpeak  (cms)=   0.866

     PEAK FLOW       (cms)=   1.059 (i)
     TIME TO PEAK    (hrs)=   8.750
     RUNOFF VOLUME    (mm)=  84.218
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.623

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0010)|   Area    (ha)=   0.67   Curve Number   (CN)= 85.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.90   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.21

     Unit Hyd Qpeak  (cms)=   0.122

     PEAK FLOW       (cms)=   0.120 (i)
     TIME TO PEAK    (hrs)=   8.083
     RUNOFF VOLUME    (mm)=  97.697
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.723

     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0021)|   Area    (ha)=   2.27
|ID= 1 DT= 5.0 min |   Total Imp(%)=  57.00   Dir. Conn.(%)=  57.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.29         0.98
     Dep. Storage     (mm)=       1.00         2.70
     Average Slope     (%)=       1.07         1.07
     Length            (m)=     123.02        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       144.86
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.27 (ii)    9.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.62         0.24          0.839 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.08           8.00
     RUNOFF VOLUME    (mm)=     134.17       107.09         122.52
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.79           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  89.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0032)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0010):      0.67   0.120     8.08    97.70
      + ID2= 2 (  0021):      2.27   0.839     8.00   122.52
        ==================================================
        ID = 3 (  0032):      2.94   0.933     8.00   116.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0032)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0032):      2.94   0.933     8.00   116.86
      + ID2= 2 (  0009):     16.32   1.059     8.75    84.22
        ==================================================
        ID = 1 (  0032):     19.26   1.212     8.00    89.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0011)|  Area    (ha)=  38.70   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |  Ia      (mm)=   5.23   # of Linear Res.(N)= 3.00
--------------------  U.H. Tp(hrs)=   0.84

     Unit Hyd Qpeak  (cms)=   1.760

     PEAK FLOW       (cms)=   2.127 (i)
     TIME TO PEAK    (hrs)=   8.917
     RUNOFF VOLUME    (mm)=  80.340
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|  Area    (ha)=   5.54
|ID= 1 DT= 5.0 min |  Total Imp(%)=  59.00   Dir. Conn.(%)=  59.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.27         2.27
     Dep. Storage     (mm)=       1.00         2.70
     Average Slope     (%)=       0.88         0.88
     Length            (m)=     192.18        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       144.86
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.15 (ii)   10.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.52         0.49          1.848 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17           8.00
     RUNOFF VOLUME    (mm)=     134.17       107.09         123.06
     TOTAL RAINFALL   (mm)=     135.17       135.17         135.17
     RUNOFF COEFFICIENT   =       0.99         0.79           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  89.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):    38.70   2.127     8.92    80.34
      + ID2= 2 (  0022):     5.54   1.848     8.00   123.06
        ================================================
        ID = 3 (  0033):    44.24   2.343     8.83    85.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0012)|   Area    (ha)=  65.86   Curve Number   (CN)= 76.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.23   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.87

     Unit Hyd Qpeak  (cms)=   2.891

     PEAK FLOW       (cms)=   3.531 (i)
     TIME TO PEAK    (hrs)=   8.917
     RUNOFF VOLUME    (mm)=  80.340
     TOTAL RAINFALL   (mm)= 135.166
     RUNOFF COEFFICIENT   =   0.594

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0025)|   Area    (ha)=   3.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  52.00   Dir. Conn.(%)=  52.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.99         1.83
     Dep. Storage     (mm)=       1.00         3.30
     Average Slope     (%)=       0.75         0.75
     Length            (m)=     159.58        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.74       137.47
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.96 (ii)   11.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.93         0.37          1.174 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.17          8.00
     RUNOFF VOLUME    (mm)=     134.17       102.39        118.91
     TOTAL RAINFALL   (mm)=     135.17       135.17        135.17
     RUNOFF COEFFICIENT   =       0.99         0.76          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  87.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0034)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0012):    65.86   3.531     8.92    80.34
      + ID2= 2 (  0025):     3.82   1.174     8.00   118.91
        ================================================
        ID = 3 (  0034):    69.68   3.671     8.92    82.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
```

Appendix C

Hydraulic Analysis Output

Pre-Development Culvert Analysis

Culvert Calculator Report
Culvert 1

Comments: Culvert 1

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	265.60	m	Headwater Depth/Height	1.17	
Computed Headwater Eleva	265.54	m	Discharge	0.0670	m^3/s
Inlet Control HW Elev.	265.52	m	Tailwater Elevation	265.18	m
Outlet Control HW Elev.	265.54	m	Control Type	Outlet Control	

Grades					
Upstream Invert	265.18	m	Downstream Invert	264.94	m
Length	16.60	m	Constructed Slope	0.014458	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.24	m
Slope Type	Mild		Normal Depth	0.26	m
Flow Regime	Subcritical		Critical Depth	0.20	m
Velocity Downstream	1.09	m/s	Critical Slope	0.025338	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.30	m
Section Size	300 mm		Rise	0.30	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	265.54	m	Upstream Velocity Head	0.05	m
Ke	0.90		Entrance Loss	0.05	m

Inlet Control Properties					
Inlet Control HW Elev.	265.52	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.1	m^2
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 2

Comments: Culvert 2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	263.85	m	Headwater Depth/Height	0.98	
Computed Headwater Eleva	263.28	m	Discharge	0.5110	m³/s
Inlet Control HW Elev.	263.24	m	Tailwater Elevation	262.84	m
Outlet Control HW Elev.	263.28	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.53	m	Downstream Invert	262.33	m
Length	20.80	m	Constructed Slope	0.009615	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.51	m
Slope Type	Mild		Normal Depth	0.53	m
Flow Regime	Subcritical		Critical Depth	0.44	m
Velocity Downstream	1.58	m/s	Critical Slope	0.016645	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	263.28	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.11	m

Inlet Control Properties					
Inlet Control HW Elev.	263.24	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 3

Comments: Culvert 3

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	263.55	m	Headwater Depth/Height	9.68	
Computed Headwater Eleva	266.01	m	Discharge	0.5800	m³/s
Inlet Control HW Elev.	264.10	m	Tailwater Elevation	262.08	m
Outlet Control HW Elev.	266.01	m	Control Type	Outlet Control	

Grades

Upstream Invert	261.59	m	Downstream Invert	261.39	m
Length	21.00	m	Constructed Slope	0.009190	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.69	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.45	m
Velocity Downstream	3.53	m/s	Critical Slope	0.116156	m/m

Section

Section Shape	Circular	Mannings Coefficient	0.024	
Section Material	CMP	Span	0.46	m
Section Size	450 mm	Rise	0.46	m
Number Sections	1			

Outlet Control Properties

Outlet Control HW Elev.	266.01	m	Upstream Velocity Head	0.64	m
Ke	0.90		Entrance Loss	0.57	m

Inlet Control Properties

Inlet Control HW Elev.	264.10	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 4

Comments: Culvert 4

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	262.50	m	Headwater Depth/Height	2.51	
Computed Headwater Elev:	262.36	m	Discharge	0.6580	m³/s
Inlet Control HW Elev.	262.07	m	Tailwater Elevation	261.12	m
Outlet Control HW Elev.	262.36	m	Control Type	Outlet Control	

Grades					
Upstream Invert	260.83	m	Downstream Invert	260.14	m
Length	20.70	m	Constructed Slope	0.033478	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.98	m
Slope Type	N/A		Normal Depth	0.52	m
Flow Regime	N/A		Critical Depth	0.52	m
Velocity Downstream	2.25	m/s	Critical Slope	0.033485	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	262.36	m	Upstream Velocity Head	0.26	m
Ke	0.90		Entrance Loss	0.23	m

Inlet Control Properties					
Inlet Control HW Elev.	262.07	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 5

Comments: Culvert 5

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	262.00	m	Headwater Depth/Height	10.15	
Computed Headwater Eleva	265.42	m	Discharge	0.9520	m³/s
Inlet Control HW Elev.	263.58	m	Tailwater Elevation	260.29	m
Outlet Control HW Elev.	265.42	m	Control Type	Outlet Control	

Grades					
Upstream Invert	260.01	m	Downstream Invert	259.77	m
Length	21.90	m	Constructed Slope	0.010685	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.53	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.53	m
Velocity Downstream	4.27	m/s	Critical Slope	0.140012	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.53	m
Section Size	525 mm		Rise	0.53	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	265.42	m	Upstream Velocity Head	0.93	m
Ke	0.90		Entrance Loss	0.83	m

Inlet Control Properties					
Inlet Control HW Elev.	263.58	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 6

Comments: Culvert 6

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	262.20	m	Headwater Depth/Height	12.51	
Computed Headwater Eleva	266.12	m	Discharge	0.6730	m³/s
Inlet Control HW Elev.	263.69	m	Tailwater Elevation	260.67	m
Outlet Control HW Elev.	266.12	m	Control Type	Outlet Control	

Grades

Upstream Invert	260.40	m	Downstream Invert	260.25	m
Length	21.50	m	Constructed Slope	0.007070	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.49	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.45	m
Velocity Downstream	4.10	m/s	Critical Slope	0.160167	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	266.12	m	Upstream Velocity Head	0.86	m
Ke	0.90		Entrance Loss	0.77	m

Inlet Control Properties

Inlet Control HW Elev.	263.69	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 7

Comments: Culvert 7

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	263.35	m	Headwater Depth/Height	2.16	
Computed Headwater Eleva	263.31	m	Discharge	0.5490	m³/s
Inlet Control HW Elev.	262.96	m	Tailwater Elevation	262.38	m
Outlet Control HW Elev.	263.31	m	Control Type	Outlet Control	

Grades					
Upstream Invert	261.99	m	Downstream Invert	261.89	m
Length	21.20	m	Constructed Slope	0.004858	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.49	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.48	m
Velocity Downstream	2.18	m/s	Critical Slope	0.026756	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	263.31	m	Upstream Velocity Head	0.18	m
Ke	0.90		Entrance Loss	0.16	m

Inlet Control Properties					
Inlet Control HW Elev.	262.96	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 8

Comments: Culvert 8

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	263.45	m	Headwater Depth/Height	1.87	
Computed Headwater Eleva	263.55	m	Discharge	0.5850	m³/s
Inlet Control HW Elev.	263.45	m	Tailwater Elevation	262.57	m
Outlet Control HW Elev.	263.55	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.41	m	Downstream Invert	262.07	m
Length	19.90	m	Constructed Slope	0.017136	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.50	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.50	m
Velocity Downstream	2.30	m/s	Critical Slope	0.028721	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	263.55	m	Upstream Velocity Head	0.20	m
Ke	0.90		Entrance Loss	0.18	m

Inlet Control Properties					
Inlet Control HW Elev.	263.45	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 9

Comments: Culvert 9

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	264.15	m	Headwater Depth/Height	4.31	
Computed Headwater Eleva	264.05	m	Discharge	0.3730	m³/s
Inlet Control HW Elev.	263.26	m	Tailwater Elevation	262.25	m
Outlet Control HW Elev.	264.05	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.08	m	Downstream Invert	261.68	m
Length	24.20	m	Constructed Slope	0.016446	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.57	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.41	m
Velocity Downstream	2.27	m/s	Critical Slope	0.047005	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	264.05	m	Upstream Velocity Head	0.26	m
Ke	0.90		Entrance Loss	0.24	m

Inlet Control Properties					
Inlet Control HW Elev.	263.26	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 10

Comments: Culvert 10

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	264.40	m	Headwater Depth/Height	7.08	
Computed Headwater Eleva	267.75	m	Discharge	1.1540	m³/s
Inlet Control HW Elev.	266.60	m	Tailwater Elevation	263.77	m
Outlet Control HW Elev.	267.75	m	Control Type	Outlet Control	

Grades

Upstream Invert	263.43	m	Downstream Invert	263.23	m
Length	21.70	m	Constructed Slope	0.009263	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.60	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.60	m
Velocity Downstream	3.98	m/s	Critical Slope	0.098616	m/m

Section

Section Shape	Circular	Mannings Coefficient	0.024	
Section Material	CMP	Span	0.61	m
Section Size	600 mm	Rise	0.61	m
Number Sections	1			

Outlet Control Properties

Outlet Control HW Elev.	267.75	m	Upstream Velocity Head	0.80	m
Ke	0.90		Entrance Loss	0.72	m

Inlet Control Properties

Inlet Control HW Elev.	266.60	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 11

Comments: Culvert 11

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	264.80	m	Headwater Depth/Height	2.56	
Computed Headwater Eleva	264.74	m	Discharge	1.1990	m³/s
Inlet Control HW Elev.	264.45	m	Tailwater Elevation	263.17	m
Outlet Control HW Elev.	264.74	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.79	m	Downstream Invert	262.53	m
Length	22.80	m	Constructed Slope	0.011447	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.66	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.66	m
Velocity Downstream	2.84	m/s	Critical Slope	0.033090	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	264.74	m	Upstream Velocity Head	0.35	m
Ke	0.90		Entrance Loss	0.32	m

Inlet Control Properties					
Inlet Control HW Elev.	264.45	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 12

Comments: Culvert 12

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	264.25	m	Headwater Depth/Height	3.47	
Computed Headwater Eleva	264.79	m	Discharge	0.7850	m³/s
Inlet Control HW Elev.	264.31	m	Tailwater Elevation	263.00	m
Outlet Control HW Elev.	264.79	m	Control Type	Outlet Control	

Grades

Upstream Invert	262.67	m	Downstream Invert	262.34	m
Length	21.20	m	Constructed Slope	0.015519	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.66	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.56	m
Velocity Downstream	2.69	m/s	Critical Slope	0.044657	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	264.79	m	Upstream Velocity Head	0.37	m
Ke	0.90		Entrance Loss	0.33	m

Inlet Control Properties

Inlet Control HW Elev.	264.31	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 13

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	261.60	m	Headwater Depth/Height	18.37	
Computed Headwater Eleva	269.10	m	Discharge	1.0750	m³/s
Inlet Control HW Elev.	265.62	m	Tailwater Elevation	260.31	m
Outlet Control HW Elev.	269.10	m	Control Type	Outlet Control	

Grades

Upstream Invert	259.91	m	Downstream Invert	259.84	m
Length	21.20	m	Constructed Slope	0.003632	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.50	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.50	m
Velocity Downstream	5.48	m/s	Critical Slope	0.261646	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.50	m
Section Size	500 mm		Rise	0.50	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	269.10	m	Upstream Velocity Head	1.53	m
Ke	0.90		Entrance Loss	1.38	m

Inlet Control Properties

Inlet Control HW Elev.	265.62	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 14

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	261.20	m	Headwater Depth/Height	1.60	
Computed Headwater Eleva	260.86	m	Discharge	0.2040	m³/s
Inlet Control HW Elev.	260.68	m	Tailwater Elevation	260.32	m
Outlet Control HW Elev.	260.86	m	Control Type	Outlet Control	

Grades

Upstream Invert	260.13	m	Downstream Invert	259.86	m
Length	24.40	m	Constructed Slope	0.011189	m/m

Hydraulic Profile

Profile	PressureProfile		Depth, Downstream	0.46	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.32	m
Velocity Downstream	1.24	m/s	Critical Slope	0.023482	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	260.86	m	Upstream Velocity Head	0.08	m
Ke	0.90		Entrance Loss	0.07	m

Inlet Control Properties

Inlet Control HW Elev.	260.68	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 15

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	259.50	m	Headwater Depth/Height	2.80	
Computed Headwater Eleva	260.03	m	Discharge	0.7050	m³/s
Inlet Control HW Elev.	259.70	m	Tailwater Elevation	258.57	m
Outlet Control HW Elev.	260.03	m	Control Type	Outlet Control	

Grades

Upstream Invert	258.32	m	Downstream Invert	258.00	m
Length	21.30	m	Constructed Slope	0.015070	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.57	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.54	m
Velocity Downstream	2.47	m/s	Critical Slope	0.037172	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	260.03	m	Upstream Velocity Head	0.30	m
Ke	0.90		Entrance Loss	0.27	m

Inlet Control Properties

Inlet Control HW Elev.	259.70	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 16

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	258.10	m	Headwater Depth/Height	3.72	
Computed Headwater Eleva	259.32	m	Discharge	0.8130	m³/s
Inlet Control HW Elev.	258.78	m	Tailwater Elevation	257.37	m
Outlet Control HW Elev.	259.32	m	Control Type	Outlet Control	

Grades					
Upstream Invert	257.05	m	Downstream Invert	256.72	m
Length	21.80	m	Constructed Slope	0.015138	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.65	m
Slope Type	N/A		Normal Depth	N/A	m
Flow Regime	N/A		Critical Depth	0.56	m
Velocity Downstream	2.79	m/s	Critical Slope	0.047647	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	259.32	m	Upstream Velocity Head	0.40	m
Ke	0.90		Entrance Loss	0.36	m

Inlet Control Properties					
Inlet Control HW Elev.	258.78	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 17

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	257.25	m	Headwater Depth/Height	1.45	
Computed Headwater Eleva	257.00	m	Discharge	0.8800	m³/s
Inlet Control HW Elev.	256.88	m	Tailwater Elevation	256.43	m
Outlet Control HW Elev.	257.00	m	Control Type	Outlet Control	

Grades					
Upstream Invert	256.12	m	Downstream Invert	255.81	m
Length	21.60	m	Constructed Slope	0.014306	m/m

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.62	m
Slope Type	N/A		Normal Depth	0.54	m
Flow Regime	N/A		Critical Depth	0.43	m
Velocity Downstream	1.51	m/s	Critical Slope	0.022067	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	257.00	m	Upstream Velocity Head	0.12	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	256.88	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.6	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 18

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	256.70	m	Headwater Depth/Height	7.10	
Computed Headwater Eleva	260.01	m	Discharge	2.1050	m³/s
Inlet Control HW Elev.	258.87	m	Tailwater Elevation	255.15	m
Outlet Control HW Elev.	260.01	m	Control Type	Outlet Control	

Grades					
Upstream Invert	254.60	m	Downstream Invert	254.42	m
Length	24.70	m	Constructed Slope	0.007206	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.75	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.75	m
Velocity Downstream	4.64	m/s	Critical Slope	0.100526	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.76	m
Section Size	750 mm		Rise	0.76	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	260.01	m	Upstream Velocity Head	1.09	m
Ke	0.90		Entrance Loss	0.98	m

Inlet Control Properties					
Inlet Control HW Elev.	258.87	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.5	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 19

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	256.50	m	Headwater Depth/Height	8.81	
Computed Headwater Eleva	260.45	m	Discharge	1.2910	m³/s
Inlet Control HW Elev.	258.95	m	Tailwater Elevation	255.12	m
Outlet Control HW Elev.	260.45	m	Control Type	Outlet Control	

Grades

Upstream Invert	255.07	m	Downstream Invert	254.95	m
Length	21.60	m	Constructed Slope	0.005556	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.60	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.60	m
Velocity Downstream	4.44	m/s	Critical Slope	0.125725	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	260.45	m	Upstream Velocity Head	1.00	m
Ke	0.90		Entrance Loss	0.90	m

Inlet Control Properties

Inlet Control HW Elev.	258.95	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Post-Development Culvert Analysis

Culvert Calculator Report
Culvert 3

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	263.55	m	Headwater Depth/Height	1.47	
Computed Headwater Eleva	263.16	m	Discharge	1.8350	m³/s
Inlet Control HW Elev.	262.97	m	Tailwater Elevation	262.08	m
Outlet Control HW Elev.	263.16	m	Control Type	Outlet Control	

Grades

Upstream Invert	261.59	m	Downstream Invert	261.39	m
Length	21.00	m	Constructed Slope	0.009524	m/m

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.77	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.77	m
Velocity Downstream	2.66	m/s	Critical Slope	0.029221	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.07	m
Section Size	1050 mm		Rise	1.07	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	263.16	m	Upstream Velocity Head	0.21	m
Ke	0.90		Entrance Loss	0.19	m

Inlet Control Properties

Inlet Control HW Elev.	262.97	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.9	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 5

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	262.00	m	Headwater Depth/Height	1.41	
Computed Headwater Eleva	261.73	m	Discharge	2.5710	m³/s
Inlet Control HW Elev.	261.59	m	Tailwater Elevation	260.36	m
Outlet Control HW Elev.	261.73	m	Control Type	Outlet Control	

Grades					
Upstream Invert	260.01	m	Downstream Invert	259.77	m
Length	21.90	m	Constructed Slope	0.010959	m/m

Hydraulic Profile					
Profile	CompositeM2PressureProfile		Depth, Downstream	0.88	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.88	m
Velocity Downstream	2.85	m/s	Critical Slope	0.028021	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	261.73	m	Upstream Velocity Head	0.25	m
Ke	0.90		Entrance Loss	0.22	m

Inlet Control Properties					
Inlet Control HW Elev.	261.59	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 7

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	263.35	m	Headwater Depth/Height	0.75	
Computed Headwater Eleva	262.74	m	Discharge	0.5880	m³/s
Inlet Control HW Elev.	262.64	m	Tailwater Elevation	262.38	m
Outlet Control HW Elev.	262.74	m	Control Type	Outlet Control	

Grades					
Upstream Invert	261.99	m	Downstream Invert	261.89	m
Length	21.20	m	Constructed Slope	0.004717	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.49	m
Slope Type	Mild		Normal Depth	0.69	m
Flow Regime	Subcritical		Critical Depth	0.43	m
Velocity Downstream	1.54	m/s	Critical Slope	0.020988	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.00	m
Section Size	1000 mm		Rise	1.00	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	262.74	m	Upstream Velocity Head	0.07	m
Ke	0.90		Entrance Loss	0.06	m

Inlet Control Properties					
Inlet Control HW Elev.	262.64	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.8	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 8

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	263.45 m	Headwater Depth/Height	0.50
Computed Headwater Eleva	263.02 m	Discharge	0.9570 m³/s
Inlet Control HW Elev.	262.92 m	Tailwater Elevation	262.57 m
Outlet Control HW Elev.	263.02 m	Control Type	Outlet Control

Grades

Upstream Invert	262.41 m	Downstream Invert	262.07 m
Length	19.90 m	Constructed Slope	0.017085 m/m

Hydraulic Profile

Profile	M1	Depth, Downstream	0.50 m
Slope Type	Mild	Normal Depth	0.38 m
Flow Regime	Subcritical	Critical Depth	0.37 m
Velocity Downstream	1.06 m/s	Critical Slope	0.018834 m/m

Section

Section Shape	Circular	Mannings Coefficient	0.030
Section Material	CMP	Span	1.22 m
Section Size	1200 mm	Rise	1.22 m
Number Sections	2		

Outlet Control Properties

Outlet Control HW Elev.	263.02 m	Upstream Velocity Head	0.12 m
Ke	0.90	Entrance Loss	0.11 m

Inlet Control Properties

Inlet Control HW Elev.	262.92 m	Flow Control	N/A
Inlet Type	Projecting	Area Full	2.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

Culvert Calculator Report
Culvert 11

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	264.85	m	Headwater Depth/Height	1.09	
Computed Headwater Eleva	264.11	m	Discharge	1.9100	m³/s
Inlet Control HW Elev.	264.04	m	Tailwater Elevation	263.17	m
Outlet Control HW Elev.	264.11	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.79	m	Downstream Invert	262.53	m
Length	22.80	m	Constructed Slope	0.011404	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.76	m
Slope Type	Mild		Normal Depth	1.02	m
Flow Regime	Subcritical		Critical Depth	0.76	m
Velocity Downstream	2.51	m/s	Critical Slope	0.023535	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.22	m
Section Size	1200 mm		Rise	1.22	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	264.11	m	Upstream Velocity Head	0.19	m
Ke	0.90		Entrance Loss	0.17	m

Inlet Control Properties					
Inlet Control HW Elev.	264.04	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 12

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	264.25	m	Headwater Depth/Height	0.88	
Computed Headwater Eleva	263.55	m	Discharge	0.8330	m³/s
Inlet Control HW Elev.	263.48	m	Tailwater Elevation	263.00	m
Outlet Control HW Elev.	263.55	m	Control Type	Outlet Control	

Grades					
Upstream Invert	262.67	m	Downstream Invert	262.34	m
Length	21.20	m	Constructed Slope	0.015566	m/m

Hydraulic Profile					
Profile	M1		Depth, Downstream	0.66	m
Slope Type	Mild		Normal Depth	0.58	m
Flow Regime	Subcritical		Critical Depth	0.52	m
Velocity Downstream	1.51	m/s	Critical Slope	0.022421	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.00	m
Section Size	1000 mm		Rise	1.00	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	263.55	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev.	263.48	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.8	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 13

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	261.60	m	Headwater Depth/Height	1.07	
Computed Headwater Eleva	261.05	m	Discharge	1.2120	m³/s
Inlet Control HW Elev.	260.92	m	Tailwater Elevation	260.34	m
Outlet Control HW Elev.	261.05	m	Control Type	Outlet Control	

Grades					
Upstream Invert	259.91	m	Downstream Invert	259.84	m
Length	21.20	m	Constructed Slope	0.003302	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.62	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.62	m
Velocity Downstream	2.24	m/s	Critical Slope	0.023420	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.07	m
Section Size	1050 mm		Rise	1.07	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	261.05	m	Upstream Velocity Head	0.11	m
Ke	0.90		Entrance Loss	0.10	m

Inlet Control Properties					
Inlet Control HW Elev.	260.92	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	0.9	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 17

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	257.30	m	Headwater Depth/Height	0.69	
Computed Headwater Eleva	257.06	m	Discharge	2.3430	m³/s
Inlet Control HW Elev.	256.95	m	Tailwater Elevation	256.43	m
Outlet Control HW Elev.	257.06	m	Control Type	Outlet Control	

Grades

Upstream Invert	256.12	m	Downstream Invert	255.81	m
Length	21.60	m	Constructed Slope	0.014352	m/m

Hydraulic Profile

Profile	M1		Depth, Downstream	0.62	m
Slope Type	Mild		Normal Depth	0.61	m
Flow Regime	Subcritical		Critical Depth	0.56	m
Velocity Downstream	1.81	m/s	Critical Slope	0.018661	m/m

Section

Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.37	m
Section Size	1350 mm		Rise	1.37	m
Number Sections	2				

Outlet Control Properties

Outlet Control HW Elev.	257.06	m	Upstream Velocity Head	0.18	m
Ke	0.90		Entrance Loss	0.16	m

Inlet Control Properties

Inlet Control HW Elev.	256.95	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	3.0	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Culvert Calculator Report
Culvert 18

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	256.70	m	Headwater Depth/Height	1.18	
Computed Headwater Eleva	256.40	m	Discharge	3.6710	m³/s
Inlet Control HW Elev.	256.28	m	Tailwater Elevation	255.26	m
Outlet Control HW Elev.	256.40	m	Control Type	Outlet Control	

Grades					
Upstream Invert	254.60	m	Downstream Invert	254.42	m
Length	24.70	m	Constructed Slope	0.007287	m/m

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.99	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.99	m
Velocity Downstream	2.92	m/s	Critical Slope	0.022891	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.030	
Section Material	CMP		Span	1.52	m
Section Size	1500 mm		Rise	1.52	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	256.40	m	Upstream Velocity Head	0.23	m
Ke	0.90		Entrance Loss	0.21	m

Inlet Control Properties					
Inlet Control HW Elev.	256.28	m	Flow Control	N/A	
Inlet Type	Projecting		Area Full	1.8	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

Appendix D

Storm Sewer Sizing Calculations

Assesses storm sewer sizing and capacity to convey flows from sub-catchments

A. Input Data (Apply for A <10 ha)

Specify "Design Storm" using drop-down (see "Rainfall Data" sheet for reference data) or manual IDF input; Set maximum inlet time and manning's roughness for pipe

Design Storm	IDF Coeff			
	Year	*A*	*B*	*C*
Return Period Storm	10	604.12		0.70
[Optional] User Defined				

Sewer Characteristics	Input Value	
Inlet Time [min]	15	*Region of Peel Public Works Design, Specification & Procedures Manual - Storm Sewers*
Manning's "n"	0.013	*Concrete Pipe, HDPE*

B. Storm Sewer Calculation Sheet

At minimum, input "Length", "Diameter" and "Slope" of pipe

Sub-Catchment ID	MH Location			Runoff Calculations							Designed Pipe Characteristics					
	From	To	Distance [m]	A [ha]	C	A x C	Total AxC	Tin [min]	i [mm/hr]	Q [cms]	Diameter [mm]	Slope [%]	Q_Full [cms]	V_Full [cms]	Pipe Time [min]	Capacity [%]
C11-A			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.304	0.097	0.876	0.952	46%
C11-A			50	0.193	0.900	0.174	0.347	15.952	88.140	0.085	375	0.304	0.097	0.876	0.952	88%
C11-A			50	0.193	0.900	0.174	0.521	16.903	84.662	0.123	450	0.304	0.157	0.989	0.843	78%
C11-A			50	0.193	0.900	0.174	0.695	17.746	81.847	0.158	525	0.304	0.237	1.096	0.760	67%
C11-A			50	0.193	0.900	0.174	0.869	18.506	79.495	0.192	525	0.304	0.237	1.096	0.760	81%
C11-A			50	0.193	0.900	0.174	1.042	19.266	77.301	0.224	525	0.304	0.237	1.096	0.760	94%
C11-A			50	0.193	0.900	0.174	1.216	20.027	75.249	0.254	600	0.304	0.339	1.198	0.696	75%
C11-A			50	0.193	0.900	0.174	1.390	20.722	73.485	0.284	600	0.304	0.339	1.198	0.696	84%
C11-A			26.591	0.103	0.900	0.092	1.482	21.418	71.818	0.296	600	0.304	0.339	1.198	0.370	87%
C11-B			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.548	0.130	1.176	0.709	34%
C11-B			50	0.193	0.900	0.174	0.347	15.709	89.086	0.086	375	0.548	0.130	1.176	0.709	66%
C11-B			50	0.193	0.900	0.174	0.521	16.417	86.396	0.125	375	0.548	0.130	1.176	0.709	96%
C11-B			50	0.193	0.900	0.174	0.695	17.126	83.895	0.162	450	0.548	0.211	1.328	0.627	77%
C11-B			50	0.193	0.900	0.174	0.869	17.753	81.823	0.197	450	0.548	0.211	1.328	0.627	93%
C11-B			53.497	0.206	0.900	0.186	1.054	18.381	79.872	0.234	525	0.548	0.319	1.472	0.606	73%
C12			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.820	0.159	1.439	0.579	28%
C12			50	0.193	0.900	0.174	0.347	15.579	89.600	0.086	375	0.820	0.159	1.439	0.579	54%
C12			50	0.193	0.900	0.174	0.521	16.158	87.355	0.126	375	0.820	0.159	1.439	0.579	80%
C12			39.813	0.154	0.900	0.138	0.659	16.737	85.243	0.156	375	0.820	0.159	1.439	0.461	98%
C13			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.820	0.159	1.439	0.579	28%
C13			50	0.193	0.900	0.174	0.347	15.579	89.600	0.086	375	0.820	0.159	1.439	0.579	54%
C13			50	0.193	0.900	0.174	0.521	16.158	87.355	0.126	375	0.820	0.159	1.439	0.579	80%
C13			50	0.193	0.900	0.174	0.695	16.737	85.243	0.165	450	0.820	0.258	1.625	0.513	64%
C13			50	0.193	0.900	0.174	0.869	17.250	83.474	0.201	450	0.820	0.258	1.625	0.513	78%
C13			50	0.193	0.900	0.174	1.042	17.763	81.792	0.237	450	0.820	0.258	1.625	0.513	92%
C13			50	0.193	0.900	0.174	1.216	18.276	80.190	0.271	525	0.820	0.390	1.801	0.463	69%
C13			60.829	0.235	0.900	0.211	1.427	18.739	78.808	0.312	525	0.820	0.390	1.801	0.563	80%
C17			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.450	0.118	1.066	0.782	38%
C17			50	0.193	0.900	0.174	0.347	15.782	88.798	0.086	375	0.450	0.118	1.066	0.782	73%
C17			50	0.193	0.900	0.174	0.521	16.000	87.955	0.127	450	0.450	0.191	1.204	0.692	67%
C17			50	0.193	0.900	0.174	0.695	16.692	85.403	0.165	450	0.450	0.191	1.204	0.692	86%
C17			50	0.193	0.900	0.174	0.869	17.000	84.326	0.203	525	0.450	0.289	1.334	0.625	70%
C17			50	0.193	0.900	0.174	1.042	17.625	82.237	0.238	525	0.450	0.289	1.334	0.625	82%

Sub-Catchment ID	MH Location			Runoff Calculations							Designed Pipe Characteristics					
	From	To	Distance [m]	A [ha]	C	A x C	Total AxC	Tin [min]	i [mm/hr]	Q [cms]	Diameter [mm]	Slope [%]	Q_Full [cms]	V_Full [cms]	Pipe Time [min]	Capacity [%]
C17			50	0.193	0.900	0.174	1.216	18.000	81.042	0.274	525	0.450	0.289	1.334	0.625	95%
C17			50	0.193	0.900	0.174	1.390	18.625	79.143	0.305	600	0.450	0.412	1.458	0.571	74%
C17			50	0.193	0.900	0.174	1.563	19.000	78.053	0.339	600	0.450	0.412	1.458	0.571	82%
C17			50	0.193	0.900	0.174	1.737	19.571	76.462	0.369	600	0.450	0.412	1.458	0.571	89%
C17			50	0.193	0.900	0.174	1.911	20.000	75.319	0.400	600	0.450	0.412	1.458	0.571	97%
C17			50	0.193	0.900	0.174	2.084	20.571	73.859	0.428	750	0.450	0.748	1.692	0.492	57%
C17			50	0.193	0.900	0.174	2.258	21.000	72.808	0.457	750	0.450	0.748	1.692	0.492	61%
C17			50	0.193	0.900	0.174	2.432	21.492	71.645	0.484	750	0.450	0.748	1.692	0.492	65%
C17			31.906	0.123	0.900	0.111	2.543	22.000	70.492	0.498	750	0.450	0.748	1.692	0.314	67%
C18-A			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.400	0.111	1.005	0.829	40%
C18-A			50	0.193	0.900	0.174	0.347	15.829	88.613	0.086	375	0.400	0.111	1.005	0.829	77%
C18-A			50	0.193	0.900	0.174	0.521	16.658	85.524	0.124	450	0.400	0.180	1.135	0.734	69%
C18-A			50	0.193	0.900	0.174	0.695	17.393	82.998	0.160	450	0.400	0.180	1.135	0.734	89%
C18-A			50	0.193	0.900	0.174	0.869	18.127	80.647	0.195	525	0.400	0.272	1.258	0.663	71%
C18-A			44.238	0.171	0.900	0.154	1.022	18.789	78.660	0.223	525	0.400	0.272	1.258	0.586	82%
C18-B			50	0.193	0.900	0.174	0.174	15.000	91.990	0.044	375	0.300	0.096	0.870	0.957	46%
C18-B			50	0.193	0.900	0.174	0.347	15.957	88.118	0.085	375	0.300	0.096	0.870	0.957	88%
C18-B			50	0.193	0.900	0.174	0.521	16.915	84.621	0.122	450	0.300	0.156	0.983	0.848	78%
C18-B			25	0.097	0.900	0.087	0.608	17.763	81.792	0.138	450	0.300	0.156	0.983	0.424	88%

G

NATURAL HERITAGE ASSESSMENT

GUIDING SOLUTIONS IN THE
NATURAL ENVIRONMENT

Natural Environment Report
Mayfield Road Widening Class EA

Prepared For:

Region of Peel

Prepared By:

Beacon Environmental Limited

Date:	*Project:*
March 2016	**212276**

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Appendices

1. Introduction

Beacon Environmental Limited (Beacon) has been retained to complete a natural heritage assessment of aquatic and terrestrial habitat for the proposed widening of Mayfield Road in the City of Brampton, Municipal Region of Peel. The proposed study area is along Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard, which is a distance of approximately 5.6 km (**Figure 1**).

The Study Area was investigated to characterize the natural features through assessment of the watercourses and vegetation communities, and identify all individual trees and tree groups which may be impacted by the proposed road widening

The information provided in this report was used to inform the planning and design of the proposed widening in regards to impacts to natural heritage features, including watercourse crossings and to recommend mitigation measures for crossings. The report also includes a tree inventory and measures for tree preservation and tree removal.

2. Methodology

Background information was gathered and reviewed at the outset of the project. This included the following sources:

- Credit Valley Conservation (CVC) policies and regulations;
- Ontario Ministry of Natural Resources and Forestry (MNRF) screening for Species at Risk;
- *Endangered Species Act* (2007);
- Provincial Policy Statement (MMAH 2014);
- The Regional Municipality of Peel Official Plan (2008); and
- City of Brampton Official Plan (2006).

A search of the Natural Heritage Information Centre (NHIC) of the Ministry of Natural Resources and Forestry (MNRF) was completed for specific Elemental Occurrences that may be present within the Study Area. An Element is defined as a unit of natural biological diversity. An Elemental Occurrence is defined as an area where an Element is or was present (NHIC website). Data from the MNRF and CVC have been incorporated into this report.

Other sources of information, such as aerial photography and topographic maps, were also consulted prior to commencing field investigations.

2.1 Field Investigations

Field investigations for the subject properties were undertaken in 2014 by Beacon Environmental staff, for the review of existing conditions with respect to natural aquatic and terrestrial habitats.

2.1.1 Aquatic Resources

Detailed field investigations were undertaken on May 16, 2014 to assess the watercourses in the study area and in particular, the watercourse crossings of the proposed area of road widening. Drainage features were classified using the *Evaluation, Classification and Management of Headwater Drainage Features Guidelines* (TRCA and CVC, 2011). Access was restricted to the road right of ways and specific areas with permission to enter; the assessments were completed to the extent possible.

Habitat assessments of drainage features within the study area were completed based on an analysis of channel form (channel width and depth profile, bank height, stability and channel morphology), vegetation (riparian cover type and extent, wetland areas and floodplain vegetation), and linkage (side channels and floodplain, valley lands, ponds and wetlands).

The flow regime of the drainage features was considered ephemeral, meaning that flow is present only in response to surface events such as the spring freshet and after rain events. The investigation was conducted after two days of >10 mm rain fall and therefore flow was present in most of the features. Each of the drainage features is upstream of watercourses managed as warmwater riverine systems by the CVC (Credit River FMP 2002).

2.1.2 Terrestrial Resources

Aerial photographs were reviewed to determine the presence of vegetation communities within the Study Area. No vegetation communities as per the Ecological Land Classification (ELC) system for southern Ontario (Lee *et al*., 1998) are present in the Study Area. This was confirmed via field reconnaissance in October 2014, during the Tree Inventory.

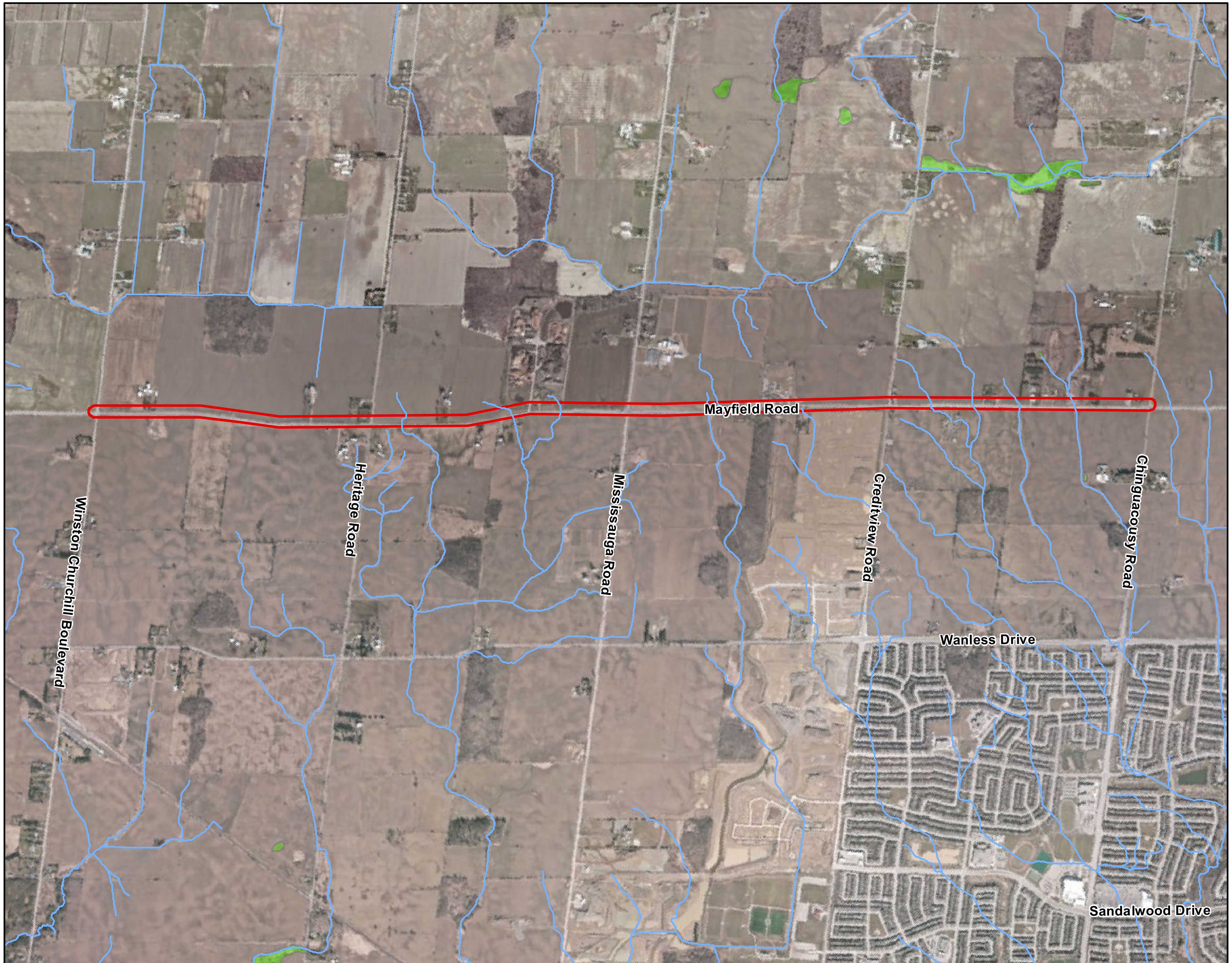
A tree inventory of single yard and laneway trees was conducted to determine if any trees of relative importance are within the study area. Trees were measured at dbh (diameter at breast height, or 1.4 m) and condition was assessed based on presence and severity of flaws, damage, evidence of pests or diseases, structural condition, dead or dying branches, or other decline indicators. Only trees measuring 15 cm dbh or greater were documented, as per the City of Brampton’s *Interim Guidelines for the Assessment of Existing Tableland Vegetation (2009)*.

Where Permission to Enter (PTE) had been granted, trees were tagged, if not already tagged, with metal, numbered labels, using a staple gun. Where appropriate, trees were documented as a group and named Group A, Group B, etc. and without metal tags. For properties where PTE was not granted, trees were documented from the roadway, dbh was estimated and no tags were affixed to the trees. All trees included in this inventory are located within 20 m from the edge of road. The general location of each tree or group of trees was recorded in the field on field maps. An Ontario Land Surveyor has documented the tree locations, which will be used in conjunction with design drawings prior to construction to determine the impact of the road widening on local trees and required preservation methods.

Site Location

Figure 1

Mayfield Road Widening Class EA



Legend

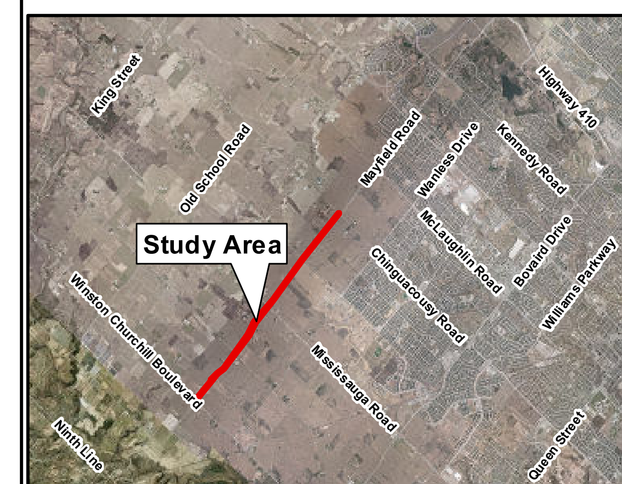
Study Area

Drainage Features

Wetlands (MNR, 2013)

Provincially Significant

Other



First Base Solutions
Web Mapping Service 2010

UTM Zone 17 N, NAD 83

0 225 450 900 Meters

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March 2016

3. Policy Context

The following section provides the provincial, regional and local policy context for this assessment, with consideration of the following documents/information sources relevant to the subject property:

- Provincial Policy Statement (2014);
- Regional Municipality of York Official Plan (2008);
- Town of Richmond Hill Official Plan (2006);
- Toronto and Region Conservation Authority (TRCA) Regulations and Policies;
- Ministry of Natural Resources and Forestry (MNRF) resource information; and
- *Endangered Species Act* (2007).

Other sources of information such as aerial photography were also consulted prior to commencing a field investigation.

3.1 Provincial Policy Statement (2014)

Natural Heritage Policy 2.1 of the *Provincial Policy Statement* (PPS) (MMAH 2014) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources for applications pursuant to the *Planning Act*. The PPS 2014 defines eight natural heritage features and provides planning policies for each. The *Natural Heritage Reference Manual* (OMNR 2010) is a technical document used to help assess the natural heritage features listed below:

i. significant wetlands;
ii. significant coastal wetlands;
iii. habitat of endangered and threatened species;
iv. fish habitat;
v. significant woodlands;
vi. significant valleylands;
vii. significant Areas of Natural and Scientific Interest (ANSIs); and
viii. significant wildlife habitat.

Each of these features is afforded varying levels of protection subject to guidelines, and in some cases, regulations. Of these features, significant wetlands can be designated and/or identified either by the Ministry of Natural Resources and Forestry (MNRF) and/or the municipality. Habitat of threatened and endangered species is determined in accordance with provincial and federal requirements. Fish habitat is governed by Fisheries and Oceans Canada (DFO). The identification and regulation of the remaining features is the responsibility of the municipality or other planning authority.

PPS natural heritage features relevant to the subject property include habitat of endangered and threatened species.

3.2 Region of Peel Official Plan (2014 Office Consolidation)

The wooded area between crossings 11 and 12 (Figure 2b) is depicted as a Core Area of the Greenlands System on Schedule A. All areas north of Mayfield Road within the Study Area are depicted as Prime Agricultural Areas on Schedule B.

Among other features, Core Areas include Woodlands which meet municipal Criteria in Table 1 of the Official Plan, Significant Habitat of Endangered and Threatened Species and Valley and Stream Corridors which meet the municipal criteria in Table 2 of the Official Plan.

The primary objective of the Region with respect to Prime Agricultural Area is *to protect the Prime Agricultural Area for long-term use for agriculture as a natural resource of major importance to the economic viability of the Region, and to support Peel's farmers and agricultural organizations as valuable contributors to the community and the economy of Peel*. The policies for Prime Agricultural Areas are in Section 3.2.2. of the Official Plan.

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3.3 City of Brampton Official Plan (2015 Consolidation)

On Schedule D - Natural Heritage Features and Areas of the City of Brampton Official Plan, the wooded area between crossings 11 and 12 is depicted as a valleyland/watercourse corridor. The majority of the drainage features in the Study Area are identified as watercourses and tributaries and are shown for contextual purposes only. The delineation of all natural features is to be conducted during site specific investigations with the appropriate agencies, as required, as per Section 4.6.6.1.

Section 4.6.6.8 states that *development and site alteration shall not be permitted on lands adjacent to the natural heritage features and areas identified on Schedule "D" unless an Environmental Implementation Report and/or Environmental Impact Study has been prepared having regard for the concerns of the relevant conservation authority, as well as other agencies, to the satisfaction of the City and the report and/or study has demonstrated that there will be no negative impacts on the significant natural features or their ecological functions."*

3.4 Credit Valley Conservation Regulations and Policies

Credit Valley Conservation (CVC) regulates land use activities in and adjacent to wetlands, watercourses and valleylands under Ontario Regulation 160/06 (Regulation for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses) made under the *Conservation Authorities Act*.

CVC recognizes that certain types of interference or development related to infrastructure by their nature must locate within hazardous land, watercourses, wetlands and natural features and areas contributing to the conservation of land and associated setbacks. Considering this, CVC may permit such works where all reasonable alternatives have been explored through an environmental study and are determined not to be feasible. The regulation requires the issuance of a permit from the Conservation Authority to allow "interference" with a wetland or for infringement within the flood and fill areas associated with a watercourse.

3.5 *Endangered Species Act*

Ontario's *Endangered Species Act, 2007* (ESA) came into effect on June 30, 2008 and replaced the former 1971 Act. Under the new ESA, over 200 species in Ontario are identified as extirpated, endangered, threatened, or of special concern. Section 9 of the ESA generally prohibits the killing or harming of a threatened or endangered species, as well as the destruction of its habitat. Section 10 of the ESA prohibits the damage or destruction of the habitat of all endangered and threatened species.

In February 2009, the Redside Dace was designated Endangered under the ESA. A permit from MNRF is required under Section 17(2)(c) of the ESA for any works proposed within habitat of a threatened or endangered species.

Ontario Regulation 293/11 was released in July 2011 and Section 29.1(1) defines Redside Dace habitat in Peel Region as follows:

- *i. any part of a stream or other watercourse that is being used by a redside dace,*
- *ii. any part of a stream or other watercourse that was used by a redside dace at any time during the previous 20 years and that provides suitable conditions for a redside dace to carry out its life processes,*
- *iii. the area encompassing the meander belt width of an area described in subparagraph i or ii,*
- *iv. the vegetated area or agricultural lands that are within 30 metres of an area described in subparagraph iii, and*
- *v. a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i or ii, provided the part of the stream or watercourse has an average bankfull width of 7.5 metres or less.*

Drainage Features at Crossings 11 and 18 have been identified as contributing Redside Dace habitat in the Block 51-1 EIR (Stonybrook Consulting *et al*. 2013). The results of surveys of the subject property for commonly found Species at Risk are presented in **Section 4.3**.

4. Existing Conditions

4.1 Aquatic Resources

The study area is located entirely within the jurisdiction of Credit Valley Conservation, within the subwatersheds of Fletcher's Creek in the east and Huttonville Creek in in the West. The headwaters of both of these subwatersheds area located along the study area at Mayfield Road.

Characteristics of each of the crossings are summarized in **Table 1** below with locations provided on **Figures 2a** through **2d.** Photographs are provided in the accompanying photograph log (**Appendix B**). Although nineteen culverts along Mayfield Road were identified by project engineers, only those which conveyed flow from a drainage feature to downstream reaches were evaluated in the aquatic assessment. Two additional culvert crossings were identified as conveying upstream ephemeral drainage to downstream areas (i.e., 2a and 4a).

Table 1. Characteristics of Drainage Features in Study Area

Crossing	Photos	General Description	Thermal/Flow Regime	Riparian Vegetation	Function/ Sensitivity
19	1, 2	Fletcher's Creek Subwatershed: Ill defined feature; ploughed through upstream and downstream; substrate is sandy soil, moderate flow at time of assessment; plastic corrugated culvert	Warmwater/ Ephemeral	Agricultural field	Low – ephemeral swale in farm field
18	3, 4	Fletcher's Creek Subwatershed: Ill defined feature, originating from upstream meadow marsh; majority of flow is from roadside ditches; northern ditch contains cattails. Downstream reach is contained within a narrow band of terrestrial grasses	Warmwater/ Intermittent (potential groundwater contribution identified through studies by others)	Cattail meadow marsh, grasses	High – intermittent swale with limited riparian vegetation; regulated Redside Dace contributing habitat
17	5, 6	Fletcher's Creek Subwatershed: Majority of flows reach feature from ditch; ill defined swale feature, ploughed through upstream; at time of investigation, downstream reach of feature was rerouted due to Feedermain installation, but is likely vegetated corridor; substrate is sandy soil, moderate flow at time of assessment; double plastic corrugated culvert.	Warmwater/ Ephemeral	Agricultural field, meadow	Low – ephemeral swale in farm field
16	7, 8	Fletcher's Creek Subwatershed: Ill defined feature; ploughed through upstream and downstream with tractor tracks downstream and some terrestrial grasses upstream; substrate is sandy soil, moderate flow at time of assessment; plastic corrugated culvert	Warmwater/ Ephemeral	Agricultural field, meadow	Low – ephemeral swale with limited riparian vegetation

Crossing	Photos	General Description	Thermal/Flow Regime	Riparian Vegetation	Function/ Sensitivity
15	9, 10	Fletcher's Creek Subwatershed: Undefined flows immediately upstream of road through ploughed field, disperse into ditch, then through culvert. Downstream, flows are undefined through manicured lawn. Channel becomes defined along front of building in narrow grassed channel to driveway culvert.	Warmwater/ Ephemeral	Agricultural field, Manicured Lawn	Low – ephemeral swale with limited riparian vegetation
14	11, 12	Fletcher's Creek Subwatershed: Wetland downstream, but with no connection to upstream flows. No culverts under Mayfield Road, but flows collect in ditches and are conveyed under Creditview Road.	Warmwater/ Ephemeral	Agricultural, meadow marsh	Medium – ephemeral swale with limited riparian vegetation; Meadow marsh south of Mayfield Road
12	13, 14	No feature. Subdivision is being constructed in this area	--	--	--
11	15, 16	Huttonville Creek Subwatershed: Feature protected through robust erosion sediment control measures, as part of Feedermain installation at the time of assessment. Upstream flow from ploughed farm field, with considerable ponding adjacent to rock check dam within sediment fencing. Downstream the feature flows through a wide swale with some woody vegetation.	Warmwater/ Intermittent (potential groundwater contribution identified through studies by others)	Agricultural, meadow marsh – some woody vegetation	High – Meadow marsh corridor south of Mayfield Road; regulated Redside Dace contributing habitat
8	17,18	Huttonville Creek Subwatershed No feature identified upstream. Some ponding in grass yard, flows from adjacent roadside ditches. Downstream reach is undefined swale, ploughed through.	Warmwater/ Ephemeral	Manicured Lawn, Agricultural field,	Low – ephemeral swale in yard/farm field
7	19, 20	Huttonville Creek Subwatershed Upstream is a defined channel, likely dug, receiving augmented flows from tile drains of adjacent agricultural fields; Downstream is a defined cattail corridor along property boundary	Warmwater/ Ephemeral	Manicured Lawn, meadow marsh	Low – cattail corridor in downstream reach

Crossing	Photos	General Description	Thermal/Flow Regime	Riparian Vegetation	Function/ Sensitivity
5	21, 22	Huttonville Creek Subwatershed No evidence of upstream feature; tile drain outletting to culvert. Downstream flows dispersed through grassy field.	Warmwater/ Ephemeral	Agriculture (tile drain), grass field	Low – ephemeral swale in yard
4a	23, 24	Huttonville Creek Subwatershed Upstream ponding in field, no culvert connection under Mayfield Road. Downstream reach in poorly defined narrow (10 cm) channel within farm field	Warmwater/ Ephemeral	Agricultural	Low – ephemeral channel in farm field
3	25, 26	Huttonville Creek Subwatershed Culvert connection under Mayfield Road, upstream flows from northern ditch. Downstream reach in moderately defined channel within farm field, no riparian vegetation	Warmwater/ Ephemeral	Agricultural	Low – ephemeral channel in farm field
2	27, 28	Huttonville Creek Subwatershed Culvert connection under Mayfield Road, upstream flows from northern ditch. Downstream reach in moderately defined channel within farm field, no riparian vegetation	Warmwater/ Ephemeral	Agricultural	Low – ephemeral channel in farm field
2a	29, 30	Huttonville Creek Subwatershed Upstream swale in farm field, with, no culvert connection under Mayfield Road. Downstream reach in poorly defined narrow (10 cm) channel within farm field	Warmwater/ Ephemeral	Agricultural	Low – ephemeral channel in farm field

4.2 Terrestrial Resources

No woodlands or identified wetlands of any size have been identified along the study route. A woodlot (identified on Schedule A of the Region of Peel Official Plan as part of the Greenlands System) is approximately 80 m south of Mayfield Road. Individual trees closer to the road in this area have been identified in the tree inventory. There are several smaller wetlands associated with the riparian areas of tributaries identified within the study area. Parts of these features will likely need to be removed, to accommodate the proposed construction works. Given their relatively low function and biodiversity, we anticipate that any adverse impacts can be readily mitigated.

Legend

- Study Area
- Edge of Disturbance
- Tree Groups
- Watercourse (MNR, 2014)
- Contributing Redside Dace Habitat
- 19 Culvert Number

Proposed Widening

Figure 2a

Mayfield Road Widening Class EA

First Base Solutions Web Mapping Service 2015

UTM Zone 17 N, NAD 83

0 50 100 200 Metres

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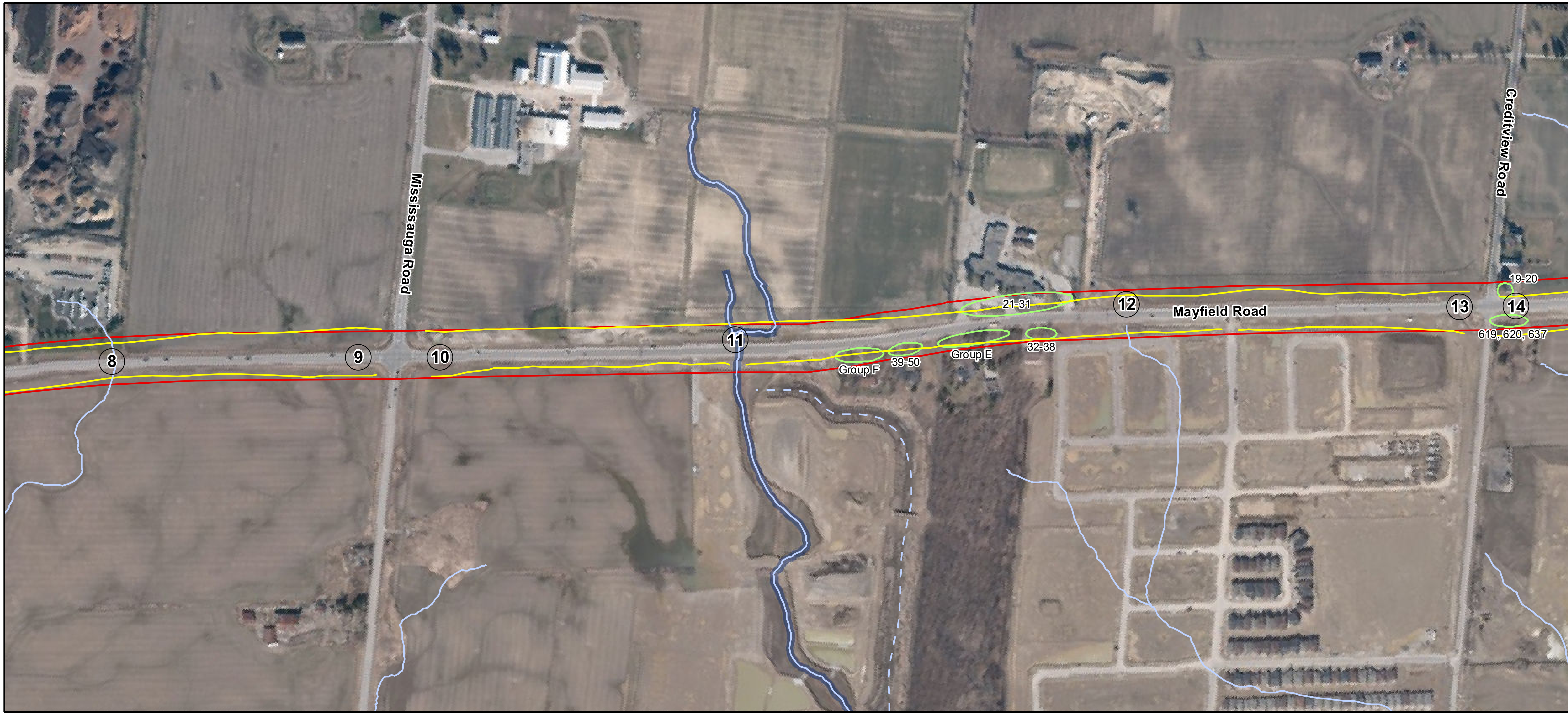

Legend

- Study Area
- Edge of Disturbance
- Tree Groups
- Watercourse (MNR, 2014)
- Contributing Redside Dace Habitat
- Future Contributing Redside Dace Habitat (as per Block 51-1 EIR)
- 19 Culvert Number

Proposed Widening

Figure 2b

Mayfield Road Widening Class EA

First Base Solutions Web Mapping Service 2015

UTM Zone 17 N, NAD 83

0 50 100 200 Metres

1:5,000

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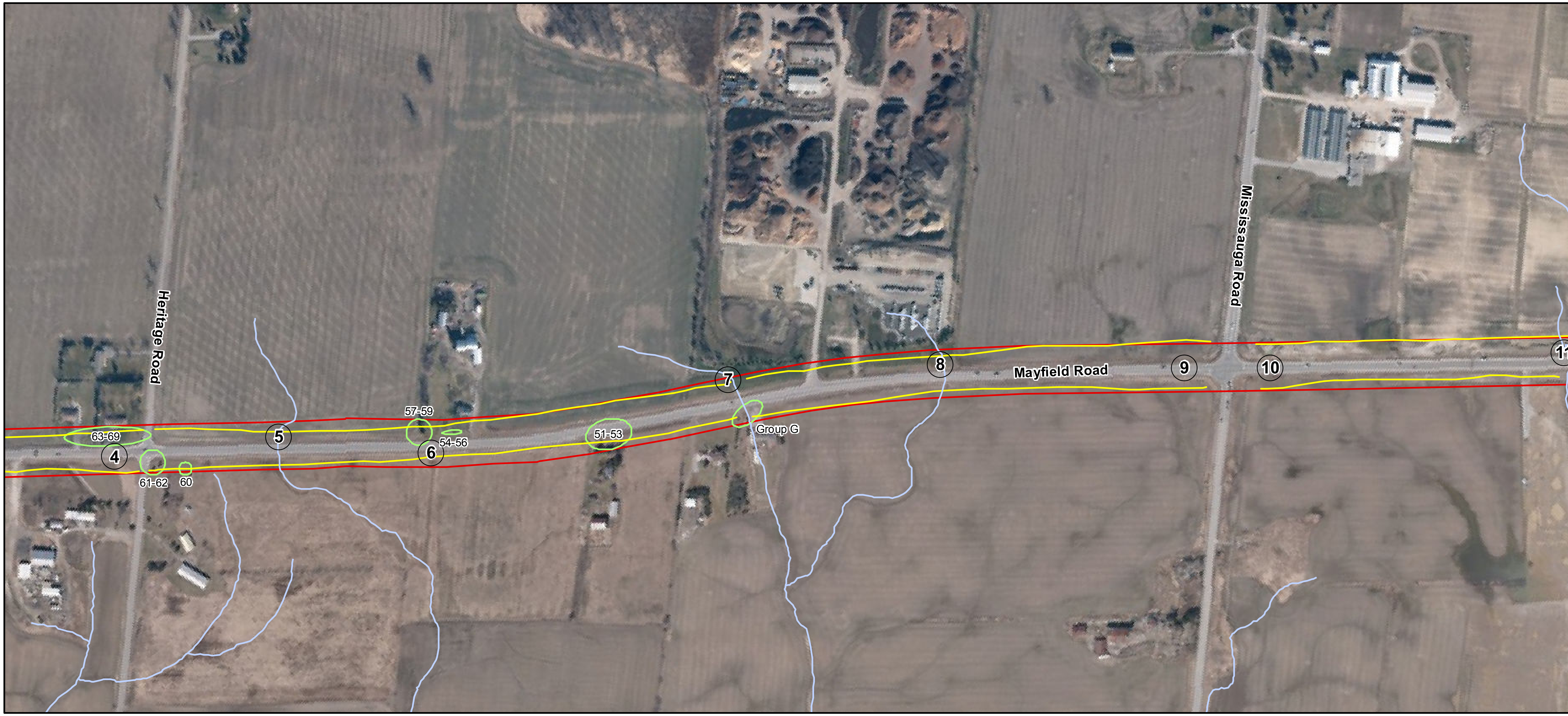


Legend

- Study Area
- Edge of Disturbance
- Tree Groups
- Watercourse (MNR, 2014)
- 19 Culvert Number

Proposed Widening

Figure 2c

Mayfield Road Widening Class EA

First Base Solutions Web Mapping Service 2015

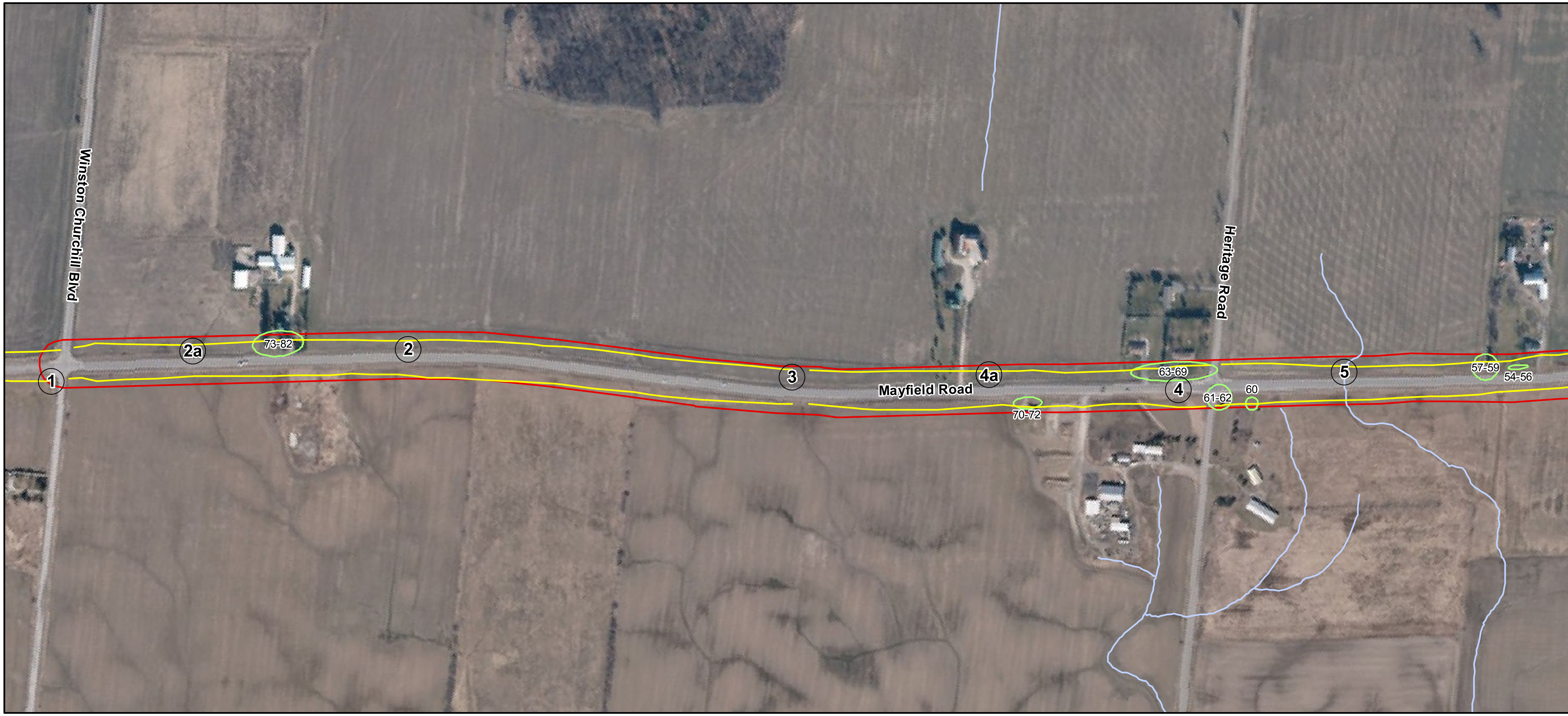
UTM Zone 17 N, NAD 83

0 50 100 200 Metres

1:5,000

BEACON ENVIRONMENTAL

Project 212276
March 2016



Legend

- Study Area
- Edge of Disturbance
- Tree Groups
- Watercourse (MNR, 2014)
- 19 Culvert Number

Proposed Widening

Figure 2d

Mayfield Road Widening Class EA

First Base Solutions Web Mapping Service 2015

UTM Zone 17 N, NAD 83

0 50 100 200 Metres

1:5,000

BEACON ENVIRONMENTAL

Project 212276
March 2016

4.3 Tree Inventory

A total of 243 trees were documented within 20 m of either side of Mayfield Road between Chinguacousy Road and Winston Churchill Boulevard. Of these 243 trees, 91 were individually numbered and tagged and are shown in **Appendix A**. The remaining 152 trees were documented as part of tree groupings. These tree groups are described below by property number and street address and are identified on **Figures 2a** through **2d**.

Group A – Property 4 (1890 Mayfield Road)

No Permission To Enter (PTE) was received for this property, so it was inventoried from the road. The trees were in good condition, ranged in size from 15 to 25 cm dbh and included:

- 15 White Spruce (*Picea glauca*)
- 8 Freeman's Maple (*Acer X Freemanii*)
- 5 Scotch Pine (*Pinus sylvestris*)
- 2 Eastern White Cedar (*Thuja occidentalis*)
- 1 Jack Pine (*Pinus banksiana*)

Group B – Property 4 (1890 Mayfield Road)

The trees in this group were good to fair condition with a few in fair to poor condition likely due to being overtopped by the taller poplar trees. They were planted in rows and included the following:

- 13 Hybrid Poplar (*Populus* spp.) from 20 to 36 cm dbh with an average of 25 cm
- 22 Freeman's Maple from 5 to 34 cm dbh with an average of 10 cm
- 2 White Ash (*Fraxinus americana*) measuring 22 and 23 cm dbh

Group C – Property 7 (1760 Mayfield Road)

The first six (6) trees at the southern end of this immature coniferous hedgerow were within 20 m of the edge of the road. These six trees were White Spruce measuring between 8 and 16 cm dbh and were in good condition.

Group D – Property 10 (1680 Mayfield Road)

No Permission To Enter (PTE) was received for this property, so it was inventoried from the road. This group consists of immature, planted trees in a manicured, residential front yard. The trees were in good condition and included the following:

- 7 Colorado Blue Spruce (*Picea pungens*) from 25 to 40 cm
- 2 Little-leaf Linden (*Tilia cordata*) both approximately 20 cm dbh
- 1 Austrian Pine (*Pinus nigra*) approximately 20 cm dbh
- 1 Norway Maple (*Acer platanoides*) approximately 15 cm

Property 30 (1637 Mayfield Road)

No Permission To Enter (PTE) was received for this property, so it was inventoried from the road. One Freeman's Maple, estimated at 60 cm dbh was within 20 m of the edge. This tree was in good to fair condition.

Group E – Property 36 (1255 Mayfield Road)

No Permission To Enter (PTE) was received for this property, so it was inventoried from the road. This group consisted of eight species of planted and naturally-occurring trees of various sizes (up to approximately 40 cm dbh) with maintained lawn in the understory. A tally of the 43 trees, by species and estimated size class is provided in **Table 2** below.

Table 2. Tree Inventory for Group E (Property 36, 1255 Mayfield Road)

Common Name	Scientific Name	Size class (dbh in cm)				
		15 – 20	20 – 25	25 – 30	30 – 35	35 - 40
White Spruce	*Picea glauca*	8	2	1	1	
Bur Oak	*Quercus macrocarpa*	1	1	1	1	
Shagbark Hickory	*Carya ovata*		3	2	3	1
Sugar Maple	*Acer saccharum*	4	2			
Norway Maple	*Acer platanoides*	2	2			
Red Pine	*Pinus resinosa*	1	2	1		
White Pine	*Pinus strobus*	1	2			
American Beech	*Fagus grandifolia*		1			

With the exception of one of the Shagbark Hickory that was in poor condition, all of the trees in this group were in good or good to fair condition.

Group F – Property 38 (1209 Mayfield Road)

No Permission To Enter (PTE) was received for this property, so it was inventoried from the road. Similar to the previous group, these trees were in maintained front lawn with native tree species all in good or fair condition. The trees in this group included the following:

- 5 American Beech from 25 to 35 cm dbh
- 2 Shagbark Hickory from 20 to 30 cm dbh
- 2 Bur Oak from 30 to 35 cm dbh
- 4 White Elm from 20 to 35 cm dbh

Group G – Property 43 (709 Mayfield Road)

This group is a hedgerow of 10 trees running parallel with Mayfield Road. The trees were in good to fair condition and consisted of the following:

- 8 Norway Spruce (*Picea abies*) from 25 to 40 cm dbh
- 1 Sugar Maple measuring approximately 27 cm dbh
- 1 Red Maple (*Acer rubrum*) measuring approximately 30 cm dbh

4.4 Species at Risk

The Natural Heritage Information Centre (NHIC) has records of Threatened species: Bobolink (*Dolichonyx oryzivorous*), Eastern Meadowlark (*Sturnella magna*), and Barn Swallow (*Hirundo rustica*); and Species of Special Concern: Canada Warbler (*Wilsonia canadensis*), Wood Thrush (*Hylocichla mustelina*), Eastern Wood Pewee (*Contopus virens*) and Snapping Turtle (*Chelydra serpentina*) within the 10 km^2 area surrounding the study area. Each of these species and the potential for habitat within the study area are discussed below.

Ontario Regulation 293/11 was released in July 2011 and Section 29.1(1) defines Redside Dace habitat in Peel Region as follows:

i. any part of a stream or other watercourse that is being used by a redside dace,
ii. any part of a stream or other watercourse that was used by a redside dace at any time during the previous 20 years and that provides suitable conditions for a redside dace to carry out its life processes,
iii. the area encompassing the meander belt width of an area described in subparagraph i or ii,
iv. the vegetated area or agricultural lands that are within 30 metres of an area described in subparagraph iii, and
v. a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i or ii, provided the part of the stream or watercourse has an average bankfull width of 7.5 metres or less.

Drainage Features at Crossings 11 and 18 have been identified by MNRF as contributing Redside Dace habitat. The relocation of the downstream portion of the watercourse at Crossing 11 is being undertaken as was contemplated in the Block 51-1 EIR (Stonybrook Consulting *et al*. 2013). Refer to Figure **2b**.

MNRF may have records of other Species at Risk for this area, however no suitable habitat is present in the study area for the three most common birds protected under the *Act*. The first two bird species Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*), are Provincially Threatened species that require large grassland or old field meadows. Barn Swallow (*Hirundo rustica*) nest in structures (e.g., barns) and under bridges. It is not anticipated that any structures within the study area will be removed as part of the proposed works.

The Butternut tree (*Juglans cinerea*) is an endangered species protected under the *Act*. The tree inventory confirmed no Butternuts are present along the Study Area route

5. Summary of Natural Heritage Features and Functions

The Study Area consists of the Right of Way of Mayfield Road from Chinguacousy Road to Winston Churchill Boulevard. The surrounding land use is a primarily agricultural and rural residential. Nineteen existing culverts have been identified, fourteen of which convey flow from headwater features, the majority of which are ephemeral. Two headwaters have been identified as contributing Redside Dace habitat; culvert 11 and 18. None of the drainage features provide direct fish habitat.

There are no terrestrial Species at Risk identified within the study area, and no notable plant species considered rare within the region. No vegetation communities (e.g. woodland or wetlands) are located within the Study Area.

A total 243 trees were documented within the Right of Way. Of these, 91 were individually numbered and tagged and the remaining 152 trees were documented as part of tree groupings.

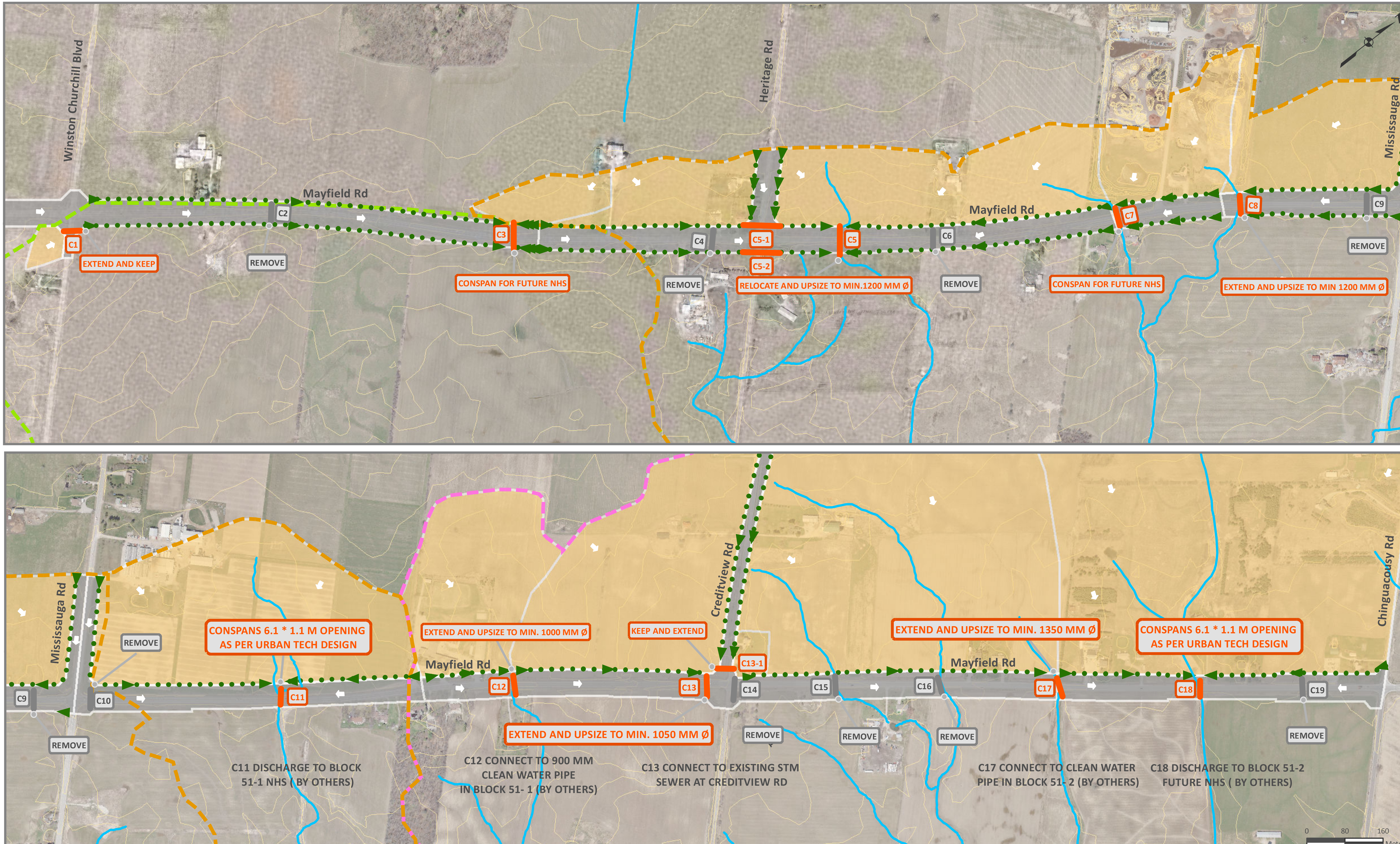
6. Proposed Design

Mayfield Road is proposed to be widened from two lanes to six lanes from Chinguacousy Road to approximately 1 km west of Mississauga Road, where the remainder of the road to Winston Churchill Boulevard will be widened to four lanes. The area of disturbance, including all grading areas is illustrated on **Figures 2a through 2d**.

The post development major drainage plan has been illustrated by Hatch Mott MacDonald and is attached.

The widening will involve the removal of culverts at crossings 2, 4, 6, 9, 10, 14, 15, 16, and 19. Flow from these culverts will be collected along the northern roadside ditch and directed toward the remaining culverts. Downstream of the Study Area, within Blocks 51-1 and 51-2, these drainage features are to be removed from the landscape and their functions replicated within the proposed residential development area. Culverts at crossings 12 and 17 will connect to clean water pipes, as proposed by others within the development to the south.

All remaining culverts will need to be extended and upsized, and in some cases, replaced. Culverts at crossings 11 and 18, which are Redside Dace habitat are to be replaced via a 6.1 m conspans. Culverts at crossings 3 and 7 are to be replaced with conspans with sufficient openings to facilitate wildlife passage.



Mayfield Road EA

Post - Development Major Drainage Plan

Culvert
Culvert (Remove)
Ditch Flow
Contours
External Catchment
ROW Catchment
Credit River Subwatershed Boundary
Fletcher's Creek Subwatershed Boundary
Huttonville Creek Subwatershed Boundary

Hatch Mott MacDonald

7. Impacts and Mitigation Measures

7.1 Aquatic Resources

All drainage features with the exception of the features at crossings 11 and 18 are ephemeral with limited function. Where these features are to be removed and replicated in the development south of Mayfield Road, the associated culvert crossing will also be removed. Drainage from the upstream portion of the landscape will be collected within the roadside ditch and directed to a remaining feature. To prevent increased sedimentation of downstream drainage features, it will be necessary to plant the newly created ditches with a robust native seed mix. Erosion control blankets, coir logs and other Erosion and Sediment Control (ESC) measures should be implemented as appropriate.

7.1.1 Redside Dace

Any work within regulated Redside Dace habitat is subject to the *Endangered Species Act*. Culvert replacements and extensions can likely be registered via the online Notice of Registry process, as per Section 23.4(1).1 of Ontario Regulation 242/08. This straightforward registry process may be undertaken if the modification or replacement of the culvert 1) does not increase the portion of the existing footprint within the bankfull width of the watercourse by more than 25%; and 2) does not damage more than 300 m^2 of land situated either within the watercourse or outside of the watercourse but within 30 metres of the bankfull width of the watercourse or more than 100 square metres of land situated within the watercourse below the bankfull width.

If these criteria cannot be met, an Overall Benefit permit under Section 17(2)(c) of the ESA must be obtained from the Ministry prior to the commencement of work within the regulated area.

In all cases, disturbed areas are to be fully restored and stabilized. To mitigate for the disturbance of Redside Dace habitat, if the activity is eligible for the Registry process, it will be necessary to follow the prescribed measures detailed in Section 23.4(11) of O. Reg 242/08. If a Section 17(2)(c) permit is required, it will be necessary to demonstrate an overall benefit to the species. Potential overall benefit activities are negotiated with MNRF.

7.2 Terrestrial Resources

No significant terrestrial resources as defined by the PPS have been identified. Only individual trees and groups of trees have the potential to be impacted by the proposed road widening. A final determination of which trees will be removed and which can be retained will be confirmed at the detailed design phase.. Preliminary drawings show it may be possible to retain the majority of trees within Group A, Group D, and Group F, as well as trees, 16-18, 21-31, 39-50, 51-53, 57-59 63-69 and 73-82. Refer to **Figures 2a to 2d**. Upon detailed design, a certified arborist will delineate tree protection fences and any additional measures so as to protect as many trees as possible. At this time, an updated Tree Inventory and Protection Plan shall be prepared for the proposed widening.

7.3 General Mitigation Measures

Erosion and Sediment Control

Prior to any construction, a detailed Erosion and Sediment Control Plan should be developed using the Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Control Guidelines for Urban Construction (2006). Proposed erosion controls could include the phasing of earthworks, seeding or hydro seeding, using erosion control blankets or the implementing of scarification, to limit the amount of exposed soils during construction. Temporary double sediment control fence shall be erected at crossings 11 and 18, to protect the watercourses and Redside Dace habitat. Silt fence will consist of non-woven geotextile fabric (Terrafix 270R or equivalent) and will be supported by wire mesh and T-Bars, and staked in hay bales.

Tree Removal and Preservation

A Tree Inventory and Preservation Plan, as discussed above, shall identify single trees and groups of trees to be protected or removed. Tree protection fences should be placed so as to protect the root zones of the trees to be preserved and shall be inspected by a certified arborist prior to the commencement of grading. General guidelines including nest surveys during the breeding bird season prior to removal of any specimens are detailed below.

Timing Windows

The federal *Migratory Birds Convention Act* (1994) and provincial *Fish and Wildlife Conservation Act* protect the nests, eggs and young of most bird species from harm or destruction. As the breeding bird season in southern Ontario is generally from mid-April to mid-July, the clearing of vegetation should occur outside of these periods. For any proposed clearing of vegetation within these dates, or where birds may be suspected of nesting outside of typical dates, an ecologist should undertake detailed nest searches immediately prior to site alteration to ensure that no active nests are present.

Within the watercourses designated Redside Dace habitat (Crossings 11 and 18), works within the regulated habitat must be conducted from July 1 to September 15, unless otherwise directed by MNRF.

8. Conclusion

Based on the assessment of existing natural environment features and an evaluation of potential impacts of the proposed widening of Mayfield Road, the preferred alternative is not anticipated to adversely affect the natural heritage features in the Study Area. Impacts are limited to removal and replication of several ephemeral drainage features and will likely include the removal of some trees. Mitigation measures, including erosion and sediment control and tree preservation fencing have been identified. Culvert crossings have been chose to promote wildlife passage and to address concerns related to Redside Dace habitat. Notice of Registry or a 17(2)(c) permit will be required to facilitate the works proposed in Redside Dace habitat. No other SAR have been identified.

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Appendix A

Tree Inventory

Appendix A

Tree Inventory

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
1	POPULUS DELTOIDES SSP. MONILIFERA	EASTERN COTTONWOOD	39	FAIR	ICE STORM DAMAGE	1	12016 Chinguacousy Rd.
2	POPULUS DELTOIDES SSP. MONILIFERA	EASTERN COTTONWOOD	39	FAIR	ICE STORM DAMAGE	1	12016 Chinguacousy Rd.
3	POPULUS DELTOIDES SSP. MONILIFERA	EASTERN COTTONWOOD	37	FAIR-POOR	ICE STORM DAMAGE	1	12016 Chinguacousy Rd.
4	ACER PLATANOIDES	NORWAY MAPLE	16	GOOD	GOOD CROWN AND TRUNK	1	12016 Chinguacousy Rd.
5	POPULUS DELTOIDES SSP. MONILIFERA	EASTERN COTTONWOOD	34	FAIR	GOOD CROWN AND TRUNK	1	12016 Chinguacousy Rd.
6	ACER NEGUNDO	MANITOBA MAPLE	30, 30	GOOD-FAIR	FORKED AT 0.4m	1	12016 Chinguacousy Rd.
7	ACER X FREEMANII	FREEMAN'S MAPLE	24, 23, 23	GOOD	FORKED AT BASE (19, 18, 16 cm DBH)	1	12016 Chinguacousy Rd.
8	BETULA PAPYRIFERA	PAPER BIRCH	50	FAIR	1/2 OF CROWN HAS BROKEN BRANCHES DUE TO ICE STORM	1	12016 Chinguacousy Rd.
9	SALIX X RUBENS	REDDISH WILLOW	45, 40, 38	GOOD-FAIR	FORKED AT BASE X4 (4th STEM = 36cm); BROKEN BRANCHES	5	North side of Mayfield Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
10	ACER X FREEMANII	FREEMAN'S MAPLE	20	FAIR	BROKEN TOP	5	North side of Mayfield Rd.
11	ACER X FREEMANII	FREEMAN'S MAPLE	27, 26	GOOD	FORKED AT 1m	5	North side of Mayfield Rd.
12	ACER X FREEMANII	FREEMAN'S MAPLE	16, 15, 15	GOOD	FORKED AT BASE X3	5	North side of Mayfield Rd.
13	PICEA PUNGENS	COLORADO BLUE SPRUCE	30	GOOD	IN LANDSCAPED AREA WITH STONE MULCH	7	1760 Mayfield Rd.
14	TILIA CORDATA	LITTLE-LEAF LINDEN	34	GOOD	IN LANDSCAPED AREA WITH STONE MULCH	7	1760 Mayfield Rd.
15	TILIA CORDATA	LITTLE-LEAF LINDEN	38	GOOD	IN LANDSCAPED AREA WITH STONE MULCH	7	1760 Mayfield Rd.
16	ACER PLATANOIDES	NORWAY MAPLE	15	GOOD-FAIR	SPLIT IN SIDE; MODERATE VIGOUR	9	1704 Mayfield Rd.
17	PINUS NIGRA	AUSTRIAN PINE	23	GOOD		9	1704 Mayfield Rd.
18	PINUS NIGRA	AUSTRIAN PINE	29	FAIR-POOR	DIEBACK; LOW VIGOUR; STUNTED	9	1704 Mayfield Rd.
612	ACER X FREEMANII	FREEMAN'S MAPLE	33	POOR	DYIING; LEANING; BROKEN	32	1577 Mayfield Rd.
613	ACER X FREEMANII	FREEMAN'S MAPLE	39	POOR	BROKEN TOP & BRANCHES	32	1577 Mayfield Rd.
614	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	22	GOOD-FAIR		32	1577 Mayfield Rd.
615	ACER PLATANOIDES	NORWAY MAPLE	34	GOOD-FAIR		32	1577 Mayfield Rd.
616	ACER PLATANOIDES	NORWAY MAPLE	32, 32	POOR	FORKED AT BASE; BROKEN BRANCHES; DIEBACK	32	1577 Mayfield Rd.
617	PICEA GLAUCA	WHITE SPRUCE	19	POOR	ALMOST COMPLETELY DEAD	32	1577 Mayfield Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
19	ACER RUBRUM	RED MAPLE	51	GOOD	DITCH RECENTLY CUT IN ROOTZONE	12	1500 Mayfield Rd.
20	ACER RUBRUM	RED MAPLE	57	FAIR-POOR	OLD DEAD MAINSTEM; DIEBACK	12	1500 Mayfield Rd.
619	FRAXINUS PENNSYLVANICA	GREEN ASH	23	POOR		31	11953 Creditview Rd.
620	FRAXINUS PENNSYLVANICA	GREEN ASH	20, 16	FAIR-POOR	BROKEN BRANCHES	31	11953 Creditview Rd.
637	FRAXINUS PENNSYLVANICA	GREEN ASH	36, 27	POOR	DEAD TOP	31	11953 Creditview Rd.
21	PICEA PUNGENS	COLORADO BLUE SPRUCE	34	GOOD-FAIR	DIEBACK; LOW VIGOUR	15	1248 Mayfield Rd.
22	FRAXINUS PENNSYLVANICA	GREEN ASH	35	POOR	DEAD TOP	15	1248 Mayfield Rd.
23	ACER SACCHARUM	SUGAR MAPLE	20	FAIR-POOR	BROKEN TOP; IN SCHOOL YARD; MEMORIAL TREE	15	1248 Mayfield Rd.
24	ACER PLATANOIDES	NORWAY MAPLE	38	GOOD-FAIR	PRUNED; ASYMMETRICAL CROWN	15	1248 Mayfield Rd.
25	ACER PLATANOIDES	NORWAY MAPLE	31	GOOD		15	1248 Mayfield Rd.
26	ACER PLATANOIDES	NORWAY MAPLE	33	GOOD		15	1248 Mayfield Rd.
27	CATALPA SPECIOSA	NORTHERN CATALPA	51	GOOD-FAIR		15	1248 Mayfield Rd.
28	TILIA AMERICANA	AMERICAN BASSWOOD	29	POOR	ALMOST DEAD	15	1248 Mayfield Rd.
29	TILIA AMERICANA	AMERICAN BASSWOOD	35	POOR	ALMOST DEAD	15	1248 Mayfield Rd.
30	CATALPA SPECIOSA	NORTHERN CATALPA	30	FAIR-POOR	POOR VIGOUR; DIEBACK	15	1248 Mayfield Rd.
31	ACER PLATANOIDES	NORWAY MAPLE	24	GOOD		15	1248 Mayfield Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
32	ULMUS AMERICANA	AMERICAN ELM	42, 35	FAIR	FORKED AT BASE; DIEBACK; LOW VIGOUR	35	1285 Mayfield Rd.
33	PICEA GLAUCA	WHITE SPRUCE	33	DEAD	DEAD	35	1285 Mayfield Rd.
34	PICEA GLAUCA	WHITE SPRUCE	26	DEAD	DEAD	35	1285 Mayfield Rd.
35	PICEA GLAUCA	WHITE SPRUCE	16	FAIR		35	1285 Mayfield Rd.
36	PICEA GLAUCA	WHITE SPRUCE	20	FAIR		35	1285 Mayfield Rd.
37	CARYA OVATA VAR. OVATA	SHAGBARK HICKORY	25	POOR	BROKEN BRANCHES; DIEBACK	35	1285 Mayfield Rd.
38	ACER PLATANOIDES	NORWAY MAPLE	38	FAIR	DIEBACK	35	1285 Mayfield Rd.
39	QUERCUS MACROCARPA	BUR OAK	27	FAIR		37	1235 Mayfield Rd.
40	TILIA AMERICANA	AMERICAN BASSWOOD	33	GOOD		37	1235 Mayfield Rd.
41	QUERCUS MACROCARPA	BUR OAK	17	GOOD-FAIR	EPICORMIC BRANCHING	37	1235 Mayfield Rd.
42	QUERCUS MACROCARPA	BUR OAK	16	FAIR	EPICORMIC BRANCHING	37	1235 Mayfield Rd.
43	CARYA OVATA VAR. OVATA	SHAGBARK HICKORY	36	GOOD		37	1235 Mayfield Rd.
44	FRAXINUS AMERICANA	WHITE ASH	30	DEAD		37	1235 Mayfield Rd.
45	CARYA OVATA VAR. OVATA	SHAGBARK HICKORY	44	GOOD		37	1235 Mayfield Rd.
46	ACER RUBRUM	RED MAPLE	38	POOR	<50% LIVE CROWN	37	1235 Mayfield Rd.
47	FRAXINUS AMERICANA	WHITE ASH	31	FAIR	POOR VIGOUR; DIEBACK	37	1235 Mayfield Rd.
48	ULMUS PUMILA	SIBERIAN ELM	40	GOOD-FAIR	SOME DIEBACK	37	1235 Mayfield Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
49	ULMUS PUMILA	SIBERIAN ELM	26	GOOD-FAIR	SOME DIEBACK	37	1235 Mayfield Rd.
50	ULMUS PUMILA	SIBERIAN ELM	22	FAIR-POOR	POOR STRUCTURE; DIEBACK	37	1235 Mayfield Rd.
51	PICEA PUNGENS	COLORADO BLUE SPRUCE	22	GOOD		41	781 Mayfield Rd.
52	PICEA PUNGENS	COLORADO BLUE SPRUCE	23	GOOD		41	781 Mayfield Rd.
53	PICEA PUNGENS	COLORADO BLUE SPRUCE	16	GOOD-FAIR	MODERATE VIGOUR	41	781 Mayfield Rd.
54	ACER X FREEMANII	FREEMAN'S MAPLE	70	FAIR	BROKEN BRANCHES	20	624 Mayfield Rd.
55	JUGLANS REGIA	ENGLISH WALNUT	26	FAIR	BROKEN BRANCHES	20	624 Mayfield Rd.
56	GLEDITSIA TRIACANTHOS INERMIS	HONEY LOCUST (THORNLESS)	51	FAIR-POOR	DIEBACK	20	624 Mayfield Rd.
57	PICEA ABIES	NORWAY SPRUCE	35	GOOD	IN HEDGEROW WITH 12 UNDERSIZED CEDAR AND SOME BUCKTHORN	20	624 Mayfield Rd.
58	PINUS STROBUS	EASTERN WHITE PINE	18	GOOD	IN HEDGEROW WITH 12 UNDERSIZED CEDAR AND SOME BUCKTHORN	20	624 Mayfield Rd.
59	PINUS STROBUS	EASTERN WHITE PINE	25	GOOD	IN HEDGEROW WITH 12 UNDERSIZED CEDAR AND SOME BUCKTHORN	20	624 Mayfield Rd.
60	PICEA PUNGENS	COLORADO BLUE SPRUCE	16	FAIR	BROKEN LEADER; LOTS OF PITCH	44	SW corner of Mayfield Rd.and Heritage Rd.
61	PINUS NIGRA	AUSTRIAN PINE	25	GOOD		44	SW corner of Mayfield Rd.and Heritage Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
62	PINUS NIGRA	AUSTRIAN PINE	23	GOOD		44	SW corner of Mayfield Rd.and Heritage Rd.
63	FRAXINUS AMERICANA	WHITE ASH	39	FAIR	PRUNED BRANCHES BROKEN IN ICE STORM	21	486 Mayfield Rd.
64	PICEA GLAUCA	WHITE SPRUCE	35	GOOD-FAIR	MINOR DIEBACK; LOW VIGOUR	21	486 Mayfield Rd.
65	PICEA PUNGENS	COLORADO BLUE SPRUCE	18	GOOD	IN HEDGEROW	21	486 Mayfield Rd.
66	PICEA PUNGENS	COLORADO BLUE SPRUCE	20	GOOD	IN HEDGEROW	21	486 Mayfield Rd.
67	PICEA PUNGENS	COLORADO BLUE SPRUCE	18	GOOD	IN HEDGEROW	21	486 Mayfield Rd.
68	PICEA PUNGENS	COLORADO BLUE SPRUCE	23	GOOD	IN HEDGEROW	21	486 Mayfield Rd.
69	ACER PLATANOIDES	NORWAY MAPLE	15	GOOD-FAIR	SPLIT IN TRUNK HEALED; BRONZE VARIETY	21	486 Mayfield Rd.
70	ACER X FREEMANII	FREEMAN'S MAPLE	31, 29	GOOD		21	486 Mayfield Rd.
71	MORUS ALBA	WHITE MULBERRY	27	GOOD	WEEPING VARIETY	21	486 Mayfield Rd.
72	FRAXINUS PENNSYLVANICA	GREEN ASH	22	GOOD-FAIR		21	486 Mayfield Rd.
73	PICEA PUNGENS	COLORADO BLUE SPRUCE	34	GOOD		24	84 Mayfield Rd.
74	PICEA PUNGENS	COLORADO BLUE SPRUCE	40	GOOD		24	84 Mayfield Rd.
75	PICEA ABIES	NORWAY SPRUCE	57	GOOD-FAIR	MODERATE VIGOUR	24	84 Mayfield Rd.
76	FRAXINUS PENNSYLVANICA	GREEN ASH	52	POOR	DYING TOP; BROKEN LIMBS	24	84 Mayfield Rd.
77	POPULUS ALBA	WHITE POPLAR	52, 43	FAIR	FORKED AT BASE; DIEBACK	24	84 Mayfield Rd.
78	PICEA ABIES	NORWAY SPRUCE	18	DEAD	DEAD	24	84 Mayfield Rd.
79	PICEA ABIES	NORWAY SPRUCE	38	GOOD		24	84 Mayfield Rd.

Tree No.	Scientific Name	Common Name	DBH (cm)	Condition*	Comments	Property #	Address
80	PICEA ABIES	NORWAY SPRUCE	34	GOOD-FAIR	MODERATE VIGOUR	24	84 Mayfield Rd.
81	PICEA ABIES	NORWAY SPRUCE	46	GOOD		24	84 Mayfield Rd.
82	PICEA ABIES	NORWAY SPRUCE	47	GOOD		24	84 Mayfield Rd.

***Legend:**

Poor – Severe dieback, significant lean, missing leader, major defects, significant decay and/or disease presence

Fair – Moderate dieback and/or lean, limb defects, multiple stems, moderate foliage damage from stress

Good – Healthy vigorous growth, minor visible defects or damage

Dead – No live growth

Appendix B

Photo Log

Appendix B

Photo Log

Crossing #19

Photo 1.
Upstream of Mayfield Road.

Photo 2.
Downstream of Mayfield Road.

Crossing #18

Photo 3.
Upstream of Mayfield Road. Note meadow marsh.

Photo 4.
Downstream of Mayfield Road.

Crossing #17

Photo 5.
Upstream of Mayfield Road.

Photo 6.
Downstream of Mayfield Road. Note active construction and flow diversion.

Crossing #16

Photo 7.
Upstream of Mayfield Road.

Photo 8.
Downstream of Mayfield Road.

Crossing #15

Photo 9.
Upstream of Mayfield Road. Flows converge in ditch.

Photo 10.
Downstream of Mayfield Road.

Crossing #14

Photo 11.
North of Mayfield Road, looking west along ditch.

Photo 12.
South of Mayfield Road. Note meadow marsh.

Crossing #12

Photo 13.
North of Mayfield Road. No feature and no culvert connection.

Photo 14.
South of Mayfield Road. No feature. Note construction of subdivion.

Crossing #11

Photo 15.
Upstream of Mayfield Road.

Photo 16.
Downstream of Mayfield Road.

Crossing #8

Photo 17.
Upstream of Mayfield Road.

Photo 18.
Downstream of Mayfield Road.

Crossing #7

Photo 19.
Upstream of Mayfield Road.

Photo 20.
Downstream of Mayfield Road. Note cattail corridor.

Crossing #5

Photo 21.
Upstream of Mayfield Road. Note tile drain outlet.

Photo 22.
Downstream of Mayfield Road.

Crossing #4a

Photo 23.
North of Mayfield Road. No culvert connection.

Photo 24.
South of Mayfield Road.

Crossing #3

Photo 25.
Upstream of Mayfield Road. Flows from ditch.

Photo 26.
Downstream of Mayfield Road.

Crossing #2

Photo 27.
Upstream of Mayfield Road. Flows from ditch.

Photo 28.
Downstream of Mayfield Road.

Crossing #2a

Photo 29.
North of Mayfield Road. No culvert connection.

Photo 30.
South of Mayfield Road.