Appendix A

Public Consultation

SUMMARY OF PUBLIC INFORMATION CENTRE

Subject: Gordon Dean Avenue
Municipal Class Environmental Assessment
City of Hamilton

Date/Time: April 4, 2017; 3:30 pm – 5:00 pm,
6 pm – 7:30 pm

Location: Stoney Creek Municipal Centre
777 Highway 8, Stoney Creek

Written by: Olivia Babcock

File no.: TP115082

Present

Angelo Cutaia, Project Manager, Amec Foster Wheeler
Margaret Fazio, Project Manager, City of Hamilton

Matters Discussed

1. Public Information Centre (PIC) No. 1 for the above project was held on Tuesday April 4, 2017 from 3:30 pm to 5:00pm and 6:00pm to 7:30pm at the Stoney Creek Municipal Centre, 777 Highway 8, Stoney Creek ON. Notices were placed in the Stoney Creek News on March 24th and 31st, 2016. Information regarding the PIC was also advertised on the City of Hamilton project website, and all affected land owners and agencies were mailed directly. City councillors were emailed the PIC notice information on March 10th, 2017.

2. The PIC was an open house drop-in format including display boards and maps detailing the progress of the project, initial findings of background studies, alternatives being considered, and next steps in the study. The PIC had 26 attendees sign the meeting attendance record.

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited
3215 North Service Road
Burlington, Ontario
Canada L7N 3G2
Tel (905) 335-2353
Fax (905) 335-1414

www.amecfw.com

Matters Discussed

3. Display boards were prepared to summarize the following:
    - Welcome;
    - Study Area and Structure;
    - Previous Class Environmental Assessment
    - Class Environmental Assessment Process
    - Planning and Policy Context;
    - Existing and Future Land Use;
    - Planned Active Transportation and Transit;
    - Technical Studies Being Completed:
        - Terrestrial Ecology
        - Fisheries & Aquatic Ecosystems
        - Fluvial Geomorphology
        - Hydrogeology
        - Geotechnical
        - Air Drainage Assessment
        - Transportation & Traffic
    - Alternative Evaluation – Horizontal Alignment
    - Alternative Evaluation – Cross Sections
    - Intersection Design
    - Preliminary Preferred Design
    - Thank you for your participation

4. Display boards and mapping were located along one side of the room. Participants browsed the display boards and discussed issues with project team members. Specific issues and concerns were raised and discussed amongst the visitors and project team staff. These questions and concerns were addressed by the project team, and participants were encouraged to provide written comments on a Comment Sheet. Three individuals provided written comments via the Comment Sheets at the PIC. One email requesting clarification on the information provided on the project website was sent to Margaret Fazio after the PIC.

   Mapping showing the alternatives being considered was provided on tables to facilitate small group discussions and to encourage input from PIC attendees.

5. Comment Forms were provided to promote the opportunity of providing input/comments by members of the public and the agencies. They were encouraged to provide feedback on the project by submitting their comments on site, via mail, fax, or email. All comments were requested to be returned by April 19, 2017. Three comment sheets were received at the PIC, while one email with comments was received on April 17, 2017.

   Comments received via email and comment sheets included:

    - Concern over changes to the Fruitland Road & Barton Street intersection, specifically that a roundabout should not be used at this location
    - Questions regarding widening of Fruitland Road and concern that widening may have impact on residential property
    - Concern that creek channelization may impact property values and questions regarding what may occur if residents do not agree to creek channelization
    - Questions regarding how a specific property owner would be impacted by the Secondary Plan
    - Clarification regarding the Block Servicing Strategies

Matters Discussed

6. All information presented at the PIC was posted to the City's project webpage on April 6, 2017, including:
    - Block 1 & 2 Servicing Strategies mapping
    - Comment Sheet
    - Display panels for block 1 and 2
    - Block 1 mapping for study area boundary, concept plan, natural heritage, road grades, sanitary drains, Secondary Plan land use, storm drainage and watermain plan

Minutes prepared by:

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Limited

Per: Olivia Babcock, EIT
Junior Transportation Designer

cc: All Present

Appendix A
Notification of PIC

Notice of Study Commencement and
Joint Public Information Centre
Gordon Dean Avenue Municipal Class Environmental Assessment
(Phases 3 and 4), and
Block 1 and 2 Servicing Strategies

THE STUDIES

The land owners within Block 1 Servicing Strategy area have started Phase 3 and 4 of a Municipal Class Environmental Assessment (Class EA) for **Gordon Dean Avenue located between Barton Street and Highway 8***.

In 2011, the City of Hamilton completed Phase 1 and 2 of the Municipal Class EA at Fruitland Road. At that time, the recommendation was that trucks use a new road, travelling north-south, east of the existing Fruitland Road between Highway 8 and Barton Street.

Phase 3 of the assessment has now been completed, and alternative designs as well as the recommended preferred design will be presented at this PIC for public review and comment.

Block Servicing Strategies 1 and 2, are within the areas outlined by the Fruitland-Winona Secondary Plan* and include the layout of stormwater ponds, water and wastewater services and local road networks, within the updated natural heritage constraints. Block 2 Servicing Strategy is being conducted by the City of Hamilton.

STUDIES' MAP

THE PROCESS

The Municipal Class EA study (Phases 3 and 4) is being carried out in accordance with the requirements of a Schedule C project as outlined in the Municipal Engineers Association Municipal Class EA document. This is an approved process under the Ontario Environmental Assessment Act.

Once the study is complete, an Environmental Study Report (ESR) will be prepared, a notice of Completion will be issued, and information will be made available to the public for their review and comment, and an appeal option.

While the Block Servicing Strategies follow the Class EA public consultation process; this process does not include a public appeal option.

PUBLIC INFORMATION CENTRE (PIC) No 1

Public consultation is an important part of the Class EA process and Block Servicing Strategies. This PIC will provide an opportunity for the public to review the studies and Class EA design alternatives, and Block Servicing DRAFT Concept Plans.

Date: Tuesday, April 4th, 2017
Time: 3:30PM to 5PM and 6PM to 7:30PM (Open House Format)
Location: Stoney Creek Municipal Centre, 777 Highway 8, Stoney Creek

If you require special accommodations to attend this PIC, please contact the City's Project Manager by **March 22, 2017**. If you are unable to attend this PIC, information will be available on the city's website at: *Hamilton.ca/blockservicingstrategies*

PUBLIC COMMENTS INVITED

To share your concerns, find out more or be added to the studies mailing lists, please contact:

Amec Foster Wheeler (Block 1 and Gordon Dean Class EA) Angelo Cutaia, P.Eng. Consultant Project Manager 3215 North Service Road Burlington, ON L7N 3G2 Tel: 905.335.2353 Fax: 905.335.1414 Email: *Angelo.Cutaia@amecfw.com*	**City of Hamilton (Block 2)** Margaret Fazio, B.Sc., EP, MCIP, RPP Senior Project Manager City of Hamilton 71 Main Street West, 6th Floor Hamilton, ON L8P 4Y5 Tel: 905.546.2424 ext.2218 Fax: 905.540.5611 Email: *jplanning@hamilton.ca*

Information will be collected in accordance with the *Municipal Freedom of Information and Protection of Privacy Act*. With the exception of personal information, all comments will become part of the public record.

This notice published in Stoney Creek News on March 23rd and 30th, 2017.

*****(please see studies map)

Appendix B
PIC Boards

Welcome to Public Information Centre

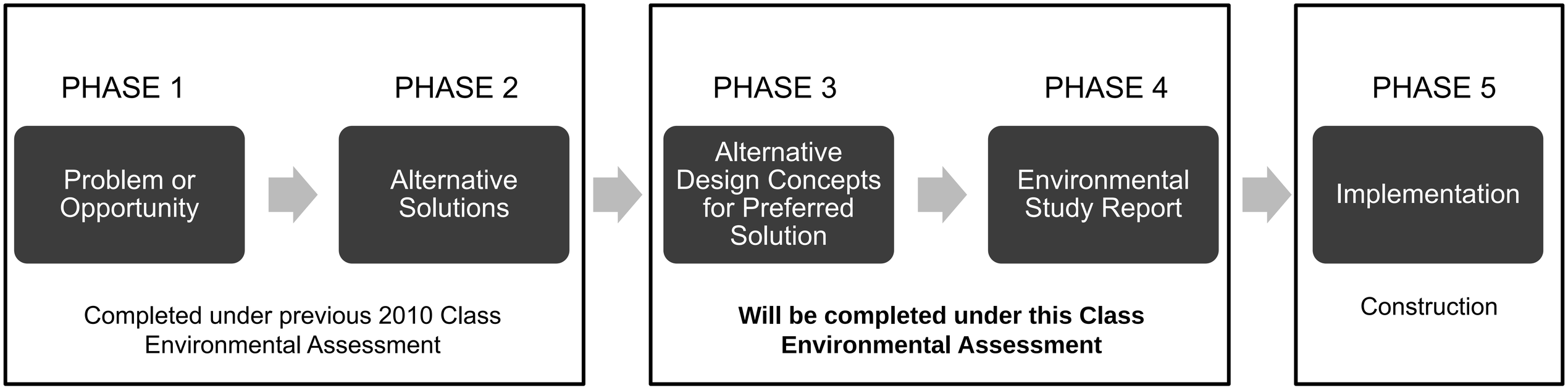
Municipal Class Environmental Assessment, Phase 3 & 4 for Gordon Dean Avenue

Previous Class Environmental Assessment

Fruitland Road from Barton Street to Highway 8 Municipal Class EA Study Phases 1 & 2 was completed in December, 2010.

- **Phase 1: A problem was identified and an opportunity was presented.**
  - Problem: Residents concerned about high vehicle speeds and overly-aggressive driving which makes it difficult to enter and exit driveways fronting Fruitland Road.
  - Opportunity: Fruitland-Winona Secondary Plan presents opportunity to address these problems and to redistribute traffic to proposed growth areas
- **Phase 2: Alternative solutions were generated and evaluated.**
  A preferred alternative was chosen.
  - Alternatives included:
    - "Do Nothing"
    - Alternative 2 Series: two options using cul-de-sacs
    - Alternative 3 Series: four options based on using a new North-South road east of Fruitland Road
  - Preferred Alternative: New North-South Road with Fruitland Road gateway features and pedestrian crosswalk enhancements

Class Environmental Assessment Process



Planning and Policy Context

Stoney Creek Urban Boundary Expansion Transportation Master Plan (2008)

Study Area falls within SCUBE West

Recommends:

- Conducting a new Class EA for Fruitland Road between Barton Street and Highway 8
- Collectors and local roads to appropriately subdivide land for development (SCUBE West):
  - North-South collector between Jones and Glover
  - East-West collector between Fruitland Road and North-South collector

Fruitland-Winona Secondary Plan (2014)

- Lands south of Barton Street;
- Identifies current zoning and future development;
- Identifies the transportation, transit and active transportation linkage objectives including addressing the following issues:
  - Truck traffic on Fruitland Road between Barton Street and Highway 8
  - Excessive Speeding
  - Truck routes

Existing and Future Land Use

Existing Land Use

- Primarily low-density residential with a single office space and a few commercial buildings
- Land to the south of Highway 8 designated as ‘Escarpment Protection Area’ as well as Greenbelt Area

Future Land Use

- Future land use has been identified through the Fruitland-Winona Secondary Plan[1].

[1] Portions of this Secondary Plan are still under Appeal at the Ontario Municipal Board.

Technical Studies Being Completed

The following investigations and inventories are being completed as part of the current Class EA or as part of the Block Servicing Study:

Terrestrial Ecology Background studies and fieldwork will determine the presence of species-at-risk, sensitive vegetation communities, and critical features. Identification of where mitigation may be needed.		**Geotechnical** Determine the physical properties of soil and rock in the study area.	
Fisheries & Aquatic Ecosystems Determination of the sensitivity of water crossings within the study limits and the presence of species-at-risk fish or mussels. Identification of which water crossings require mitigation.		**Air Drainage Assessment** Assessment of potential impacts to tender fruit crops resulting from changes in air flow patterns resulting from adjacent development.	
Fluvial Geomorphology To confirm stream channelization, flows and fish passage. Identification of mitigation measures as required.		**Transportation & Traffic** Identification of existing safety concerns. Modelling of existing and future traffic to determine lane and intersection configurations.	
Hydrogeology Determine whether the project will present any risk to the existing water wells and apply mitigation measures as required.			

Name	E-mail	Address (Please include Postal Code)
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		
29.		

Appendix D
Comment Form Summary

Cutaia, Angelo

From:
Sent: April-04-17 9:12 AM
To: Cutaia, Angelo; iplanning@hamilton.ca; brenda.johnson@hamilton.ca
Subject: Meeting tonight

Hi,

Property at

It has been a long time since this process started of planning the Fruitland/Winona residential expansion area. I have been in contact with many departments at City Hall over the years concerning the by-pass route and as of recently on Feb. 4 , I was told there has not been a decision made yet I was also told by real estate agents there there was a decision made. All this in concerning the sale of our property which the outcome of the road decides if the sale goes or not. So after all these **years** of planning I am asking you has a decision been made on the Fruitland road by-pass?

Also, why we were not notified of this meeting tonight like others were? You would think that after all the worrying over the years about a road going through our dining room, we just might have been kept in the loop.

Comment Sheet

Public Information Centre No.1
April 4, 2017

amec foster wheeler

PROJECT: **Gordon Dean Avenue**
Class Environmental Assessment

PLEASE PRINT

NAME: _____

Date: _____

E-mail: _____

(Number & _____

(Municipal _____

(Postal Co _____

Comments:

Road widening of fruitland Rd.
→ How wide?
→ Will it take part of my property & how much?
→ Widening will not work at the current plan I have heard tonight. It will go into my house if it will go to plan.

Creek Channilization
→ The creek leaving our property will impact our value.
→ the area where the creek channilization is projected to be involves the creek leaving my property? Will we be bought out for that land?
→ If all houses do not agree to the creek channilization, what will happen next with the progress with the creek?
→ Will the creek be cleared out regarless of the new plan happens?

Please send your comments by April 19, 2017 to:

Amec Foster Wheeler
Environment & Infrastructure
Angelo Cutaia, P.Eng.
Consultant Project Manager
Amec Foster Wheeler
3215 North Service Road
Burlington, ON L7N 3G2
Tel: 905.335.2353
Fax: 905.335.1414
Email: Angelo.Cutaia@amecfw.com

Comment Sheet

Public Information Centre No.1
April 4, 2017

PROJECT: **Gordon Dean Avenue**
Class Environmental Assessment

PLEASE PRINT

NAME: _____

Date: _____

E-mail: _____

(Number & _____

(Municipalit _____

(Postal Cod _____

Comments:

Barton and Fruitland Rd Intersection!
I prefer to leave the intersection as it is.
Please, we do not want a round a bout
Thank You

Please send your comments by April 19, 2017 to:

Amec Foster Wheeler
Environment & Infrastructure
Angelo Cutaia, P.Eng.
Consultant Project Manager
Amec Foster Wheeler
3215 North Service Road
Burlington, ON L7N 3G2
Tel: 905.335.2353
Fax: 905.335.1414
Email: Angelo.Cutaia@amecfw.com

Tuesday, April 4, 2017

Block Servicing Strategies 1 and 2 and Gordon Dean Avenue Phases 3 and 4 Municipal Class Environmental Assessment (EA) Comment Sheet

Please take a moment to provide us with input regarding the three above mentioned projects. This questionnaire is your opportunity to provide your comments on all three. ***Given that your views are important to us, please kindly complete this questionnaire (please print) and deposit it in the "Comment Sheets" box provided or by mail, email/scan or fax to the address provided on the fourth page. Thank you.***

1. My relation to this Project is: (Please check all that apply)

[ ] resident within the project limit

[ ] land or business owner within the project limit

[X] user of roads or lands within the study areas but not within project limit

[ ] member of an interest group (Please specify) _____

[ ] member of the general public not within the project limit

[ ] other (Please specify) _____

2. My interest is: (Please check all that apply?

[X] property/land impacts

[ ] stormwater management

[ ] pedestrian / bicycle safety

[ ] traffic volume

[ ] traffic signals

[ ] recreational

[ ] natural environment and creeks

[ ] speed limits

[ ] general interest

[ ] other:_____

3. Please provide your comments as they relate to the Block 1 and Gordon Dean Avenue EA Concept Plans presented here today.

N/A

Personal information collected at public meetings or submitted in writing is collected under the authority of the *Municipal Act, 2001*, and will be used by members of the City of Hamilton. The written submissions including names and contact information and the report of the public meeting will be used for the purposes of assessing number of attendees, areas of interest, and contact information.

4. Please provide your comments as they relate to the Block 2 details provided here today.

w/ 18

5. How did you hear about this Public Information Centre (PIC)? (Please checkmark)

[X] Newspaper [ ] Website [ ] Friend [ ] Notice in the mail [ ] Other: _____

6. Please indicate your satisfaction with the following:

	Satisfied (Y/N)	If not satisfied, please specify your preference below
Location of Meeting	Y	
Time of Meeting	Y	
Day of Week	Y	
Accessibility of the Location		

7. On a scale of 1 to 5, where "1" is "very" and "5" is "not at all", please rate the following by circling the appropriate number:

a) How informative were the display materials? (please circle)

Very		Somewhat		Not at all
1	**2**	**3**	**4**	**5**

b) How helpful were the Municipal staff and consultants in attendance? (please circle)

Very		Somewhat		Not at all
1	**2**	**3**	**4**	**5**

8. Were all your questions answered satisfactorily?

[X] Yes [ ] No [ ] If No, can someone contact you? _____

9. Please provide any additional comments.

I would like to know if I am in Block 3 S.S. Area, and what's coming.

Personal information collected at public meetings or submitted in writing is collected under the authority of the *Municipal Act, 2001*, and will be used by members of the City of Hamilton. The written submissions including names and contact information and the report of the public meeting will be used for the purposes of assessing number of attendees, areas of interest, and contact information.

Marketplace

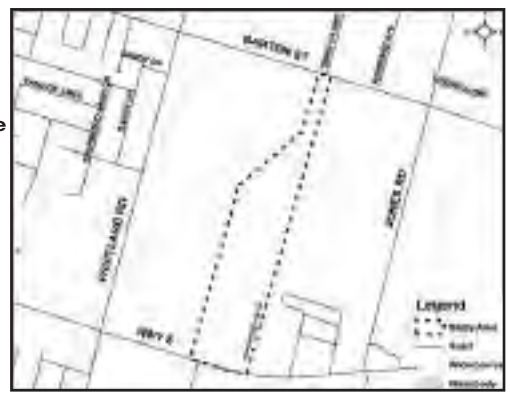
Public Notices | Public Notices | Public Notices | Public Notices | Public Notices | Astrology/ Psychics | Astrology/ Psychics | Astrology/ Psychics

Fruitland – Winona Development Group wood.

Notice of Public Information Update
Gordon Dean Avenue Schedule 'C' Municipal Class Environmental Assessment (Phases 3 & 4), City of Hamilton

The Fruitland – Winona Development Group invites the public to drop by the Public Information Centre (PIC) for the Gordon Dean Avenue Class Environmental Assessment (Class EA), which will be held at the following date and place:

Date: Thursday, October 17, 2019
Format: Open House (No formal presentation)
Time: 5:00 p.m. – 7:00 p.m.
Location: Stoney Creek Municipal Centre – 777 Highway 8, Stoney Creek



The Gordon Dean Avenue Class EA (Study) is being completed in accordance with the requirements outlined in the Municipal Engineers Association (MEA) Municipal Class EA document (October 2000, as amended in 2007, 2011 & 2015), which is an approved process under the Ontario Environmental Assessment Act. Previous phases were completed as part of the of the City of Hamilton's Fruitland Road Class EA (Phases 1 and 2), which recommended this new north-south road (Gordon Dean Avenue). The current Study will meet the requirements of the next phases.

Information that will be available for review and comment include: Study background, summary of completed technical studies, road design alternatives evaluation and preliminary recommended design. The Fruitland-Winona Development Group and our Consultants will be on hand to answer any questions you may have.

If you have any accessibility requirements to participate in this event, please contact the individuals listed below. There is an opportunity at any time during this process for interested persons to review outstanding issues and bring concerns to the attention of the Project Managers. If you have any questions or comments or wish to be added to the Study mailing list, please contact:

Angelo Cutaia, P.Eng.
Project Manager
Fruitland – Winona Development Group
905-580-6441
angelocutaia@ac3group.ca

Jim Enos, CET
Consultant Project Manager
Wood Environment & Infrastructure Solutions
905-335-2353, ext. 3049
jim.enos@woodplc.com

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This Notice Issued October 3 and 10, 2019.

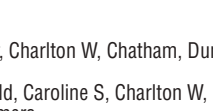
INDIAN ASTROLOGER & PSYCHIC
World's No. #1 Spiritual Healer & Fortune Teller

Pandit: RAJU JI
Over 27 yrs of Experience. Palm Reading, Face Reading * Date of Birth * Horoscope
SPECIAL PRAYERS FOR FULL MOON & DARK MOON
Specialty: Bringing Back Loved Ones
Solves Problems like Health, Love, Marriage, Job, Depression, Family, Husband-Wife, Jealousy court etc
Removes Black Magic, Jadoo, Vodoo, Obeya & Gives 100% Protection
CALL FOR AN APPOINTMENT **905-379-1439** OPEN 7 DAYS A WEEK
263 Victoria Ave N, Hamilton ON L8L 5G3

Garage Sales, Bazaars, Flea Markets

Garage Sales | Garage Sales

Freelton
Rescued and Restored Indoor Garage Sale
Sat., Oct. 5th ~ 10 am - 5 pm
248 Freelton Road
Antiques, furniture, housewares, clothing, jewelry & more! FALL FEST - SALE



West Mountain
MOVING SALE
Saturday, October 5th
and Sunday, October 6th
8am - 3pm
107 Horning Drive

PLEASE RECYCLE ME!

You just proved that eye catchers **work**!
Classifieds Work too!
1-800-263-6480

LocalWork.ca
YOUR BEST SOURCE FOR LOCAL JOBS

General Help | General Help | General Help | General Help | General Help | General Help | General Help | General Help

LOOKING FOR WORK?

metroland media
Connected to your community®

PART-TIME WORK
$15/hour

YOU COULD BE WORKING WITHIN 2 BUSINESS DAYS!

LOCATION:
901 GUELPH LINE • BURLINGTON, ONTARIO L7R 3N8
(CORNER OF HARVESTER & GUELPH LINE)

WE ARE CURRENTLY HIRING
Assemby Line Team Members, Operators, Cleaners And Skidders

To apply please email your resume to:
cahrens@burlingtonpost.com

The Following Shifts:
Days, Afternoons, Midnights and Weekend
SHIFTS AVAILABLE:

Day Shift:	**7am to 3pm** Monday, Tuesday, Wednesday and Thursday (possibility) and Friday
Afternoon Shift:	**3pm to 11pm** Monday, Tuesday, Wednesday (possibility) and Thursday
	3pm to 8pm Friday
Midnight Shift:	**11pm to 7am** Sunday, Monday, Tuesday, Thursday & Wednesday (possibility)
Weekend Shift:	**8am to 8pm** Saturday and Sunday

Metroland is committed to accessibility in employment and to ensuring equal access to employment opportunities for candidates, including persons with disabilities. In compliance with AODA, Metroland will endeavour to provide accommodation to persons with disabilities in the recruitment process upon request. If you are selected for an interview and you require accommodation due to a disability during the recruitment process, please notify the hiring manager upon scheduling your interview.

THE HAMILTON SPECTATOR

CARRIERS NEEDED
In the following postal codes

East Mountain/Stoney Creek Mountain
L8J00011 - Branthaven, Joncaire, Lemoyne, Odessa, Rand, William Johnson - 48 customers
L8J00025 - Alden, Aster, AV Geranium, Bates, Bellflower, Blue Mountain, Bocelli, Bonhill, etc. - 81 customers
Call Paul Carroll at 905-526-4630 or email pcarroll@thespec.com

Stoney Creek/East Hamilton
L8E00008 - Darrow, Deerhurst, Drayton, Ellington, Federal, Green, Hemlock, Henley, etc. - 92 customers
L8E00009 - Apple, Barton, Deerhurst, Durrani, Heartside, Henley, Lynwood, Seaton place, Tyler - 65 customers
Call Tommy Cho at 905-526-4616 or email tcho@thespec.com

West Hamilton
L8P00006 - Alexander, Charlton W, Chatham, Dundurn S, Kent, Locke S, Melbourne, etc. - 86 customers
L8P00063 - Bay S, Bold, Caroline S, Charlton W, Duke, Herkimer, James S, Park S, Robinson - 115 customers
Call Andre Rivard at 905-526-4634 or email arivard@thespec.com

Caledonia
N3W00001 - Braemar, Caledon, Celtic, Glengary, Haddington, Hyslop, Jamieson, Scottacres, Scottwood, Thistlemoor - 72 customers
N3W00006 - Argyle N, Caithness W, Dumfries, Mackenzie, Macmillan, Morrison, Orkney W, Queen, Ross, Williamson - 83 customers
Call Bruce Greer at 905-526-4652 or email bgreer@thespec.com

FIND THE RIGHT CANDIDATE TODAY

WITH YOUR LOCAL RECRUITMENT SPECIALISTS!

LocalWork.ca
YOUR BEST SOURCE FOR LOCAL JOBS

POST YOUR JOB ONLINE NOW
www.localwork.ca

Careers | Careers | Careers | Careers | Careers

Appendix B: PIC Boards

Fruitland – Winona Development Group

Public Information Centre

Gordon Dean Avenue Schedule “C” Municipal Class Environmental Assessment (Phase 3 & 4)

Date: October 17, 2019
Time: 5:00pm – 7:00pm
Location: Stoney Creek Municipal Centre –
777 Highway 8, Stoney Creek

woodplc.com

Land Acknowledgement

Located within the traditional territories of the Erie, Neutral, Huron-Wendat, Haudenosaunee and Mississaugas. This land is covered by the Dish With One Spoon Wampum Belt Covenant, whan agreement between the Haudenosaunee and Anishinaabek to share and care for the resources around the Great Lakes. We further acknowledge that this land is covered by the Between the Lakes Purchase, 1792, between the Crown and the Mississaugas of the Credit First Nation.

(Adapted from City of Hamilton)

Welcome to the Public Information Centre

Tonight, we invite you to....

01 Sign-in and take a comment sheet

02 Learn about the process.

03 Review findings of previous studies

04 Learn about the preferred alternative

05 Discover the problems and opportunities being addressed

06 Ask questions and provide insight

07 Provide feedback

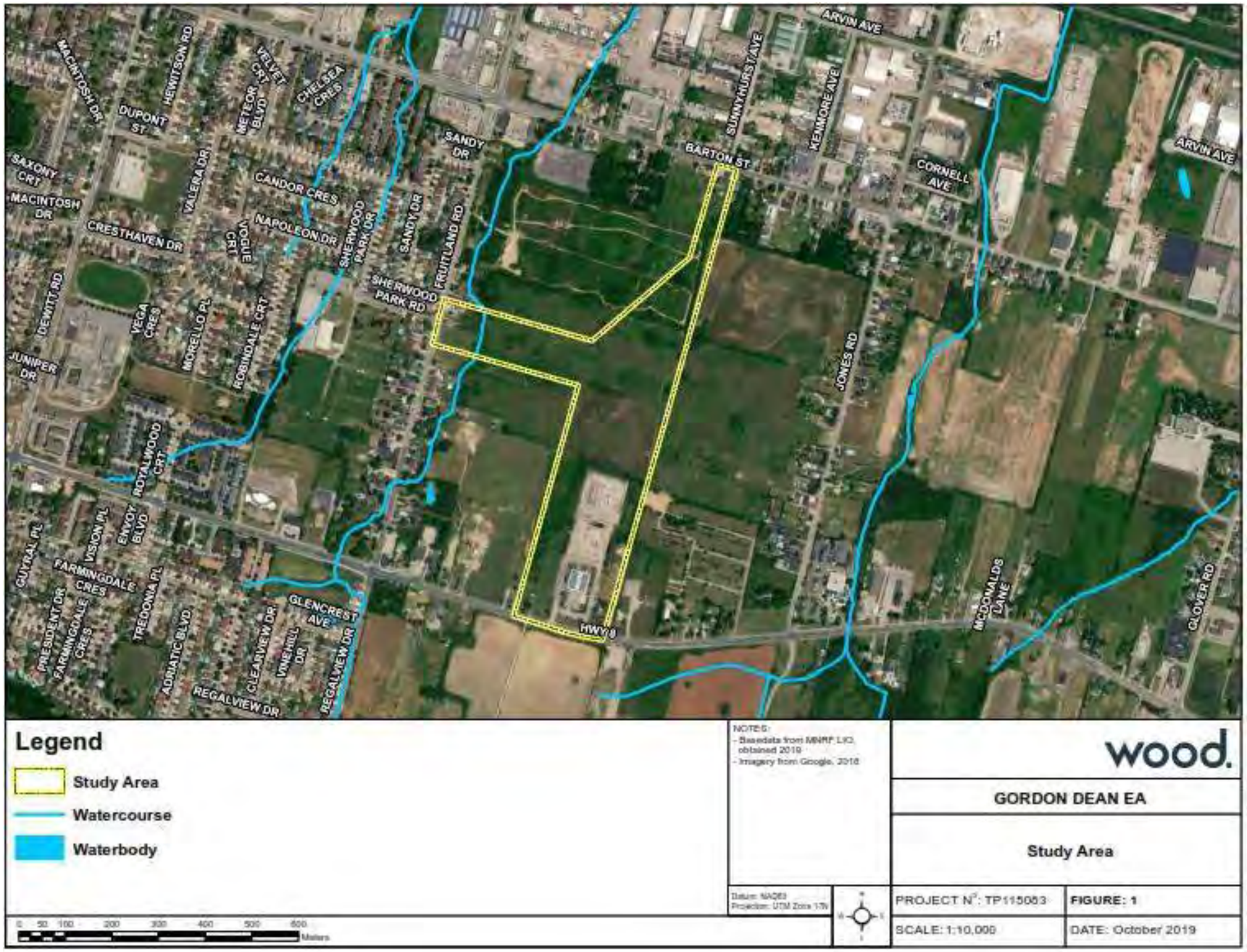
08 Let us know what is most important to you

09 Find out where the study is going next

Your feedback is important and will be incorporated and considered in the design process!

Comment Deadline is November 1, 2019

Study Area

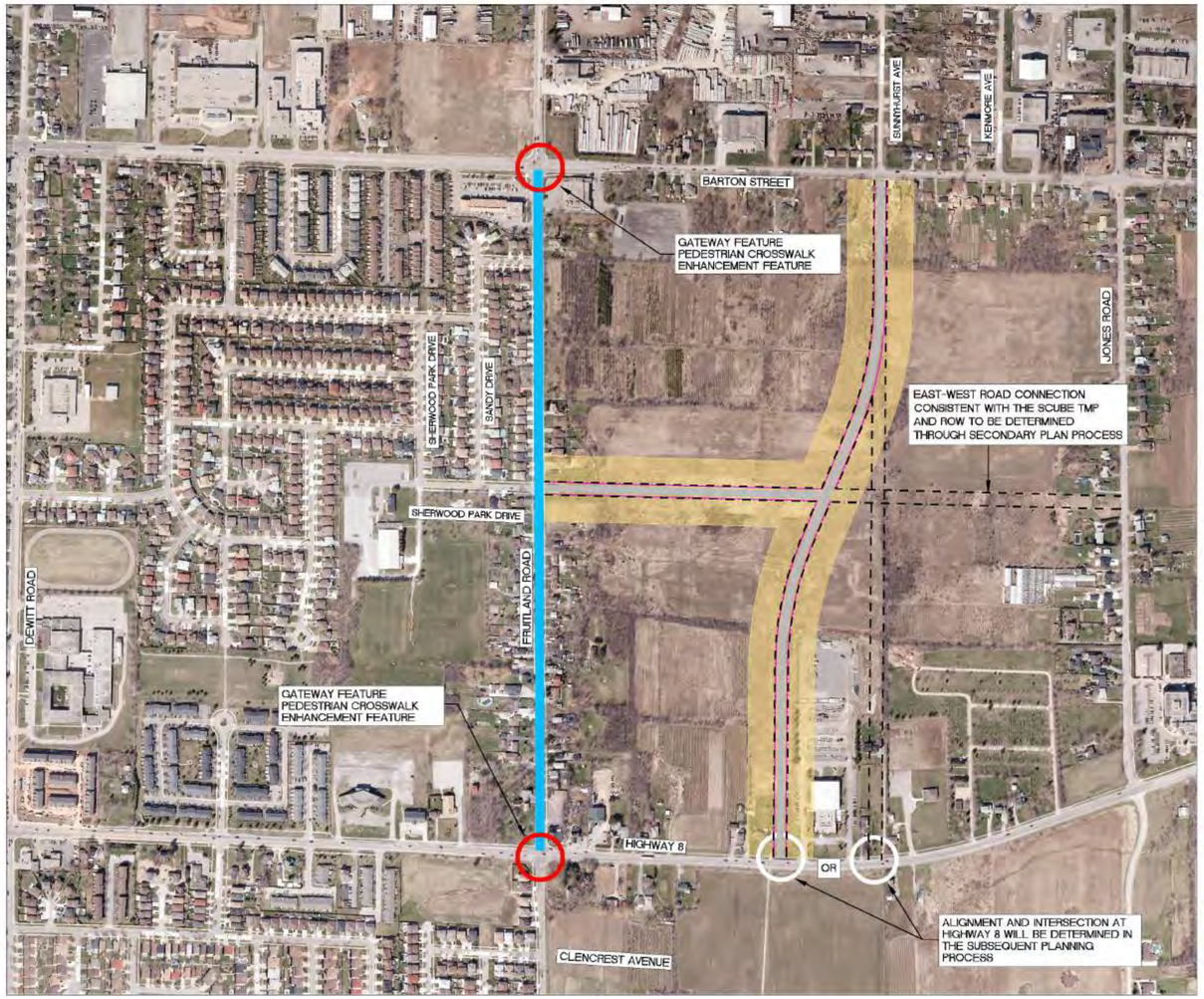

MACINTOSH DR
HEWITSON RD
DUPONT ST
VELVET CRT
METEOR BLVD
CHELSEA CRES
SANDY DR
SUNNYHURST AVE
KENMORE AVE
ARVIN AVE
BARTON ST
CORNELL AVE
SAXONY CRT
MACINTOSH DR
VALERA DR
CANDOR CRES
NAPOLEON DR
SHERWOOD PARK DR
SANDY DR
FRUITLAND RD
CRESTHAVEN DR
VOGUE CRT
SHERWOOD PARK RD
DEWITT RD
VEGA CRES
MORELLO PL
ROBINDALE CRT
JUNIPER DR
JONES RD
ROYALWOOD CRT
GUYRAL PL
VISION PL
ENVOY BLVD
FARMINGDALE CRES
TREDONNA PL
PRESIDENT DR
FARMINGDALE CRES
ADRIATIC BLVD
CLEARVIEW DR
VINEHILL DR
GLENCREST AVE
REGALVIEW DR
REGALVIEW DR
HWY 8
MCDONALDS LANE
GLOVER RD
Legend
Study Area
Watercourse
Waterbody
NOTES:
- Baseddata from MNRF LIO, obtained 2019
- Imagery from Google, 2018
Datum: NAD83
Projection: UTM Zone 17N
0 50 100 200 300 400 500 600
Meters
wood.
GORDON DEAN EA
Study Area
PROJECT N°: TP115053
FIGURE: 1
SCALE: 1:10,000
DATE: October 2019

Previous Project Work

In 2010, the City of Hamilton completed a Class Environmental Assessment (EA) on Fruitland Road between Barton Street and Highway 8), which included two phases.

- Phase 1: Identify problem and opportunity.
  - Problem: Residents concerned about high vehicle speeds and overly-aggressive driving which makes it difficult to enter and exit driveways fronting Fruitland Road.
  - Opportunity: Fruitland-Winona Secondary Plan presents opportunity to address these problems and to redistribute traffic to proposed growth areas.

- Phase 2: Develop alternative solutions to address the problem and opportunity, and select a preliminary preferred alternative.
  - Alternatives included:
    - "Do Nothing"
    - Alternative 2 Series: two options using cul-de-sacs on Fruitland Road
    - Alternative 3 Series: four options based on creating a new North-South road east of Fruitland Road
  - Preferred Alternative: New North-South Road with Fruitland Road gateway features and pedestrian crosswalk enhancements



The Fruitland Road Class EA provided the foundation for this project, the Gordon Dean Avenue Class EA.

Municipal Class Environmental Assessment Process

Phase 1
Identify and Describe the Problem(s)

Phase 2
Alternative Planning Solutions

- Identify reasonable alternative planning solutions.
- Evaluate the alternative solutions, taking into consideration environmental and technical factors.
- Identify a preferred solution to the problem(s).

Phase 3
Alternative Design Concepts For the Preliminary Preferred Design

- Confirm Phase 1 and 2 findings
- Identify alternative designs for Gordon Dean Avenue
- Document existing natural, social/cultural and economic environments.
- Identify the impact of the alternative designs and mitigation.
- Evaluate alternative designs.
- Identify a preliminary preferred design.
- Present to the Public for feedback.

We are here

Phase 4
Environmental Study Report

- Compile an Environmental Study Report (ESR).
- Place ESR on public record for review for 30 days.
- Notify the public and government agencies of completion of the ESR
- If anyone is opposed to this Study, you may submit a Part II Order request to the Ministry of Environment, Conservation and Parks.

Phase 5
Implementation

- Complete Detailed Design and Contract Administration
- Proceed to construction of the project.
- Monitor environmental provisions and commitments.

Problem Statement

Preferred Solution

Agency and Stakeholder Consultation

Preferred Design

ESR

Phases 1 and 2 was completed through Fruitland Road (from Barton Street to Highway 8) Schedule 'C' Municipal Class Environmental Assessment Study

Phase 3 and 4 will be completed as part of the current Study.
Phase 5 Implementation: The timeline for construction is unknown and dependent on the development of Block 1.

Background Information: PIC # 1 (April 2017)

Phase 1 and 2 (Fruitland Road MCEA)

- Based on the findings of the Fruitland Road (from Barton Street to Highway 8) Schedule 'C' Municipal Class Environmental Assessment (MCEA) Study, the preferred alterative solution was chosen to create a new north-south collector road between Fruitland Road and Jones Road. This project satisfied Phase 1 and 2 of the current Gordon Dean Avenue Class EA project.

Phase 3 and 4 (Gordon Dean MCEA): PIC#1 (April 2017)

- The Gordon Dean Avenue Phase 3 and 4 MCEA commenced in 2017. In April 2017, a Public Information Update (PIU) was held after technical studies were completed to determine existing conditions and corresponding mitigation measures. At this point a preliminary preferred alignment was chosen.
- This alignment was eliminated after the PIU due to the angle at the intersection of Gordon Dean Avenue and Collector B. Originally, the undesirable angle was to be addressed using a roundabout, however due to feedback received, the Project Team decided to investigate other options.

Phase 3 and 4 (Gordon Dean MCEA): 2019 Update

- Further consultation with the City of Hamilton revealed the need to undertake a more rigorous assessment to determine the preferred alternative. Although the City of Hamilton is not the proponent, they provided oversight on this project to ensure the MCEA process was followed and the design reflected the City of Hamilton's values.
- Further natural heritage studies were undertaken to determine impacts to terrestrial and aquatic habitats.

Phase 3 and 4 (Gordon Dean MCEA): PIC #2 (October 2019)

- Based on the updated evaluation of alternatives undertaken in early 2019, a new preliminary preferred alternative was identified. Due to the change in the preferred alternative, the current Public Information Centre (PIC) is being held to present the new alternative and gain feedback.

Planning and Policy Context

This Study builds upon several other studies and policies including:

- Hamilton Official Plan (UHOP) (2009) – The Gordon Dean alternative alignments are located in the land use designation neighbourhoods. The UHOP identifies a number of policies applicable to the Gordon Dean Avenue MCEA.

- Rapid Ready- Expanding Mobility Choices in Hamilton (2013) – Outlines plans for future rapid transit service. It includes Highway 8 and Fifty Road but does not recommend to service Gordon Dean Avenue.

- *Shifting Gears* - Cycling Master Plan (2018) – Developed before completion of the previous phases of this Study, and therefore no cycling lanes / multi-use pathways are identified for Gordon Dean Avenue.

- Barton Street and Fifty Road Schedule 'C' Municipal Class EA (Ongoing) - In development, this will include road widening and pedestrian promenade. Gordon Dean Avenue borders Barton Street to the north.

- Highway 8 Schedule 'C' Municipal Class EA (Ongoing) – In development this will investigate the need for widening, along with improving safety, connectivity and accessibility. Gordon Dean Avenue borders Barton Street to the south.

- Complete Streets - a concept that involves designing streets in a manner that is safe for all users, regardless of age and physical ability.

- Vision Zero – with a goal of zero fatalities or serious injuries on the roadway, it targets safer streets by addressing traffic safety holistically through education, enforcement, engineering, evaluation and engagement.

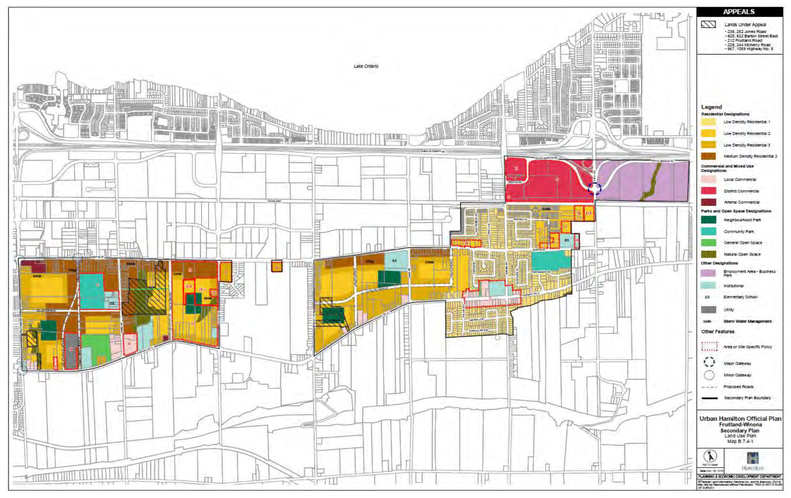
Planning and Policy Context Cont'd

Stoney Creek Urban Boundary Expansion Transportation Master Plan (SCUBE TMP) (2008)

- Conducting a new Class EA for Fruitland Road between Barton Street and Highway 8
- Collectors and local roads to appropriately subdivide land for development (SCUBE West):
    - North-South collector between Jones and Glover
    - East-West collector between Fruitland Road and North-South collector

Fruitland – Winona Secondary Plan (2014)

- Applies to areas identified in the map to the right
- Identifies current zoning and future development
- Identifies the transportation, transit and active transportation linkage objectives including addressing the following issues:
    - Truck traffic on Fruitland Road between Barton Street and Highway 8
    - Excessive Speeding
    - Truck routes
- In June 2018, the Local Planning Appeal Tribunal approved the Fruitland-Winona Secondary Plan (except for lands subject to site specific appeals)



Existing and Future Land Use

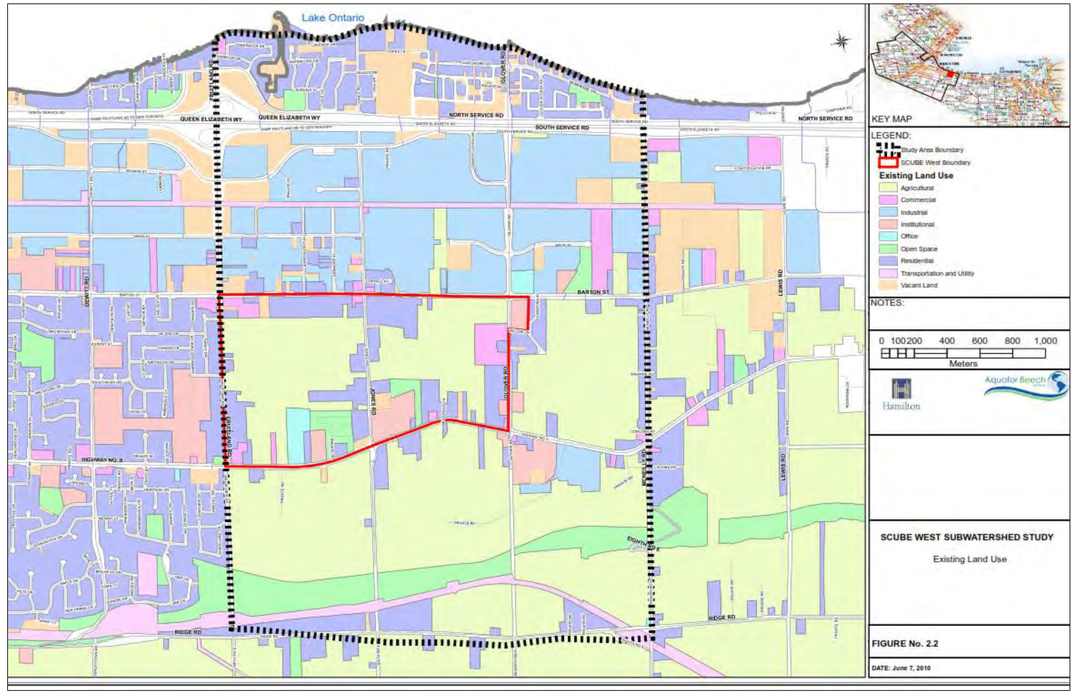
Existing Land Use

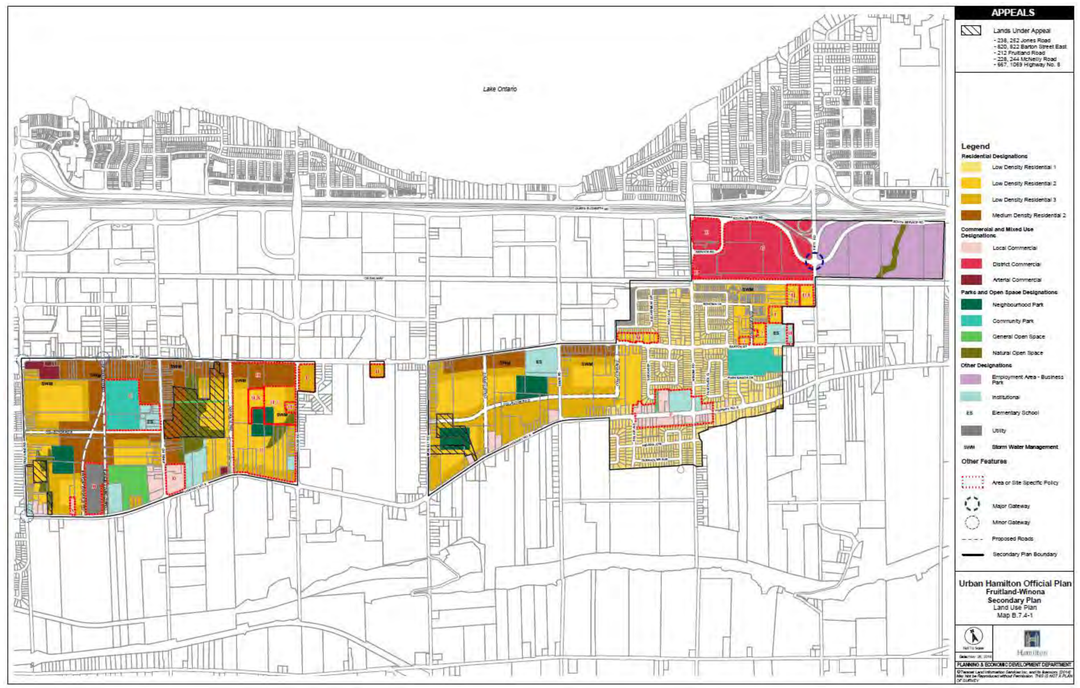
- Primarily low-density residential and agricultural land with a single office space and a few commercial buildings
- Land to the south of Highway 8 designated as ‘Escarpment Protection Area’ as well as ‘Greenbelt Area’

Future Land Use

- Future land use has been identified through the Fruitland-Winona Secondary Plan[1]
- Several development applications requesting land use to be rezoned from agricultural to residential throughout the Study Area. To implement the land use designations of the Secondary Plan

[1] Portions of this Secondary Plan are still under Appeal at the Local Planning Appeal Tribunal.





Technical Studies

- Technical studies were completed to understand the existing conditions within the Study Area
- To avoid duplication of effort, many of these studies were completed for the entire Block 1 area (see map on the right), as part of the Block 1 Servicing Strategy
- Archaeology (Stage 1) and Cultural Heritage studies were completed during the Fruitland Road Class EA.
  - Stage 2 Archeological Assessment will be completed during detailed design
- Other technical studies (i.e. Noise Assessments and Air Quality Impact Assessments) will be completed during the Block 1 Site Plan Application stage
- Technical studies for consideration in the Gordon Dean Avenue MCEA include:
  - Fruitland – Winona Block 1 Servicing Strategy Environmental Assessment & Natural Heritage System Plan
  - Fruitland – Winona Block 1 Servicing Strategy Fluvial Geomorphology and Meander Belt Width Assessment
  - Hydrogeological Assessment Block 1 Fruitland- Winona Block Servicing Strategy
  - Fruitland-Winona Secondary Plan Area – Block 1 Traffic Operations Assessment

Natural Heritage

Natural Heritage Assessment: completed as part of the Fruitland – Winona Block 1 Servicing Strategy, which had a significantly larger study area than the Gordon Dean Avenue Study Area, may have identified potential impacts and mitigation measures outside of the Gordon Dean Avenue Study Area

Findings

- The Block 1 study area contains portions of significant woodlands, wetlands, habitat of endangered or threatened species and fish habitat
- Three bird Species at Risk (Barn Swallow, Bobolink, and Eastern Meadowlark) were confirmed as present on portions of the Block 1 lands; compensation will be determined in consultation with Provincial Government by the affected landowners at the Environmental Impact Stage
- Further surveys have been completed in 2019 which determined if any of the breeding distribution of birds have changed
- Feature alteration occurred on lands abutting Watercourse 5 and 6; there areas will require restoration and compensation as discussed in the draft BSS report (September 2017)..
- Protection of core features with minimum 15m Vegetation Protection Zones (VPZ) is recommended, with a 15% overall woodland target
- Channel habitat creation (5%) and stormwater management facilities, combined with protected Natural Heritage System (NHS) and VPZs, will provide approximately 25% natural/restored future cover overall, aligned with a well-linked NHS
- Feature based water balance will be required at detailed design stage to confirm that the VPZ will adequately maintain the existing water balance

Barn Swallow

Bobolink

Recommendations

- An impact assessment will be required for the preferred alternative. This will be part of the final Environmental Study Report
- Vegetation removal for road construction should be completed outside of the breeding bird window (April 15 – August 15)
- Where NHS features have been removed or altered, restoration areas will be required as defined in the Secondary Plan
- Future forest cover of 15% is desirable for Block 1. Habitats in the created channel for watercourse 5 will represent an additional 5% of natural cover.
- Within restoration areas, an initial tree canopy cover of 30% should be established using native species that will spread aggressively to give 60% canopy cover in 20-30 years

Eastern Meadowlark

**All images from Ontario.ca Species at Risk webpage*

Alternative Design Option 2a and 2b

Option 2a

Option 2b

Thank You for Attending!

Next Steps

1. Prepare the Environmental Study Report (ESR)
2. The ESR will be provided for public review and comment during a 30 day review period.
3. If anyone is strongly opposed to the report, an appeal may be made to the Minister of Environment, Conservation and Parks under the *EA Act* (Part II Order).

Contact Us

Let us know what is most important to you, your family and / or your business! Please place comment sheets in the Comment Box or send to one of the mailing or email addresses listed on the comment sheet and below.

By Mail:	**Angelo Cutaia, P.Eng.** Project Manager Fruitland – Winona Development Group 3380 South Service Road, Unit 104 Burlington, ON, L7N 3J5	**Jim Enos, CET** Consultant Project Manager Wood Environment & Infrastructure Solutions 3450 Harvester Road, Suite 100 Burlington, ON, L7N 3W5
By Phone:	905-580-6441	905-335-2353 Ext. 3049
By E-mail:	angelocutaia@ac3group.ca	jim.enos@woodplc.com

Comment Deadline November 1, 2019

Appendix C: Comment Forms

Fruitland – Winona Development Group
Municipal Class Environmental Assessment (Phase 3 & 4)
Gordon Dean Avenue

wood.

1

Comment Form

October 17, 2019: 5:00 pm – 7:00 pm

The Fruitland – Winona Development Group welcomes your comments on the Gordon Dean Avenue Project. Please share your feedback on today's open house.

1. What are your thoughts on the preliminary preferred alternative (Option 4b)?

Category	Comments
Natural Environment (i.e., water, wildlife, plants)	fill the ditch
Socio-Economic (i.e., noise, recreation)	No hanks
Archaeology, Cultural and Built Heritage	fruit farms to be affected ?
Governance (i.e., policy and plans, costs, implementation)	NA
Sustainability / Active Transportation (i.e., Cycling, Walking, Transit)	need lanes for walkers & cycling & transit
Safety	NA

Fruitland – Winona Development Group
Municipal Class Environmental Assessment (Phase 3 & 4)
Gordon Dean Avenue

wood.

2. Do you have additional thoughts to share with the Study Team?

very glad to see the development projects coming to Highway 8 & Winona areas.

City of Hamilton has been doing a great job for generations

Please share your contact information if you wish to be contacted directly.

Name:

Address:

Phone:

Email:

Please drop your completed Comment Form in the box provided or mail / email your comments to either of the following individuals by **November 1, 2019**:

Angelo Cutaia P.Eng.
Project Manager
Fruitland – Winona Development Group
3380 South Service Road, Unit 104
Burlington, ON, L7N 3J5
Tel: 905-580-6441
E-mail: angelocutaia@ac3group.ca

Jim Enos, CET
Consultant Project Manager
Wood, Environment & Infrastructure Solution
3450 Harvester Road, Suite 100
Burlington ON L7N 3W5
Tel: 905-335-2353 ext. 3049
email: jim.enos@woodplc.com

Personal information is protected under authority of the Freedom of Information and Protection of Privacy Act and is used solely for the purpose of evaluating and improving the Project assessment. Individuals will not be identified in any public documents or names used for any purpose other than this project.

Fruitland – Winona Development Group
Municipal Class Environmental Assessment (Phase 3 & 4)
Gordon Dean Avenue

wood.

2

Comment Form

October 17, 2019: 5:00 pm – 7:00 pm

The Fruitland – Winona Development Group welcomes your comments on the Gordon Dean Avenue Project. Please share your feedback on today's open house.

1. What are your thoughts on the preliminary preferred alternative (Option 4b)?

Category	Comments
Natural Environment (i.e., water, wildlife, plants)	pls. protect wildlife / birds / water
Socio-Economic (i.e., noise, recreation)	- parks! pls. lots of greenspace - proper sidewalks - slow down drivers!
Archaeology, Cultural and Built Heritage	- protect heritage properties & the history of the area incl. Indigenous
Governance (i.e., policy and plans, costs, implementation)	- how much will taxes increase?
Sustainability / Active Transportation (i.e., Cycling, Walking, Transit)	- need bus/transit - need proper sidewalks
Safety	- school / buses / proper drop off for - pedestrian / cyclist safety children

Fruitland – Winona Development Group
Municipal Class Environmental Assessment (Phase 3 & 4)
Gordon Dean Avenue

wood.

2. Do you have additional thoughts to share with the Study Team?

Please share your contact information if you wish to be contacted directly.

Name: _____

Address: _____

Phone: _____

Email: _____

Please drop your completed Comment Form in the box provided or mail / email your comments to either of the following individuals by **November 1, 2019**:

Angelo Cutaia P.Eng.
Project Manager
Fruitland – Winona Development Group
3380 South Service Road, Unit 104
Burlington, ON, L7N 3J5
Tel: 905-580-6441
E-mail: angelocutaia@ac3group.ca

Jim Enos, CET
Consultant Project Manager
Wood, Environment & Infrastructure Solutions
3450 Harvester Road, Suite 100
Burlington ON L7N 3W5
Tel: 905-335-2353 ext. 3049
email: jim.enos@woodplc.com

Personal information is protected under authority of the Freedom of Information and Protection of Privacy Act and is used solely for the purpose of evaluating and improving the Project assessment. Individuals will not be identified in any public documents or names used for any purpose other than this project.

Appendix D: Comments via Emails

From: Enos, Jim
Sent: Tuesday, October 29, 2019 1:47 PM
angelocutaia@ac3group.ca
Cc:
Subject: RE: Gordon Dean Avenue- Resident Feedback

Good afternoon

We have received and properly filed your e-mail of feedback found below.

We intend to respond to your various questions and requests in the very near future.

Thank you for taking the time to contact us in this regard.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

From:
Sent: Tuesday, October 29, 2019 11:23 AM
To: Enos, Jim <jim.enos@woodplc.com>; angelocutaia@ac3group.ca
Cc:
Subject: Gordon Dean Avenue- Resident Feedback

Good Morning,

We attended the last public information session for this project 2 years ago. At that time it showed two options, the second option going right through our home. When we asked what the odds of that happening were, we were assured it was highly unlikely as that was not the preferred option. Fast forward to the most recent session where we were shocked to find out that the preferred option is now right through our home.

We understand that progress in any community is good and we have always been excited for this project (albeit less now that it will have a negative impact on our lives). What we do not understand is why we found out about this change from a public information session and not ahead of time. There are only two homes that this new plan effects and approaching us ahead of time would have been appreciated and a more respectful way to let us know. We are lucky enough that one of us could even attend. To that end, we would appreciate being directed to the full report on why you need to change the original plan and the concerns about the curve in the roadway so we have a better understanding of why this is now the preferred option.

We chose our home for many unique and different reasons, one being the school we wanted our children to attend. We can not replicate our home and property in this area or anywhere nearby. Our daughters are 3 and 1 and the first will start school in September. Displacing us from our home and potentially into another school area is a big deal to us as we don't want to see our daughter struggle more than anyone else.

We understand that we are basically at the mercy of the project, but we would appreciate being contacted ASAP and walked through the process that pertains to us once the formal decision on the road is made. We do not want anymore surprises. We want to have a full understanding of the timelines so we are not in a holding pattern. We had plans in place and contractors booked for renovations in January that have now been put on hold indefinitely. While we appreciate the progress in the community, we feel as though our own progress in our home and our children's home is now being halted and to leave us in limbo is not fair.

Thank you for your time. Please confirm that you have received this email.

We look forward to hearing from you.
Sincerely,

Appendix E: Attendance Record

Highway 8 Improvements (Fruitland Road to Fifty Road) Municipal Class Environmental Assessment (MCEA) Phase 3 & 4
Gordon Dean Avenue Schedule C Municipal Class Environmental Assessment (MCEA) Phases 3 & 4

MEETING ATTENDANCE RECORD

Date: Thursday October 17, 2019

Time: 5:00 pm – 7:00 pm

Location: Stoney Creek Municipal Centre – 777 Highway 8, Stoney Creek

Name	Address	E-mail Address / Phone Number	*Please check the study that interests you (check both if applicable)*	
			City of Hamilton / Highway 8 MCEA Phase 3, PIC #1	Fruitland – Winona Development Group / Gordon Dean Avenue MCEA Phase 3, PIC #2
			☐	☐
			☑	☐
			☑	☐
			☑	☐
			☑	☐
			☑	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Highway 8 Improvements (Fruitland Road to Fifty Road) Municipal Class Environmental Assessment (MCEA) Phase 3 & 4
Gordon Dean Avenue Schedule C Municipal Class Environmental Assessment (MCEA) Phases 3 & 4

MEETING ATTENDANCE RECORD

Date: Thursday October 17, 2019

Time: 5:00 pm – 7:00 pm

Location: Stoney Creek Municipal Centre – 777 Highway 8, Stoney Creek

Name	Address	E-mail Address / Phone Number	*Please check the study that interests you (check both if applicable)*	
			City of Hamilton / Highway 8 MCEA Phase 3, PIC #1	Fruitland – Winona Development Group / Gordon Dean Avenue MCEA Phase 3, PIC #2
			☑	☑
			☑	☑
			☑	☐
			☑	☐
			☑	☐
			☑	☐
			☐	☐
			☒	☒
			☒	☒
			☒	☒
			☑	☑

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Name	Address	E-mail Address / Phone Number	*Please check the study that interests you (check both if applicable)* City of Hamilton / Highway 8 MCEA Phase 3, PIC #1	Fruitland – Winona Development Group / Gordon Dean Avenue MCEA Phase 3, PIC #2
			☑	☐
			☐	☑
			☑	☑
			☐	☐
			☐	☐
			☑	☑
			☐	☑
			☐	☐
			☑	☑
			☐	☑
			☑	☑
			☐	☐
			☑	☑

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information. all comments will become part of the public record.

Name	Address	E-mail Address / Phone Number	Please check the study that interests you (check both if applicable)	
			City of Hamilton / Highway 8 MCEA Phase 3, PIC #1	Fruitland – Winona Development Group / Gordon Dean Avenue MCEA Phase 3, PIC #2
			☑	☑
			☑	☑
			☐	☐
			☐	☐
			☑	☐
			☑	☐
			☑	☐
			☑	☐
			☑	☑
			☑	☐
			☐	☐
			☑	☐
			☐	☐
			☑	☑
			☑	☑

Information will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

Shams, Aniqa

-----Original Message-----
From:
Sent: Wednesday, October 16, 2019 10:49 AM
To: Enos, Jim <jim.enos@woodplc.com>
Subject: Re: I for block 1 watercourse 5

Hi Jim
My address is I can find a lot of information on watercourse 6 but not watercourse 5 in block 1. I have just had major surgery and most likely won't be able to attend this meeting.
Thanks

Sent from my iPad

> On Oct 16, 2019, at 10:38 AM, Enos, Jim <jim.enos@woodplc.com> wrote:
>
> Good morning
>
> Your correspondence below does not identify your address and is
> unclear as to your request.
>
> Please plan on attending the PIC meeting tomorrow evening.
>
> Thank you
>

> Jim Enos, CET
> Senior Technologist, Land Development
> 905-335-2353 ex. 3049
> www.woodplc.com
>
>
>
>
>
>
>
> -----
> From:
> Sent: Wednesday, October 16, 2019 10:13 AM
> To: Enos, Jim <jim.enos@woodplc.com>
> Subject: I for block 1 watercourse 5
>
>
> Hello
> Please sent me any updated information for Block 1.
> Thank you

> Sent from my iPad
>
>
>
>
> This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.
>
> If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.
>
> Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.
>
> As a recipient of an email from a John Wood Group Plc company, your
> contact information will be on our systems and we may hold other
> personal data about you such as identification information, CVs,
> financial information and information contained in correspondence. For
> more information on our privacy practices and your data protection
> rights, please see our privacy notice at
> https://www.woodplc.com/policies/privacy-notice
>
>
>

Shams, Aniqa

From: Enos, Jim
Sent: Friday, October 18, 2019 8:24 AM
To: Shams, Aniqa
Subject: FW: Good morning Jim

-----Original Message-----
From:
Sent: Friday, October 18, 2019 7:57 AM
To: Enos, Jim <jim.enos@woodplc.com>
Subject: Good morning Jim

It was nice to talk to you at the meeting last night. I thoroughly enjoyed the conversation.

Just wanted to Thank you for the introduction to Dominic. We had a good conversation and I feel like I walked away with a better understanding of what's happening in my neighborhood. I didn't catch Dominics last name. Thought you would know.
Just wanted to remind you to include me on any updates to the plans for Barton Street.
Thanks again Jim.

Sent from my iPad

Shams, Aniqa

From: Enos, Jim
Sent: Wednesday, October 30, 2019 9:12 AM
To: maria.pearson@hamilton.ca
Cc: Shams, Aniqa; angelocutaia@ac3group.ca
Subject: Gordon Dean Avenue Municipal PIC - Updated Slideshow to Place on City Website
Attachments: PIC_Gordon Dean_(2019-Oct-8)_Compressed_for PIC version 3.pdf

Good morning Councilor Pearson

Please find attached the latest PIC panel slideshow from the Oct 17 PIC for Gordon Dean.

Thank you for attending.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

Shams, Aniqa

From: Enos, Jim
Sent: Thursday, February 27, 2020 12:48 PM
To: Shams, Aniqa
Subject: FW: Gordon Dea
ombined).pdf

Aniqa

The combined letter was just e-mailed to

Please follow up with the hard copy by registered e-mail.

Thank you

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

wood.

From: Enos, Jim
Sent: Thursday, February 27, 2020 12:45 PM
To:
Cc: angelo cutaia <angelocutaia@ac3group.ca>
Subject: Gordon Dean Avenue- Resident Feedback

Good afternoon

Please find attached our response to your original e-mail request of October 29, 2020.

A hard copy will follow by mail.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

wood.

From:
Sent: Monday, February 24, 2020 2:07 PM
To: Enos, Jim <jim.enos@woodplc.com>; angelocutaia@ac3group.ca
Cc:
Subject: Re: Gordon Dean Avenue- Resident Feedback

Good Afternoon,

I'm following up on my emails again as we have yet to hear anything back from our original email.

Thanks in advance,

On Jan 29, 2020, at 11:05 AM, wrote:

Good Morning,

I wanted to follow up on this as we still have not had any additional information provided to us from our email of October 29, 2020.

Please advise a date when you will be responding by.

Thanks in advance,

From: Enos, Jim <jim.enos@woodplc.com>
Sent: December 4, 2019 7:08 AM
To: angelocutaia@ac3group.ca <angelocutaia@ac3group.ca>
Cc:
Subject: RE: Gordon Dean Avenue- Resident Feedback

Dear

Thank you for your follow up e-mail.

We understand your concerns, please know that you are not forgotten.

We have been and are currently working to prepare a response to your e-mail of October 29, 2019.

We will be in touch with you once we have finalized our response.

We thank you for your patience.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com
<image001.png>

From:
Sent: Monday, December 02, 2019 3:00 PM
To: Enos, Jim <jim.enos@woodplc.com>;
Cc:
Subject: Re: Gordon Dean Avenue- Resident Feedback

Good Afternoon,

I wanted to follow up on my comments/questions to see if you had any additional information to provide us with.

As you can understand we are feeling very uncertain right now and would like to gain a better understanding of what is going to happen.

Thanks,

From: Enos, Jim <jim.enos@woodplc.com>
Sent: October 29, 2019 10:47 AM
To:
<angelocutaia@ac3group.ca>

Subject: RE: Gordon Dean Avenue- Resident Feedback

Good afternoon

We have received and properly filed your e-mail of feedback found below.

We intend to respond to your various questions and requests in the very near future.

Thank you for taking the time to contact us in this regard.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com
<image001.png>

From:
Sent: Tuesday, October 29, 2019 11:23 AM
To: Enos, Jim <jim.enos@woodplc.com>; angelocutaia@ac3group.ca
Cc:
Subject: Gordon Dean Avenue- Resident Feedback

Good Morning,

We attended the last public information session for this project 2 years ago. At that time it showed two options, the second option going right through our home. When we asked what the odds of that happening were, we were assured it was highly unlikely as that was not the preferred option. Fast forward to the most recent session where we were shocked to find out that the preferred option is now right through our home.

We understand that progress in any community is good and we have always been excited for this project (albeit less now that it will have a negative impact on our lives). What we do not understand is why we found out about this change from a public information session and not ahead of time. There are only two homes that this new plan effects and approaching us ahead of time would have been appreciated and a more respectful way to let us know. We are lucky enough that one of us could even attend. To that end, we would appreciate being directed to the full report on why you need to change the original plan and the concerns about the curve in the roadway so we have a better understanding of why this is now the preferred option.

We chose our home for many unique and different reasons, one being the school we wanted our children to attend. We can not replicate our home and property in this area or anywhere nearby. Our daughters are 3 and 1 and the first will start school in September. Displacing us from our home and potentially into another school area is a big deal to us as we don't want to see our daughter struggle more than anyone else.

We understand that we are basically at the mercy of the project, but we would appreciate being contacted ASAP and walked through the process that pertains to us once the formal decision on the road is made. We do not want anymore surprises. We want to have a full understanding of the timelines so we are not in a holding pattern. We had plans in place and contractors booked for renovations in January that have now been put on hold indefinitely. While we appreciate the progress in the community, we feel as though our own progress in our home and our children's home is now being halted and to leave us in limbo is not fair.

Thank you for your time. Please confirm that you have received this email.

We look forward to hearing from you.
Sincerely,

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include "Unsubscribe" in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

---

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

February 26, 2020

Dear

RE: Gordon Dean Road Class Environmental Assessment, Correspondence

Thank-you for your email message of October 29, 2019. We understand and appreciate your concerns and are responding to address these as well as provide some additional information. We apologize that you did not receive the enclosed letter, dated October 4, 2019, issued in advance of the October 17, 2019 public meeting. With your permission, we will endeavor to send any future formal correspondence to you via both email and regular post to ensure delivery.

Municipal development projects are multi-step, multi-year activities. Municipal planning projects follow the municipal class environmental assessment process (Class EA) under the *Environmental Assessment Act*. Depending on the potential impact to the environment, Class EAs have specific phases that must be completed. Further details about this process are available on the City of Hamilton's website: https://www.hamilton.ca/municipal-class-environmental-assessment-process

In 2011, the City of Hamilton completed Phases 1 and 2 for the Fruitland Road from Barton Street to Highway 8 Class EA. The recommendation, or preferred alternative identified was to develop a new north-south road for Fruitland Road truck traffic to be located east of the existing Fruitland Road between Highway 8 and Barton Street. This proposed road will become Gordon Dean Road. The preferred alternative proposed two potential alignments for Gordon Dean Road. The final alignment and detailed design of this preferred alternative would be determined through future studies.

In 2017, the Fruitland-Winona Block 1 Development Group initiated the next Class EA phases (Phases 3 and 4) to examine alternative design concepts for the preferred Gordon Dean Road alignment and prepare an Environmental Study Report. The meeting referred to in your email may have been the April 2017 information session. This was a joint session held by the City of Hamilton and the Fruitland-Winona Development Group. During this meeting, two north-south alignments were presented: Alternative 1: straight alignment and Alternative 2: curved alignment. The preferred alignment was identified as Alternative 2. Following the information session and additional technical review, intersection safety concerns with Alternative 2 were identified by the City.

In response, the intersection was reconfigured under several options to consider safety considerations. Further discussions with the City of Hamilton resulted in an extensive and more detailed evaluation of further developed design options that included the intersection and associated road alignments.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

With the completion of this advanced iterative design and evaluation process, results were brought forward to inform stakeholders such as yourselves and the public at the October 17th, 2019 PIC. The preferred alternative proposed at this public meeting, Option 4B, conforms with the City's approved Fruitland-Winona Secondary Plan, the plan for a new north-south road for truck traffic located east of the existing Fruitland Road, and the safety requirement objectives.

Option 4B is a recommendation and we are seeking community input on this option to further review, refine and address any identified concerns with this option where feasible. No formal decision has been made about the location of the proposed new north-south road – Gordon Dean Road at this time.

As mentioned above, these projects are iterative, multi-step, multi-year efforts that apply many considerations in the final determination of the design and associated alignment. We have noted your concerns, and consultation with you will continue as additional details advance such that we can more clearly answer your detailed questions regarding timelines. There are also recognized direct property impacts associated with the development of a preferred alignment, as we have noted with your property. Please be aware that property requirements from landowners for the construction of the preferred alignment will be addressed by the proponent responsible for the construction of Gordon Dean Road within the various lands not owned by the City nor Fruitland Winona Block1 Development Group. To this point in time, this proponent has not been determined. This will occur in future phases of the project as design details are developed.

We thank you for providing your comments such that we are aware of your concerns and can continue to consult with you accordingly.

Sincerely,

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T.
Project Manager

JWE/kf

P:\Work\TP115082 - Gordon Dean Avenue\04_COR\Letter\20-02-24 Hinton.docx

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

October 4, 2019
Our File: TP115082

Dear Sir/Madam:

Re: Gordon Dean Avenue Schedule 'C' Municipal Class Environmental Assessment (MCEA) Phases 3 & 4 – Potential Impact to Properties

We are writing to let you know that there is currently an MCEA Study underway that has the potential to impact a portion or the entirety of your property. We strongly recommend attending the Public Information Centre (PIC) on October 17 (5:00pm – 7:00pm) to learn more (see attached Notice).

Project Background

Wood Environment & Infrastructure Solutions, on behalf of the Fruitland – Winona Development Group is undertaking a Schedule 'C' MCEA Phases 3 & 4 Study for the new north-south collector road - *Gordon Dean Avenue*. The City of Hamilton completed the Fruitland Road (from Barton Street to Highway 8) MCEA Phases 1 & 2 Study in 2010. Through this Study, a preferred alternative was chosen as Creation of a New North-South Road with Fruitland Road gateway features and pedestrian crosswalk enhancements. This formed the basis for this Gordon Dean Avenue Study – MCEA Phase 3 & 4 being completed by the Fruitland-Winona Development Group as proponent.

This Gordon Dean Avenue Study – MCEA Phase 3 & 4 commenced in 2017. A PIC was held in April 2017 to present the process, introduce route alternative concepts, and introduce technical studies and next steps to be completed. Further consultation with the City of Hamilton revealed the need to undertake a more rigorous assessment to determine the preferred alternative and its alignment. Although the City of Hamilton is not the proponent of this study, it provided oversight to support meeting the MCEA process, and confirm that the selected design reflects the City's values, standards and objectives.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

Preferred Alternative

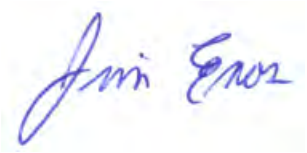
An updated evaluation of alternatives was undertaken in 2019, which identified a preferred alternative and its alignment. This October 17th, 2019, a second PIC is being held to present the preferred alternative and its alignment to the public. We are writing to you because the preferred alignment may potentially impact your property and we wanted to ensure you had an opportunity to review the preferred alignment and provide comment.

With the selection and finalization of the preferred alignment, Phase 3 will be complete, and an Environmental Study Report will be prepared and submitted through a Notice of Completion for public, stakeholder, agency and City review for a 30 day period (Phase 4). On completion of Phase 4, the proponent will initiate Phase 5 implementation with detailed design of Gordon Dean Avenue at which time additional information will be made available to the public. Please note that the City of Hamilton will be ultimately responsible for any property acquisitions and will contact you during detailed design and closer to the construction phase.

If you have any questions or comments, please don't hesitate to contact the undersigned.

Sincerely,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited



Per: James W. Enos, C.E.T.
Senior Technologist
Wood

CC- Angelo Cutaia, Fruitland -Winona Development Group

Attachments – Notice of Public Information Centre

Appendix B

Indigenous Consultation

Shams, Aniqa

From: Kelly, Mary K
Sent: Wednesday, October 2, 2019 1:57 PM
To: 'Chief Ava Hill'
Cc: Enos, Jim; angelo cutaia; King, Maria E; Shams, Aniqa; Stenzel, Andreas
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA
Attachments: Notice of PIC #2 _ Gordon Dean EA_FINAL.pdf

Good afternoon Chief Hill,

We inadvertently forgot to attach the notice in our original email. Please find it attached.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 01, 2019 4:52 PM
To: 'Chief Ava Hill' <avahill@sixnations.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Chief Hill,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Six Nations of the Grand River in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

October 1, 2019
On Behalf of the Fruitland – Winona Development Group

Chief Ava Hill
Six Nations of the Grand River
2498 Chiefswood Road
P.O. Box 5000
Ohsweken, ON N0A 1M0
avahill@sixnations.ca

Re: Gordon Dean Avenue Municipal Schedule 'C' Class Environmental Assessment – Phases 3 & 4

Dear Chief Hill,

The Fruitland – Winona Development Group is undertaking a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the creation of a new east-west collector road, named Gordon Dean Avenue. The new road would be bounded by Barton Street to the north, Highway 8 to the south, Fruitland Road to the west and Jones Road to the east.

The Fruitland – Winona Development Group has retained Wood Environment & Infrastructure Solutions (Wood) to undertake this Class EA Study. Through the Study, the team will evaluate potential alternatives to determine the location of Gordon Dean Avenue and will consider such elements as traffic capacity, transportation demand management, accommodation for goods movement and active transportation, safety, integration with existing and planned land uses and stormwater management. To address transportation capacity needs, alternatives will be examined, including the impacts of alternatives on the biological, physical and human environment.

The Fruitland – Winona Development Group is committed to engaging stakeholders and Indigenous communities. For information, the Fruitland – Winona Development Group has attached a Project summary and the Notice of Public Information Centre. Please feel free to share this information within your community as you feel appropriate.

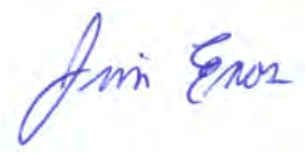
We are interested in understanding any interests or questions that the Six Nations of the Grand River may have about this Project and if there is a potential for the Project to affect Indigenous and treaty rights. We would also be interested to know if there are any sites of cultural significance to your community within, or adjacent to, the study area. The Fruitland – Winona Development Group would welcome the opportunity to meet with your community to provide more information about the Project and discuss any interests or questions you may have.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

We will contact you by telephone in the near future to determine your interest in a meeting. Please do not hesitate to contact me if you have any questions or concerns.

Sincerely,

Wood Environment and Infrastructure Solutions,
a Division of Wood Canada Limited



Per: James W. Enos, C.E.T.
Project Manager

Cc: Angelo Cutaia, Fruitland – Winona Development Group
Maria King, Wood
Mary Kelly, Wood

Encl: Project Summary
Notice of Public Information Centre

Shams, Aniqa

From: Kelly, Mary K
Sent: Wednesday, October 2, 2019 1:57 PM
To: Fawn Sault
Cc: Enos, Jim; angelo cutaia; King, Maria E; Shams, Aniqa; Stenzel, Andreas
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA
Attachments: Notice of PIC #2 _ Gordon Dean EA_FINAL.pdf

Good afternoon Fawn,

We inadvertently forgot to attach the notice in our original email. Please find it attached.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 01, 2019 4:52 PM
To: Fawn Sault <Fawn.Sault@mncfn.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Fawn,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Mississaugas of the Credit First Nation in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

October 1, 2019
On Behalf of the Fruitland – Winona Development Group

Fawn Sault
Consultation Manager
Mississaugas of the Credit First Nation
4065 Hwy 6
Hagersville, ON N0A 1H0
Fawn.Sault@newcreditfirstnation.com

Re: Gordon Dean Avenue Municipal Schedule 'C' Class Environmental Assessment – Phases 3 & 4

Dear Ms. Sault,

The Fruitland – Winona Development Group is undertaking a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the creation of a new east-west collector road, named Gordon Dean Avenue. The new road would be bounded by Barton Street to the north, Highway 8 to the south, Fruitland Road to the west and Jones Road to the east.

The Fruitland – Winona Development Group has retained Wood Environment & Infrastructure Solutions (Wood) to undertake this Class EA Study. Through the Study, the team will evaluate potential alternatives to determine the location of Gordon Dean Avenue and will consider such elements as traffic capacity, transportation demand management, accommodation for goods movement and active transportation, safety, integration with existing and planned land uses and stormwater management. To address transportation capacity needs, alternatives will be examined, including the impacts of alternatives on the biological, physical and human environment.

The Fruitland – Winona Development Group is committed to engaging stakeholders and Indigenous communities. For information, the Fruitland – Winona Development Group has attached a Project summary and the Notice of Public Information Centre. Please feel free to share this information within your community as you feel appropriate.

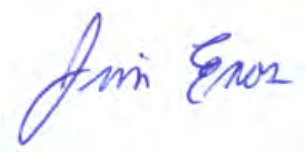
We are interested in understanding any interests or questions that the Mississaugas of the Credit First Nation may have about this Project and if there is a potential for the Project to affect Indigenous and treaty rights. We would also be interested to know if there are any sites of cultural significance to your community within, or adjacent to, the study area. The Fruitland – Winona Development Group would welcome the opportunity to meet with your community to provide more information about the Project and discuss any interests or questions you may have.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

We will contact you by telephone in the near future to determine your interest in a meeting. Please do not hesitate to contact me if you have any questions or concerns.

Sincerely,

Wood Environment and Infrastructure Solutions,
a Division of Wood Canada Limited



Per: James W. Enos, C.E.T.
Project Manager

Cc: Angelo Cutaia, Fruitland – Winona Development Group
Maria King, Wood
Mary Kelly, Wood

Encl: Project Summary
Notice of Public Information Centre

Shams, Aniqa

From: Kelly, Mary K
Sent: Wednesday, October 2, 2019 12:58 PM
To: King, Maria E; Shams, Aniqa
Subject: FW: MCFN Response to the Highway 8 Improvements from Fruitland Road Gordon Dean Avenue Class
Attachments: LOLC City of Hamilton Fruitland Road.docx

From: Fawn Sault <Fawn.Sault@mncfn.ca>
Sent: Wednesday, October 02, 2019 12:36 PM
To: melanie.anderton@hamilton.ca; Kelly, Mary K <mary.k.kelly@woodplc.com>
Cc: Mark LaForme <Mark.LaForme@mncfn.ca>
Subject: MCFN Response to the Highway 8 Improvements from Fruitland Road Gordon Dean Avenue Class

Dear Melanie,

Thank you for the notification sent to The Mississaugas of the Credit First Nation (MCFN) regarding *the Highway 8 Improvements from Fruitland Road Gordon Dean Avenue Class*. We have reviewed the document you have provided and determined that, at this time, MCFN has a **low level** of concern about the project. ***Please see the attached letter for more information***.

Respectfully, we ask that you immediately notify MCFN if there are any changes to the project as they may impact MCFN's interests. Additionally, MCFN requests a copy of all associated environmental and/or archaeological reports. These can be electronic copies, if you prefer. Furthermore, MCFN employs Field Liaison Representatives who **must** be on location whenever any fieldwork for environmental and/or archaeological assessments is undertaken. If additional work is scheduled, please notify us as soon as possible so that we may work together to discuss and arrange for MCFN's participation.

Sincerely,

Fawn D. Sault
Consultation Manager
Department of Consultation and Accommodation
Mississaugas of the Credit First Nation
4065 Hwy 6 North
Hagersville, On.
N0A 1H0
Office - 905-768-4260
Cell – 289-527-6580
http://www.mncfn.ca
Facebook: Mississauga of the Credit First Nation

Shams, Aniqa

From: Kelly, Mary K
Sent: Wednesday, October 2, 2019 1:57 PM
To: 'HDI (hdi2@bellnet.ca)'
Cc: Enos, Jim; angelo cutaia; King, Maria E; Shams, Aniqa; Stenzel, Andreas
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA
Attachments: Notice of PIC #2 _ Gordon Dean EA_FINAL.pdf

Good afternoon Ms. General,

We inadvertently forgot to attach the notice in our original email. Please find it attached.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 01, 2019 4:52 PM
To: 'HDI (hdi2@bellnet.ca)' <hdi2@bellnet.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Ms. General,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Haudenosaunee Development Institute in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
3450 Harvester Road, Suite 100
Burlington, ON L7N 3W5, Canada
T: 905-335-2353
www.woodplc.com

October 1, 2019
On Behalf of the Fruitland – Winona Development Group

Tracey General
Senior Administrator
Haudenosaunee Confederacy Chiefs Council
c/o Haudenosaunee Development Institute
16 Sunrise Court, Suite 600
P.O. Box 714
Ohsweken, ON N0A 1M0
hdi2@bellnet.ca

Re: Gordon Dean Avenue Municipal Schedule 'C' Class Environmental Assessment – Phases 3 & 4

Dear Ms. General,

The Fruitland – Winona Development Group is undertaking a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the creation of a new east-west collector road, named Gordon Dean Avenue. The new road would be bounded by Barton Street to the north, Highway 8 to the south, Fruitland Road to the west and Jones Road to the east.

The Fruitland – Winona Development Group has retained Wood Environment & Infrastructure Solutions (Wood) to undertake this Class EA Study. Through the Study, the team will evaluate potential alternatives to determine the location of Gordon Dean Avenue and will consider such elements as traffic capacity, transportation demand management, accommodation for goods movement and active transportation, safety, integration with existing and planned land uses and stormwater management. To address transportation capacity needs, alternatives will be examined, including the impacts of alternatives on the biological, physical and human environment.

The Fruitland – Winona Development Group is committed to engaging stakeholders and Indigenous communities. For information, the Fruitland – Winona Development Group has attached a Project summary and the Notice of Public Information Centre. Please feel free to share this information within your community as you feel appropriate.

We are interested in understanding any interests or questions that the Haudenosaunee Confederacy Chiefs Council, as represented by the Haudenosaunee Development Institute may have about this Project and if there is a potential for the Project to affect Indigenous and treaty rights. We would also be interested to know if there are any sites of cultural significance to your community within, or adjacent

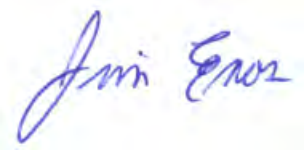
'Wood' is a trading name for John Wood Group PLC and its subsidiaries

to, the study area. The Fruitland – Winona Development Group would welcome the opportunity to meet with your community to provide more information about the Project and discuss any interests or questions you may have.

We will contact you by telephone in the near future to determine your interest in a meeting. Please do not hesitate to contact me if you have any questions or concerns.

Sincerely,

Wood Environment and Infrastructure Solutions,
a Division of Wood Canada Limited



Per: James W. Enos, C.E.T.
Project Manager

Cc: Angelo Cutaia, Fruitland – Winona Development Group
Maria King, Wood
Mary Kelly, Wood

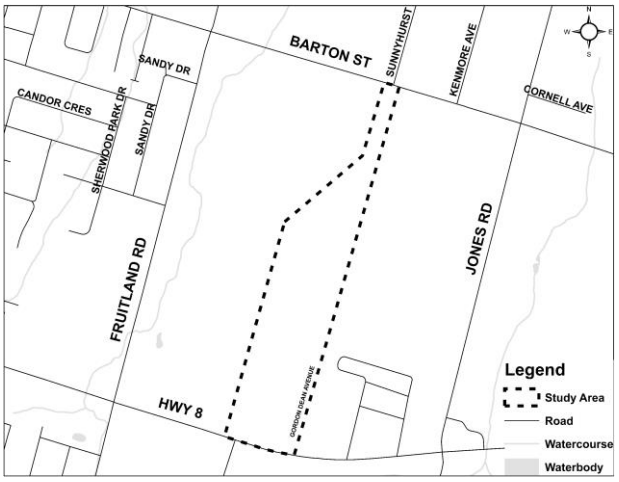
Encl: Project Summary
Notice of Public Information Centre

Gordon Dean Avenue (in City of Hamilton) Municipal Class Environmental Assessment

A Municipal Class EA is a decision-making and planning process that identifies the potential effects of projects, such as road improvements, so that they can be managed prior to implementation.

Project Description

To accommodate the City of Hamilton's growth as well as its transportation capacity, the Fruitland- Winona Development Group (Proponent) is undertaking a Schedule 'C' Municipal Class Environmental Assessment (Class EA) for the creation of a new north-south collector road, named Gordon Dean Avenue. The new road would be bounded by Barton Street to the north, Highway 8 to the south, Fruitland Road to the west and Jones Road to the east. Wood Environment & Infrastructure Solutions (Wood) is the consultant hired to complete the Class EA Study (Study).



Municipal Class Environmental Assessment

The Class EA planning process helps identify the potential effects of proposed projects. Each proposed alternative alignment is assessed against baseline conditions to determine the potential effects, and where necessary, identify mitigation measures to minimize or avoid those impacts. From these alternatives, the most feasible alternative will be identified. A key component of this study is to consult with regulatory agencies, conservation authorities, stakeholders and Indigenous groups.

The Fruitland Road (from Barton Street to Highway 8) Municipal Class EA Study was completed in 2010. It satisfied Phases 1 and 2 of the Class EA process, including the identifaction of a preferred alternative. The Gordon Dean Class EA Study will review and confirm the preferred alternative and complete Phases 3 and 4 of the Class EA process.

Through the Study an understanding of the current conditions as well as future traffic growth and safety considerations will be developed. Several potential alternative alignments have been developed and will be shared at a public meeting for feedback.

Baseline Studies

Baseline studies are prepared to describe the current biological, human and physical environment conditions. The following were completed as part of this Study:

Biological Environment	Human Environment	Physical Environment
• Fisheries and aquatic biology • Species at Risk • Vegetation • Wildlife	• Land use • Socio-economics • Visual aesthetics / landscape design	• Hydrology (waterbodies) • Hydrogeology (groundwater)

Potential Project Related Effects

Potential effects will depend on the alignment of the road. There may be effects based on the alignment and location of the new road, which will need to be mitigated. This may include effects on:

- Private property owners because of the new road (such as property purchase or changes to access);
- Heritage properties and cultural heritage landscapes; and
- Environmental features including land-based and water-based environments.

Schedule and Next Steps

- Public Information Sessions: planned for October 17, 2019; and
- Environmental Study Report (*final report)*: submission tentatively planned for Winter 2019-2020.

Additional Information

For more information about the Class EA study, please visit:
https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

Contact Information

Fruitland – Winona Development Group
Angelo Cutaia P.Eng.
Project Manager
Tel: (905) 580 6441
angelocutaia@ac3group.ca

Wood Environment & Infrastructure Solutions
Jim Enos, CET
Consultant Project Manager
Tel: 905-335-2353 ext. 3049
jim.enos@woodplc.com

Shams, Aniqa

From: Kelly, Mary K
Sent: Thursday, May 28, 2020 4:23 PM
To: Mark B. Hill
Cc: Enos, Jim; angelo cutaia; Shams, Aniqa; Stenzel, Andreas; Talpur, Mir
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Chief Hill,

In October 2019, we shared some information about the Gordon Dean Avenue – Schedule 'C' Municipal Class Environmental Assessment (Phases 3 and 4), being undertaken by the Fruitland-Winona Development Group. Since then we have made progress on this project, including a Public Information Centre (PIC) that was held on October 17, 2019. The preliminary preferred alternative was presented at the PIC, in addition to the results of technical studies completed. The preferred alternative is shown in the attached figure. The presentation boards from the PIC can be found on the City of Hamilton Project website: https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

The purpose of this email is to provide you with an update on the project and solicit any comments or questions you may have. A summary of review and results of technical studies is provided below:

- **Archaeology:** According to Appendix F-4 (Archaeological Potential) of the Urban Hamilton Official Plan (2013), archaeological potential exists within the entire Study Area. A Stage 1 Archaeological Assessment was completed in February 2007 in support of the Watercourse 5 and 6 Class EA. The report concluded that there is moderate potential for the discovery of archaeological resources in the undisturbed portions of any fields which are currently used for agricultural purposes. It recommended that a Stage 2 Archaeological Investigation will be required prior to any construction activities in undisturbed lands. The Stage 2 Archaeological Assessment was not completed as part of the current study but will be completed during detailed design phase.

- **Cultural Heritage:** Appendix F of the 2013 Urban Hamilton Official Plan (UHOP) indicates that there are no built or cultural landscape heritage areas within the Study Area. An Information Sheet was completed as part of Fruitland Road Municipal Class EA (January 2011). It provided background information on the development history and cultural heritage resources (archaeology, built heritage and cultural heritage landscapes) in the Study Area. It noted that no properties within the Study Area have been designated under Part IV of the Ontario Heritage Act, and concluded that no significant built heritage features or cultural heritage landscapes will be displaced or disrupted as a result of this project. Therefore, no further cultural and built heritage assessments or mitigation measures are required.

- **Natural Environment:** The Study Area has residential and rural uses, portions of small (human created) wetlands, two hedgerows and a small woodland. The 120 m adjacent lands include open country habitat for two threatened bird species, one category of Candidate Significant Wildlife Habitat (potential Special Concern and Rare Wildlife Species), and warmwater fish habitat. Two SAR bird species were confirmed as breeding with habitat overlapping portions of the Study Area; next steps regarding ESA compliance will need to be confirmed through consultation with MECP. Other locally known SAR were not detected and/or were detected but criteria to support breeding was not identified. No wetlands or woodlands that meet UHOP criteria for inclusion as Core Areas (and Natural Heritage

System) were detected. As well, there were no ANSIs or Environmentally Sensitive Areas present. Watercourse 5.0, which runs east of Fruitland Road and crosses the proposed Collector Road 'B', is considered to be a permanent watercourse within the Study Area and there were no fish were observed during the field investigation within the Study Area.

We are now working on preparing the Environmental Study Report (ESR), which will include the final design of the Preferred Alternative. It will also identify any required permits/approvals and propose appropriate mitigation measures in order to mitigate/reduce any impacts. It will be available for review along with background documents in near future. We will email you a copy of the Notice of Completion, when it becomes available, which will include a link to the City of Hamilton website, where the ESR and background documents will be located for review.

If after reading above information, you have any questions or comments, please do not hesitate to contact us.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 1, 2019 4:52 PM
To: 'Chief Ava Hill' <avahill@sixnations.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Chief Hill,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Six Nations of the Grand River in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Shams, Aniqa

From: Kelly, Mary K
Sent: Thursday, May 28, 2020 4:23 PM
To: Fawn Sault; Mark LaForme
Cc: Enos, Jim; angelo cutaia; Shams, Aniqa; Stenzel, Andreas; Talpur, Mir
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Mark and Fawn,

In October 2019, we shared some information about the Gordon Dean Avenue – Schedule 'C' Municipal Class Environmental Assessment (Phases 3 and 4), being undertaken by the Fruitland-Winona Development Group. Since then we have made progress on this project, including a Public Information Centre (PIC) that was held on October 17, 2019. The preliminary preferred alternative was presented at the PIC, in addition to the results of technical studies completed. The preferred alternative is shown in the attached figure. The presentation boards from the PIC can be found on the City of Hamilton Project website: https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

The purpose of this email is to provide you with an update on the project and solicit any comments or questions you may have. A summary of review and results of technical studies is provided below:

- **Archaeology:** According to Appendix F-4 (Archaeological Potential) of the Urban Hamilton Official Plan (2013), archaeological potential exists within the entire Study Area. A Stage 1 Archaeological Assessment was completed in February 2007 in support of the Watercourse 5 and 6 Class EA. The report concluded that there is moderate potential for the discovery of archaeological resources in the undisturbed portions of any fields which are currently used for agricultural purposes. It recommended that a Stage 2 Archaeological Investigation will be required prior to any construction activities in undisturbed lands. The Stage 2 Archaeological Assessment was not completed as part of the current study but will be completed during detailed design phase.

- **Cultural Heritage:** Appendix F of the 2013 Urban Hamilton Official Plan (UHOP) indicates that there are no built or cultural landscape heritage areas within the Study Area. An Information Sheet was completed as part of Fruitland Road Municipal Class EA (January 2011). It provided background information on the development history and cultural heritage resources (archaeology, built heritage and cultural heritage landscapes) in the Study Area. It noted that no properties within the Study Area have been designated under Part IV of the Ontario Heritage Act, and concluded that no significant built heritage features or cultural heritage landscapes will be displaced or disrupted as a result of this project. Therefore, no further cultural and built heritage assessments or mitigation measures are required.

- **Natural Environment:** The Study Area has residential and rural uses, portions of small (human created) wetlands, two hedgerows and a small woodland. The 120 m adjacent lands include open country habitat for two threatened bird species, one category of Candidate Significant Wildlife Habitat (potential Special Concern and Rare Wildlife Species), and warmwater fish habitat. Two SAR bird species were confirmed as breeding with habitat overlapping portions of the Study Area; next steps regarding ESA compliance will need to be confirmed through consultation with MECP. Other locally known SAR were not detected and/or were detected but criteria to support breeding was not identified. No wetlands or woodlands that meet UHOP criteria for inclusion as Core Areas (and Natural Heritage

System) were detected. As well, there were no ANSIs or Environmentally Sensitive Areas present. Watercourse 5.0, which runs east of Fruitland Road and crosses the proposed Collector Road 'B', is considered to be a permanent watercourse within the Study Area and there were no fish were observed during the field investigation within the Study Area.

We are now working on preparing the Environmental Study Report (ESR), which will include the final design of the Preferred Alternative. It will also identify any required permits/approvals and propose appropriate mitigation measures in order to mitigate/reduce any impacts. It will be available for review along with background documents in near future. We will email you a copy of the Notice of Completion, when it becomes available, which will include a link to the City of Hamilton website, where the ESR and background documents will be located for review.

If after reading above information, you have any questions or comments, please do not hesitate to contact us.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 1, 2019 4:52 PM
To: Fawn Sault <Fawn.Sault@mncfn.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Fawn,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Mississaugas of the Credit First Nation in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Shams, Aniqa

From: Kelly, Mary K
Sent: Thursday, May 28, 2020 4:23 PM
To: 'HDI (hdi2@bellnet.ca)'
Cc: Enos, Jim; angelo cutaia; Shams, Aniqa; Stenzel, Andreas; Talpur, Mir
Subject: RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Ms. General,

In October 2019, we shared some information about the Gordon Dean Avenue – Schedule 'C' Municipal Class Environmental Assessment (Phases 3 and 4), being undertaken by the Fruitland-Winona Development Group. Since then we have made progress on this project, including a Public Information Centre (PIC) that was held on October 17, 2019. The preliminary preferred alternative was presented at the PIC, in addition to the results of technical studies completed. The preferred alternative is shown in the attached figure. The presentation boards from the PIC can be found on the City of Hamilton Project website: https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

The purpose of this email is to provide you with an update on the project and solicit any comments or questions you may have. A summary of review and results of technical studies is provided below:

- **Archaeology:** According to Appendix F-4 (Archaeological Potential) of the Urban Hamilton Official Plan (2013), archaeological potential exists within the entire Study Area. A Stage 1 Archaeological Assessment was completed in February 2007 in support of the Watercourse 5 and 6 Class EA. The report concluded that there is moderate potential for the discovery of archaeological resources in the undisturbed portions of any fields which are currently used for agricultural purposes. It recommended that a Stage 2 Archaeological Investigation will be required prior to any construction activities in undisturbed lands. The Stage 2 Archaeological Assessment was not completed as part of the current study but will be completed during detailed design phase.

- **Cultural Heritage:** Appendix F of the 2013 Urban Hamilton Official Plan (UHOP) indicates that there are no built or cultural landscape heritage areas within the Study Area. An Information Sheet was completed as part of Fruitland Road Municipal Class EA (January 2011). It provided background information on the development history and cultural heritage resources (archaeology, built heritage and cultural heritage landscapes) in the Study Area. It noted that no properties within the Study Area have been designated under Part IV of the Ontario Heritage Act, and concluded that no significant built heritage features or cultural heritage landscapes will be displaced or disrupted as a result of this project. Therefore, no further cultural and built heritage assessments or mitigation measures are required.

- **Natural Environment:** The Study Area has residential and rural uses, portions of small (human created) wetlands, two hedgerows and a small woodland. The 120 m adjacent lands include open country habitat for two threatened bird species, one category of Candidate Significant Wildlife Habitat (potential Special Concern and Rare Wildlife Species), and warmwater fish habitat. Two SAR bird species were confirmed as breeding with habitat overlapping portions of the Study Area; next steps regarding ESA compliance will need to be confirmed through consultation with MECP. Other locally known SAR were not detected and/or were detected but criteria to support breeding was not identified. No wetlands or woodlands that meet UHOP criteria for inclusion as Core Areas (and Natural Heritage

System) were detected. As well, there were no ANSIs or Environmentally Sensitive Areas present. Watercourse 5.0, which runs east of Fruitland Road and crosses the proposed Collector Road 'B', is considered to be a permanent watercourse within the Study Area and there were no fish were observed during the field investigation within the Study Area.

We are now working on preparing the Environmental Study Report (ESR), which will include the final design of the Preferred Alternative. It will also identify any required permits/approvals and propose appropriate mitigation measures in order to mitigate/reduce any impacts. It will be available for review along with background documents in near future. We will email you a copy of the Notice of Completion, when it becomes available, which will include a link to the City of Hamilton website, where the ESR and background documents will be located for review.

If after reading above information, you have any questions or comments, please do not hesitate to contact us.

Cheers, Mary

From: Kelly, Mary K
Sent: Tuesday, October 1, 2019 4:52 PM
To: 'HDI (hdi2@bellnet.ca)' <hdi2@bellnet.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; angelo cutaia <angelocutaia@ac3group.ca>; King, Maria E <maria.e.king@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good afternoon Ms. General,

The Fruitland-Winona Development Group is undertaking a Class Environmental Assessment for the creation of a new north-south collector road, named Gordon Dean Avenue, in the City of Hamilton.

Please find attached a letter from us on behalf of the Fruitland-Winona Development Group as well as a summary of the Project.

I will follow-up with Haudenosaunee Development Institute in the near future to discuss. Please do not hesitate to contact us should you have any questions or comments.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.
Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

MISSISSAUGAS OF THE CREDIT FIRST NATION

DEPARTMENT OF
CONSULTATION AND ACCOMMODATION

August 28, 2020

Dear Sir/Madam,

I am writing on behalf of the Department of Consultation and Accommodation [DOCA], requesting information on a project within the Mississaugas of the Credit First Nation's [MCFN] treaty territory.

MCFN are an Aboriginal people within the meaning of section 35 of the *Constitution Act, 29182*. We have signed numerous treaties with the Crown, reaffirming our rights as the original owners of the lands in our territory and establishing Treaty rights over the same. Furthermore, we have un-surrendered Aboriginal title to the waters, beds of water, and foreshore within our territory. Our constitutionally protected rights give rise to specific legal obligations and duties which supersede policies and guidelines.

We are an Indigenous community as understood by the United Nations and our rights include those referenced in the United Nations Declaration on the Rights of Indigenous Peoples ("UNDRIP"). Article 11 of UNDRIP states that Indigenous peoples have "the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artefacts…" In May, 2016, the Federal Government committed to adopting and implementing UNDRIP; therefore, the rights of Indigenous peoples outlined in it deserve renewed consideration and respect.

These lands have been the territory and home of MCFN and our ancestors for many generations. As such, there is significant potential for archaeological and other cultural resources of our people to be located during the archaeological fieldwork required for projects or development. Such resources are of critical importance to MCFN given the increasing urbanization and development of our territory that effectively whitewashes our past. Without our active participation and monitoring during archaeological fieldwork, our history stands to be lost forever. As the original stewards of these lands – and continuing owners of the waters – we have ongoing obligations to ensure the protection of our cultural and natural resources for future generations. This is our responsibility and our right.

DEPARTMENT OF CONSULTATION AND ACCOMMODATION
Mississaugas of the Credit First Nation
4065 Hwy #6, Hagersville, Ontario N0A 1H0
Phone: (905) 768-4260

DOCA has been notified that in a project information file was submitted to the Ministry of Heritage, Sport, Tourism, and Culture Industries for the following project:

PIF ID	111054
Project Name	Stage 1 Archaeological Assessment In Support of the Gordon Dean Avenue Schedule "C" Municipal Class EA for the Proposed north-south road (Gordon Dean Avenue) from Barton Street to Highway 8 and the east-west connection (Collector Road "B") to Fruitland Road at Sherwood Park Road from the Proposed north-south road in the City of Hamilton, Located on Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario
Proponent Identified	Fruitland Winona Block 1 Development Group
Municipal Address	n/a
Stage of Assessment	Stage 1
Licensee Name and Number	Jason Seguin (P354)

Please provide a summary of the history of this project and the current state of its associated environmental and archaeological fieldwork. If it is complete, please provide a summary of the preliminary results, followed by the draft report when available. If it is not yet complete, please provide the anticipated start date of fieldwork.

Please be aware that the development may have impacts on MCFN's treaty and aboriginal rights and MCFN has not been properly consulted on this project. Until a reasonable understanding has been reached between MCFN and the proponent regarding the project and our participation in it to ensure that the fieldwork is conducted in a respectful manner that protects our rights, we are of the opinion that any duty to consult over the project has not been met and all subsequent approvals relating to the project are subject to challenge on this basis.

Finally, we would like to take this opportunity to remind you that MCFN has its own *Standards and Guidelines for Archaeology*, which we expect that will be followed in our Territory. Additionally, DOCA requires that our Field Liaison Representatives participate in all environmental and archaeological fieldwork within the MCFN treaty territory, including Stages 2 through 4. **It is our expectation that no fieldwork will take place without the participation of our FLRs.** MCFN has an Aboriginal and Treaty Right to protect the environmental and our archaeological heritage and our FLRs are our boots on the ground to ensure our interests are protected. MCFN considers it disrespectful to our rights as Indigenous peoples if our natural and cultural heritage is interfered with without our involvement.

It is my hope that in light of the above considerations and with a renewed focus on reconciliation, we can navigate through these issues towards a relationship of respect,

partnership, and mutual benefit. **Please provide the requested information by 4pm on September 18, 2020.**

DEPARTMENT OF CONSULTATION AND ACCOMMODATION
Mississaugas of the Credit First Nation
4065 Hwy #6, Hagersville, Ontario N0A 1H0
Phone: (905) 768-4260

Thank you.

Megan DeVries,
Archaeological Operations Supervisor

CC Mark LaForme, MCFN-DOCA (mark.laforme@mncfn.ca)
Ministry of Heritage, Sport, Tourism, and Culture Industries
(archaeology@ontario.ca)

DEPARTMENT OF CONSULTATION AND ACCOMMODATION
Mississaugas of the Credit First Nation
4065 Hwy #6, Hagersville, Ontario N0A 1H0
Phone: (905) 768-4260

Talpur, Mir

From: Kelly, Mary K
Sent: Friday, September 11, 2020 8:46 AM
To: Megan DeVries
Cc: Mark LaForme; angelo cutaia; Enos, Jim; Stenzel, Andreas; Talpur, Mir
Subject: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA
Attachments: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA; MCFN Response to the Highway 8 Improvements from Fruitland Road Gordon Dean Avenue Class; RE: Fruitland-Winona Development Group: Gordon Dean Avenue Class EA

Good morning Megan,

We hope all is well! Thanks for sharing your letter (dated August 28, 2020) in response to the Stage 1 Archaeological Assessment that is being carried out in support of Gordon Dean Avenue – Municipal Class EA (Phases 3 and 4). The letter identified Mississaugas of the Credit First Nation's (MCFN) "Standards and Guidelines for Archaeology" and outlined the requirement for participation in all environmental and archaeological fieldwork as well as requesting a summary of the project.

On October 1, 2019, an introductory letter, Project Information Sheet and Notice of PIC #2 was shared with MCFN (see the attached email). On October 2, 2019, MCFN notified Wood that there is a low level of concern for the Study, and respectfully asked to be notified should there be changes to the Study as they may impact MCFN. MCFN also requested copies of associated environmental and/or archeological reports. MCFN further clarified that Field Liaison Representatives must be present when the environmental and/or archaeological assessment fieldwork is undertaken (Please refer to the second pdf attachment).

On May 28, 2020, we followed up with MCFN to provide an update on the project, including a summary of review and results of technical studies including, Archaeology, Cultural Heritage and Natural Environment (see the attached email). The May correspondence noted that a 2007 Stage 1 Archaeological Assessment Report and a 2011 Cultural Heritage Information Sheet were being used for background information for this project.

Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) has recommended that due to the age of archaeology and cultural heritage information used as background information, a new Stage 1 Archeological Assessment Report and Built Heritage Resources and Cultural Heritage Landscapes Checklist should be completed as part of this EA Study. These two items are currently being undertaken by Wood. Once approved by MHSTCI, we will provide the Stage 1 Archaeological Assessment Report to MCFN. Please note that we will also identify in the Environmental Study Report commitments that MCFN is to be involved in Stage 2 Archaeological Assessment (and any additional archaeological fieldwork) during detailed design phase of project.

I trust that you find this information to be satisfactory. Please let me know if you have any additional questions.

Cheers, Mary

Mary Kathryn Kelly, B.Sc.

Indigenous Relations & Partnerships Lead / Senior Human Environment Consultant
Direct/Mobile: 705-493-9393
mary.k.kelly@woodplc.com
www.woodplc.com

Appendix C

Agency Consultation

Last Name	*First Name*	*Title*	*Job Title*	*Organization*	*Street Address*	*City and Province*	*Postal Code*	*Contact Information*
City of Hamilton Staff **TO BE SENT ELECTRONIC COPY OF MAILOUT*								
Fazio	Margaret	Ms.	Senior Project Manager, Infrastructure Planning	Growth Management, Planning and Economic Development Department	28 James Street North, 6th Floor	Hamilton, ON	L8R 4Y5	905-546-2424 x2218 Margaret.Fazio@hamilton.ca
Councillors								
Johnson	Brenda	Ms.	Councillor, Ward 11	City of Hamilton	71 Main Street West, 2nd Floor	Hamilton, ON	L8P 4Y5	905-546-2424 x4513 brenda.johnson@hamilton.ca
Pearson	Maria	Ms.	Councillor, Ward 10	City of Hamilton	74 Main Street West, 2nd Floor	Hamilton, ON	L8P 4Y5	905-546-2424 x2701 maria.pearson@hamilton.ca
Conservation Authority								
Stone	Michael	Mr.	Manager, Watershed Planning Services	Hamilton Conservation Authority	838 Mineral Springs Road, Box 81067	Ancaster, ON	L9G 4X1	(905) 525-2181 ext 133 mstone@conservationhamilton.ca
Provinicial Authorities								
Verhaeghe	Tammy	Mr.	District Manager, Guelph District Office	Ministry of Natural Resources	1 Stone Rd. W.	Guelph, ON	N1G 4Y2	519-826-4931 Fax 519-826-4929 tammy.verhaeghe@ontario.ca
Slattery	Barbara	Ms.	Environmental Assessment & Planning Co-ordinator	Ministry of the Environment and Climate Change	119 King St. W., 12th Floor	Hamilton, ON	L8P 4Y7	905-521-7864 Fax 905-521-7806 barbara.slattery@ontario.ca
Van Roon	Pauline	Ms.	Highway Engineering Hamilton	Ministry of Transportation	1201 Wilson Ave; Bldg. D. 4th Floor	Downsview, ON	M4V 1L5	416-235-5442 pauline.vanroon@ontario.ca
Baran	Michael	Mr.	Manager	Niagara Escarpment Commission	232 A Guelph Street	Georgetown, ON	L7G 4B1	michael.baran@ontario.ca
Miller	Laurie	Ms.	Planner	Ministry of Municipal Affairs & Housing	777 Bay St., 13th Floor	Toronto, ON	M5G 2C8	P: 416-585-6062 laurie.miller@ontario.ca
Barboza	Karla		Team Lead - Heritage Land Use Planning	Ministry of Tourism, Culture & Sport	401 Bay Street, 17th Floor	Toronto, ON	M7A 0A7	416-314-7120 Fax 416-314-7175 karla.barboza@ontario.ca
Other Related Community Groups-								
Lukasik	Lynda			Environment Hamilton	22 Wilson Street, Unit 4	Hamilton, ON	L8R 1G7	905-549-0900 contactus@environmenthamilton.org
McLean	Don		Organizer	Citizens at City Hall (CATCH)				905-664-8796 info@hamiltoncatch.org
Murchie	Angela		President	Hamilton Wentworth Council of Home & School Associations				hwcouncil@gmail.com
Stephenson	Sandra		Chair	Hamilton Community Foundation	120 King St. W., Suite 700	Hamilton, ON	L8P 4V2	information@hcf.on.ca
Transportation								
Salsberg	Lisa	Mr.	Manager, Strategic Strategy and Policy	Metrolinx	97 Front St W, 4th Floor	Toronto, ON	M5J 1E6	416-202-5955 ext 25955 lisa.salsberg@metrolinx.com
Sir/Madam				Smart Commute Hamilton				smartcommute@hamilton.ca
Other								

Platts	Megan	Ms.	Manager, Government & External Relations	REALTORS Association of Hamilton-Burlington	505 York Blvd.	Hamilton, ON	L8R 3K4	905-529-8101 ext. 295 fax: 905-529-4349 email: meganp@rahb.ca

Minutes of Meeting

Date:	August 18, 2015
File #:	TP115082
Date & Time:	August 11, 2015 @ 09:00 am
Meeting at:	Hamilton City Hall – Hamilton, Ontario
Subject:	Fruitland-Winona Block 1 Servicing - SCUBE

Attendees:

Melanie Anderton, City of Hamilton
Margaret Fazio, City of Hamilton
Angelo Cutaia, Amec Foster Wheeler
Heather Dearlove, Amec Foster Wheeler
Vince Pugliese, Amec Foster Wheeler

MATTERS DISCUSSED **ACTION BY:**

Introduction

- Angelo Cutaia introduced the reasoning behind the meeting. Amec Foster Wheeler is asking for feedback from the City of Hamilton on how they would like to see the Municipal Class EA process for the north-south collector road being completed within the Fruitland-Winona Block 1 Servicing (SCUBE). **Info.**

Contacts and Communication

- Main point of contact is Melanie Anderton, Margaret will be providing support and overseeing the EA process on behalf of the City. **Info.**

Key Element Discussion

Municipal Class EA

- When the City of Hamilton conducted the EA, they stopped after phase 1 and 2 to allow the future land owners to develop the land with greater flexibility including the ultimate location of the collector road. This also **Info.**

3215 North Service Road
Burlington, On L7N 3G2 Canada
905-335-2353
amecfw.com

Amec Foster Wheeler Environment & Infrastructure
A division of Amec Foster Wheeler Americas Limited

MATTERS DISCUSSED	ACTION BY:
leaves developers the responsibility of conducting the remaining phases of the EA process.	**AFW**
• Only the items that directly impact the layout of the proposed north/south road need to be considered as part of the EA.	**AFW**
• Archeological study will need to be conducted at some point. Stage 2 could be pushed to the detailed design phase once the exact footprint has been determined. Stage 1 will need to be completed during the phase 3 and 4 EA.	**AFW / City**
• Additional traffic analysis will need to be completed especially to review the potential for roundabouts at various intersections	**AFW**
• Natural environment investigations are currently underway and will be incorporated into the Municipal EA process.	**Info.**
• Other reports requirements will be reviewed and determined with discussions with the City.	**AFW**
• Amec Foster Wheeler would like to have the Public Information Centre for end of September, or early October. This will require co-ordination of information for advertising, and facility booking. o Please note: Materials need to be available 1 month prior. The newspaper 'At your Service' requires 3 weeks advance notice. Please discuss proposed PIC with City of Hamilton staff ASAP.	**AFW / City**
• Amec Foster Wheeler should speak with the local councilor	**AFW**
• Advertising costs will apply for PIC and will be the responsibility of AFW. The City stated they will contribute to the cost of the facility rental for the PIC.	**AFW / City**
• Proponency of the project was discussed. The City's preference is to support the Municipal Class EA process but would not be included as a key contact person. The City logo would be included on all public notices.	**AFW / City**
• Notification to residents and businesses will be required as a component of the Municipal Class EA process. Post card type communication to each resident, which has links to City website for complete details. Letters to businesses.	**AFW / City**
• City to provide current agency mailing list. Agencies would receive a letter notification.	**AFW / City**

MATTERS DISCUSSED	ACTION BY:
Miscellaneous	
• AFW should check with Hydro (Property A) as to whether they are moving locations. This could impact the preferred option decision.	**AFW**
• The City would like to see a multi-use pathway along the north/south road to accommodate cyclists and pedestrians as part of the design.	**AFW**
• The proposed road is to be a collector, and it is expected that there be no residential individual driveways along the collector road.	**AFW**
• The City would like to see roundabouts options evaluated at the proposed intersections. An intersection may not be able to feasibly have a roundabout due to space restrictions, but the option is to be considered as part of the EA Phase 3 process.	**AFW**
• Weighted evaluation process could be used and should be similar to what was used during Phase 1 and 2 report.	**AFW**
• A status report on all of the outstanding appeals to Block 1 is required. Need to know status with regards to OMB hearing before proceeding to public consultation. City to forward report.	**AFW / City**
Summary	
• In order to proceed to the PIC, design analysis and alternative selection and evaluation must be complete. In order to prevent having a second PIC, the preferred alternative must be presented at the PIC	**AFW**
• All reporting, and formal emails must follow the AODA format. City is to forward their AODA guidance document.	**AFW / City**

Meeting Minutes prepared by,

Amec Foster Wheeler Environment & Infrastructure
a division of Amec Foster Wheeler Americas Limited

Per: Angelo Cutaia, P. Eng.
Vince Pugliese, P. Eng
AC/vp

Meeting agenda

Date: December 1, 2016 at 9:30 a.m. **Meeting at:** Hamilton City Hall

File No.: TP115082

Subject/purpose: **SCUBE Block 1**

To be presented/discussed:

1. Land Purchase of 716, 718, 720 Barton Street to facilitate Street A connection to Barton Street and also Lands at Hwy 8 to facilitate Street A connection to HWY 8. It was discussed and agreed that this Arterial Road serves as a truck routs and future LRT Route for the entire SCUBE Secondary Plan and thus all land owners in the SCUBE Area, including the City, should contribute to the cost of the Land and Road construction accordingly.

2. Phasing of development for Block 1 to allow the construction of the East/West road with cul-de-sacs at both the north and south end, depending on timing for land purchase of the above lands.

3. Cost and implementation of Pond 3 requiring 13 properties to facilitate this SWM block. Possible option for the relocation to the Fontana lands under contract with the City and/or 332 Jones just south of Barton.

We must stay focused on these issues to get some resolution.

AJC/kf

3215 North Service Road
Burlington, ON L7N 3G2
905-335-2353
amecfw.com

Amec Foster Wheeler Environment & Infrastructure
a division of Amec Foster Wheeler Americas Limited

Meeting agenda

Date: February 6, 2017 at 9:30 a.m. **Meeting at:** Hamilton City Hall

File No.: TP115082

Subject/purpose: **SCUBE Block 1**

To be presented/discussed:

1. Land Purchase of 716, 718, 720 Barton Street to facilitate Street A connection to Barton Street and also Lands at Hwy 8 to facilitate Street A connection to HWY 8. It was discussed and agreed that this Arterial Road serves as a truck route and future LRT Route for the entire SCUBE Secondary Plan and thus all land owners in the SCUBE Area, including the City, should contribute to the cost of the Land and Road construction accordingly.
   City response/support of this position.

2. Phasing of development for Block 1 to allow the construction of the East/West road with cul-de-sacs at both the north and south end, depending on timing for land purchase of the above lands. Reopen discussions.

3. Cost and implementation of Pond 3 requiring 13 properties to facilitate this SWM Block. Possible option for the relocation to the Fontana lands under contract with the City. City to update on OMB status.

4. City update on Status of OMB appeals impacting Block 1 _ Nigro/DeFillipis/ and WC 6.

5. Other Business.

AJC/

3215 North Service Road
Burlington, ON L7N 3G2
905-335-2353
amecfw.com

Amec Foster Wheeler Environment & Infrastructure
a division of Amec Foster Wheeler Americas Limited

Minutes

Date:	July 13, 2018
File #:	TP115082
Meeting Date & Time:	April 19, 2018 – 10:30 a.m.
Meeting at:	Hamilton City Hall
Subject:	SCUBE 1 Block Servicing Strategy (BSS)

Attendees:

Margaret Fazio, City of Hamilton	Mike Stone, Hamilton Conservation Authority
Sally Yong Lee, City of Hamilton	Jonathan Bastien, Hamilton Conservation Authority
Monir Moniruzzaman, City of Hamilton	Colin Oaks, Hamilton Conservation Authority
Mohan Philip, City of Hamilton	Gene Chartier, Paradigm
Alissa Mahood, City of Hamilton	Heather Goodman, Paradigm
Stephen Cooper, City of Hamilton	Steve Chipps, Wood
Michael Fang, City of Hamilton	Jim Enos, Wood
Ian Richards, Dougan & Associates	Angelo Cutaia

MATTERS DISCUSSED **ACTION BY:**

1. This is a 'Block Servicing Strategy Study' (BSS), not a detailed design. Reporting & level of assessment have been provided at the BSS level.

2. Detail of internal road layout is 'high level' only except for the 2 major roads which are shown as per the approved Secondary Plan as directed by the City. Road layout and detailed design is subject to the next level of development, Plan of Subdivision /Site Plan etc.

3. Population densities have a wide range but maximum densities have been used for traffic design purposes but not beyond maximum. The City is supportive of 'not beyond maximum'.

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

	MATTERS DISCUSSED	ACTION BY:
4.	Block 1 SS consultant team stated that the City comments are considered to be very detailed for a high level report and well beyond the scope of the Block Servicing Strategy. Gordon Dean Drive (north-south major road) is to be 36.58m R.O.W as per the Secondary Plan, which is sufficient for 4 driving lanes, 2 bike lanes (if required) sidewalks and/or multi-purpose corridors. Block 1 SS Consultant team felt that the projecting of specific needs for LRT or BRT is too much detail at this point in time and therefore not part of the BSS. City staff answered that it was not expected that specific BRT/LRT requirements are met, since those details are not known at this time, but that the presence of the corridor/ROW and attention to potential needs at intersections – to minimize land needs be preserved as part of the Gordon Dean Study is needed, based on the information known today. Therefore, as a result of the above discussion it may be better to have no roundabout for Gordon Dean Drive at the intersection with Collector Road B.	
5.	Barton Street may have exclusive RT lane, reviewing under current EA.	
6.	Ultimately the intersection of any 2 roads should not form a skewed intersection. The road alignment (Gordon Dean Ave in this case, but applicable to all roads) should be adjusted accordingly, based on City Development Design Standards. **Provide a statement in BSS and Traffic Impact Study that angle of intersection must be dealt with at the detailed design stage**.	Paradigm Wood
7.	Block 1 SS Consultant: Traffic Impact Study (TIS) was not required in the Scope of this BSS, it was an add-on, Block 2 BSS does not have a TIS but was approved.	
8.	Intersection of Gordon Dean Ave. with Collector Road B currently is as per Secondary Plan and should not be adjusted at this stage. If a roundabout was required it would require a 100m diameter area to accommodate large trucks, buses etc. The City is not supporting a roundabout at this time. This intersection may require signalization at some stage (RT implementation) and is to be discussed in the TIS.	Paradigm

	MATTERS DISCUSSED	ACTION BY:
	City will assist with wording to deal with timing of signalization.	City
9.	Wetlands in south west sector are not really frog habitat, as such frog studies not undertaken recently Dougan & Associates. Should HCA suggest that a frog study be undertaken, fieldwork would have to be conducted within the next 2 weeks. HCA to confirm if assessment required. MNRF does not expect to be consulted, just follow MNR regulations. MNRF is currently attentive to bats and bat habitat. Watercourse 5 will require fisheries and watercourse assessment, as part of detailed design.	HCA
10.	HCA staff indicated that a Fisheries Assessment could be done at detailed design for Watercourse 5.	
11.	City requested Wood to show restoration areas from PIC plans on BSS plans, Ref Plan B.7.4.2.	Wood
12.	For Watercourse 5 in BSS, HCA staff requested Wood to provide justification for channelization south of Sherwood Drive i.e., it improves the area and enlarges the area.	D&A/Matrix/ Wood
	HCA staff requested Wood to replace term 'channelization' with 'realignment with naturalization design' and to add 2 lines indicating the natural low flow channel within the watercourse corridor.	Wood
13.	Wood staff noted that erosion setbacks for WC5 and WC6 are based on meander belt and setbacks (based on MNRF guidelines) as determined by Matrix. Matrix has noted a lack of ongoing erosion in the watercourses.	
14.	Wood staff noted that erosion control incorporated Aquafor Beech SWS criteria and has not included determining critical flows. Further additional analysis could be done at detailed design.	
15.	Block 2 suggests a 70m wide meander belt for Watercourse 6, Block 1 determined 40m. HCA staff requested Wood to review the Block 2 study to determine if 70m is agreeable and provide comment. Wood is to also include wording the BSS requiring further assessment during	Wood

	MATTERS DISCUSSED	ACTION BY:
	detailed design. City is to provide wording included in the Block 2 BSS for consistency.	City
16.	Wording re: meander belts, flood plains etc. 'HCA to provide final flood plain later which may require adjustments at detailed design stage' is to be added to BSS by Wood.	Wood
17.	Regarding the Sunnyhurst Ave. storm sewer and ditch system, the City indicated that Wood is to provide wording in the BSS that this system downstream of Barton St. must assessed at detailed design stage.	Wood
18.	Wood staff indicated that SWM facility 2 has been oversized to account for Barton Street improvements which cannot be accommodated due to grading constraints.	
19.	Wood is to assess the impact of an upgraded Watercourse 5 culvert at Barton Street – increase in flows downstream as requested by HCA staff.	Wood
20.	Wood is to assess the impact to SWM Facility 1 elevations due to the Watercourse 5 crossing of Barton Street remaining as is. Wood is to also assess a scenario of the channel corridor through the Olympia property with upgraded driveway crossing on SWM Facility 1 elevations.	Wood
21.	SWM Pond 3 was briefly discussed, with Wood staff noting that a pond may not be possible and that they are proposing that Pond 3 be replaced with on-site controls.	Wood

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T
Senior Technologist

JWE/kf

Minutes

Date:	April 8, 2019
File #:	TP115082
Meeting Date & Time:	July 23, 2018 – 2:00 p.m.
Meeting at:	Hamilton City Hall, Room 830
Subject:	SCUBE Block 1 Collector Roads Intersection Design

Attendees:

Margaret Fazio, City of Hamilton	Rob Decleir, City of Hamilton
Sally Yong Lee, City of Hamilton	Christie Meleskie, City of Hamilton
Monir Moniruzzaman, City of Hamilton	Angelo Cutaia
Mohan Philip, City of Hamilton	Loren Polonsky, Wood
Stephen Cooper, City of Hamilton	Jim Enos, Wood
Yvette Rybensky, City of Hamilton	

MATTERS DISCUSSED	**ACTION BY:**
1. Discussion regarding the current skewed intersection of the 2 collector roads ('A' north-south, 'B' east-west). The current angle of the intersection is approximately 71.5° with the desired angle being 90°. Some City staff stated that the angle is not appropriate for a controlled intersection and that a roundabout should be considered. Other City staff stated that the current angle is suitable provided that turning movements for a large garbage truck can be suitably accommodated for right turns from 'B' onto 'A' from both directions. This may require curb radii of 15.0 m, to be reviewed.	**Wood**
2. City staff inquired about what lands would be required to accommodate the roundabout, where sidewalks could be located, and other variables, if the roundabout was constructed.	
3. The roundabout design was eliminated from consideration after City staff determined potential safety issues resulting from high-pedestrian traffic (i.e., park, community centre). As a result, a	

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

	MATTERS DISCUSSED	ACTION BY:
	signalized intersection should be designed which reflects ultimate traffic needs while accommodating sidewalks an ad multi-use path.	
4.	It was suggested that Collector Road 'A' approaching the intersection have a pavement width which contains 4 thru-lanes @ 3.5 m wide, 1 left turn lane @ 3.5 m wide, 1 median @ 1.5 m wide and 1 bus bay at a width to be determined by the City. The City will consider eliminating the cycling lanes from the roadway as it appears to serve as a redundancy to the multi-use path that would run along the boulevard.	**City**
	It was suggested that Collector Road 'B' approaching the intersection would have a pavement width comprising 2 thru lanes @ 3.5 m wide, and 1 left turn lane @ 3.5 m wide.	
	The City will consider the information above for internal discussion purposes in providing Wood with an acceptable intersection layout from a pavement width perspective.	**City**
5.	Wood will explore the possibility of adjusting the intersection angle to 85° or better.	**Wood**
6.	Upon the City providing acceptable pavement widths at the intersection, Wood will produce an intersection plan on which turning movements for garbage trucks turning right and left onto and off of Collector 'B' will be shown.	**Wood**
7.	The City will designate width, length and location of bus bays required on Collector 'A'.	**City**

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T
Senior Technologist

JWE/kf

Minutes

Date:	March 8, 2019
File #:	TP115082
Meeting Date:	March 7, 2019
Meeting at:	Marz Homes Office
Subject:	Gordon Dean Alignments for SCUBE Block 1

Attendees:

Domenic Chiaravalle, Todoc Construction	Carl Galli, NGE Land Holdings/Galli Homes
Marc Marini, 1787482 Ontario Inc.	Angelo Cutaia, AC III Group
Mark De Benedictis, Benemar Homes	Maria Pearson, City Councillor Ward 10
Dan Joyce, Sydney W. Woods	Anthony Chiarella, Marz Homes
John Conciator, 2261305 Ontario Inc.	Jim Enos, Wood

MATTERS DISCUSSED **ACTION BY:**

1. MP advised, it seems that the City may now prefer the curved alignment for Gordon Dean per the Secondary Plan with adjustments to the intersection with the east-west collector road.

2. MP asked, Could the Gordon Dean curvature not occur within the north portion of the Block 1 such that it meets the east-west collector road at 90^{o}? Group advised, Perhaps, but this has substantial impact on landowners and perhaps land usage.

3. Group advised that from a safety perspective, the straightest alignment of Gordon Dean would seem to be the safest.

4. Group advised that the suggested high level safety assessment must be based on facts of design and not various/anyone's preferences.

5. It was agreed that a meeting is to be held with development group, Tony Sergi, Brian Hollingworth, Margaret Fazio, Councillor Pearson, Wood and AC III at City Hall to review and discuss the Gordon Dean

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

MATTERS DISCUSSED	ACTION BY:
assessment/EA scope. This is tentatively on the morning of March 27, 2019.	
6. Wood is to prepare a written scope outline regarding a high level safety review including roll plans of three (3) Gordon Dean Avenue alignments in advance of the March 27 meeting for City to consider.	**Wood**

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T
Project Manager

JWE/kf

Minutes

Date:	March 28, 2019
File #:	TP115082
Meeting Date:	March 27, 2019
Meeting at:	Hamilton City Hall, Room 287
Subject:	Clarification of Process to Establish Gordon Dean Alignment Options for SCUBE Block 1

Attendees:

Tony Sergi, City of Hamilton	Mark De Benedictis, Benemar Homes
Brian Hollingworth, City of Hamilton	Dan Joyce, Sidney W. Woods
Margaret Fazio, City of Hamilton	Anthony Chiarella, Marz Homes
Sally Yong-Lee, City of Hamilton	Jack Restivo, J. R. Professional Corp.
Maria Pearson, City Councilor, Ward 10	Rudy Sooklall, Wood
Domenic Chiaravalle, Todoc Construction	Loren Polonsky, Wood
Angelo Cutaia, AC III Group	Jim Enos, Wood

MATTERS DISCUSSED	**ACTION BY:**
1. The City has been discussing the various alignments and requirements to determine the best Gordean Dean Avenue alternative. City requested that a second version of Option 1 to be considered could be one with an 80° intersection skew. The Phase 3 & 4 Municipal Class Environmental Assessment (EA) functional design should, among other things address the question or whether is can be fit within the Secondary Plan road allowance even if not centred within it?	**Wood**
2. It was agreed that the final preferred alignment must be determined via an open-minded fulsome EA which is defendable.	**Wood**
3. Safety must be one of the key factors as well as all other typical factors such as ease of implementation, land ownership impact and	**Wood**

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

	MATTERS DISCUSSED	ACTION BY:
	socio-economics, as well as archaeology and cultural heritage, as required within an EA project.	
4.	It is vital that a clear and agreed upon scope of works for Phase 3 of EA be established prior to undertaking the efforts. Wood to prepare and submit a checklist of items deemed necessary, and City to do the same. Lists to be shared and merged in a manner agreed to by all parties. Agreed checklist to be established for April 12 at the latest.	**Wood / City**
5.	The EA process must clearly demonstrate why the preferred alignment is recommended and why other options are not recommended.	**Wood**
6.	It is vital that City and Development Group work together in co-operation.	**Wood / City**
7.	The 2 collector roads are to be considered as having posted speeds of 50 km/hr and design speeds of 60 km/hr.	**Wood**
8.	Consideration will be given for truck turning movements, storage lengths, turning lanes, lane widths, pedestrian crossing safety, midway resting areas for pedestrians etc. Additional/Full list of transportation design criteria will be provided by City staff. Ask Margaret for this list.	**Wood/City**
9.	Wood will only use current Paradigm TIS and AECOM's previous TIS; a new TIS is not required for the EA.	**Wood**
10.	Where Gordon Dean intersects Highway 8 is a factor for consideration as well as vertical and horizontal site lines along Highway 8. The location of options as to where it meets Highway 8 has been approved within the Fruitland-Winona Secondary Plan. However, the City directed Wood to explore various options.	**Wood**
11.	Any relevant information from Barton Street and Highway 8 EA's to be reflected.	**Wood**
12.	EA shall include roll plans for each alignment showing sidewalks, lanes, lane widths, storage, islands, etc. Traffic islands to be minimum 1.0 m wide.	**Wood**
13.	The goal is to complete Phase 3 EA PIC information for mid-May submission to City and to hold a Public Information Centre (PIC) meeting (if necessary) by mid-June (specific time TBD) . A	**Wood / City**

MATTERS DISCUSSED **ACTION BY:**

proposed/amended project schedule to be worked out and agreed upon by all involved. It shall include time for staff to review PIC materials prior to PIC itself, this is to be finalized by Wood, after staff review, 3 weeks prior to PIC itself. Staff are discouraged by Council from holding PICs during the summer months, due to constituents being away on vacation during that time – to give them a fair change to express opinions/attend, etc. Therefore, if a PIC is needed, it is desirable to do so by June 2019.

14. Advertising deadlines 1 and 2 weeks prior to the PIC dictate the 3 week lead for PIC. Also, once PIC is finalized, Block 1 Servicing Strategy may or may not need to be adjusted, e.g. drainage, and the rest of Block 1 SS finalized. Once the full report is submitted, City staff will need to review. Then, a Report to Council will be written once a Finalized Report is in hand. City will help write this report. The time between Submission of report and when it reaches Planning Committee is 6 weeks lead time. Once Committee passes it, it needs to go to Full Council for final approval.

Note: Secondary Plan is now in effect except for areas under appeal. If lands are under appeal they will not be developable until the appeals are finalized.

It is in everyone's interest to finalize the Block 1 SS as soon as possible – land owners and City.

15. City staff will provide Wood staff with a checklist of various items to be covered in Phase 3 EA by April 3 and Wood staff are to provide their version of checklist to City by April 3. Checklists to be discussed and merged to the satisfaction of all parties by April 12. **Wood / City**

16. PIC meeting may not be necessary if Option 1 alignment becomes the recommended alignment. However, the Environmental Study Report/any amendments to the documents provided at the last PIC should still be inclusive of the details/requirements stated by the City. **Wood/City**

17. Anyone can appeal an EA project, but the appeals can only really be made as to whether or not the A process has been followed. City

	MATTERS DISCUSSED	ACTION BY:
	staff therefore recommend that the EA process be well followed in order to avoid unnecessary delays in the process.	
18.	A noise study is not required as part of EA but is to be mentioned as necessary for detailed development design.	**Wood**
19.	Parks Department will have opportunity to comment on resulting park areas when documents are submitted with full EA functional design information.	
20.	It was affirmed that construction of the east-west collector road and only the north portion of Gordon Dean Avenue will be sufficient for developments along both sides of these collector roads.	
21.	EA to discuss implement-ability of various alignment options such as purchase of necessary lands.	**Wood**

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T
Project Manager

JWE/kf

Sign in Sheet

Monday May 27, 2019

Project - SCUBE Block 1 - Phase 3 EA Discussions - Hamilton City Hall Rm 433

Name	Company	Phone #	email address
Jim Enos	Wood	905 335 2353	jim.enos@woodplc.com
Loren Polonsky	Wood	905 335 2353	loren.polonsky@woodplc.com
Maria King	Wood	905 335 2353	maria.king@woodplc.com
Angelo Cutaia	AC III Group	905.580.6441	
Delfina Duarte	COH	905 546-2424 ext 6617	delfina.duarte@hamilton.ca
Brian Hollingworth	City of Hamilton	x 2953	brian.hollingworth@hamilton.ca
Sally Yong-Lee	"	1428	sally.yang-lee@hamilton.ca
DAVE MCCULLAGH	CITY OF HAMILTON	1647	david.mccullagh@hamilton.ca
RAY KESSLER	COH	1804	raymond.kessler@hamilton.ca
Maria Pearson	Councillor Ward 10	2701	maria.pearson@hamilton.ca
MARGARET FAZIO	CITY OF HAMILTON	x 2218	Margaret.Fazio@hamilton.ca

Minutes

Date:	June 12, 2019
File #:	TP115082
Meeting Date:	May 27, 2019
Meeting at:	Hamilton City hall, Room 433
Subject:	Draft Tech Memo for Fruitland-Winona Block 1 Phase 3 EA

Attendees:

Margaret Fazio, City of Hamilton
Delfina Duarte, City of Hamilton
Brian Hollingworth, City of Hamilton
Sally Yong-Lee, City of Hamilton
Dave McCullagh, City of Hamilton
Ray Kessler, City of Hamilton
Councilor Pearson, City of Hamilton
Angelo Cutaia, AC III Group (Developer Agent)
Maria King, Wood
Loren Polonsky, Wood
Jim Enos, Wood

MATTERS DISCUSSED **ACTION BY:**

1. General background history leading up to the current status of the Gordon Dean Avenue alignment options was provided by Wood.

2. City staff asked why Options 3a and 3b were introduced and why they differ from the Secondary Plan. Wood responded that the City requested additional alignments be reviewed with 80- 90 degree intersection of Street A and Street B and that this alignment would not require expropriation of private lands as it passes through lands now owned by the City.

3. The City staff stated that the 'no expropriation' policy only applies to park lands, not roads. City staff to review Council minutes to confirm this.

4. City Realty staff stated that the City wears 2 hats, one being City Corporate and the other being City Public and that the City did not purchase this property for the road. The City is not interested in dedicating lands.

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

MATTERS DISCUSSED	ACTION BY:
5. Wood enquired as to how long it might take to develop the south portion of Gordon Dean if City is not interested in dedicating lands. City Facilities/Public Works staff stated that they do not need Gordon Dean Avenue roadway as they have access from Hwy 8.	
6. City Public Works staff stated that Public Works intends to use the former Alectra Lands to expand the cemetery and for a Public Works Yard.	
7. City stated that they would normally be counting on developers to purchase lands for south leg of Gordon Dean.	
8. Wood emphasized that the development can proceed as agreed by the City with 3 collector road connection points at Barton, Jones and Fruitland and that the City will need to acquire and construct the south leg of Gordon Dean.	
9. Real Estate and Facilities staff stated that $6.68 million was the registered purchase price of the former Alectra Lands and being a value slightly below that what was appraised by City staff. As more detailed in point 4 herein these minutes, Real Estate and Facilities staff gave clarity that the lands are for the redevelopment into a new Public Works yard and other materials real estate commitments that are dependent on the timely opening of this new Public Works yard. Documentation of the City's purchase of the former Alectra property can be obtained from the Land Titles office which hold these as public records. City confirmed that Council approved the purchase of the Alectra Lands for the specific purpose of relocating the public works yard from 911 Arvin, which is sold firm and the Street Lighting group from 125 Barton which is also to be disposed of.	**City**
10. City staff asked why option 1 (running on west side of Alectra Lands) cannot be moved further west so as not to impact the Alectra Lands. Reason provided is that the house on the West side property would have to be expropriated and that expropriation was understood to not be allowed for the road	
11. City staff expressed that they believed that the only limits on expropriation were that no lands would be expropriated for the purpose of park lands and that expropriation could take place for road allowances. See Item 16 below.	
12. Wood staff emphasized that the City needs the south portion of Gordon Dean as per Fruitland Road Phases 1 & 2 Municipal Class EA,	

	MATTERS DISCUSSED	ACTION BY:
	and Fruitland-Winona Secondary Plan including the shifting of the truck route from Fruitland Road to Gordon Dean Ave. City staff agreed that Gordon Dean Ave. was indicated as a future truck route and Rapid Transit route, so for public good purposes it would be beneficial to having this road built. From the perspective of the City as the former Alectra lands land owner and in terms of timing, the Alectra property already has access to the property in question, so operations are not reliant on the construction of the southerly portion of Gordon Dean Ave. for some time. Typically, City of Hamilton would ask adjacent/affected developers to construct roads which aid their development, with applicable cost sharing with the City.	
13.	City affirmed that all EA analysis must be carried out objectively.	
14.	City Realty staff stated that they do not agree with or support any impact on the Alectra Lands site and that if any land taking was to proceed on the former Alectra property that there would be full expectation for compensation to be made back to the City inclusive not only of land value, based on highest and best use, but also including injurious affection and possible other resultant damages that may be incurred by the City as would be applicable with any institutional land use/businesses equally impacted at this location.	
15.	Wood staff explained the various matrices in the draft tech memo and recognized that some additional environmental items remain to be addressed/documented prior to finalization of the EA. These items, however, will not impact on any proposed alignment(s) for Gordon Dean Avenue.	
16.	City staff expressed that they felt that the criteria of 'Acquisition of Non-participating Lands' should be changed to 'Acquisition of Lands' on the basis that all EAs need to consider all land impacts, not just whether someone is part of the study or not. Developer Agent stated that City is a participating landowner due to expropriation limitations that were understood to be applicable within Fruitland-Winona Secondary Plan. City disagreed based on 2 hats viewpoint, and stated that expropriation is allowed for the roadway. Wood to consider this item, once City staff double-check specifics of Council Meetings, and Urban Hamilton Official Plan.	**Wood** **City/Wood**
17.	City objects to ratings under Category 4 on page 4 of tech memo. Wood to consider. It was discussed the economic impact in the	**Wood**

	MATTERS DISCUSSED	ACTION BY:
	matrices needs to be further worked on and the City does not agree with the assessment of the economic impact in some of the options.	
18.	City indicated that consideration should be given to re-evaluating Implementation (Category 7), Economic (Category 4) and Acquisition of Lands (Category 2). Wood to consider.	**Wood**
19.	The east-west collector road alignments are not considered problematic either way. It was explained that the alignment along the centre line of this collector's corridor is shifted slightly from the Fruitland-Winona Secondary Plan layout, in options "b" of each presented option within this Gordon Dean EA, in order to be more equitable to the impacted land owners.	
20.	Wood staff stated that the development group will likely say that the economic value of the former Alectra lands is small in light of the value of building permit fees that the City will collect from development of SCUBE. The City did not agree with this point. The economic value of land purchase on City's lands is just one cost, and in and of itself is not small. The cascade effect of other transactions dependent on City's ability to move its operations and operate this newly acquired land/PW Yard, etc., are additional and costly, beyond land value of the Alectra property alone. It was understood that Wood. staff would not have known about this previously, since the property only came to City of Hamilton's possession in mid-April. This information was considered confidential and could therefore not be shared by City staff with the Block 1 SS project team until the end of transaction/it became public.	
21.	City staff are to provide written comments on the tech memo for Wood to consider.	**City / Wood**
22.	City staff are to provide evidence of what types of expropriation are available for Block 1 for Wood to consider.	**City / Wood**
23.	City Public Works staff are asked to provide overall estimated costs to Public Works beyond the $6.68 million purchase price for Wood to add to the EA evaluation matrices.	**City / Wood**
24.	Developer Agent restated that the City is one entity for the City of Hamilton public good and is a stakeholder/participating party in the Gordon Dean Avenue EA process.	

MATTERS DISCUSSED **ACTION BY:**

25. June 13th PIC meetings are no longer achievable; the new goal is late June, but this will require expedient responses from the City on their three (3) actions named above. Wood staff stated that even if a Public Information Centre is held in September, there is enough to do in the meantime to fully finalize the EA evaluation criteria and other outstanding items, which will allow the project to move forward. This can allow for the project to go directly from PIC and its comment period, to Council and filing with MOECP immediately thereafter.

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: James W. Enos, C.E.T
Project Manager

JWE/kf

Minutes

Date:	July 3, 2019
File #:	TP115082
Meeting Date:	June 27, 2019
Meeting at:	Marz Homes Office
Subject:	Fruitland-Winona Block 1 – Phase 3 EA Adjusted Alignments
Attendees:	

Domenic Chiaravalle, Todoc Construction	Marc Marini, 1787482 Ont. Inc.
Dan Joyce, Sidney W. Woods	Jack Restivo, Future Homes
Mark De Benedictis, Benemar Homes	Angelo Cutaia, AC III Group (Developer Agent)
John Conciatori, 2261305 Ontario Inc.	Carl Galli, NGE Land Holdings Inc.
Dan Gabriele, Marz Homes	Councillor Maria Pearson, City of Hamilton
Dani Gabriele, Marz Homes	Jim Enos, Wood

MATTERS DISCUSSED **ACTION BY:**

1. Angelo Cutaia provided status updates as follows:

    - City in 2019 required that several alignments be considered for Gordon Dean EA.
    - City was not impartial with some of their comments on Phase 3 EA Tech Memo, therefore these comments will be noted but not be considered in the EA review.
    - Due to the City comments, the June 23rd PIC was cancelled; new goal for the PIC is mid-September, 2019.
    - Development Group met recently and agreed to tweak Option 1 off of #703 Highway 8 lands as much as possible. This is reflected in plans presented at this meeting.
    - All were reminded that Phase 3 EA must be an impartial review and assessment process.

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

MATTERS DISCUSSED **ACTION BY:**

- Proposed alignments were discussed, explained/summarized.
- Based on previous public meetings the Developer Owners Group had the clear understanding that expropriation would not be used by City to acquire any lands for Gordon Dean, so the Group purchased #716, #718 and #720 Barton Street East at great cost. Now, Four (4) years later, the City has provided meeting minutes which indicate that expropriation was only ruled out for park lands.

2. Jack Restivo commented as follows:

- City made a mistake in the Secondary Plan, their 72° alignment is now not acceptable and the City is requiring Developer Group to pay to fix the problem/issue.
- The City must work with Group; they cannot reject any encroachment on #703 Highway 8.

3. Angelo Cutaia - Developers paid high price for #716, #718 and #720 Barton Street East, and these costs must be included in City's share for Gordon Dean costs.

4. Mark De Benedictis - How will the costs of the 3 homes on Barton be reimbursed?

   Angelo Cutaia – Most likely through Development Charges.

   Jack Restivo –
   - Value of 3 homes must be considered in a satisfactory manner.
   - City should make an offer to acquire the 3 homes to the Group prior to expropriation efforts.

   Councilor Pearson – She must discuss this with City staff.

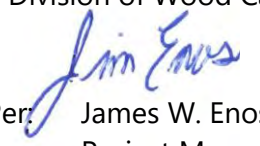
5. PIC new tentative timeline is mid-September, however, it was explained that the City reply to Dougan's May, 2018 letter was not received until June, 2019 and that HCA has not responded to a May 2018 letter to this point in time. These 2 items may impact timing.

6. Group instructed Wood to complete the Phase 3 EA without HCA comments at this time.

MATTERS DISCUSSED **ACTION BY:**

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited



Per: James W. Enos, C.E.T
Project Manager
JWE/kf

Minutes

Date:	October 15, 2019
File #:	TPB115082
Meeting Date & Time:	October 10, 2019 at 10:30 a.m.
Meeting at:	Wood, Environment & Infrastructure Solutions – Burlington Office (3450 Harvester Road, Suite 100 Burlington L7N 3W5)
Subject:	Gordon Dean Avenue Municipal Class EA – Technical Agency Committee Meeting

Attendees:

Margaret Fazio, City of Hamilton
Melissa Kiddie, City of Hamilton
Dave McCullagh, City of Hamilton
Brian Hollingworth, City of Hamilton
Jim Dougan, Dougan & Associates
Dan Minkin, Ministry of Tourism, Culture and Sport (MTCS) (By Phone)
Angelo Cutaia, ACIII Group (PM)
Jim Enos, Wood (PM)
Andreas Stenzel, Wood (Environmental)
Maria King, Wood (Assistant PM)
Aniqa Shams, Wood (Env. Planner)
Ian Richards, Dougan & Associates

MATTERS DISCUSSED	ACTION BY:
1. Project Status Update	
J. Enos thanked all in attendance for taking the time to meet with Wood for the Gordon Dean Avenue Municipal Class Environmental Assessment Study (MCEA). He requested that all in attendance provide an overview of their role on the project: Jim Enos (Wood) – Consultant Project Manager Angelo Cutaia (ACIII Group) – Project Manager Maria King (Wood) – Transportation Lead Andreas Stenzel (Wood) – Head of the Environmental Assessment Group Aniqa Shams (Wood) – Environmental Planner Melissa Kiddie (City of Hamilton) – Natural Heritage (Aquatic and Terrestrial) Margaret Fazio (City of Hamilton) – Infrastructure Planning	

PLEASE NOTE: If there is any comment or amendment to be made to these meeting notes, they should be brought to the notice of Wood within five (5) business days of issue and confirmed in writing.

3450 Harvester Road
Burlington, ON L7N 3W5
+1 905 335 2353
www.woodplc.com

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
Registered office: 2020 Winston Park Drive, Suite 700, Oakville, Ontario L6H 6X7
Registered in Canada No. 773289-9; GST: 899879050 RT0008; DUNS: 25-362-6642

MATTERS DISCUSSED	ACTION BY:
Brian Hollingworth (City of Hamilton) - Director, Transportation Planning and Parking Dave McCullagh (City of Hamilton) – Senior Business Development Consultant Dan Minkin (Ministry of Tourism, Sport and Culture) – Heritage Planner Jim Dougan (Dougan & Associates) – Senior Ecologist Ian Richards (Dougan & Associates) - Wildlife Ecologist J. Enos explained that the purpose of this meeting is to review the Public Information Centre (PIC) slides and next steps.	
2. PIC Slides	
M. King reviewed all PIC slides with attendees. Questions and comments were received and discussed throughout the presentation. The City of Hamilton staff appreciated the meeting as a chance to address their questions". B. Hollingworth asked what the top two reasons were for choosing the preferred alignment as Option 4b over Option 1. M. King explained that one reason was noise from the truck route since the entirety of Option 1 would be adjacent to a residential neighbourhood, this would be less desirable Option 4 in which a portion of the truck route is not through a residential neighbourhood. The second reason is because Option 4b better conforms to the Secondary Plan.	
3. Natural Environment Comments	
a) Pond Located on north-eastern portion of the Former Alectra Lands - B. Hollingworth asked if this pond was a significant feature. - M. Kiddie explained that there are no size requirements within the City of Hamilton standards that characterize wetlands - I. Richards indicated that the pond and associated marshes are not significant as natural features and do not warrant inclusion in the recommended Natural Heritage System for the area.	
4. Business Impacts	
a) Impact to Former Alectra lands - D. McCullagh expressed concern with the evaluation table, specifically the business impacts category. Option 4a / 4b is currently categorized as 'Good'. D. McCullagh requested 4a /	

MATTERS DISCUSSED	ACTION BY:
4b to be changed to 'Poor'. The north-eastern portion of the former Alectra lands will be impacted by 4a / 4b, which the City of Hamilton intends to use as an extension of the cemetery. This ruins the contiguous nature of the future use of land. - M. Fazio clarified that the Fruitland – Winona Secondary Plan (Secondary Plan) identified two preferred alignments for Gordon Dean Avenue (Route Option 1 and Option 4a / 4b). The Secondary Plan is the last approved legal document that this project can rely upon. The City of Hamilton's purchase of the former Alectra lands occurred after the Secondary Plan was approved and thus the alignment of Gordon Dean cannot heavily consider the impact to the former Alectra lands. - D. McCullagh expressed concern with the optics of the presentation. The general public will not understand the concern with Option 4a / 4b as residents are only concerned with impacts to their own land. The Project Team needs to be transparent regarding the impact of 4a / 4b on the City of Hamilton land (former Alectra lands). - M. King explained that the Project Team is not changing the Secondary Plan recommendations, as the Secondary Plan identifies that the 4a / 4b alignments includes right-of-way space that was set aside. - M. Fazio explained that City-owned property does not supersede other businesses and uses. - B. Hollingworth further explained that the former Alectra lands should be viewed as a contiguous land piece and the impact on this land is relevant regardless of the owner of this land. In the Secondary Plan, the alignment proposed would have also impacted this piece of the land. - M. King explained that if this land was still owned by Alectra, the part that is being impacted would not impact their operations as the alignment runs through a gravel pathway.	
5. Cultural / Archeological Impact	
a) Cultural Heritage Evaluation - D. Minkin requested clarification on the evaluation of alternatives based on cultural heritage impacts. - M. King explained that the distinction is based on the impact on the adjacent cemetery. However, the proposed alignment does not impact the existing cemetery.	

MATTERS DISCUSSED	ACTION BY:
b) Potential Cemetery Impact - D. Minkin discussed the potential impact cemeteries may have on the 4a / 4b alignment. Older cemeteries may not have the same boundaries as they do today, which increases the risk of finding human remains outside of cemetery boundaries. Since 4a / 4b alignment will be directly adjacent to the existing cemetery, there may be a risk of finding human remains in that area. - D. Minkin further explained that the evaluation of alternatives should be based on the existing report. If the existing report states no findings, then all alignments should be considered equal. The Stage 1 Archeological Assessment Report recommends a Stage 2 Archaeological Assessment, which will be completed during detailed design. There is no such thing as levels of archaeological potential, which means that alternative 4a / 4b cannot be stated as different and must be considered equal to other alternatives. - D. McCullagh clarified that the cemetery is active and has existed for a while, however he did not know the exact age. D. McCullagh asked if the Stage 1 report looked at set back requirements. - M. Fazio (PM for Phase 1 and 2 – Fruitland Road MCEA) stated that she is unsure if the report considered set back requirements, however she was advised that the proposed alignment should not impact the existing cemetery. - B. Hollingworth asked if human remains are found, how will this affect the alignment. - D. Minkin explained that if human remains are found, it becomes complicated and there are several factors to consider. However, if homestead is found, then excavation if required and there are mitigation measures for this. This would not impact the design. MTCS recommends completing a Stage 2 Archaeological Assessment during the Environmental Assessment Stage.	**Wood**
6. Access to Future EMS	
- M. Fazio explained that the City of Hamilton respects the Project Team's consideration to the future potential EMS station on the former Alectra lands; however, this category is	**Wood**

MATTERS DISCUSSED	ACTION BY:
recommended to be removed as the future potential EMS station was not considered in the Secondary Plan.	
7. Lane Configuration	
a) Bike Lanes - B. Hollingworth asked why bike lanes cannot be removed and replaced with multi-use paths right away - M. King explained that space will be reserved for bike lanes, however this space will later be turned into on-street parking.	
b) Truck Queues - M. Fazio asked how long the queues will be for trucks. - M. King explained that there will be a dedicated left turn lane for trucks.	
c) Overall Design - B. Hollingworth asked if all safety checks were made and if M. King is confident in the design. - M. King responded that safety checks were made, and she is okay with the preferred design.	
8. Capital Costs	
a) Capital Cost Calculations - M. Fazio asked how the estimated capital costs were determined. She asked why Option 1 vs Option 4a / 4b are similar even though Option 1 has one house and Option 4a / 4b has two houses. - M. King explained that the estimated capital costs were determined based on a number of considerations. This will be better explained in the technical memorandum. The residential land required for Option 1 is greater than for Option 4 and thus offsets the cost of one additional home for Option 4. The amount of land associated with the properties in each alignment is comparable.	
b) Landowner - B. Hollingworth asked if individual landowners have been notified. - M. King responded that registered letters have been distributed.	
c) Construction	

MATTERS DISCUSSED	ACTION BY:
- M. King stated that the southern portion of the road is the City of Hamilton's responsibility to build. - M. Fazio stated that the direction she received is that the entire road will be developed by developers, not the City of Hamilton. The southern portion will be given to developers interested in developing the southern portion of Gordon Dean Avenue. - The message at the PIC for residents asking about implementation of the southern portion: *Construction will be dealt with at a later date. This will not be developed right now, and we will contact you when more information is available.*	
9. Other	
- Comment deadline should be changed to November 1 in order to provide the public with time until the end of that week. - Implementation is undecided, however a separate meeting after the PIC can be arranged. M. Fazio to arrange a meeting. Post Meeting Note: This meeting may not be necessary until after the EA process is completed. - The Environmental Study Report (ESR) may be ready for review in February 2020. - Slide 6 of the presentation slides to be updated to include why Option 1b was not longer included in the alternative evaluation matrix (due to angle of intersection and roundabout). City staff felt that this information should still be provided in the ESR. - The Project Team will be revising the cross-sections and including another cross-section showing different active transportation options and a 4-lane cross section. - M. Kiddie requested that the ESR include more information regarding the connection about compensation between this Study and the Block Plan. - The Project Team will include a commitment section in the ESR as well as next steps, which will discuss compensation.	**Wood** **City of Hamilton** **Wood**

Meeting Minutes prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Per: Aniqa Shams
Environmental Planner

Gordon Dean Avenue
Municipal Class Environmental Assessment Phase 3 & 4

TAC MEETING
OCT 10/19

wood.

Name	Organization	E-mail Address
JIM ENOS	WOOD	jim.enos@woodplc.com
MARIA KING	WOOD	king.maria@woodplc.com
ANIQA SHAMS	WOOD	shams.aniqa@woodplc.com
ANDREAS STENZEL	WOOD	stenzel.andreas@woodplc.com
Ian Richards	Dougan & Assoc.	irichards@dougan.ca
BRIAN HOLLINGWORTH	CITY OF HAMILTON	brian.hollingworth@hamilton.ca
Angelo Cutaia	AC III Group	angelo.cutaia@ac3group.ca
Jim Dougan	Dougan + Assoc	jdougan@dougan.ca
DAVE McCULLAGH	CITY OF HAMILTON	david.mccullagh@hamilton.ca
MELISSA KIDDIE	CITY OF HAMILTON	melissa.kiddie@hamilton.ca
MARGARET FAZIO	— " —	Margaret.Fazio@hamilton.ca
BY PHONE		
DAN MINKIN	MINISTRY OF CULTURE	

wood.

Fruitland – Winona Development Group

Public Information Centre

Gordon Dean Avenue Schedule "C" Municipal Class Environmental Assessment (Phase 3 & 4)

Date: October 17, 2019
Time: 5:00pm – 7:00pm
Location: Stoney Creek Municipal Centre –
777 Highway 8, Stoney Creek

Land Acknowledgement

Located within the traditional territories of the Erie, Neutral, Huron-Wendat, Haudenosaunee and Mississaugas. This land is covered by the Dish With One Spoon Wampum Belt Covenant, whan agreement between the Haudenosaunee and Anishinaabek to share and care for the resources around the Great Lakes. We further acknowledge that this land is covered by the Between the Lakes Purchase, 1792, between the Crown and the Mississaugas of the Credit First Nation.

Welcome to the Public Information Centre

Tonight, we invite you to….

01 Sign-in and take a comment sheet

02 Learn about the process.

03 Review findings of previous studies.

04 Learn about the preferred alternative

05 Discover the problems and opportunities being addressed.

06 Ask questions and provide insight.

07 Provide feedback.

08 Let us know what is most important to you.

09 Find out where the study is going next…

Your feedback is important, and will be incorporated and considered in the design process!

Comment Deadline is **October 31, 2019**

Study Area

Legend
Study Area
Watercourse
WaterBody
wood.
GORDON DEAN EA
Study Area
FIGURE: 1
SCALE: 1:10,000
DATE: October 2019

Previous Project Work

In 2010, the City of Hamilton completed a Class Environmental Assessment (EA) on Fruitland Road between Barton Street to Highway 8), which included two phases.

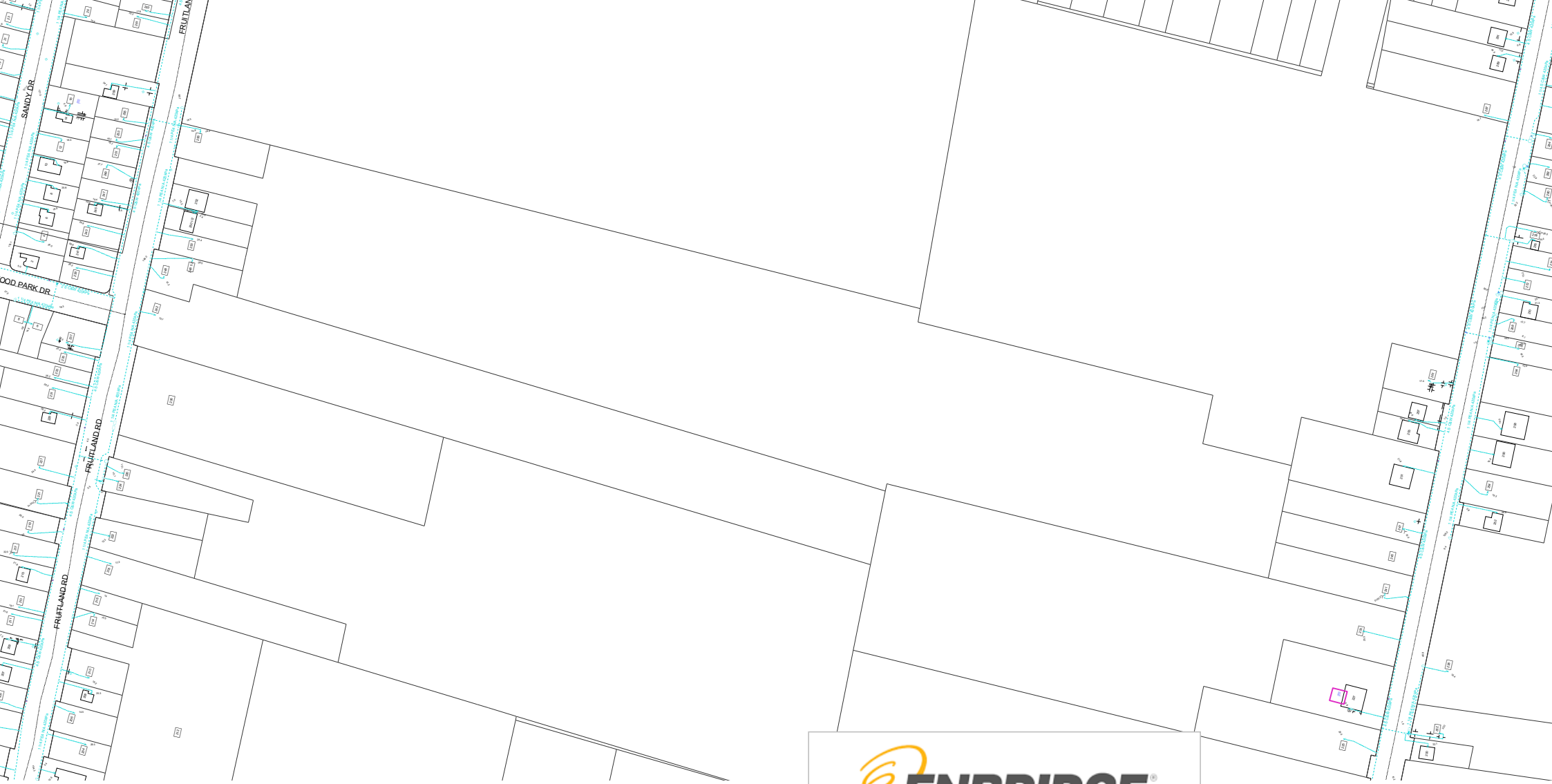
- Phase 1: Identify problem and opportunity.
  - Problem: Residents concerned about high vehicle speeds and overly-aggressive driving which makes it difficult to enter and exit driveways fronting Fruitland Road.
  - Opportunity: Fruitland-Winona Secondary Plan presents opportunity to address these problems and to redistribute traffic to proposed growth areas.

- Phase 2: Develop alternative solutions to address the problem and opportunity, and select a preliminary preferred alternative.
  - Alternatives included:
    - "Do Nothing"
    - Alternative 2 Series: two options using cul-de-sacs on Fruitland Road
    - Alternative 3 Series: four options based on creating a new North-South road east of Fruitland Road
  - Preferred Alternative: New North-South Road with Fruitland Road gateway features and pedestrian crosswalk enhancements

This provided the foundation for this project, the Gordon Dean Avenue Class EA.

Background Information: PIC # 1 (April 2017)

Phase 1 and 2 (Fruitland Road MCEA)



ENBRIDGE

The location of Enbridge Gas facilities on the following drawing is approximate and is to be used for information purposes only. Enbridge Gas re-affirms that this drawing should not be relied upon to determine the location of any Enbridge Gas facilities, exact locates can be determined by calling Ontario One Call **1-800-400-2255**.

This document is to be used for viewing purposes only. It shall not guarantee gas supply or availability for a specific project. It is for demonstration purposes only indicating Natural Gas infrastructure.

ENBRIDGE

The location of Enbridge Gas facilities on the following drawing is approximate and is to be used for information purposes only. Enbridge Gas re-affirms that this drawing should not be relied upon to determine the location of any Enbridge Gas facilities, exact locates can be determined by calling Ontario One Call **1-800-400-2255**.

This document is to be used for viewing purposes only. It shall not guarantee gas supply or availability for a specific project. It is for demonstration purposes only indicating Natural Gas infrastructure.

SHERWOOD PARK DR
FRUITLAND RD
SHERWOOD PARK RD
SALTFLEET ARENA
COMMUNITY CENTRE
MAIN END FEED SWC
2 PE4 N/A 420kPa
1 1/4 PE4 N/A 420kPa
2 S C&W 420kPa
4 S C&W 420kPa

BARTON ST
SUNNYHURST AVE
BARTON ST
687 BARTON ST
GARAGE
GARAGE
0.6M N POLE LINE
673
93.8m from elbow
1 1/4 PE4 N/A 420kPa
8 S C&W 420kPa
2 S C&W 420kPa
2 PE1 N/A 420kPa

HIGHWAY 8
HIGHWAY 8
HIGHWAY 8
4 PE4 N/A 420kPa
1 1/4 PE4 N/A 420kPa
703
717
719
725
730
715
687
693
661
663
669
672
680
718
724
738
743
745

Shams, Aniqa

From: Abraham, Dalima <Dalima.Abraham@Telecon.ca>
Sent: Tuesday, October 1, 2019 1:11 PM
To: Shams, Aniqa
Subject: MU 79571 - PLANNING Request 2019360300
Attachments: MU 79571.dgn; MU 79571.dwg; MU 79571.pdf

Hi,

Please see the attached drawing & document for the location requested.

If you have any concerns do not hesitate to contact me.

Thank You,
Dalima Abraham
Administrateur de projects MOC, Ingénierie - Centre du Canada Project Support MOC, Engineering - Central Canada
T: (289) 657-8439
7777 Weston Road
Vaughan, ON L4L 0G9

www.telecon.ca

-----Original Message-----
From: Bell Solutions <BellSolutions@topshelfsolutions.ca>
Sent: Sunday, September 1, 2019 5:55 PM
To: MOC (Bell) <bell.moc@Telecon.ca>
Subject: PLANNING Request 2019360300

BELL CANADA 360 NETWORKS/GROUP TELECOM

Station Code: BCPRE Start Date: 2019-09-01 5:52:00 PM

Ticket Type: NORMAL Priority: PLANNING
Request No: 2019360300 Prev. Request:
Excav. Name: WOOD
Phone: (416)-357-2093 ext. Fax:
Caller: JIM ENOS

Cell: Pager:
Alernate Contact:
Alt. Phone: (905)-335-2353 ext.3049
Callback: 9AM - 5PM
Excav. Address:

Excav. Street: 3450 HARVESTER RD
Excav. City: BURLINGTON
Excav. Zip/Postal Code:

Excav. State:

Civic No. From:
Civic No. To:
Street: HIGHWAY 8

Intersect. 1: GLOVER RD
Intersect. 2: FRUITLAND RD
City: HAMILTON
County/Neighb./Quarter: HAMILTON-WENTWO
State:

Excav. Email: aniqa.shams@woodplc.com
Excav. Doing Work:
Type of Work: DESIGN AND PLANNING
Plant Type: TO BE DETERMINED
Work Date: 2019-09-10

Meeting Date: 2019-09-03 1:00:00 AM
Area Marked:
Depth: 0 Length: 0
Orientation: Width: 0
Remarks:
LOT/UNIT#: NB OF SEGMENTS: 6 LATITUDE: 43.21722050 LONGITUDE: -79.69670850 D
EPTH UNKNOWN DEPTH: 0.00 FT HW01 PVS FOR HAMILTON WEN CPVS2 -C MU
LTIVIEW FOR COGECO HHP1PRE HORIZON UTILITIES PR BCPRE BELL CANADA
- PLANNI UGPHAM G-TEL FOR UNION GAS HHP3 CRAMM FOR STREET LTG
CH01 -C CITY OF HAMILTON TRA ROGHN01 PVS FOR ROGERS (ROGH
Add Loc Info:
WINOON09 CORLOT=U PLANNING STAGE OF ROAD CONSTRUCTION.

Utility Remarks:

Add Dig Info:

PUBLIC PROPERTY: NO MARK & FAX: NO AREA IS NOT MARKED: NO

MACHINE DIG: NO PRIVATE PROPERTY: NO SITE MEET REQ.: NO

PREMARKED: NO HAND DIG: NO DIRECTIONAL DRILLING: NO

Shams, Aniqa

From: Enos, Jim
Sent: Tuesday, September 3, 2019 8:36 AM
To: Scarcelli, Joseph; Shams, Aniqa
Cc: angelocutaia@ac3group.ca; King, Maria E
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Good morning Joe

We are working with Margaret Fazio and her team.

We trust that this is helpful.

Thank you

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

wood.

From: Scarcelli, Joseph [mailto:Joe.Scarcelli@hamilton.ca]
Sent: Tuesday, September 03, 2019 7:55 AM
To: Shams, Aniqa <aniqa.shams@woodplc.com>
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hello

Who at the City of Hamilton are you doing work for?

Thanks

Regards,

Joe Scarcelli
Project Manager, Special Utilities Program
Geomatics & Corridor Management

From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: Sunday, September 1, 2019 5:05 PM
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hello all,

The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).

Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.

To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.
If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.
If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings. Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149

Shams, Aniqa

From: Mike Coombe <mike.coombe@cogeco.com>
Sent: Tuesday, September 3, 2019 11:36 AM
To: Shams, Aniqa
Cc: John Kerchner
Subject: Fwd: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED
Attachments: Gordon Dean Key Plan.PNG

Good morning Aniqa,

In regards to this request, Cogeco is 100% aerial within the boundaries of your request, either on BELL or hydro poles. Any questions or concerns, please let me know.

---------- Forwarded message ---------
From: **Jordan Poole** <jordan.poole@cogeco.com>
Date: Tue, Sep 3, 2019 at 11:13 AM
Subject: Fwd: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED
To: John Kerchner <john.kerchner@cogeco.com>, Mike Coombe <mike.coombe@cogeco.com>

Hi John, Mike,

Please see the attached request for info from the City's consultant on a planned new road construction connecting Barton St & Hwy 8 near Fruitland Rd.

Thanks

JORDAN POOLE
Network Planner - Permit Design

T: 905 407 7554
jordan.poole@cogeco.com

7170 McLeod Rd
Niagara Falls
L2G 3H2
Canada
cogeco.ca

---------- Forwarded message ---------
From: **Shams, Aniqa** <aniqa.shams@woodplc.com>
Date: Sun, Sep 1, 2019 at 5:05 PM
Subject: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED
To:
Cc: angelocutaia@ac3group.ca <angelocutaia@ac3group.ca>, Enos, Jim <jim.enos@woodplc.com>, King, Maria E <maria.e.king@woodplc.com>

Hello all,

The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).

Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.

To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.
If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.
If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings. Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate

Junior Environmental Planner

160 Traders Blvd E., Suite 110

Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149

Mobile: (416) 357-2093

www.woodplc.com

Shams, Aniqa

From: gtel9@utilocate.ca
Sent: Friday, September 6, 2019 6:26 PM
To: Shams, Aniqa
Subject: Do Not Reply: G-TEL Locate:2019360300 - HIGHWAY 8,HAMILTON-ID#:1163975:#ID
Attachments: 2019360300_1.pdf; 2019360300_2.pdf; 2019360300_3.pdf; 1177483_1184364_pri.pdf

Here is the locate you have requested, for RequestNumber:2019360300

Please send all inquiries regarding your locate to: customerservice@gtel.ca (include your request number).

GTEL Engineering

OF CONSTRUCTION – G182794.01

SHERWOOD PARK DRIVE

SHERWOOD PARK RD

SHERWOOD PARK RD

FRUITLAND RD

FC-96F 8x12: 10597635
total len : 3539
total asbuilt len : 0

GP19-0723

1.5m

2.1m

2.8m

3rd

3rd

3rd

3rd

34

3

6

245

243

2

239

252

248

237

235

233

231

Shams, Aniqa

From: Dan Mozzoni <Dan.Mozzoni@rci.rogers.com>
Sent: Tuesday, September 3, 2019 11:51 AM
To: Shams, Aniqa
Cc: angelocutaia@ac3group.ca; Enos, Jim; King, Maria E
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED
Attachments: FRUITLAND RD & SHERWOOD PARK DRIVE.pdf

Hi Aniqa,

Not sure if this will impact your project. Rogers is all clear within the study area (Block 1). At the intersection of Fruitland & Sherwood Park Drive we have a underground road cross from Fruitland to Sherwood.

Thanks,
Dan

From: Shams, Aniqa [mailto:aniqa.shams@woodplc.com]
Sent: Sunday, September 01, 2019 5:05 PM
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hello all,

The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).

Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.

To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.
If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.

If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings. Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149
Mobile: (416) 357-2093
www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

ROGERS

Rogers Communications
Outside Plant Engineering
800 York St
London, ON, N6A 5B1

Markup Response Form

Application Date	September 1, 2019	**Applicant:**	Wood
Date Returned:	September 20, 2019		
Rogers Ref. No.:	G195625	**Applicant Job No.:**	2019360300
Location:	Highway 8		

Rogers Communications has reviewed your drawing(s) as requested and returns one marked-up copy.
Our comments follow below with an "X" indicating Rogers' stance on your proposed plan.

Comments:

☐	**No Conflict**	Rogers Communications currently does not possess existing plant in the area indicated on your attached plans.
☒	**No Conflict For your Reference**	Rogers Communications currently has existing plant as marked on your drawing. Our standard depth in this municipality is: **1m.** Please ensure you maintain clearances of 0.3m vertically and 0.6m horizontally.
☐	**EXTREME CAUTION**	Use vactruck and expose ducts, maintain minimum of 0.6m clearance.
☐	**CONFLICT**	Your proposed construction appears to encroach within existing Rogers Communications plant. Please relocate your proposed construction to allow adequate clearance of 0.3 m vertically and 1 m horizontally.
☒	**CAUTION**	Rogers Communications has aerial plant in this area, as it is indicated on the attached plans.
☒	**CAUTION**	Fiber Optic Cable is present in the area of your proposed construction.
☐	**Note**	Proposed Fiber Optic Cable in a joint use duct structure .
☒	**Note**	Plant currently under construction.
☒	**Note**	Please inform Rogers Communications well in advance of the proposed construction schedule in order to coordinate our plant relocation.
☒	**Note**	Locates are still required. Call for locates at 1-800-738-7893
☒	**Note**	Hand dig when crossing, or within 1.0m of existing Rogers plant.
☒	**Note**	Plant is to Approximation.

Deepak Dayalani
CAD Technician
289-657-8160

September 20, 2019
DATE

Shams, Aniqa

From: Carl Rossignoli <Carl.Rossignoli@rci.rogers.com>
Sent: Tuesday, September 3, 2019 8:16 AM
To: Shams, Aniqa
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Morning, As Source Cable we do not have any plant in the area nor do we need any.

Thanks

Carl Rossignoli
Manager Field Operations

Rogers Hamilton/Source Cable
1090 Upper Wellington St.
Hamilton, ON L9A 3S6

carl.rossignoli@rci.rogers.com
o 905-574-6464 x251 **m** 905-981-0792

ROGERS

From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: Sunday, September 01, 2019 5:05 PM
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hello all,

The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).

Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.

To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.

If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.
If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings. Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149
Mobile: (416) 357-2093
www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Shams, Aniqa

From: pvs10@utilocate.ca
Sent: Tuesday, September 3, 2019 7:15 AM
To: Shams, Aniqa
Subject: Do Not Reply: PVS Locate:2019360300 - HIGHWAY 8,HAMILTON-ID#:1365573:#ID
Attachments: 1926506_1899191.pdf

Here is the locate you have requested, for RequestNumber:2019360300

PVS Locators

Bell Canada Municipal Operations Centre - C/O TELECON DESIGN INC.
7777 Weston Rd,
Vaughan, Ontario L4L 0G9
Ph: (905) 569-2882

APPLICATION FOR PLANT LOCATION AND CONSENT

Applicant: Wood
Mark Up #: 79571
Applicant Ref #: 2019360300
Location: Hwy 8 from Glover Rd to Fruitland Rd
Switching Center/NNX: Winona/ 643
Date Received from Applicant: 2019-09-03
Marked By: PHONG NGUYEN

APPLICATION FOR PLANT LOCATION AND REQUEST

- [x] Existing and/or proposed Bell Canada underground plant are indicated on the attached plan
- [ ] Our records show no existing and / or proposed underground plant within 2m of your proposed installation
- [ ] Conflict indicated
- [ ] Meets with our approval
- [x] Not for PUCC approval - Mark up only
- [ ] If within 1 meter of Bell plant, hand dig

REMARKS: Call for locates 1.800.400.2255. Tie-in measurements are a guideline only and physical verification may be required by applicant to determine the true separation between plants. Maintain clearance of 0.6m. Hand dig when crossing Bell plant.

PROCEDURES TO FOLLOW:

1. Request locates prior to construction 1-800-400-2255
2. If exact location and depth are critical - test pits are recommended
3. Bell Canada plant location information is approximate
4. If the location of your proposed design changes, it will be necessary to re-apply
5. Permits expire six (6) months from approval date

Signature: Date:

PHONG NGUYEN October 1, 2019

_____ _____

ONTARIO ONE CALL

NOTICE OF INTENT TO EXCAVATE Header Code:PLANNING
Ticket No: 2019360300 Seq. No: 3
Update of:

Send To: HHP3 Seq No: 0003 Map Ref: 905 643

Original Call Date: 09/01/2019 Time: 05:52:02 PM OP: 1889
Transmit Date: 09/01/2019 Time: 05:52:02 PM
Work to Begin Date: 09/10/2019 Time: 12:00:00 AM

Company: Wood
Contact Name: Jim Enos
Alternate Contact:
Best Time to Call: 9am - 5pm
Cell Phone:
Caller Address: 3450 Harvester RD
Burlington, ON L7N 3W5
Email Address: aniqa.shams@woodplc.com

Contact Phone: (416)357-2093
Altern. Phone: (905)335-2353 Ext: 3049
Fax No:
Pager No:

Reg/County: HAMILTON-WENTWO City: HAMILTON
Address: , HIGHWAY 8
Lot/Unit#:
To Address:
Nearest Intersecting Street: GLOVER RD
2nd Intersecting Street: FRUITLAND RD
Community: STONEY CREEK
Nb of Segments: 6
WAP No: 1079743
Latitude: 43.21722050 Longitude: -79.69670850

CLEAR FOR STREET LIGHT WIRES
FOR CITY OF HAMILTON (HHP3)
VALID 30 DAYS FROM WTB DATE

Work Extent/Locn: CORLOT=U Planning stage of road construction.

Remarks: DEPTH UNKNOWN

Type of Work: DESIGN AND PLANNING Depth: 0.00 FT

Public property:	NO	Mark & Fax:	NO	Area is Not Marked:	NO	Machine Dig:	NO
Private property:	NO	Site Meet Req.:	NO	Premarked:	NO	Hand Dig:	NO

Directional Drilling: NO

Work Being Done For:

Sending to: (listing of utilities tkt sent to)

HW01		PVS FOR HAMILTON WEN	CPVS2	-C	MULTIVIEW FOR COGECO
HHP1PRE		HORIZON UTILITIES PR	BCPRE		BELL CANADA - PLANNI
UGPHAM		G-TEL FOR UNION GAS	HHP3		CRAMM FOR STREET LTG
CH01	-C	CITY OF HAMILTON TRA	ROGHN01		PVS FOR ROGERS (ROGH

Note: -C = Cleared, -S = Supressed, -L = Lookup center cleared, -A = Alternate Locate
-R = Existing locate valid - maintain marks

Shams, Aniqa

From: Dayalani, Deepak <Deepak.Dayalani@Telecon.ca>
Sent: Friday, September 20, 2019 2:55 PM
To: Shams, Aniqa
Subject: G195625_2019360300_HIGHWAY 8
Attachments: G195625_2019360300_HIGHWAY 8.dwg; G195625_2019360300_HIGHWAY 8_Rogers Markup Response Letter.pdf

Hi,

Please find attached completed markup request.

***** Please use "REGEN" command for proper line style *****

Thank you.

Regards,

Deepak Dayalani

CAD Technician, Engineering - Central Canada
Technicien CAO, Ingénierie - Centre du Canada

T 289-657-8160
7777 Weston Rd, Woodbridge (Ontario) L4L 0G9

telecon

telecon.ca

-----Original Message-----
From: Solutions@on1call.com <Solutions@on1call.com>
Sent: Sunday, September 01, 2019 5:52 PM
To: Rogers.MOC <Rogers.MOC@telecon.ca>
Subject: Request 2019360300

[1]
ONTARIO ONE CALL
NOTICE OF INTENT TO EXCAVATE Header Code:PLANNING
Ticket No: 2019360300 Seq. No: 949
Update of:

Send To: ROGHN01 Seq No: 0949 Map Ref: 905 643-L8E

Original Call Date: 09/01/2019 Time: 05:52:02 PM OP: 1889
Transmit Date: 09/01/2019 Time: 05:52:02 PM
Work to Begin Date: 09/10/2019 Time: 12:00:00 AM

Company: Wood

Contact Name: Jim Enos Contact Phone: (416)357-2093
Alternate Contact: Altern. Phone: (905)335-2353 Ext: 3049
Best Time to Call: 9am - 5pm Fax No:
Cell Phone: Pager No:
Caller Address: 3450 Harvester RD
Burlington, ON L7N 3W5
Email Address: aniqa.shams@woodplc.com

Reg/County: HAMILTON-WENTWO City: HAMILTON
Address: , HIGHWAY 8
Lot/Unit#:
To Address:
Nearest Intersecting Street: GLOVER RD
2nd Intersecting Street: FRUITLAND RD
Community: STONEY CREEK
Nb of Segments: 6
WAP No: 1079743
Latitude: 43.21722050 Longitude: -79.69670850

Work Extent/Locn: CORLOT=U Planning stage of road construction.

Remarks: DEPTH UNKNOWN

Type of Work: DESIGN AND PLANNING Depth: 0.00 FT
Public property: NO Mark & Fax: NO Area is Not Marked: NO Machine Dig: NO
Private property: NO Site Meet Req.: NO Premarked: NO Hand Dig: NO
Directional Drilling: NO

Work Being Done For:

Sending to: (listing of utilities tkt sent to)
HW01 PVS FOR HAMILTON WEN CPVS2 -C MULTIVIEW FOR COGECO
HHP1PRE HORIZON UTILITIES PR BCPRE BELL CANADA - PLANNI
UGPHAM G-TEL FOR UNION GAS HHP3 CRAMM FOR STREET LTG
CH01 -C CITY OF HAMILTON TRA ROGHN01 PVS FOR ROGERS (ROGH
Note: -C = Cleared, -S = Supressed, -L = Lookup center cleared, -A = Alternate Locate
-R = Existing locate valid - maintain marks

Shams, Aniqa

From: Enos, Jim
Sent: Tuesday, September 24, 2019 1:45 PM
To: Vicky Khamar
Cc: Shams, Aniqa; Asu, Ahto; John Barratt
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Yes, we needed to know if there was any underground alectra works outside of the Public Road Allowance that would be with the private lands surrounded by the 4 public roads.

You have just confirmed that there are not, thank you.

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

From: Vicky Khamar [mailto:Vicky.Khamar@alectrautilities.com]
Sent: Tuesday, September 24, 2019 1:26 PM
To: Enos, Jim <jim.enos@woodplc.com>
Cc: Shams, Aniqa <aniqa.shams@woodplc.com>; Asu, Ahto <ahto.asu@woodplc.com>; John Barratt <john.barratt@alectrautilities.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Good afternoon Jim,

Not in agreement with what you have stated below.

I have gone back to our Engineering group and we are confirming that we have infrastructure in the surrounding area that was identified by Aniqa, but nothing inside the study area.

Sorry for the confusion.

Regards,

Vicky Khamar

From: Enos, Jim <jim.enos@woodplc.com>
Sent: Friday, September 20, 2019 1:43 PM
To: Vicky Khamar <Vicky.Khamar@alectrautilities.com>
Cc: Shams, Aniqa <aniqa.shams@woodplc.com>; Asu, Ahto <ahto.asu@woodplc.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon Vicky

Thank you for calls to clarify.

As we now understand things, you left a voice message to me saying the Alectra Utilitites has underground plant within the block of land surrounded by Fruitland Road on the west, Jones Road on the east, Hwy 8 on the south and Barton Street on the north. There do not seem to be any easements in this block of land reflecting this.

Please provide us with the NDA agreement form to be executed and I will place it on the right hands.

Time is of the essence.

Thank you

Jim Enos, CET
Senior Technologist, Land Development
905-335-2353 ex. 3049
www.woodplc.com

From: Shams, Aniqa
Sent: Monday, September 09, 2019 1:05 PM
To: Enos, Jim <jim.enos@woodplc.com>
Subject: FW: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

From: Vicky Khamar <Vicky.Khamar@alectrautilities.com>
Sent: Monday, September 9, 2019 1:03 PM
To: Shams, Aniqa <aniqa.shams@woodplc.com>

Cc: Dusan Celic <Dusan.Celic@alectrautilities.com>; John Barratt <john.barratt@alectrautilities.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hello Aniqa,

In order to provide you with the requested information, an NDA will need to be executed with your company. Please provide me with the contact information for the person who has authority to bind the corporation.

Thanks,

Vicky Khamar, P.Eng., PMP
Supervisor, Construction Verification & Compliance
175 Sandalwood Pkwy W., Brampton, ON, L7A 1E8
t 1877.963.6900 x.25305 | **m** 905.460.7055
alectrautilities.com

From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: Tuesday, September 03, 2019 1:52 PM
To: Dusan Celic <Dusan.Celic@alectrautilities.com>
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Dusan,

Yes, please provide any utilities located on Fruitland Rd, Barton St, Highway 8 and Jones Road. I apologize, I provided the incorrect road last time. Our study does not extend to Glover Road. We will also need to know of any existing utility easements within Block 1. Please see the key plan attached to the previous email for Block 1 and specifically where the study area is located.

Thanks,
Aniqa

From: Dusan Celic <Dusan.Celic@alectrautilities.com>
Sent: Tuesday, September 3, 2019 8:54 AM
To: Shams, Aniqa <aniqa.shams@woodplc.com>
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: RE: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Hi Aniqa,

Please let me know if you need the hydro landbase to identify our assets on Fruitland Rd, Barton St, Highway 8 and Glover Rd.

Thank you,

Dusan Celic, B.Tech, C.E.T.
Engineering Technologist
Distribution Design – Customer Capital
55 John St N. Hamilton, ON L8R 3M8
t 905.522.6611 Ext. 2314 | **m** 905.730.4979
alectrautilities.com

From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: Sunday, September 01, 2019 5:05 PM
Cc: angelocutaia@ac3group.ca; Enos, Jim <jim.enos@woodplc.com>; King, Maria E <maria.e.king@woodplc.com>
Subject: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hello all,

The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).

Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.

To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.
If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.
If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.

	Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149
Mobile: (416) 357-2093
www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

Shams, Aniqa

From: caroline.rysyk@zayo.com on behalf of Utility Circulations <utility.circulations@zayo.com>
Sent: Tuesday, September 17, 2019 5:27 PM
To: Shams, Aniqa
Subject: Re: Gordon Dean Municipal Class EA: Utilities Locate - ACTION NEEDED

Good afternoon

Zayo has no existing plant in the area indicated in your submission. No markup and no objection. Thank you.

Utility Circulations

Caroline Rysyk

On Sun, 1 Sep 2019 at 17:05, Shams, Aniqa <aniqa.shams@woodplc.com> wrote:

> Hello all,
>
> The Fruitland Winona Block 1 Development Group has initiated a Municipal Class Environmental Assessment (Class EA) related to the creation of a new north-south collector road between Barton Street and Highway 8 (See Key Plan attached).
>
> Wood is leading the study on behalf of the Fruitland Winona Block 1 Development Group and requests your assistance with definition of existing and proposed utility infrastructure within the study area limits.
>
> To assist with evaluation of alternatives, and subsequent definition of preferred alignments, we are requesting details related to existing and/or proposed utility infrastructure within the study limits. This information will be used to ensure that any impacts to utility infrastructure is clearly identified and considered during the assessment process. Of critical importance is identification of vital or trunk mains/services. In this regard, could you kindly provide the following:

If you **DO NOT** have facilities within the study area:	Kindly respond to this email, EXPLICITLY stating that your utility/organization does not have facilities within the study area.
If you **DO** have facilities within the study area:	Kindly provide us with details regarding location, size and type of facilities in one or more of the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or • Digital copies of facility design drawings.
If you **PLAN TO** have facilities, or are modifying existing facilities within the study area:	Kindly provide us with details regarding proposed location, sizing and type of facilities in one or more the following formats: • Mark-ups on the attached basemapping; • AutoCAD, MicroStation or GIS drawings (preferred); or

	• Digital copies of facility design drawings. Please be sure to indicate that these are for future installations and, if known, provide timelines for implementation.

Please do not hesitate to contact us should you require additional information and/or file formats to work with. Your involvement with this study is greatly appreciated, and we will assist in any way possible.

Best regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate

Junior Environmental Planner

160 Traders Blvd E., Suite 110

Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149

Mobile: (416) 357-2093

www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails

Shams, Aniqa

From: Talpur, Mir
Sent: Thursday, May 21, 2020 1:45 PM
To: Stone, Mike
Cc: Enos, Jim; Torchia, Melissa; Dibbley, Roxanne; Shams, Aniqa; Jim Dougan; Ian Richards; Stenzel, Andreas
Subject: RE: Gordon Dean Avenue MCEA Phase 3 & 4 - Meeting with Hamilton Conservation Authority

No worries, Mike. We are currently preparing the ESR and will provide to HCA for review in near future.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Sent: Thursday, May 21, 2020 1:36 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Enos, Jim <jim.enos@woodplc.com>; Torchia, Melissa <melissa.torchia@woodplc.com>; Dibbley, Roxanne <roxanne.dibbley@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Jim Dougan <jdougan@dougan.ca>; Ian Richards <irichards@dougan.ca>
Subject: RE: Gordon Dean Avenue MCEA Phase 3 & 4 - Meeting with Hamilton Conservation Authority

Hello Mir,

Thank you for your email. My apologies for not responding sooner. I managed to lose track of this.

At this stage, if the ESR is nearing completion perhaps we don't need the virtual meeting. HCA can review the ESR once submitted and provide comments at that time.

However, I would be happy to discuss further if you have specific questions for HCA at this stage.

Kind regards,
Mike

Mike Stone MA, RPP | Manager, Watershed Planning Services | Hamilton Conservation Authority
838 Mineral Springs Road, P.O. Box 81067, Ancaster (Hamilton), Ontario L9G 4X1
T: 905.525.2181 ext. 133 | E: mike.stone@conservationhamilton.ca | W: www.conservationhamilton.ca

The contents of this e-mail and any attachments are intended for the named recipient(s). This e-mail may contain information that is privileged and confidential. If you have received this message in error or are not the named recipient(s), please notify the sender and permanently delete this message without reviewing, copying, forwarding, disclosing or otherwise using it or any part of it in any form whatsoever.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: Thursday, April 23, 2020 4:59 PM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Torchia, Melissa <melissa.torchia@woodplc.com>; Dibbley, Roxanne <roxanne.dibbley@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Jim Dougan <jdougan@dougan.ca>; Ian Richards <irichards@dougan.ca>
Subject: Gordon Dean Avenue MCEA Phase 3 & 4 - Meeting with Hamilton Conservation Authority

Dear Mike,

I hope this email finds you well. I am contacting you regarding the Municipal Class Environment Assessment (EA) (Schedule 'C') Phase 3 & 4 for Gordon Dean Avenue. You were previously contacted about this project to attend its Technical Agency Meeting, but it appears that you weren't able to attend that meeting.

As you may be aware that, Fruitland – Winona Development Group (proponent) is carrying out Municipal Class EA Study for this project. A Public Information Centre was held on October 17, 2019, where the Preliminary Preferred Alternative was presented to the public. The Preliminary Preferred Alternative includes a north-south alignment of the Gordon Dean Avenue from Barton Street to Highway 8; and an east-west alignment from Fruitland Road to the future Gordon Dean Avenue. For more information about the project, please refer to display panels for the PIC available on City of Hamilton's website: https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

The purpose of this email is to request a virtual meeting (via MS Teams) with Hamilton Conservation Authority to provide an update on the project, and obtain feedback for consideration into the ESR and implementation phase, as appropriate. Please provide a few time slots and dates that work for you, and I will coordinate with our team members. Thanks

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)

wood.

-----Original Appointment-----
From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: October 03, 2019 3:26 PM
To: Shams, Aniqa; Enos, Jim; angelocutaia@ac3group.ca; King, Maria E; Stenzel, Andreas; Kelly, Mary K; Jim Dougan; Ian Richards; Fazio, Margaret; Slattery, Barbara (MECP); mstone@conservationhamilton.ca; Verhaeghe, Tammy (MNRF); Van Roon, Pauline (MTO); Baran, Michael (MNRF); Miller, Laurie (MMA); Barboza, Karla (MTCS)
Subject: Gordon Dean Avenue MCEA Phase 3 & 4: Technical Agency Meeting
When: October 10, 2019 10:30 AM-11:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: CA/Burlington ON/Harvester - LF - Redhill Boardroom

Good Afternoon,

You are invited to the **Technical Agency Meeting** for the Municipal Class Environment Assessment (EA) (Schedule 'C') Phase 3 & 4 for **Gordon Dean Avenue**. The Fruitland – Winona Development Group is considering a number of design alternatives for the new north-south road (Gordon Dean Avenue). The study is being conducted in accordance with the requirements for a Municipal Class EA, which is approved under the *Ontario Environmental Assessment Act.*

The purpose of the meeting is to present the preferred alternative for Gordon Dean Avenue and to discuss the study background, results of the technical studies completed, road design alternatives evaluation, the preliminary recommended design and the upcoming Public Information Centre (PIC). You may express any design or environmental issues that your Agency may have during this meeting.

The agency meeting will be held at:

Date: **October 10th, 2019**

Location: **Wood Environment & Infrastructure Solutions**
3450 Harvester Road, Suite 100
Burlington L7N 3W5
Redhill Boardroom

Time: **10:30 p.m. to 11:30 p.m.**

Please find attached the agenda for this meeting. Feel free to forward this meeting invite to staff within your organization. Kindly acknowledge either your or other staff attendance by October 9th, 2019.

I have also attached the Notice of PIC to this email. This notice will be distributed early next week. If you have any questions prior to the meeting, please feel free to contact me at the number listed below.

Call-in Information:

.....

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

Toll-free number:	+1 (888) 304-2647,,387572428# (Dial-in Number)	English (United States)
Toll number:	+1 (647) 749-7026,,387572428# (Dial-in Number)	English (United States)

Find a local number

Conference ID: 387572428
Forgot your dial-in PIN? | Help

.....

Regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149
Mobile: (416) 357-2093
www.woodplc.com

Review of Draft Environmental Study Report by Review Agencies and City of Hamilton

Ministry of the Environment, Conservation and Parks

Talpur, Mir

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Wednesday, September 2, 2020 9:06 AM
To: Talpur, Mir
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Good morning Mir,

I don't think it is necessary to see the revised ESR. I would suggest that the final document contains the responses of the City, HCA and the MHSTCI to hopefully indicate that their concerns/questions have been addressed.

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: September 01, 2020 6:15 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; angelocutaia@ac3group.ca
Subject: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Importance: High

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Barbara,

Hope all is well. Per our previous communication, we had sent the Draft Environmental Study Report (ESR) for Gordon Dean Avenue to the Ministry of the Environment, Conservation and Parks for review. We had also circulated this report to the City of Hamilton, Hamilton Conservation Authority, and Ministry of Heritage, Sport, Tourism and Culture Industries, and received comments from these. In addressing the comments received from these parties, it became necessary to update the ESR and some of the appendices.

In addition, the MHSTCI recommended that due to the age of archaeology and cultural heritage information used as background information (i.e., the 2007 Stage 1 AA Report, and 2011 Cultural Heritage Information Sheet), a new Stage 1 Archeological Assessment Report and Built Heritage Resources and Cultural Heritage Landscapes Checklist should be completed as part of this EA Study. These two items are currently being undertaken by Wood with anticipated submission of Stage 1 AA Report to MHSTCI for review and approval

during the week of September 14, 2020. Upon MHSTCI's approval of Stage 1 AA Report, the ESR will be updated to reflect these two items prior to issuing the ESR for the formal 30-day public review period. Please note that these items are being completed to update the archaeological and cultural heritage information due to the time-lapse of previously used information, and the results of these items will not have a bearing on conclusions as laid out in the ESR.

Attached are the tables of disposition of comments from MHSTCI, HCA and the City, along with project team's responses. We trust that you find this information to be satisfactory. Please let me know if you would like the updated draft ESR, before the formal public review period.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Friday, June 12, 2020 3:39 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Subject: RE: Gordon Dean Ave

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Thank you….would it be possible to see their comments when they are submitted to you?

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: June 12, 2020 3:21 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Gordon Dean Ave

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Yes, in addition to the MECP, we have sent this report to the City of Hamilton, Hamilton Conservation Authority, and Ministry of Heritage, Sport, Tourism and Culture Industries.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Friday, June 12, 2020 3:18 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Subject: RE: Gordon Dean Ave

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Yes no problem in accessing the documents.

Have you also asked other stakeholders to review the ESR?

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: June 12, 2020 3:16 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Gordon Dean Ave

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Barb,

I was drafting a follow-up email and was just about to hit send… 😊 Please provide any comments you may have by July 14, 2020.

Were you able to download the files?

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Friday, June 12, 2020 3:13 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Subject: Gordon Dean Ave

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello,

Thank you for providing he draft ESR for this project. To help with time/project management, by when were you hoping to get MECP comments?

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please

notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

Shams, Aniqa

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Wednesday, July 15, 2020 8:47 AM
To: Talpur, Mir
Subject: RE: Gordon Dean Ave Draft ESR

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

The only comments we would be making would be with respect to the adequacy of assessment of species at risk. Due to workload, a review could not be completed on the draft ESR, but will be done for the final ESR.

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: July 14, 2020 3:59 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Subject: RE: Gordon Dean Ave Draft ESR

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Thanks for the prompt response, Barb. To clarify, will you be providing comments at a later date (i.e., during the formal 30 day review period), or you have reviewed the report and don't have any comments?

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Tuesday, July 14, 2020 3:40 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Subject: RE: Gordon Dean Ave Draft ESR

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

No comments at this time.

Thank you

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: July 14, 2020 3:36 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Gordon Dean Ave Draft ESR

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Barb - were you able to complete your review of the Gordon Dean ESR? Please send us any comments you may have on the report.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Tuesday, June 16, 2020 10:28 AM

To: Talpur, Mir <mir.talpur@woodplc.com>; Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Subject: Gordon Dean Ave Draft ESR
Importance: High

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Mir,

Can you please send an e-copy of the draft ESR to Kristina asap so the SAR staff can commence their review?

Thank you

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

---

Shams, Aniqa

From: Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Sent: Monday, July 6, 2020 1:03 PM
To: Talpur, Mir; Slattery, Barbara (MECP)
Cc: Enos, Jim; Stenzel, Andreas; Shams, Aniqa
Subject: RE: Gordon Dean Ave Draft ESR

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Mir.

It is not be feasible to have comments regarding the draft ESR for Gordon Dean Avenue by July 14th. We appreciate the offer to respond to the report and hope to do so during the more formal comment period.

Thank you!
Kristina

Kristina Hubert
Species at Risk Specialist
Ontario Ministry of the Environment, Conservation and Parks
300 Water St. 5th Floor, North Tower
Peterborough, ON K9J 8M5
*New phone: 705.761.9254

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: July-06-20 10:43 AM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>; Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Gordon Dean Ave Draft ESR
Importance: High

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good Morning Barb and Kristina – I am sending a gentle reminder that the review period (prior to 30-day public review period) for Gordon Dean Avenue ESR ends next week on July 14, 2020. We would appreciate if Ministry of the Environment, Conservation and Parks can provide any comments they may have by this timeline. Thank you.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Sent: Monday, June 22, 2020 5:07 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Subject: FW: Gordon Dean Ave Draft ESR
Importance: High

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Mir.

I've received your emails and apologise for the delayed response.
We won't be downloading the file until a Management Biologist has been assigned to begin the review process.

Thank you for your patience.
Kristina

Kristina Hubert
Species at Risk Specialist
Ontario Ministry of the Environment, Conservation and Parks
300 Water St. 5th Floor, North Tower
Peterborough, ON K9J 8M5
*New phone: 705.761.9254

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: June-22-20 4:21 PM
To: Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Cc: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Subject: RE: Gordon Dean Ave Draft ESR
Importance: High

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Kristina – did you download the files?

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Talpur, Mir
Sent: Thursday, June 18, 2020 1:36 PM
To: Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Subject: RE: Gordon Dean Ave Draft ESR
Importance: High

Hi Kristina,

I am following up regarding the draft ESR for Gordon Dean Avenue. I sent you the files via our file transfer service. Could you please confirm once you download the files? Thanks!

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Talpur, Mir
Sent: Tuesday, June 16, 2020 12:48 PM
To: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>; Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Gordon Dean Ave Draft ESR

Hi Barb – I just sent the draft ESR to Kristina via our file transfer service.

Kristina – could you confirm when you have received and downloaded the files? Thanks

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Slattery, Barbara (MECP) <barbara.slattery@ontario.ca>
Sent: Tuesday, June 16, 2020 10:28 AM
To: Talpur, Mir <mir.talpur@woodplc.com>; Hubert, Kristina (MECP) <Kristina.Hubert@ontario.ca>
Subject: Gordon Dean Ave Draft ESR
Importance: High

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Mir,

Can you please send an e-copy of the draft ESR to Kristina asap so the SAR staff can commence their review?

Thank you

Barb Slattery, EA/Planning Coordinator
Ministry of the Environment, Conservation and Parks
Project Review Unit, Environmental Assessment Branch
(905) 521-7864

We want to hear from you. How was my service? You can provide feedback at 1-888-745-8888.

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to:

Hamilton Conservation Authority

Talpur, Mir

From: Talpur, Mir
Sent: Tuesday, September 1, 2020 5:54 PM
To: Stone, Mike
Cc: Enos, Jim; Stenzel, Andreas; Shams, Aniqa
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Attachments: TP115082_Gordon Dean Avenue_HCA-Comments-DraftESR_01-09-2020.pdf

Hi Mike,

Attached to this email is the table of disposition of HCA's comments on Draft Environmental Study Report for Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4). Please let me know if you would like the updated draft ESR, before the formal public review period.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Sent: Friday, July 17, 2020 4:21 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Good afternoon Mir,

Please find attached HCA's comments on the draft ESR. Thank you for the opportunity to review prior to finalization. HCA staff are available to review these comments further as necessary.

Kind regards,

Mike

Mike Stone MA, RPP | Manager, Watershed Planning Services | Hamilton Conservation Authority
838 Mineral Springs Road, P.O. Box 81067, Ancaster (Hamilton), Ontario L9G 4X1
T: 905.525.2181 ext. 133 | E: mike.stone@conservationhamilton.ca | W: www.conservationhamilton.ca

The contents of this e-mail and any attachments are intended for the named recipient(s). This e-mail may contain information that is privileged and confidential. If you have received this message in error or are not the named recipient(s), please notify the sender and permanently delete this message without reviewing, copying, forwarding, disclosing or otherwise using it or any part of it in any form whatsoever.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: Tuesday, July 14, 2020 3:31 PM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Importance: High

Hi Mike – were you able to complete your review of the Gordon Dean ESR? Please send me any comments you may have on the report.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

wood.

From: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Sent: Tuesday, July 7, 2020 1:59 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Mir,

Thanks for checking-in and the reminder. HCA staff are reviewing and I hope to have comments to you for the 14th.

Regards,
Mike

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: Monday, July 6, 2020 10:35 AM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Stenzel, Andreas <andreas.stenzel@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Importance: High

Good Morning Mike – I hope this email finds you well. I wanted to send a gentle reminder that the review period (prior to 30-day public review period) for Gordon Dean Avenue ESR ends next week on July 14, 2020. We would appreciate if Hamilton Conservation Authority can provide any comments they may have by this timeline. Thank you.

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Sent: Tuesday, June 16, 2020 10:19 AM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Enos, Jim <jim.enos@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Good morning Mir,

Thank you for providing the ESR. I have downloaded the materials from your FTP site. I note your requested Julyl 14 comment timeframe. We will review and do our best to meet this.

Kind regards,
Mike

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: Tuesday, June 16, 2020 9:13 AM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: RE: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Importance: High

Good Morning Mike,

I'm following up to check if you saw my emails regarding the file transfer for draft ESR for Gordon Dean Avenue. Could you confirm if you were able to download the files? Thanks

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Talpur, Mir
Sent: Friday, June 12, 2020 3:24 PM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>
Subject: Draft Environmental Study Report - Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4)
Importance: High

Hi Mike,

I have sent you the Draft Environmental Study Report for Gordon Dean Avenue - Municipal Class Environmental Assessment (Phases 3 and 4) via our File Transfer Service – MoveIT. This draft report is being

provided to the Hamilton Conservation Authority for review, prior to finalizing it and making it available for a formal 30-day public review period. Please provide any comments you may have by **July 14, 2020**. Any questions or comments can be sent to Jim Enos (jim.enos@woodplc.com).

When you get a chance, could you confirm if you were able to download the files?

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

From: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Sent: Thursday, May 21, 2020 1:36 PM
To: Talpur, Mir <mir.talpur@woodplc.com>
Cc: Enos, Jim <jim.enos@woodplc.com>; Torchia, Melissa <melissa.torchia@woodplc.com>; Dibbley, Roxanne <roxanne.dibbley@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Jim Dougan <jdougan@dougan.ca>; Ian Richards <irichards@dougan.ca>
Subject: RE: Gordon Dean Avenue MCEA Phase 3 & 4 - Meeting with Hamilton Conservation Authority

Hello Mir,

Thank you for your email. My apologies for not responding sooner. I managed to lose track of this.

At this stage, if the ESR is nearing completion perhaps we don't need the virtual meeting. HCA can review the ESR once submitted and provide comments at that time.

However, I would be happy to discuss further if you have specific questions for HCA at this stage.

Kind regards,
Mike

Mike Stone MA, RPP | Manager, Watershed Planning Services | Hamilton Conservation Authority
838 Mineral Springs Road, P.O. Box 81067, Ancaster (Hamilton), Ontario L9G 4X1
T: 905.525.2181 ext. 133 | E: mike.stone@conservationhamilton.ca | W: www.conservationhamilton.ca

Hamilton Conservation Authority
A Healthy Watershed for Everyone

The contents of this e-mail and any attachments are intended for the named recipient(s). This e-mail may contain information that is privileged and confidential. If you have received this message in error or are not the named recipient(s), please notify the sender and permanently delete this message without reviewing, copying, forwarding, disclosing or otherwise using it or any part of it in any form whatsoever.

From: Talpur, Mir <mir.talpur@woodplc.com>
Sent: Thursday, April 23, 2020 4:59 PM
To: Stone, Mike <Mike.Stone@conservationhamilton.ca>
Cc: Enos, Jim <jim.enos@woodplc.com>; Torchia, Melissa <melissa.torchia@woodplc.com>; Dibbley, Roxanne <roxanne.dibbley@woodplc.com>; Shams, Aniqa <aniqa.shams@woodplc.com>; Jim Dougan <jdougan@dougan.ca>; Ian Richards <irichards@dougan.ca>
Subject: Gordon Dean Avenue MCEA Phase 3 & 4 - Meeting with Hamilton Conservation Authority

Dear Mike,

I hope this email finds you well. I am contacting you regarding the Municipal Class Environment Assessment (EA) (Schedule 'C') Phase 3 & 4 for Gordon Dean Avenue. You were previously contacted about this project to attend its Technical Agency Meeting, but it appears that you weren't able to attend that meeting.

As you may be aware that, Fruitland – Winona Development Group (proponent) is carrying out Municipal Class EA Study for this project. A Public Information Centre was held on October 17, 2019, where the Preliminary Preferred Alternative was presented to the public. The Preliminary Preferred Alternative includes a north-south alignment of the Gordon Dean Avenue from Barton Street to Highway 8; and an east-west alignment from Fruitland Road to the future Gordon Dean Avenue. For more information about the project, please refer to display panels for the PIC available on City of Hamilton's website: https://www.hamilton.ca/city-planning/master-plans-class-eas/block-servicing-strategies-stoney-creek-and-gordon-dean-class

The purpose of this email is to request a virtual meeting (via MS Teams) with Hamilton Conservation Authority to provide an update on the project, and obtain feedback for consideration into the ESR and implementation phase, as appropriate. Please provide a few time slots and dates that work for you, and I will coordinate with our team members. Thanks

Sincerely,

Mir

Mir Ahsan Talpur, M.Env.Sc., EP
Environmental Planner
E: mir.talpur@woodplc.com
M: +1 (647) 545 8974
D: +1 (905) 335 2353 (Ext. 3069)
www.woodplc.com

-----Original Appointment-----
From: Shams, Aniqa <aniqa.shams@woodplc.com>
Sent: October 03, 2019 3:26 PM
To: Shams, Aniqa; Enos, Jim; angelocutaia@ac3group.ca; King, Maria E; Stenzel, Andreas; Kelly, Mary K; Jim Dougan; Ian Richards; Fazio, Margaret; Slattery, Barbara (MECP); mstone@conservationhamilton.ca; Verhaeghe, Tammy (MNRF); Van Roon, Pauline (MTO); Baran, Michael (MNRF); Miller, Laurie (MMA); Barboza, Karla (MTCS)
Subject: Gordon Dean Avenue MCEA Phase 3 & 4: Technical Agency Meeting
When: October 10, 2019 10:30 AM-11:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: CA/Burlington ON/Harvester - LF - Redhill Boardroom

Good Afternoon,

You are invited to the **Technical Agency Meeting** for the Municipal Class Environment Assessment (EA) (Schedule 'C') Phase 3 & 4 for **Gordon Dean Avenue**. The Fruitland – Winona Development Group is considering a number of design alternatives for the new north-south road (Gordon Dean Avenue). The study is being conducted in accordance with the requirements for a Municipal Class EA, which is approved under the *Ontario Environmental Assessment Act.*

The purpose of the meeting is to present the preferred alternative for Gordon Dean Avenue and to discuss the study background, results of the technical studies completed, road design alternatives evaluation, the preliminary recommended design and the upcoming Public Information Centre (PIC). You may express any design or environmental issues that your Agency may have during this meeting.

The agency meeting will be held at:

Date: **October 10th, 2019**

Location: **Wood Environment & Infrastructure Solutions**
3450 Harvester Road, Suite 100
Burlington L7N 3W5
Redhill Boardroom

Time: **10:30 p.m. to 11:30 p.m.**

Please find attached the agenda for this meeting. Feel free to forward this meeting invite to staff within your organization. Kindly acknowledge either your or other staff attendance by October 9th, 2019.

I have also attached the Notice of PIC to this email. This notice will be distributed early next week. If you have any questions prior to the meeting, please feel free to contact me at the number listed below.

Call-in Information:

.....

Join Skype Meeting

Trouble Joining? Try Skype Web App

Join by phone

Toll-free number: +1 (888) 304-2647,,387572428# (Dial-in Number) English (United States)
Toll number: +1 (647) 749-7026,,387572428# (Dial-in Number) English (United States)

Find a local number

Conference ID: 387572428
Forgot your dial-in PIN? | Help

.....

Regards,
Aniqa

Aniqa Shams, B.E.S. LEED Green Associate
Junior Environmental Planner
160 Traders Blvd E., Suite 110
Mississauga, ON L4Z 3K7
Office: +1 (905) 568-2929 ext. 4149
Mobile: (416) 357-2093
www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include “Unsubscribe” in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

---

Natural Heritage	X		Revising the comment within the EIS with regards to adequate habitat for Barn Swallow (addressing the wording that suggested that with the removal of the open areas for the roads, there would be substantial amounts of foraging habitat within the area and surrounding lands).	Project Proponent
Natural Heritage	X		Approximately 5.06 ha of vegetation will be removed. This includes deciduous forest, hedgerow, reed canary grass wetland, mineral meadow marsh, cattail mineral shallow marsh and fresh-moist mixed meadow. It has been identified that a variety of habitats will be created within the realigned creek channel (associated with BSS1). Discussion on how the time lag between the removal of vegetation to accommodate for road construction and planting within the realigned creek channel was to be included within the EIS.	Project Proponent
Natural Heritage	X		Within the ESR addressing the concern that a Salvage/Transplant Plan was to be included within the "Future Commitments" section.	
Others?				

Please feel free to adjust formatting or order to whichever is easiest to implement on your end, and let us know if you have any further questions on this.

Thanks,

Margaret

Margaret Fazio, B.Sc., *EP, MCIP, RPP*
Senior Project Manager, Infrastructure Planning
Growth Management, Planning and Economic Development Department
City of Hamilton, 71 Main Street West, 6th Floor, Hamilton, ON, Canada, L8R 4Y5
Tel: 905-546-2424 ext. 2218; Fax: 905-540-5611; e-mail: Margaret.Fazio@hamilton.ca
DURING COVID, I am working remotely and can also Teams.

Source: *Urban Hamilton Official Plan, Fruitland-Winona Secondary Plan, Transportation Classification Plan, Map B.7.4.4-3*

Planned Transportation Network – Blocks 1 and 2

Source*: Amec Foster Wheeler, Public Information Centre Display Panels, 04 April 2017.*

Preliminary Preferred Design for Future Gordon Dean Avenue

Block 1 Conceptual Density Plan

3.2 Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual[5] provide rates and equations to estimate the peak hour traffic volumes generated by the Block 1 lands. The most representative Land Use Codes (LUC) are:

- **LUC 210 (Single-Family Detached Housing):** Includes all single-family detached homes on individual lots.
- **LUC 230 (Residential Condominium/Townhouse)**: Ownership units that have at least one other owned unit within the same building structure. Both condominiums and townhouses are included in this category.
- **LUC 412 (County Park)**: Parks owned and operated by a county. The county parks surveyed vary widely as to location, type and number of facilities, including boating or swimming facilities, ball fields, soccer fields, camp sites, picnic facilities and general open space.
- **LUC 520 (Elementary School)**: Typically serve students attending kindergarten through fifth or sixth grade. Usually centrally located in residential communities to facilitate student access and have no student drivers. This land use consists of schools where bus service is usually provided to students living beyond a specified distance from the school.
- **LUC 820 (Shopping Centre)**: Integrated group of commercial establishments that is planned, developed, owned and managed as a unit. The composition is related to its market area in terms of size, location and type of store. Provides on-site parking facilities sufficient to serve its parking demands.

The following assumptions were made in estimating the trips generation:

- LUC 210 was used for the Low Density Residential units, while LUC 230 was utilized for the Medium Density Residential units.
- LUC 412 was used for the Community Park situated in the northeast quadrant of the development area. With its location at the edge of the city, this proposed land use is more akin to a County Park than a City Park, as defined in the ITE Trip Generation Manual.
- Most trips destined to the Neighbourhood Park would originate from within the Block 1 lands and travel to the park using active transportation modes. As such, the park was assumed not to generate any trips from outside the development area. In addition, the peak hour of activity at a Neighbourhood (and Community) Park does not typically coincide with the peak hour of adjacent street traffic.

[5] Institute of Transportation Engineers. *Trip Generation Manual, 9th Edition*. 2012.

- 75% of the trips destined to the proposed elementary school in the northeast quadrant of the subject lands would originate from within the development.
- For the Arterial Commercial lands, 50% of the trips generated would originate from within the development area. For the Local Commercial lands, 75% of trips would originate from within the subject lands.

The trip generation calculations also assumed an allowance for pass-by trips. Pass-by trips are made as intermediate stops on the journey from an origin to a primary trip destination without a route diversion. These trips are attracted from traffic passing the site on an adjacent street or roadway that offers direct access to the generator, but not diverted from another roadway. Applicable pass-by rates were obtained from the ITE Trip Generation Manual.

Table 3.1 summarizes the estimated total trip generation for the development. Approximately 1,540 and 2,100 trips are forecasted to be generated during the AM and PM peak hours, respectively.

TABLE 3.1: TRIP GENERATION

Land Use	Units/ GFA	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
LUC 210 - Single Family Dwelling	1068	0.71	189	568	757	0.83	558	328	886
LUC 230 - Residential Condo/Townhouse	1,505	0.30	77	375	452	0.37	372	183	555
LUC 412 - County Park	7.16	0.02	1	0	1	0.09	1	1	2
LUC 520 - Elementary School	30,000	5.20	70	86	156	1.20	16	20	36
LUC 820 - Shopping Centre	47,145	2.10	61	38	99	7.68	174	188	362
Passby		*n/a*				*34%*	*59*	*64*	*123*
LUC 820 - Shopping Centre	28,850	2.53	45	28	73	9.05	125	136	261
Passby		*n/a*				*34%*	*43*	*46*	*89*
Total Trips			443	1095	1538		1348	966	2314
Total Passby			*0*	*0*	*0*		*102*	*110*	*212*
Net New Trips			**443**	**1095**	**1538**		**1246**	**856**	**2102**

* All rates are based on the fitted curve equation with the exception of LUC 412 and LUC 520

3.3 Trip Distribution and Assignment

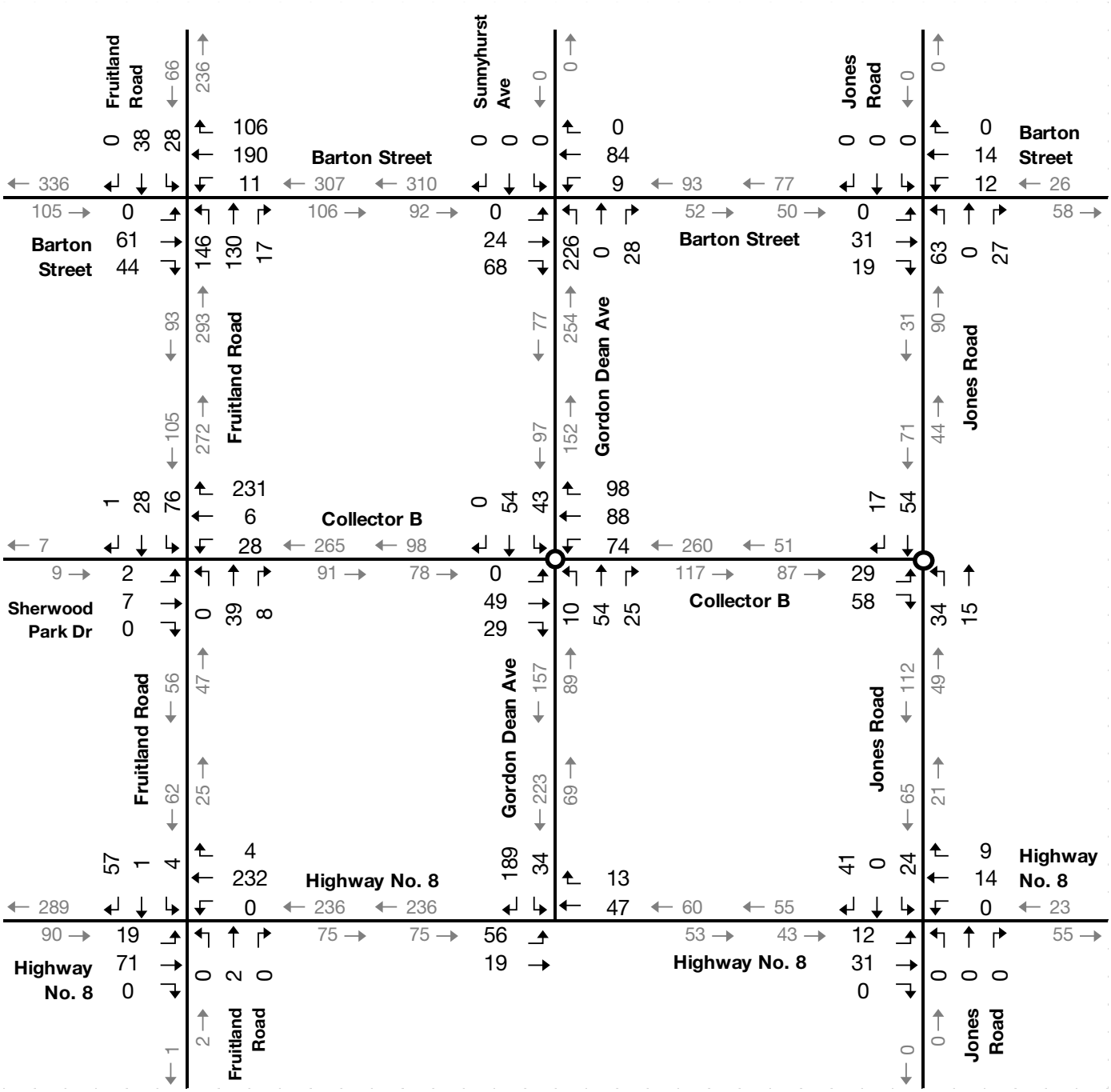
Data from the 2011 Transportation Tomorrow Survey (TTS) provided the basis to distribute site-generated trips to the wider area roadway network. All inbound and outbound trips between Traffic Analysis Zones 5077

(Development), 5061, 5071, 5076, 5090, 5096 (surrounding residential neighbourhoods), and the TTS planning districts between 6:00 AM and 9:00 AM and 3:00 PM and 6:00 PM were extracted from the database. **Table 3.2** shows the resulting trip distribution pattern.

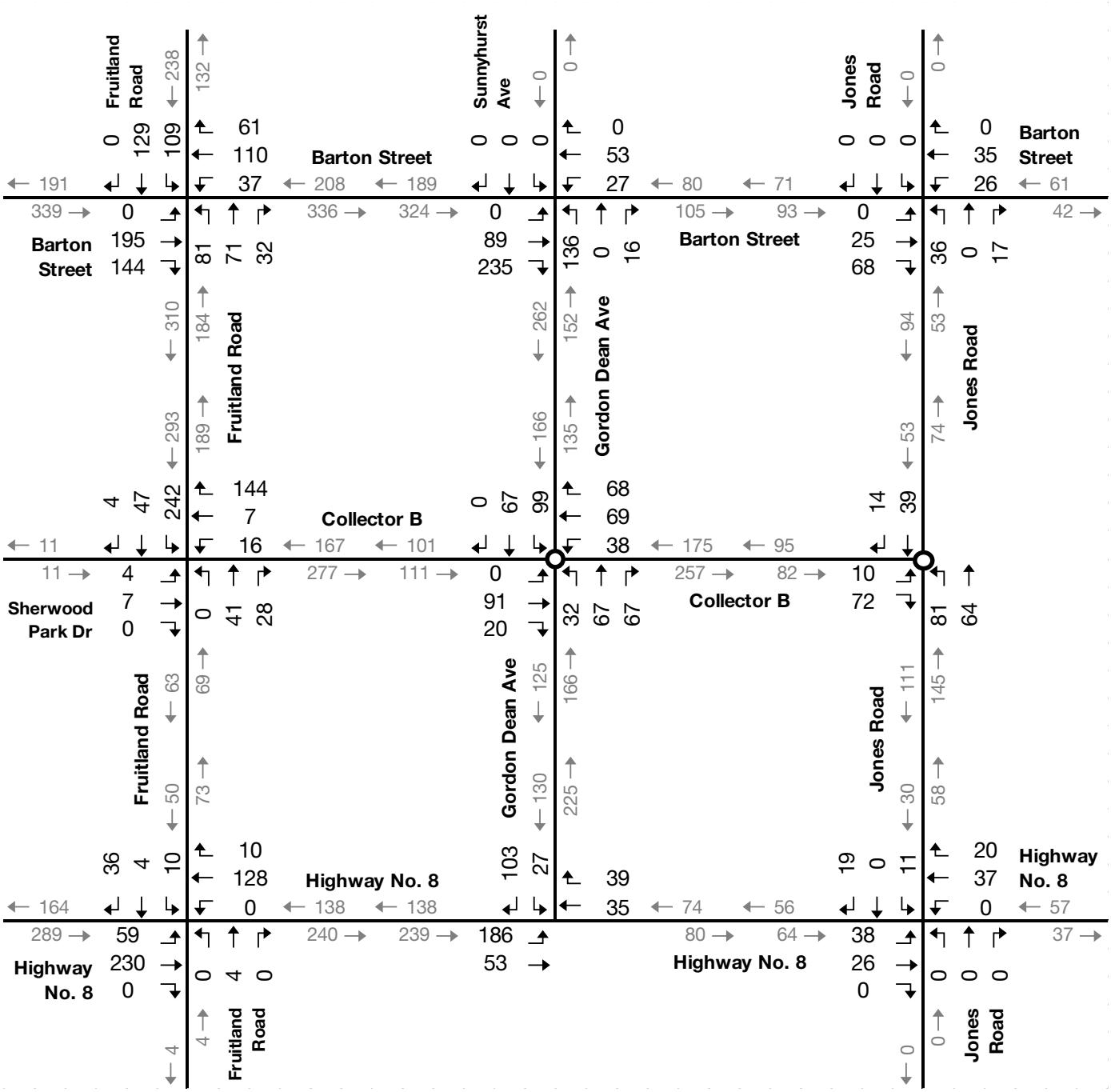
TABLE 3.2: TRIP DISTRIBUTION

Route	Direction	AM/PM Peak Hour
Barton Street	East	5%
	West	35%
Fruitland Road	North	25%
	South	0%
Highway No. 8	East	5%
	West	30%
	Total	**100%**

Trips were assigned to the external and internal road networks based on location within the development, the trip distribution pattern in **Table 3.2** and logical routing. **Figure 3.6** and **Figure 3.7** illustrate the resulting development trip assignment to the study area intersections for the AM and PM peak hours, respectively.



AM Development Traffic Forecasts



PM Development Traffic Forecasts

4 Evaluation of Future Traffic Conditions

4.1 Horizon Years and Assumptions

The assessment of future traffic conditions contained in this section includes future background and total traffic volume forecasts and operational analyses for the 2021, 2026 and 2031 horizons. The future traffic volumes consist of increased non-site traffic volumes (general background traffic growth), traffic generated by other nearby developments, and site traffic forecasted to be generated by the proposed development.

The analyses assumed that the entire development was build out in one phase by the year 2021, as stated in **Section 3.1**. This includes construction of both internal road network connections – Gordon Dean Avenue and Collector Road B. **Chapter 5** assesses the implications of phasing the development and road network build out over time.

4.2 Background Traffic

4.2.1 General Traffic Growth

Traffic volumes at the study area intersections are anticipated to increase over time even without the proposed development due to general traffic growth within Stoney Creek and the surrounding area. A compounded growth rate of 2.49% per annum, as obtained from the *Barton Street and Fifty Road Improvements Class Environmental Assessment Study*, was applied to the base year volumes to derive the background traffic for each horizon year.

4.2.2 Other Planned Development

The City requested that the traffic generated by the following approved but not yet built developments near the study area be included as part of the background traffic forecasts:

- Remaining FWSP area east of the Block 1 lands
- Winona Crossing Commercial Development at South Service Road and Fifty Road

The trips from these developments were assigned to the road network using the traffic distributions developed for the *Barton Street and Fifty Road Improvements Class Environmental Assessment Study*. It is noted that not all trips from these developments will enter the study area.

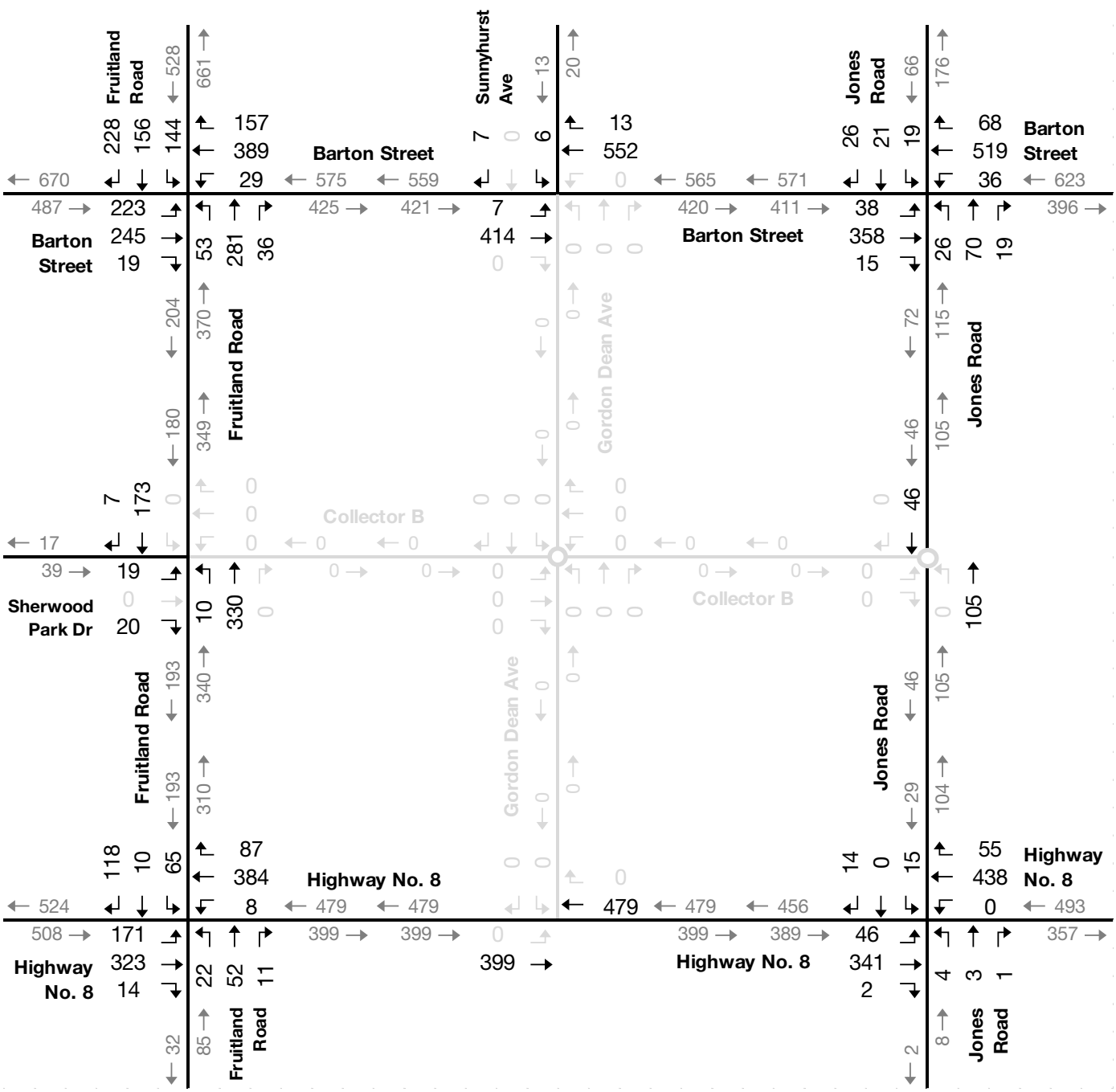
4.3 2021 Horizon

4.3.1 2021 Background Traffic Operations

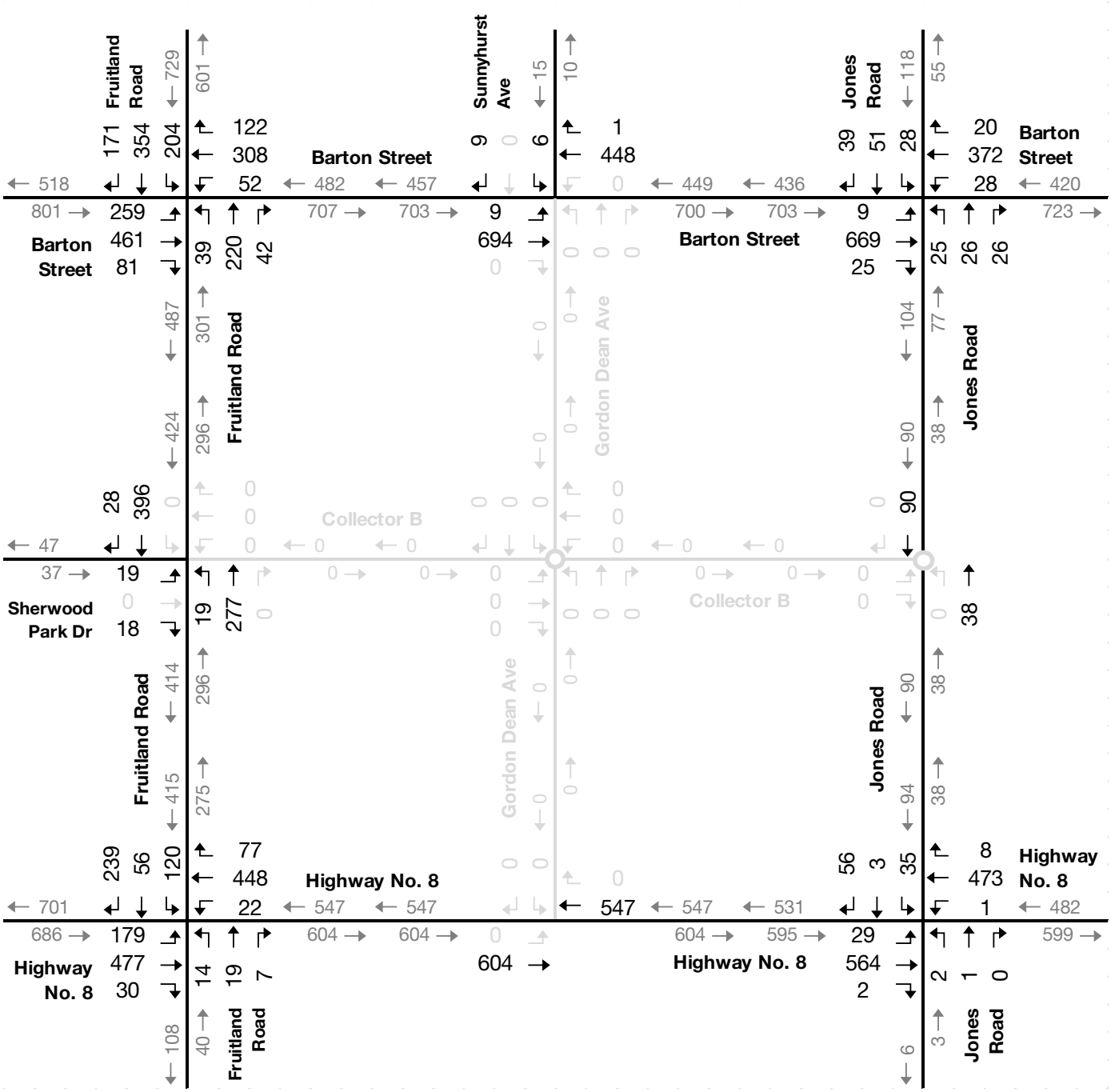
Figure 4.1 and **Figure 4.2** show the forecasted 2021 Background traffic volumes (background traffic with 2.49% per annum growth plus traffic from other planned developments) for the AM and PM peak hours, respectively. **Table 4.1** and **Table 4.2** summarize the operational analysis results based on these traffic forecasts. **Appendix C** contains the detailed Synchro 9 reports.

The study area intersections are forecasted to operate similar to Base Year conditions, with all intersections and movements expected to function with acceptable v/c ratios and levels of service except for:

- Barton Street and Jones Road:
  - Northbound left-through-right movement (LOS F for AM peak hour)
  - Southbound left-through-right movement (LOS E for AM peak hour)
- Highway No. 8 and Jones Road:
  - Northbound left-turn movement (LOS D for PM peak hour)
  - Southbound left-turn movement (LOS D for PM peak hour)



2021 AM Background Traffic Forecasts



2021 PM Background Traffic Forecasts

TABLE 4.1: 2021 AM BACKGROUND TRAFFIC OPERATIONS SUMMARY

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	D	A	>	**C**	A	B	>	**B**	B	B	>	**B**	B	B	>	**B**	**B**
			Delay	41	9	>	**24**	9	11	>	**11**	11	12	>	**12**	14	13	>	**13**	**15**
			V/C	0.87	0.21	>		0.09	0.42	>		0.21	0.48	>		0.45	0.48	>		**0.67**
			Q	52	13	>		6	23	>		9	36	>		22	32	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	28	-	>		30	-	>		26	-	>		28	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A		**A**		A	>	**A**					C		>	**C**	**A**
			Delay	<	0		**0**		0	>	**0**					17		>	**17**	**0**
			V/C	<	0.01				0.36	>						0.05		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	E	>	**E**	**A**
			Delay	<	1	>	**1**	<	1	>	**1**	<	61	>	**61**	<	41	>	**41**	**9**
			V/C	<	0.04	>		<	0.04	>		<	0.69	>		<	0.42	>		
			Q	<	1	>		<	1	>		<	34	>		<	15	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	B		>	**B**					A	A		**A**		A	>	**A**	**A**
			Delay	11		>	**11**					8	0		**0**		0	>	**0**	**1**
			V/C	0.07		>						0.01	0.21				0.12	>		
			Q	2		>						0	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						20	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	A	A	A	**A**	A	A	A	**A**	C	C	>	**C**	C	C	>	**C**	**A**
			Delay	6	5	4	**6**	4	6	4	**6**	20	21	>	**21**	22	20	>	**21**	**9**
			V/C	0.33	0.32	0.01		0.01	0.38	0.07		0.14	0.22	>		0.39	0.14	>		**0.38**
			Q	21	31	1		2	38	5		7	14	>		16	13	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	54	-	10		58	-	30		18	-	>		9	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	C	C	>	**C**	C	B	>	**C**	**A**
			Delay	9	0	>	**1**	0	0	>	**0**	22	18	>	**20**	23	12	>	**18**	**1**
			V/C	0.05	0.22	>		0.00	0.32	>		0.02	0.01	>		0.08	0.03	>		
			Q	1	0	>		0	0	>		0	0	>		2	1	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	79	-	>		35	-	>		25	-	>		13	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE 4.2: 2021 PM BACKGROUND TRAFFIC OPERATIONS SUMMARY

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	B	B	>	**B**	B	B	>	**B**	C	C	>	**C**	C	D	>	**D**	**C**
			Delay	18	12	>	**15**	12	12	>	**12**	22	22	>	**22**	21	37	>	**35**	**22**
			V/C	0.52	0.17	>		0.09	0.19	>		0.29	0.38	>		0.26	0.84	>		**0.65**
			Q	62	23	>		12	25	>		12	45	>		20	109	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	18	-	>		23	-	>		23	-	>		30	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A		**A**		A	>	**A**					B		>	**B**	**A**
			Delay	<	0		**0**		0	>	**0**					12		>	**12**	**0**
			V/C	<	0.01				0.21	>						0.03		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	C	>	**C**	<	C	>	**C**	**A**
			Delay	<	0	>	**0**	<	1	>	**1**	<	16	>	**16**	<	17	>	**17**	**4**
			V/C	<	0.01	>		<	0.01	>		<	0.18	>		<	0.27	>		
			Q	<	0	>		<	0	>		<	5	>		<	9	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	B		>	**B**					A	A		**A**		A	>	**A**	**A**
			Delay	13		>	**13**					8	0		**1**		0	>	**0**	**1**
			V/C	0.07		>						0.02	0.16				0.25	>		
			Q	2		>						0	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						20	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	A	A	A	**A**	A	A	A	**A**	B	B	>	**B**	C	B	>	**B**	**B**
			Delay	8	8	5	**8**	5	8	5	**7**	18	18	>	**18**	20	19	>	**19**	**11**
			V/C	0.35	0.45	0.02		0.05	0.42	0.05		0.09	0.05	>		0.45	0.32	>		**0.45**
			Q	23	50	2		4	46	5		5	6	>		23	22	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	53	-	8		56	-	30		20	-	>		2	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	D	C	>	**D**	D	B	>	**C**	**A**
			Delay	9	0	>	**0**	9	0	>	**0**	28	22	>	**26**	28	12	>	**18**	**2**
			V/C	0.03	0.33	>		0.00	0.28	>		0.01	0.00	>		0.18	0.11	>		
			Q	1	0	>		0	0	>		0	0	>		5	3	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	79	-	>		35	-	>		25	-	>		10	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

4.3.2 2021 Total Traffic Operations

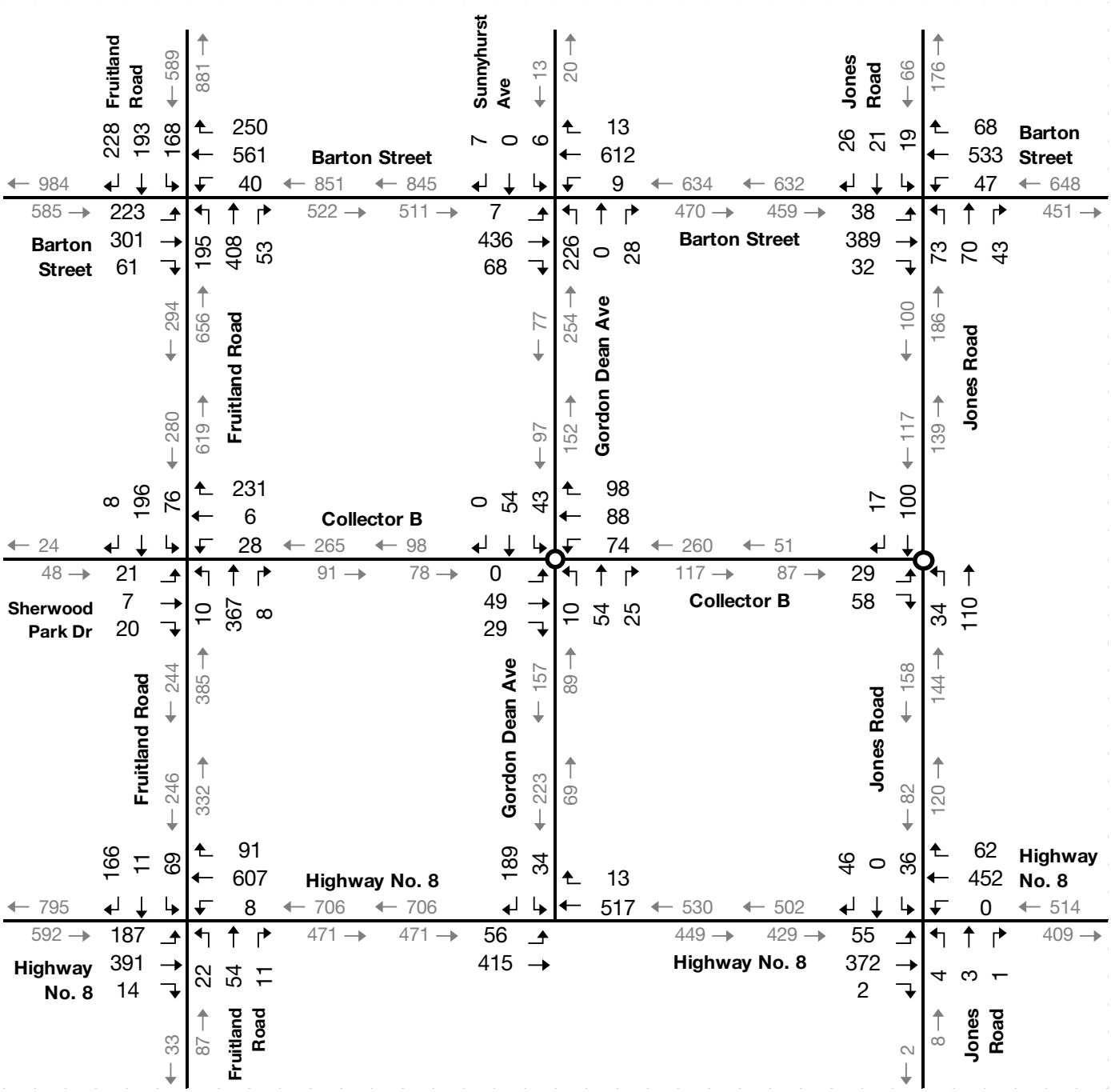
Figure 4.3 and **Figure 4.4** show the forecasted 2021 Total traffic volumes (background plus development) for the AM and PM peak hours, respectively. **Table 4.3** and **Table 4.4** summarize the operational analysis results based on these forecasts. **Appendix D** contains the detailed Synchro 9 reports. The analyses assumed:

- The intersections of Gordon Dean Avenue at Collector Road B and Jones Road at Collector Road B operate under roundabout control (The roundabout operational analysis was performed using ARCADY)
- The Highway No. 8 and Gordon Dean Avenue intersection operates as Stop controlled with free flow on Highway No. 8

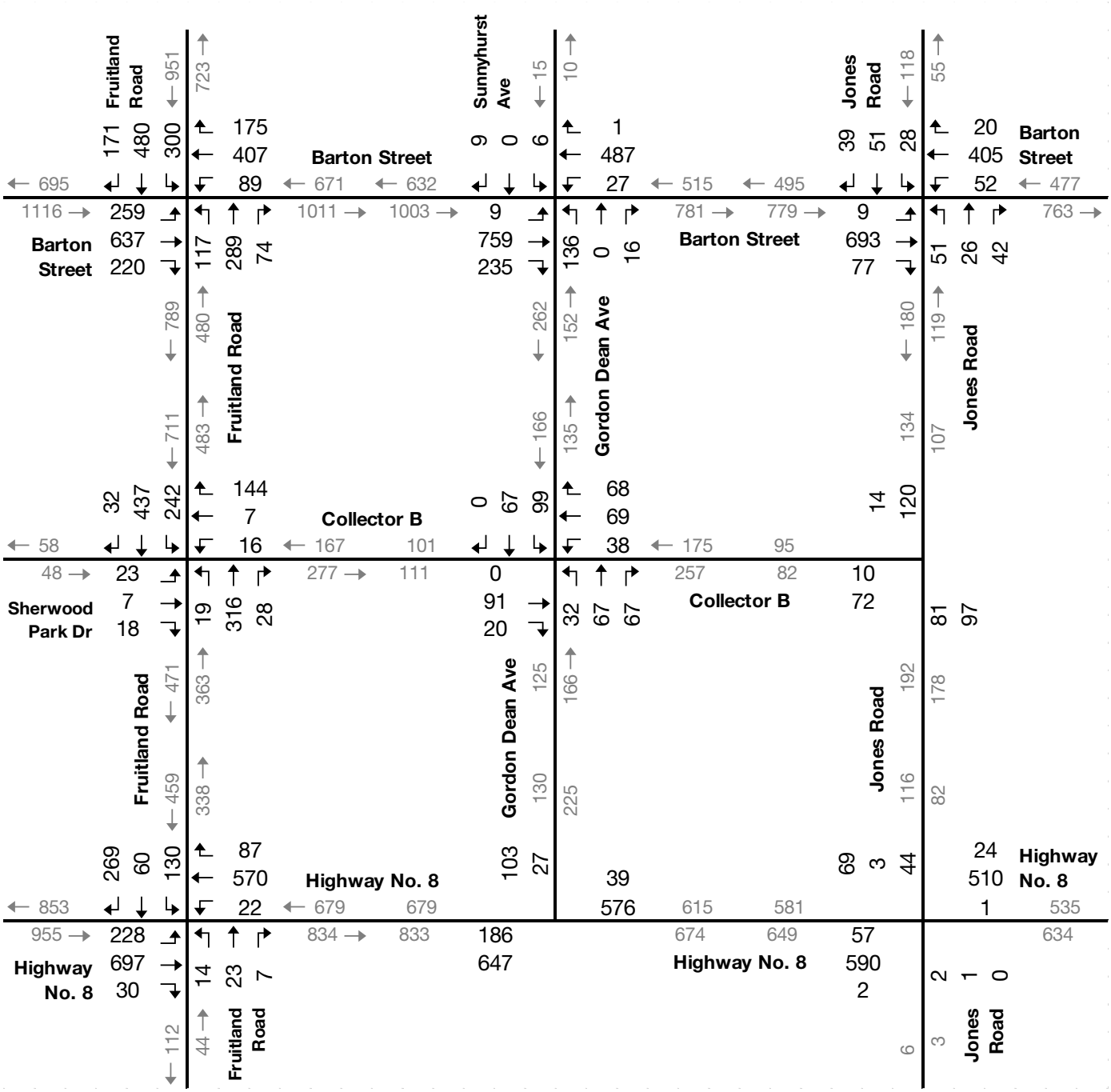
The study area intersections are forecasted to operate acceptably except for the following movements, which are projected to function with less than acceptable v/c ratios and/or levels of service:

- Barton Street and Fruitland Road:
  - Eastbound left-turn movement (LOS F, v/c=1.14 and 95th percentile queues exceeding available storage by 19 metres for AM peak hour. LOS F, v/c=1.08 and 95th percentile queues exceeding available storage by 25 metres for PM peak hour)
  - Westbound left-turn movement (95th percentile queues exceeding available storage by 4 metres for PM peak hour)
  - Northbound left-turn movement (LOS F, v/c=1.10 and 95th percentile queues exceeding available storage by 53 metres for AM peak hour. LOS F, v/c=1.43 and 95th percentile queues exceeding available storage by 17 metres for PM peak hour)
  - Southbound left-turn movement (LOS F, v/c=1.08 and 95th percentile queues exceeding available storage by 29 metres for AM peak hour. LOS F, v/c=1.08 and 95th percentile queues exceeding available storage by 69 metres for PM peak hour)
- Barton Street and Sunnyhurst Avenue/Gordon Dean Avenue:
  - Northbound left-through-right movement (LOS F for AM and PM peak hours)
  - Southbound left-through-right movement (LOS D for PM peak hour)
- Barton Street and Jones Road:
  - Northbound left-through-right movement (LOS F for PM peak hour) – critical movement for 2021 Background traffic conditions
  - Southbound left-through-right movement (LOS F for AM and PM peak hours) – critical movement for 2021 Background traffic conditions in AM peak hour

- Fruitland Road and Sherwood Park Road/Collector Road B:
  - Eastbound left-through-right movement (LOS D for AM peak hour. LOS F for PM peak hour)
- Highway No. 8 and Jones Road:
  - Northbound left-turn movement (LOS D for AM peak hour. LOS E for PM peak hour) – critical movement for 2021 Background traffic conditions in PM peak hour
  - Northbound through-right movement (LOS D for PM peak hour).
  - Southbound left-turn movement (LOS D for AM peak hour. LOS F for PM peak hour) – critical movement for 2021 Background traffic conditions in PM peak hour
- Highway No. 8 and Gordon Dean Avenue:
  - Southbound left-right-turn movement (LOS F for PM peak hour)



2021 AM Total Traffic Forecasts



2021 PM Total Traffic Forecasts

Street 1 / Street 2

CONTROLLER DATA

4/16/2013

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DET	Ph Grns																
SWITCH	Switch (TS1)																
& COPY	G1 Copy																
3 of 16	G2 Copy																

	Swtch	G1C	G2C
From Ph:	**3**		
To Ph:	**8**		

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DET	Ph Grns																
SWITCH	Switch (TS1)																
& COPY	G1 Copy																
5 of 16	G2 Copy																

	Swtch	G1C	G2C
From Ph:	**5**		
To Ph:	**2**		

	DET/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DET	Ph Grns																
SWITCH	Switch (TS1)																
& COPY	G1 Copy																
7 of 16	G2 Copy																

	Swtch	G1C	G2C
From Ph:	**7**		
To Ph:	**4**		

Copyright Peek Traffic Systems, Inc.

DUAL ENTRY ENABLE:	Y	Y/N: Y=Enable Dual Entry. Note this is only one setting even though it appears on each controller screen.

PG1	PH/CALLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DUAL	1																
ENTRY	2						X										
ASSIGN-	3																
MENTS	4								X								
	5																
	6		X														
	7																
	8				X												

Dual Entry = Left column phase automatically places call on selected phase(s) if no other real calls within selected phases ring and co-phase group

ENHANCED OPTIONS

DYNAMIC OMITS (MM-3-1-9-1-1)

DYNAM OMITS GP1 ENABLE:		Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS																
OMITS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

Select phases to be dynamically omitted from OMIT PHS row. Select the PH-ONs and/or O/L GRNs that will cause those omits. Phases are omitted when controller state matches IF PH ON row or O/L GRN row.
Note that there are 2 groups of dynamic omits, each with 8 patterns. Group 1 is the default group and group 2 can be selected by input or TOD ckt 96. When a group is active, any one or all of the pattterns within that group may be true depending on the controller state.

Copyright Peek Traffic Systems, Inc.

CONTROLLER DATA

GRP1-2	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS																
OMITS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-3	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS																
OMITS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-4	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	OMIT PHS																
OMITS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

DYNAMIC RECALLS (MM-3-1-9-1-2)

DYN. RECALL GP1 ENABLE:		Y/N: Y=Enable. Note: This is one setting but appears on each screen. No input rquired for GP1.

(X = ENABLE)

GRP1-1	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS																
RECALLS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

Select phases to be dynamically recalled from RCL PHS row. Select the PH-ONs and/or O/L GRNs that will cause those recalls. Phases are recalled when controller state matches PH ON row or O/L GRN row.

Note that there are 2 groups of dynamic recalls, each with 8 patterns. Group 1 is the default group and group 2 can be selected by input or TOD ckt 96. When a group is active, any one or all of the pattterns within that group may be true depending on the controller state.

Copyright Peek Traffic Systems, Inc.

CONTROLLER DATA

GRP1-2	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS																
RECALLS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-3	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS																
RECALLS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

GRP1-4	FUNC/PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DYNAM.	RCL PHS																
RECALLS	IF PH ON																
ASSIGN-	OR O/L	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
MENTS	GRN																

Copyright Peek Traffic Systems, Inc.

SELECTION SOURCE (MM-3-2-2)

Entries determine how parameters get selected

Cycle Source:	1	0=TOD, 1=CL, 2=INT
Split Source:	1	0=TOD, 1=CL, 2=INT
Offset Source:	1	0=TOD, 1=CL, 2=INT

Free Source:	1	0=TOD, 1=CL, 2=INT
Flash Source:	0	0=TOD, 1=CL, 2=INT
Inter-TOD Revert:	255	0-255 SECS

TOD = Time of day control by internal clock, CL = Closed loop (comm), INT = Interconnect. Inter-TOD Revert is time allowed after failed interconnect before unit reverts to TOD (Time Base) control.

COORD BASIC OPTIONS (MM-3-2-3)

Reference to End (vs. begin) of Main St.:	N	Y/N: Y = Offset references to end of main st. green. N = Beginning of Main st. green.
Use % (vs. secs) for Phase Allocation:	N	Y/N: Y = Phase allocations loaded as percent of 100. N = Allocations in seconds.
Use % (vs. secs) for Offset Entry:	N	Y/N: Y = Offset loaded as percent of 100. N = Offset loaded in seconds.
Use Fixed (vs. floating) Force Offs:	Y	Y/N: Y = Force offs are fixed to cycle. N=Force offs like max times, begin with green.
Permissive Type:	1	0-2: 0=Yield, 1= Single, 2= Multiple. See Permissives note below

Copyright Peek Traffic Systems, Inc.

C/S TO TIMING PLAN (MM-3-2-9-6)

USE THIS CHART WHEN 4 SPLITS/CYCLE = Y

	CYCLE	1	2	3	4	5	6
SPLIT TO TIME PLAN	SPLIT 1	1	2	3	4		
	SPLIT 2						
	SPLIT 3						
	SPLIT 4						

(0-4 = TIME PLAN IMPLEMENTED WHEN SPLIT IN EFFECT)

CYCLES & OFFSETS (MM-3-2-4)

NOTE: FIRST SPECIFY OFFSET SEEKING MODE AND 4 SPLITS CYCLE MODE (ENHANCED OPTIONS, OPERATING MODES)

	Cycle #	1/1	2/1	3/1	4/1		
CYCLE & OFFSETS	Length	80	90	90	90		
	Offset 1	54	2	78	69		
	Offset 2						
	Offset 3						
	Offset 4						
	Offset 5						
	Max Dwell	32	32	32	32		

COORD PHASES (MM-3-2-5)

	CYCLE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
COORD PHASES	1-1		X				X										
	2-1		X				X										
	3-1		X				X										
	4-1		X				X										

Copyright Peek Traffic Systems, Inc.

CONTROLLER DATA

OFFSET SEEKING MODE (MM-3-2-7)

Offset Seeeling Mode:	1

Mode

0 Add only, cycle times 20% slow only to get in sync
1 Dwell, cycle timer stops at cycle 0 up to max dwell time to get in step
2 Short Route, cycle times 20% fast or slow--whichever gets in step fastest

ENHANCED OPTIONS

OPERATING OPTIONS (MM-3-2-9-1)

Enhanced Perm:	Y	Y/N: See note	Invert Free In:	N	Y/N: See note
Central Override:	N	Y/N: See note	Split Matrix:	N	Y/N: See note
No PCL Offset Adjust:	N	Y/N: See note	4 Splits/Cycle:	Y	Y/N: See note
			No Early Coord Ped:	N	Y/N: See note

Yeil Percent	0	0-10%: See note
EGB%	0	0-100%: See note
RGB%	0	0-100%: See note
# Cycles to out of step:	0	0-255: 0=Disable

CYCLE SYNC OPTIONS (MM-3-2-9-2)

Sync Source:	0	0-2, 0=TOD/CL/Interconnect, 1= City Zero, 2= Absolute

Charts below only For City Zero offfsets or Absolute (0's). These are not daily reference times for Sync Source Option 0 (see TOD).

Cycle 1:	0	Cycle 2:	0	Cycle 3:	0
Cycle 4:	0	Cycle 5:	0	Cycle 6:	0

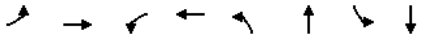
Copyright Peek Traffic Systems, Inc.

Appendix G

2026 Background Traffic Operations Reports

Queues
1: Fruitland Road & Barton Street

07-20-2017

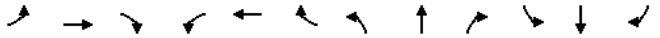


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	274	319	34	644	65	388	172	471
v/c Ratio	1.07	0.24	0.10	0.50	0.28	0.54	0.55	0.63
Control Delay	98.4	9.0	9.4	9.0	13.0	13.5	19.1	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	98.4	9.0	9.4	9.0	13.0	13.5	19.1	10.8
Queue Length 50th (m)	~26.6	8.0	1.7	14.2	3.4	22.0	10.3	15.7
Queue Length 95th (m)	#61.6	14.6	5.8	25.2	10.8	42.2	#31.6	39.4
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	256	1313	347	1280	236	712	312	743
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	1.07	0.24	0.10	0.50	0.28	0.54	0.55	0.63

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

07-20-2017

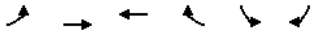


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	252	272	21	31	421	171	60	318	39	158	176	258
Future Volume (vph)	252	272	21	31	421	171	60	318	39	158	176	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.99		1.00	0.96		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1660	3253		1477	2957		1585	1758		1661	1566	
Flt Permitted	0.37	1.00		0.56	1.00		0.35	1.00		0.45	1.00	
Satd. Flow (perm)	642	3253		869	2957		591	1758		780	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	274	296	23	34	458	186	65	346	42	172	191	280
RTOR Reduction (vph)	0	13	0	0	97	0	0	10	0	0	117	0
Lane Group Flow (vph)	274	306	0	34	547	0	65	378	0	172	354	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Effective Green, g (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	256	1301		347	1182		236	703		312	626	
v/s Ratio Prot		0.09			0.18			0.22			c0.23	
v/s Ratio Perm	c0.43			0.04			0.11			0.22		
v/c Ratio	1.07	0.24		0.10	0.46		0.28	0.54		0.55	0.57	
Uniform Delay, d1	13.5	8.9		8.4	9.9		9.1	10.3		10.4	10.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	76.1	0.4		0.6	1.3		2.9	2.9		6.9	3.7	
Delay (s)	89.6	9.4		9.0	11.2		12.0	13.3		17.2	14.1	
Level of Service	F	A		A	B		B	B		B	B	
Approach Delay (s)		46.5			11.1			13.1			15.0	
Approach LOS		D			B			B			B	

Intersection Summary					
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	0.82				
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0		
Intersection Capacity Utilization	75.5%	ICU Level of Service	D		
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
2: Barton Street & Sunnyhurst Avenue

07-20-2017



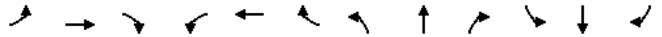
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	458	599	15	6	7
Future Volume (Veh/h)	7	458	599	15	6	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	498	651	16	7	8
Pedestrians					1	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	668				1174	660
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	668				1174	660
tC, single (s)	4.4				6.6	6.4
tC, 2 stage (s)						
tF (s)	2.5				3.7	3.5
p0 queue free %	99				96	98
cM capacity (veh/h)	791				193	437

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	506	667	15
Volume Left	8	0	7
Volume Right	0	16	8
cSH	791	1700	275
Volume to Capacity	0.01	0.39	0.05
Queue Length 95th (m)	0.2	0.0	1.4
Control Delay (s)	0.3	0.0	18.8
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	18.8
Approach LOS			C

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		42.4%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

07-20-2017



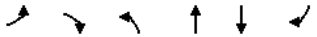
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	395	17	37	562	74	30	79	21	21	24	30
Future Volume (Veh/h)	42	395	17	37	562	74	30	79	21	21	24	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	429	18	40	611	80	33	86	23	23	26	33
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	691			449			1309	1303	440	1327	1272	651
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	691			449			1309	1303	440	1327	1272	651
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	95			96			68	41	96	63	83	92
cM capacity (veh/h)	913			1012			102	146	620	62	151	418

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	493	731	142	82
Volume Left	46	40	33	23
Volume Right	18	80	23	33
cSH	913	1012	149	132
Volume to Capacity	0.05	0.04	0.95	0.62
Queue Length 95th (m)	1.3	1.0	54.8	25.9
Control Delay (s)	1.4	1.0	120.0	69.1
Lane LOS	A	A	F	F
Approach Delay (s)	1.4	1.0	120.0	69.1
Approach LOS			F	F

Intersection Summary				
Average Delay		16.7		
Intersection Capacity Utilization		58.1%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road

07-20-2017



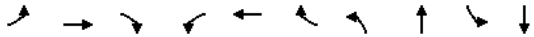
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	22	11	373	196	7
Future Volume (Veh/h)	21	22	11	373	196	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	24	12	405	213	8
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	650	221	225			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	650	221	225			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	97	99			
cM capacity (veh/h)	432	821	1351			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	47	12	405	221
Volume Left	23	12	0	0
Volume Right	24	0	0	8
cSH	570	1351	1700	1700
Volume to Capacity	0.08	0.01	0.24	0.13
Queue Length 95th (m)	2.1	0.2	0.0	0.0
Control Delay (s)	11.9	7.7	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	11.9	0.2		0.0
Approach LOS	B			

Intersection Summary					
Average Delay			1.0		
Intersection Capacity Utilization			29.6%	ICU Level of Service	A
Analysis Period (min)			15		

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	210	398	17	10	472	108	27	77	80	158
v/c Ratio	0.38	0.34	0.02	0.02	0.41	0.12	0.12	0.21	0.34	0.39
Control Delay	9.1	6.9	0.6	5.3	7.6	1.8	19.1	17.1	23.0	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	6.9	0.6	5.3	7.6	1.8	19.1	17.1	23.0	8.0
Queue Length 50th (m)	9.9	18.2	0.0	0.4	22.8	0.0	2.3	5.5	7.1	1.0
Queue Length 95th (m)	26.5	37.3	0.7	2.0	46.5	5.1	7.7	14.5	17.2	13.3
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	552	1169	915	641	1158	909	553	899	598	809
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	0.38	0.34	0.02	0.02	0.41	0.12	0.05	0.09	0.13	0.20

Intersection Summary

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	193	366	16	9	434	99	25	59	12	74	11	134
Future Volume (vph)	193	366	16	9	434	99	25	59	12	74	11	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1317	1582	1760		1586	1455	
Flt Permitted	0.47	1.00	1.00	0.53	1.00	1.00	0.66	1.00		0.71	1.00	
Satd. Flow (perm)	833	1766	1358	969	1749	1317	1094	1760		1180	1455	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	398	17	10	472	108	27	64	13	80	12	146
RTOR Reduction (vph)	0	0	6	0	0	40	0	11	0	0	123	0
Lane Group Flow (vph)	210	398	11	10	472	68	27	66	0	80	35	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	34.1	34.1	34.1	34.1	34.1	34.1	8.5	8.5		8.5	8.5	
Effective Green, g (s)	34.1	34.1	34.1	34.1	34.1	34.1	8.5	8.5		8.5	8.5	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63	0.63	0.16	0.16		0.16	0.16	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	521	1104	849	606	1094	824	170	274		184	226	
v/s Ratio Prot		0.23			c0.27			0.04			0.02	
v/s Ratio Perm	0.25		0.01	0.01		0.05	0.02			c0.07		
v/c Ratio	0.40	0.36	0.01	0.02	0.43	0.08	0.16	0.24		0.43	0.15	
Uniform Delay, d1	5.1	4.9	3.8	3.9	5.2	4.0	19.9	20.2		20.8	19.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.9	0.0	0.0	1.2	0.2	0.4	0.5		1.6	0.3	
Delay (s)	7.4	5.8	3.9	3.9	6.5	4.2	20.3	20.6		22.5	20.2	
Level of Service	A	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		6.3			6.0			20.6			21.0	
Approach LOS		A			A			C			C	

Intersection Summary				
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.43			
Actuated Cycle Length (s)	54.5	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	75.0%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

07-20-2017

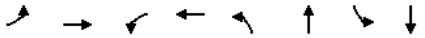
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	386	2	0	495	62	5	4	1	17	0	16
Future Volume (Veh/h)	52	386	2	0	495	62	5	4	1	17	0	16
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	57	420	2	0	538	67	5	4	1	18	0	17
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	606			422			1090	1141	421	1110	1108	572
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	606			422			1090	1141	421	1110	1108	572
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			100			97	98	100	89	100	96
cM capacity (veh/h)	929			1148			178	190	637	170	198	468

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	57	422	0	605	5	5	18	17
Volume Left	57	0	0	0	5	0	18	0
Volume Right	0	2	0	67	0	1	0	17
cSH	929	1700	1700	1700	178	221	170	468
Volume to Capacity	0.06	0.25	0.00	0.36	0.03	0.02	0.11	0.04
Queue Length 95th (m)	1.6	0.0	0.0	0.0	0.7	0.6	2.8	0.9
Control Delay (s)	9.1	0.0	0.0	0.0	25.8	21.7	28.7	13.0
Lane LOS	A				D	C	D	B
Approach Delay (s)	1.1		0.0		23.7		21.0	
Approach LOS					C		C	

Intersection Summary				
Average Delay	1.3			
Intersection Capacity Utilization	50.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Queues
1: Fruitland Road & Barton Street

07-20-2017



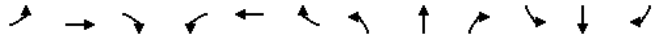
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	318	635	63	518	48	319	235	646
v/c Ratio	0.91	0.41	0.22	0.34	0.46	0.45	0.71	0.92
Control Delay	56.8	17.1	18.6	14.3	35.5	20.4	35.2	44.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	56.8	17.1	18.6	14.3	35.5	20.4	35.2	44.5
Queue Length 50th (m)	54.5	39.1	7.0	26.6	6.0	37.5	33.2	99.7
Queue Length 95th (m)	#110.2	53.8	16.6	39.1	18.8	60.1	#64.3	#168.6
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	350	1532	287	1518	110	753	351	739
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	0.91	0.41	0.22	0.34	0.44	0.42	0.67	0.87

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

07-20-2017



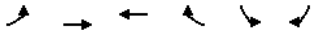
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	493	91	58	341	135	44	248	45	216	401	193
Future Volume (vph)	293	493	91	58	341	135	44	248	45	216	401	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.96		1.00	0.98		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)	1693	3313		1661	3224		1643	1735		1600	1675	
Flt Permitted	0.43	1.00		0.36	1.00		0.15	1.00		0.49	1.00	
Satd. Flow (perm)	767	3313		629	3224		255	1735		818	1675	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	318	536	99	63	371	147	48	270	49	235	436	210
RTOR Reduction (vph)	0	16	0	0	44	0	0	8	0	0	20	0
Lane Group Flow (vph)	318	619	0	63	474	0	48	311	0	235	626	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	41.2	41.2		41.2	41.2		36.5	36.5		36.5	36.5	
Effective Green, g (s)	41.2	41.2		41.2	41.2		36.5	36.5		36.5	36.5	
Actuated g/C Ratio	0.46	0.46		0.46	0.46		0.41	0.41		0.41	0.41	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	351	1516		287	1475		103	703		331	679	
v/s Ratio Prot		0.19			0.15			0.18			c0.37	
v/s Ratio Perm	c0.41			0.10			0.19			0.29		
v/c Ratio	0.91	0.41		0.22	0.32		0.47	0.44		0.71	0.92	
Uniform Delay, d1	22.6	16.3		14.7	15.5		19.6	19.4		22.3	25.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	29.2	0.8		1.8	0.6		3.3	0.4		6.8	18.0	
Delay (s)	51.8	17.1		16.5	16.1		22.9	19.8		29.2	43.4	
Level of Service	D	B		B	B		C	B		C	D	
Approach Delay (s)		28.7			16.1			20.2			39.6	
Approach LOS		C			B			C			D	

Intersection Summary					
HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	0.91				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.3		
Intersection Capacity Utilization	104.4%	ICU Level of Service	G		
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
2: Barton Street & Sunnyhurst Avenue

07-20-2017



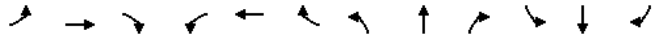
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	739	496	1	6	10
Future Volume (Veh/h)	10	739	496	1	6	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	803	539	1	7	11
Pedestrians					2	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	542				1366	542
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	542				1366	542
tC, single (s)	4.3				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.4				3.7	3.3
p0 queue free %	99				95	98
cM capacity (veh/h)	919				146	544

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	814	540	18
Volume Left	11	0	7
Volume Right	0	1	11
cSH	919	1700	264
Volume to Capacity	0.01	0.32	0.07
Queue Length 95th (m)	0.3	0.0	1.7
Control Delay (s)	0.3	0.0	19.6
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	19.6
Approach LOS			C

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		56.9%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

07-20-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	710	29	30	409	21	29	30	28	31	57	44
Future Volume (Veh/h)	10	710	29	30	409	21	29	30	28	31	57	44
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	772	32	33	445	23	32	33	30	34	62	48
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	469			804			1412	1345	788	1380	1350	458
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	469			804			1412	1345	788	1380	1350	458
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			96			53	77	92	58	56	92
cM capacity (veh/h)	982			829			68	142	394	81	141	599

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	815	501	95	144
Volume Left	11	33	32	34
Volume Right	32	23	30	48
cSH	982	829	122	154
Volume to Capacity	0.01	0.04	0.78	0.94
Queue Length 95th (m)	0.3	1.0	36.1	54.2
Control Delay (s)	0.3	1.1	98.0	114.8
Lane LOS	A	A	F	F
Approach Delay (s)	0.3	1.1	98.0	114.8
Approach LOS			F	F

Intersection Summary				
Average Delay		17.1		
Intersection Capacity Utilization		57.5%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road

07-20-2017

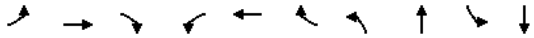
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	20	21	313	448	31
Future Volume (Veh/h)	21	20	21	313	448	31
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	23	22	23	340	487	34
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	894	508	525			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	894	508	525			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	96	98			
cM capacity (veh/h)	306	567	1049			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	45	23	340	521
Volume Left	23	23	0	0
Volume Right	22	0	0	34
cSH	395	1049	1700	1700
Volume to Capacity	0.11	0.02	0.20	0.31
Queue Length 95th (m)	3.1	0.5	0.0	0.0
Control Delay (s)	15.3	8.5	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	15.3	0.5		0.0
Approach LOS	C			

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			35.5%	ICU Level of Service
Analysis Period (min)			15	

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	220	586	37	27	551	95	17	31	148	365
v/c Ratio	0.57	0.59	0.04	0.08	0.55	0.11	0.13	0.07	0.50	0.69
Control Delay	18.0	12.4	2.5	8.2	11.6	3.0	18.4	13.4	24.7	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	12.4	2.5	8.2	11.6	3.0	18.4	13.4	24.7	15.4
Queue Length 50th (m)	12.5	33.7	0.0	1.1	30.6	0.4	1.4	1.9	13.7	13.6
Queue Length 95th (m)	#51.8	85.3	3.3	5.6	77.5	7.0	5.6	7.1	27.9	36.6
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	383	997	885	359	1006	846	280	855	610	866
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	0.57	0.59	0.04	0.08	0.55	0.11	0.06	0.04	0.24	0.42

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	202	539	34	25	507	87	16	21	7	136	64	271
Future Volume (vph)	202	539	34	25	507	87	16	21	7	136	64	271
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1614	1766		1631	1566	
Flt Permitted	0.38	1.00	1.00	0.35	1.00	1.00	0.34	1.00		0.74	1.00	
Satd. Flow (perm)	693	1801	1561	651	1818	1459	581	1766		1265	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	586	37	27	551	95	17	23	8	148	70	295
RTOR Reduction (vph)	0	0	16	0	0	38	0	6	0	0	165	0
Lane Group Flow (vph)	220	586	21	27	551	57	17	25	0	148	200	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	31.2	31.2	31.2	31.2	31.2	31.2	13.1	13.1		13.1	13.1	
Effective Green, g (s)	31.2	31.2	31.2	31.2	31.2	31.2	13.1	13.1		13.1	13.1	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56	0.56	0.23	0.23		0.23	0.23	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	384	999	866	361	1009	809	135	411		294	365	
v/s Ratio Prot		c0.33			0.30			0.01			c0.13	
v/s Ratio Perm	0.32		0.01	0.04		0.04	0.03			0.12		
v/c Ratio	0.57	0.59	0.02	0.07	0.55	0.07	0.13	0.06		0.50	0.55	
Uniform Delay, d1	8.2	8.2	5.6	5.8	8.0	5.8	17.0	16.8		18.7	18.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.1	2.5	0.1	0.4	2.1	0.2	0.4	0.1		1.4	1.7	
Delay (s)	14.2	10.8	5.7	6.2	10.1	6.0	17.4	16.8		20.1	20.6	
Level of Service	B	B	A	A	B	A	B	B		C	C	
Approach Delay (s)		11.5			9.4			17.0			20.5	
Approach LOS		B			A			B			C	

Intersection Summary				
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.57			
Actuated Cycle Length (s)	56.2	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	80.1%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	638	2	1	535	9	2	1	0	40	4	64
Future Volume (Veh/h)	32	638	2	1	535	9	2	1	0	40	4	64
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	35	693	2	1	582	10	2	1	0	43	4	70
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	592			695			1420	1358	694	1352	1354	587
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	592			695			1420	1358	694	1352	1354	587
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			98	99	100	65	97	86
cM capacity (veh/h)	941			910			95	144	446	124	145	513

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	35	695	1	592	2	1	43	74
Volume Left	35	0	1	0	2	0	43	0
Volume Right	0	2	0	10	0	0	0	70
cSH	941	1700	910	1700	95	144	124	451
Volume to Capacity	0.04	0.41	0.00	0.35	0.02	0.01	0.35	0.16
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.5	0.2	11.2	4.6
Control Delay (s)	9.0	0.0	9.0	0.0	43.9	30.1	48.7	14.5
Lane LOS	A		A		E	D	E	B
Approach Delay (s)	0.4		0.0		39.3		27.1	
Approach LOS					E		D	

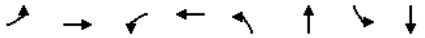
Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	49.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix H

2026 Total Traffic Operations Reports

Queues
1: Fruitland Road & Barton Street

08-16-2017



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	274	425	46	932	220	545	198	512
v/c Ratio	1.41	0.27	0.12	0.62	1.42	0.82	1.42	0.80
Control Delay	237.8	12.9	13.7	16.9	249.4	37.4	254.8	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	237.8	12.9	13.7	16.9	249.4	37.4	254.8	32.5
Queue Length 50th (m)	~67.6	20.8	4.4	55.1	~54.5	86.9	~49.1	70.5
Queue Length 95th (m)	#82.5	30.6	10.8	75.5	#99.3	#143.9	#91.9	#125.4
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	194	1567	378	1496	155	662	139	639
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	1.41	0.27	0.12	0.62	1.42	0.82	1.42	0.80

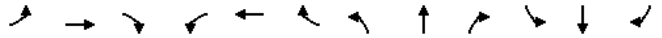
Intersection Summary

~ 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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-16-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	252	328	63	42	593	264	202	445	56	182	213	258
Future Volume (vph)	252	328	63	42	593	264	202	445	56	182	213	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.95		1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3170		1477	2944		1585	1756		1661	1578	
Flt Permitted	0.23	1.00		0.50	1.00		0.25	1.00		0.21	1.00	
Satd. Flow (perm)	399	3170		774	2944		414	1756		372	1578	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	274	357	68	46	645	287	220	484	61	198	232	280
RTOR Reduction (vph)	0	17	0	0	56	0	0	5	0	0	48	0
Lane Group Flow (vph)	274	408	0	46	876	0	220	540	0	198	464	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	44.0	44.0		44.0	44.0		33.7	33.7		33.7	33.7	
Effective Green, g (s)	44.0	44.0		44.0	44.0		33.7	33.7		33.7	33.7	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.37	0.37		0.37	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	195	1549		378	1439		155	657		139	590	
v/s Ratio Prot		0.13			0.30			0.31			0.29	
v/s Ratio Perm	c0.69			0.06			0.53			c0.53		
v/c Ratio	1.41	0.26		0.12	0.61		1.42	0.82		1.42	0.79	
Uniform Delay, d1	23.0	13.5		12.5	16.7		28.1	25.4		28.1	25.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	210.1	0.4		0.7	1.9		222.1	8.2		227.5	6.8	
Delay (s)	233.1	13.9		13.2	18.7		250.3	33.6		255.6	31.8	
Level of Service	F	B		B	B		F	C		F	C	
Approach Delay (s)		99.8			18.4			95.9			94.2	
Approach LOS		F			B			F			F	

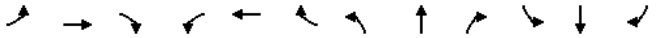
Intersection Summary

HCM 2000 Control Delay	72.3	HCM 2000 Level of Service		E	
HCM 2000 Volume to Capacity ratio	1.41				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	101.7%	ICU Level of Service		G	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

08-16-2017



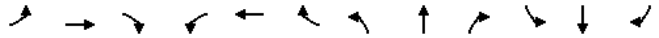
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	480	68	9	659	15	226	0	28	6	0	7
Future Volume (Veh/h)	7	480	68	9	659	15	226	0	28	6	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	522	74	10	716	16	246	0	30	7	0	8
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	733			596			1327	1328	559	1350	1357	725
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	733			596			1327	1328	559	1350	1357	725
tC, single (s)	4.4			4.1			7.1	6.5	6.2	7.3	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			99			0	100	94	94	100	98
cM capacity (veh/h)	746			990			129	153	532	108	147	401

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	604	742	276	15
Volume Left	8	10	246	7
Volume Right	74	16	30	8
cSH	746	990	140	177
Volume to Capacity	0.01	0.01	1.97	0.08
Queue Length 95th (m)	0.3	0.2	173.7	2.2
Control Delay (s)	0.3	0.3	512.1	27.2
Lane LOS	A	A	F	D
Approach Delay (s)	0.3	0.3	512.1	27.2
Approach LOS			F	D

Intersection Summary					
Average Delay	86.8				
Intersection Capacity Utilization	68.4%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

08-16-2017



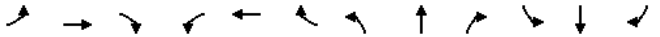
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	426	34	48	576	74	77	79	45	21	24	30
Future Volume (Veh/h)	42	426	34	48	576	74	77	79	45	21	24	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	463	37	52	626	80	84	86	49	23	26	33
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	706			502			1392	1386	484	1436	1364	666
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	706			502			1392	1386	484	1436	1364	666
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	95			95			3	33	92	46	80	92
cM capacity (veh/h)	902			966			87	128	586	43	130	409

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	546	758	219	82
Volume Left	46	52	84	23
Volume Right	37	80	49	33
cSH	902	966	127	100
Volume to Capacity	0.05	0.05	1.73	0.82
Queue Length 95th (m)	1.3	1.4	132.0	36.3
Control Delay (s)	1.4	1.4	417.9	122.7
Lane LOS	A	A	F	F
Approach Delay (s)	1.4	1.4	417.9	122.7
Approach LOS			F	F

Intersection Summary					
Average Delay	64.4				
Intersection Capacity Utilization	70.4%	ICU Level of Service		C	
Analysis Period (min)	15				

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

08-16-2017



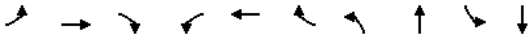
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	7	22	28	6	231	11	410	8	76	219	8
Future Volume (Veh/h)	23	7	22	28	6	231	11	410	8	76	219	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	8	24	30	7	251	12	446	9	83	238	9
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1137	892	246	906	892	450	251			455		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1137	892	246	906	892	450	251			455		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	74	97	97	87	97	59	99			93		
cM capacity (veh/h)	97	259	795	229	259	613	1322			1116		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	57	288	12	455	83	247
Volume Left	25	30	12	0	83	0
Volume Right	24	251	0	9	0	9
cSH	179	508	1322	1700	1116	1700
Volume to Capacity	0.32	0.57	0.01	0.27	0.07	0.15
Queue Length 95th (m)	10.3	27.9	0.2	0.0	1.9	0.0
Control Delay (s)	34.2	21.0	7.7	0.0	8.5	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	34.2	21.0	0.2		2.1	
Approach LOS	D	C				

Intersection Summary					
Average Delay	7.7				
Intersection Capacity Utilization	52.8%	ICU Level of Service		A	
Analysis Period (min)	15				

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	227	472	17	10	714	112	27	79	85	211
v/c Ratio	0.76	0.45	0.02	0.02	0.69	0.14	0.13	0.22	0.37	0.55
Control Delay	31.3	8.6	0.6	5.7	13.2	3.0	19.0	17.1	23.4	13.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.3	8.6	0.6	5.7	13.2	3.0	19.0	17.1	23.4	13.9
Queue Length 50th (m)	14.7	22.8	0.0	0.4	42.8	1.2	2.3	5.6	7.5	7.1
Queue Length 95th (m)	#58.1	49.8	0.7	2.2	#97.2	7.4	7.7	14.8	18.0	23.0
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	298	1048	825	499	1038	814	498	850	564	762
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	0.76	0.45	0.02	0.02	0.69	0.14	0.05	0.09	0.15	0.28

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	434	16	9	657	103	25	61	12	78	12	182
Future Volume (vph)	209	434	16	9	657	103	25	61	12	78	12	182
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.86	
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)	1677	1766	1358	1745	1749	1317	1582	1762		1586	1452	
Flt Permitted	0.29	1.00	1.00	0.46	1.00	1.00	0.63	1.00		0.71	1.00	
Satd. Flow (perm)	503	1766	1358	841	1749	1317	1042	1762		1178	1452	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	227	472	17	10	714	112	27	66	13	85	13	198
RTOR Reduction (vph)	0	0	7	0	0	32	0	10	0	0	105	0
Lane Group Flow (vph)	227	472	10	10	714	80	27	69	0	85	106	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	33.8	33.8	33.8	33.8	33.8	33.8	11.1	11.1		11.1	11.1	
Effective Green, g (s)	33.8	33.8	33.8	33.8	33.8	33.8	11.1	11.1		11.1	11.1	
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.60	0.60	0.20	0.20		0.20	0.20	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	299	1050	808	500	1040	783	203	344		230	283	
v/s Ratio Prot		0.27			0.41			0.04			c0.07	
v/s Ratio Perm	c0.45		0.01	0.01		0.06	0.03			0.07		
v/c Ratio	0.76	0.45	0.01	0.02	0.69	0.10	0.13	0.20		0.37	0.38	
Uniform Delay, d1	8.5	6.4	4.7	4.7	7.9	5.0	18.9	19.1		19.8	19.8	
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	16.5	1.4	0.0	0.1	3.7	0.3	0.3	0.3		1.0	0.8	
Delay (s)	25.0	7.7	4.7	4.8	11.6	5.2	19.2	19.4		20.8	20.7	
Level of Service	C	A	A	A	B	A	B	B		C	C	
Approach Delay (s)		13.1			10.6			19.4			20.7	
Approach LOS		B			B			B			C	

Intersection Summary				
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.66			
Actuated Cycle Length (s)	56.8	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	86.8%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

08-16-2017

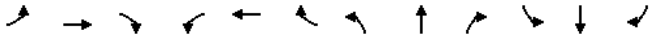
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	61	417	2	0	509	69	5	4	1	38	0	48
Future Volume (Veh/h)	61	417	2	0	509	69	5	4	1	38	0	48
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	453	2	0	553	75	5	4	1	41	0	52
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	629			455			1191	1215	454	1180	1178	592
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	629			455			1191	1215	454	1180	1178	592
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	93			100			96	98	100	73	100	89
cM capacity (veh/h)	911			1116			139	169	610	150	178	456

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	66	455	0	628	5	5	41	52
Volume Left	66	0	0	0	5	0	41	0
Volume Right	0	2	0	75	0	1	0	52
cSH	911	1700	1700	1700	139	198	150	456
Volume to Capacity	0.07	0.27	0.00	0.37	0.04	0.03	0.27	0.11
Queue Length 95th (m)	1.9	0.0	0.0	0.0	0.9	0.6	8.4	3.1
Control Delay (s)	9.3	0.0	0.0	0.0	31.9	23.6	37.6	13.9
Lane LOS	A				D	C	E	B
Approach Delay (s)	1.2		0.0		27.8		24.4	
Approach LOS					D		C	

Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	53.1%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
7: Gordon Dean Avenue & Collector Road B

08-16-2017

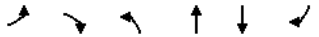


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	49	29	74	88	98	10	54	25	43	54	0
Future Volume (veh/h)	0	49	29	74	88	98	10	54	25	43	54	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	53	32	80	96	107	11	59	27	47	59	0
Approach Volume (veh/h)		85			283			97			106	
Crossing Volume (veh/h)		186			70			100			187	
High Capacity (veh/h)		1197			1311			1281			1196	
High v/c (veh/h)		0.07			0.22			0.08			0.09	
Low Capacity (veh/h)		991			1094			1067			990	
Low v/c (veh/h)		0.09			0.26			0.09			0.11	

Intersection Summary				
Maximum v/c High	0.22			
Maximum v/c Low	0.26			
Intersection Capacity Utilization	39.9%	ICU Level of Service	A	

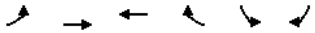
HCM Unsignalized Intersection Capacity Analysis
8: Jones Road & Collector Road B

08-16-2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	29	58	34	124	106	17
Future Volume (veh/h)	29	58	34	124	106	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	63	37	135	115	18
Approach Volume (veh/h)	95			172	133	
Crossing Volume (veh/h)	115			32	37	
High Capacity (veh/h)	1266			1351	1345	
High v/c (veh/h)	0.08			0.13	0.10	
Low Capacity (veh/h)	1053			1130	1125	
Low v/c (veh/h)	0.09			0.15	0.12	

Intersection Summary				
Maximum v/c High	0.13			
Maximum v/c Low	0.15			
Intersection Capacity Utilization	30.2%	ICU Level of Service	A	



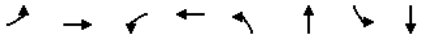
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	56	468	580	13	34	189
Future Volume (Veh/h)	56	468	580	13	34	189
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	509	630	14	37	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		346				
pX, platoon unblocked					0.90	
vC, conflicting volume	644				1268	637
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644				1242	637
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				77	57
cM capacity (veh/h)	951				164	481

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	570	644	242
Volume Left	61	0	37
Volume Right	0	14	205
cSH	951	1700	371
Volume to Capacity	0.06	0.38	0.65
Queue Length 95th (m)	1.6	0.0	35.3
Control Delay (s)	1.7	0.0	31.2
Lane LOS	A		D
Approach Delay (s)	1.7	0.0	31.2
Approach LOS			D

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		

Queues
1: Fruitland Road & Barton Street

08-16-2017



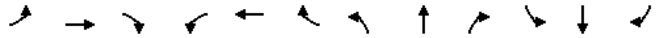
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	318	977	103	682	133	429	339	783
v/c Ratio	1.27	0.67	0.74	0.47	1.75	0.57	1.22	1.05
Control Delay	176.6	21.7	55.8	16.7	409.7	22.3	155.6	74.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	176.6	21.7	55.8	16.7	409.7	22.3	155.6	74.5
Queue Length 50th (m)	~73.6	67.7	15.1	38.5	~36.2	54.9	~76.6	~154.7
Queue Length 95th (m)	#125.7	90.1	#45.1	54.1	#60.2	85.3	#129.8	#226.7
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	250	1453	139	1445	76	748	277	743
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	1.27	0.67	0.74	0.47	1.75	0.57	1.22	1.05

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-16-2017

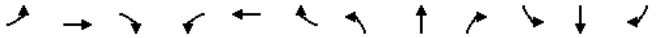


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	293	669	230	95	440	188	122	317	77	312	527	193
Future Volume (vph)	293	669	230	95	440	188	122	317	77	312	527	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		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	
Frt	1.00	0.96		1.00	0.96		1.00	0.97		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)	1693	3264		1661	3215		1646	1717		1600	1694	
Flt Permitted	0.32	1.00		0.18	1.00		0.10	1.00		0.38	1.00	
Satd. Flow (perm)	579	3264		323	3215		179	1717		646	1694	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	318	727	250	103	478	204	133	345	84	339	573	210
RTOR Reduction (vph)	0	38	0	0	53	0	0	10	0	0	15	0
Lane Group Flow (vph)	318	939	0	103	629	0	133	419	0	339	768	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Effective Green, g (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	250	1414		139	1393		76	738		277	728	
v/s Ratio Prot		0.29			0.20			0.24			0.45	
v/s Ratio Perm	c0.55			0.32			c0.74			0.52		
v/c Ratio	1.27	0.66		0.74	0.45		1.75	0.57		1.22	1.06	
Uniform Delay, d1	25.5	20.3		21.3	18.0		25.6	19.3		25.6	25.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	149.9	2.5		29.6	1.1		385.8	1.0		128.6	48.9	
Delay (s)	175.4	22.8		50.8	19.0		411.5	20.4		154.2	74.5	
Level of Service	F	C		D	B		F	C		F	E	
Approach Delay (s)		60.2			23.2			112.9			98.6	
Approach LOS		E			C			F			F	

Intersection Summary					
HCM 2000 Control Delay	71.8	HCM 2000 Level of Service		E	
HCM 2000 Volume to Capacity ratio	1.50				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	115.2%	ICU Level of Service		H	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 08-16-2017

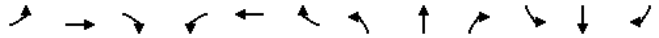


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	804	235	27	535	1	136	0	16	6	0	10
Future Volume (Veh/h)	10	804	235	27	535	1	136	0	16	6	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	874	255	29	582	1	148	0	17	7	0	11
Pedestrians											2	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	585			1129			1675	1666	1002	1683	1794	584
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	585			1129			1675	1666	1002	1683	1794	584
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			95			0	100	94	88	100	98
cM capacity (veh/h)	885			626			72	92	297	61	77	514

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1140	612	165	18
Volume Left	11	29	148	7
Volume Right	255	1	17	11
cSH	885	626	78	132
Volume to Capacity	0.01	0.05	2.13	0.14
Queue Length 95th (m)	0.3	1.2	120.3	3.7
Control Delay (s)	0.4	1.3	634.2	36.6
Lane LOS	A	A	F	E
Approach Delay (s)	0.4	1.3	634.2	36.6
Approach LOS			F	E

Intersection Summary				
Average Delay			55.1	
Intersection Capacity Utilization			81.8%	ICU Level of Service D
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street 08-16-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	734	81	54	442	21	55	30	44	31	57	44
Future Volume (Veh/h)	10	734	81	54	442	21	55	30	44	31	57	44
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	798	88	59	480	23	60	33	48	34	62	48
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	504			886			1554	1486	842	1539	1518	494
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	504			886			1554	1486	842	1539	1518	494
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			92			0	71	87	37	42	92
cM capacity (veh/h)	952			773			43	112	367	54	107	573

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	897	562	141	144
Volume Left	11	59	60	34
Volume Right	88	23	48	48
cSH	952	773	78	111
Volume to Capacity	0.01	0.08	1.81	1.29
Queue Length 95th (m)	0.3	2.0	97.6	77.3
Control Delay (s)	0.3	2.0	497.9	255.2
Lane LOS	A	A	F	F
Approach Delay (s)	0.3	2.0	497.9	255.2
Approach LOS			F	F

Intersection Summary				
Average Delay			62.2	
Intersection Capacity Utilization			78.3%	ICU Level of Service D
Analysis Period (min)			15	

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

08-16-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	7	20	16	7	144	21	352	28	242	489	35
Future Volume (Veh/h)	25	7	20	16	7	144	21	352	28	242	489	35
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	27	8	22	17	8	157	23	383	30	263	532	38
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1671	1540	555	1528	1544	398	574			413		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1671	1540	555	1528	1544	398	574			413		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	39	91	96	76	91	76	98			77		
cM capacity (veh/h)	44	88	534	70	87	656	1006			1157		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	57	182	23	413	263	570
Volume Left	27	17	23	0	263	0
Volume Right	22	157	0	30	0	38
cSH	77	318	1006	1700	1157	1700
Volume to Capacity	0.74	0.57	0.02	0.24	0.23	0.34
Queue Length 95th (m)	28.5	26.9	0.6	0.0	7.0	0.0
Control Delay (s)	132.5	30.5	8.7	0.0	9.0	0.0
Lane LOS	F	D	A		A	
Approach Delay (s)	132.5	30.5	0.5		2.8	
Approach LOS	F	D				

Intersection Summary					
Average Delay		10.4			
Intersection Capacity Utilization		53.9%	ICU Level of Service		A
Analysis Period (min)		15			

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	273	825	37	27	684	105	17	35	159	401
v/c Ratio	1.13	0.88	0.04	0.19	0.72	0.13	0.11	0.07	0.46	0.75
Control Delay	121.5	28.4	3.1	14.8	18.9	4.7	16.6	12.4	21.7	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	121.5	28.4	3.1	14.8	18.9	4.7	16.6	12.4	21.7	21.4
Queue Length 50th (m)	~36.4	72.5	0.0	1.4	52.2	1.4	1.4	2.3	14.9	26.0
Queue Length 95th (m)	#93.2	#189.7	3.8	8.2	#143.5	10.2	5.4	7.5	29.1	52.9
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	241	941	839	141	950	799	252	812	573	790
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	1.13	0.88	0.04	0.19	0.72	0.13	0.07	0.04	0.28	0.51

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.

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	251	759	34	25	629	97	16	25	7	146	68	301
Future Volume (vph)	251	759	34	25	629	97	16	25	7	146	68	301
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1614	1774		1631	1564	
Flt Permitted	0.25	1.00	1.00	0.15	1.00	1.00	0.33	1.00		0.73	1.00	
Satd. Flow (perm)	462	1801	1561	270	1818	1459	555	1774		1260	1564	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	273	825	37	27	684	105	17	27	8	159	74	327
RTOR Reduction (vph)	0	0	18	0	0	36	0	6	0	0	103	0
Lane Group Flow (vph)	273	825	19	27	684	69	17	29	0	159	298	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	31.3	31.3	31.3	31.3	31.3	31.3	16.6	16.6		16.6	16.6	
Effective Green, g (s)	31.3	31.3	31.3	31.3	31.3	31.3	16.6	16.6		16.6	16.6	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52	0.52	0.28	0.28		0.28	0.28	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	241	942	817	141	951	763	154	492		349	434	
v/s Ratio Prot		0.46			0.38			0.02			c0.19	
v/s Ratio Perm	c0.59		0.01	0.10		0.05	0.03			0.13		
v/c Ratio	1.13	0.88	0.02	0.19	0.72	0.09	0.11	0.06		0.46	0.69	
Uniform Delay, d1	14.2	12.5	6.9	7.5	10.9	7.1	16.1	15.9		17.9	19.3	
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	98.4	11.2	0.1	3.0	4.7	0.2	0.3	0.1		0.9	4.5	
Delay (s)	112.7	23.8	6.9	10.5	15.6	7.4	16.4	15.9		18.8	23.7	
Level of Service	F	C	A	B	B	A	B	B		B	C	
Approach Delay (s)		44.6			14.3			16.1			22.3	
Approach LOS		D			B			B			C	

Intersection Summary				
HCM 2000 Control Delay	29.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.98			
Actuated Cycle Length (s)	59.8	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	93.7%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

08-16-2017

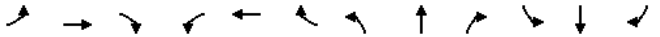
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	664	2	1	572	25	2	1	0	49	4	77
Future Volume (Veh/h)	60	664	2	1	572	25	2	1	0	49	4	77
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	722	2	1	622	27	2	1	0	53	4	84
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	649			724			1563	1504	723	1490	1492	636
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	649			724			1563	1504	723	1490	1492	636
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			100			97	99	100	45	97	83
cM capacity (veh/h)	895			888			70	114	430	97	116	482

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	65	724	1	649	2	1	53	88
Volume Left	65	0	1	0	2	0	53	0
Volume Right	0	2	0	27	0	0	0	84
cSH	895	1700	888	1700	70	114	97	421
Volume to Capacity	0.07	0.43	0.00	0.38	0.03	0.01	0.55	0.21
Queue Length 95th (m)	1.9	0.0	0.0	0.0	0.7	0.2	20.0	6.2
Control Delay (s)	9.3	0.0	9.1	0.0	58.3	37.0	80.3	15.8
Lane LOS	A		A		F	E	F	C
Approach Delay (s)	0.8		0.0		51.2		40.1	
Approach LOS					F		E	

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	57.8%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
7: Gordon Dean Avenue & Collector Road B

08-16-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	91	20	38	69	68	32	67	67	99	67	0
Future Volume (veh/h)	0	91	20	38	69	68	32	67	67	99	67	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	99	22	41	75	74	35	73	73	108	73	0
Approach Volume (veh/h)		121			190			181			181	
Crossing Volume (veh/h)		222			108			207			151	
High Capacity (veh/h)		1164			1273			1178			1231	
High v/c (veh/h)		0.10			0.15			0.15			0.15	
Low Capacity (veh/h)		961			1059			973			1021	
Low v/c (veh/h)		0.13			0.18			0.19			0.18	

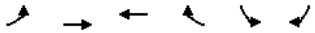
Intersection Summary				
Maximum v/c High	0.15			
Maximum v/c Low	0.19			
Intersection Capacity Utilization	45.0%	ICU Level of Service	A	

HCM Unsignalized Intersection Capacity Analysis
8: Jones Road & Collector Road B

08-16-2017

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	10	72	81	101	132	14
Future Volume (veh/h)	10	72	81	101	132	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	78	88	110	143	15
Approach Volume (veh/h)	89			198	158	
Crossing Volume (veh/h)	143			11	88	
High Capacity (veh/h)	1238			1373	1293	
High v/c (veh/h)	0.07			0.14	0.12	
Low Capacity (veh/h)	1028			1151	1078	
Low v/c (veh/h)	0.09			0.17	0.15	

Intersection Summary				
Maximum v/c High	0.14			
Maximum v/c Low	0.17			
Intersection Capacity Utilization	32.6%	ICU Level of Service	A	



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	186	726	648	39	27	103
Future Volume (Veh/h)	186	726	648	39	27	103
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	202	789	704	42	29	112
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		370				
pX, platoon unblocked					0.55	
vC, conflicting volume	746				1918	725
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	746				2255	725
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	77				0	74
cM capacity (veh/h)	871				20	428

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	991	746	141
Volume Left	202	0	29
Volume Right	0	42	112
cSH	871	1700	81
Volume to Capacity	0.23	0.44	1.74
Queue Length 95th (m)	7.2	0.0	95.4
Control Delay (s)	5.7	0.0	466.1
Lane LOS	A		F
Approach Delay (s)	5.7	0.0	466.1
Approach LOS			F

Intersection Summary			
Average Delay	38.0		
Intersection Capacity Utilization	102.8%	ICU Level of Service	G
Analysis Period (min)	15		

Appendix I

2026 Signal Justification Warrant Worksheets

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2026
Region/City/Township: Hamilton

Major Street: Barton Street
Minor Street: Sunnyhurst Ave/Gordon Dean Ave
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Barton Street						Sunnyhurst Ave/Gordon Dean Ave						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	7	480	68	9	659	15	226	0	28	6	0	7	
PM Peak Hour	10	804	235	27	535	1	136	0	16	6	0	10	
Average Hourly Volume	4	321	76	9	299	4	91	0	11	3	0	4	0

Warrant	AHV
1A - All	821
1B - Minor	109
2A - Major	713
2B - Cross	94

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	821
					% Fulfilled	114.1%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	109
					% Fulfilled	64.0%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	713
					% Fulfilled	99.0%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	94
					% Fulfilled	124.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2026
Region/City/Township: Hamilton

Major Street: Barton Street
Minor Street: Jones Road
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Barton Street						Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	42	426	34	48	576	74	77	79	45	21	24	30	
PM Peak Hour	10	734	81	54	442	21	55	30	44	31	57	44	
Average Hourly Volume	13	290	29	26	255	24	33	27	22	13	20	19	0

Warrant	AHV
1A - All	770
1B - Minor	134
2A - Major	636
2B - Cross	73

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	770
					% Fulfilled	106.9%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	134
					% Fulfilled	79.0%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	636
					% Fulfilled	88.3%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	73
					% Fulfilled	97.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2021
Region/City/Township: Hamilton

Major Street: Fruitland Road
Minor Street: Sherwood Park Road/Collector B
North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Fruitland Road						Sherwood Park Road/Collector B						
	Northbound			Southbound			Eastbound			Westbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	11	410	8	76	219	8	23	7	22	28	6	231	
PM Peak Hour	21	352	28	242	489	35	25	7	20	16	7	144	
Average Hourly Volume	8	191	9	80	177	11	12	4	11	11	3	94	0

Warrant	AHV
1A - All	609
1B - Minor	134
2A - Major	475
2B - Cross	27

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	609
					% Fulfilled	84.5%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	134
					% Fulfilled	78.8%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	475
					% Fulfilled	65.9%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	27
					% Fulfilled	35.3%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2021
Region/City/Township: Hamilton

Major Street: Highway No. 8
Minor Street: Gordon Dean Avenue
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? Y
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Highway No. 8						Gordon Dean Avenue						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	56	468			580	13				34		189	
PM Peak Hour	186	726			648	39				27		103	
Average Hourly Volume	61	299	0	0	307	13	0	0	0	15	0	73	0

Warrant	AHV
1A - All	767
1B - Minor	88
2A - Major	679
2B - Cross	15

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	767
					% Fulfilled	106.6%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	180	255	180	255	88
					% Fulfilled	34.6%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	679
					% Fulfilled	94.3%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	15
					% Fulfilled	20.3%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2021
Region/City/Township: Hamilton

Major Street: Highway No. 8
Minor Street: Jones Road
North/South?: N

Number of Approach Lanes: 2 or more
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Highway No. 8						Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	61	417	2	0	509	69	5	4	1	38	0	48	
PM Peak Hour	60	664	2	1	572	25	2	1	0	49	4	77	
Average Hourly Volume	30	270	1	0	270	24	2	1	0	22	1	31	0

Warrant	AHV
1A - All	653
1B - Minor	57
2A - Major	596
2B - Cross	25

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
					X	
	All Approaches	480	720	600	900	653
					% Fulfilled	72.5%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
					X	
	Minor Street Approaches	120	170	120	170	57
					% Fulfilled	33.7%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
					X	
	Major Street Approaches	480	720	600	900	596
					% Fulfilled	66.2%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
					X	
	Traffic Crossing Major Street	50	75	50	75	25
					% Fulfilled	33.0%

Appendix J

2026 Roundabout Traffic Operations Reports

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Barton & Sunnyhurt-GDA 2-Lane.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 2:28:48 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.02	~1	5.46	0.02	A	3.65	A
Leg West	0.48	1.00	2.81	0.32	A		
Leg South	0.37	~1	4.78	0.27	A		
Leg East	0.81	1.00	3.89	0.45	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 2:28:48 PM

File summary

Title	Barton & Sunnyhurst/Gordon Dean Ave
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			3.65	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Sunnyhurst Ave SB	
West	West	Barton Street EB	
South	South	Gordon Dean Avenue NB	
East	East	Barton Street WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	55.00	25.00	
West	3.50	8.00	30.00	20.00	55.00	25.00	
South	3.50	4.50	30.00	20.00	55.00	25.00	
East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.527	1357.445
West		(calculated)	(calculated)	0.647	2016.168
South		(calculated)	(calculated)	0.527	1357.445
East		(calculated)	(calculated)	0.647	2016.168

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	13.00	100.000
West	ONE HOUR	✓	555.00	100.000
South	ONE HOUR	✓	254.00	100.000
East	ONE HOUR	✓	683.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	7.000	0.000	6.000
	West	7.000	0.000	68.000	480.000
	South	0.000	226.000	0.000	28.000
	East	15.000	659.000	9.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.54	0.00	0.46
	West	0.01	0.00	0.12	0.86
From	South	0.00	0.89	0.00	0.11
	East	0.02	0.96	0.01	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.170	1.020	1.200
	West	1.330	1.000	1.020	1.060
	South	1.020	1.020	1.000	1.020
	East	1.180	1.100	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	17.0	2.0	20.0
	West	33.0	0.0	2.0	6.0
	South	2.0	2.0	0.0	2.0
	East	18.0	10.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.02	5.46	0.02	~1	A
West	0.32	2.81	0.48	1.00	A
South	0.27	4.78	0.37	~1	A
East	0.45	3.89	0.81	1.00	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	9.79	9.74	670.67	0.00	824.58	0.012	0.01	4.417	A
West	417.83	416.71	11.25	0.00	1897.24	0.220	0.28	2.431	A
South	191.22	190.41	370.15	0.00	1127.11	0.170	0.20	3.840	A
East	514.20	512.51	174.68	0.00	1726.10	0.298	0.42	2.962	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	11.69	11.67	802.94	0.00	761.08	0.015	0.02	4.803	A
West	498.94	498.64	13.47	0.00	1895.75	0.263	0.36	2.576	A
South	228.34	228.10	442.93	0.00	1087.05	0.210	0.26	4.190	A
East	614.00	613.46	209.24	0.00	1705.20	0.360	0.56	3.295	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	14.31	14.29	982.98	0.00	674.63	0.021	0.02	5.451	A
West	611.07	610.60	16.49	0.00	1893.74	0.323	0.47	2.806	A
South	279.66	279.24	542.37	0.00	1032.32	0.271	0.37	4.778	A
East	752.00	751.01	256.16	0.00	1676.83	0.448	0.81	3.884	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	14.31	14.31	984.30	0.00	673.99	0.021	0.02	5.456	A
West	611.07	611.06	16.51	0.00	1893.72	0.323	0.48	2.806	A
South	279.66	279.65	542.80	0.00	1032.08	0.271	0.37	4.784	A
East	752.00	751.99	256.53	0.00	1676.60	0.449	0.81	3.893	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	11.69	11.71	805.01	0.00	760.08	0.015	0.02	4.812	A
West	498.94	499.40	13.51	0.00	1895.73	0.263	0.36	2.578	A
South	228.34	228.75	443.62	0.00	1086.67	0.210	0.27	4.197	A
East	614.00	614.98	209.83	0.00	1704.84	0.360	0.57	3.307	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	9.79	9.80	673.82	0.00	823.08	0.012	0.01	4.426	A
West	417.83	418.14	11.31	0.00	1897.20	0.220	0.28	2.434	A
South	191.22	191.47	371.43	0.00	1126.40	0.170	0.21	3.851	A
East	514.20	514.76	175.64	0.00	1725.52	0.298	0.43	2.974	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.20	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.42	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.26	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A

						small or very big.			
East	0.56	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.37	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.81	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.48	0.00	0.00	0.00	1.00			N/A	N/A
South	0.37	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.81	0.00	0.00	0.00	1.00			N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.27	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.57	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.43	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Barton & Sunnyhurt-GDA 2-Lane.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 2:28:27 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.02	~1	4.22	0.02	A	4.51	A
Leg West	1.65	2.00	5.17	0.62	A		
Leg South	0.25	~1	5.50	0.20	A		
Leg East	0.52	1.00	3.00	0.34	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 2:28:26 PM

File summary

Title	Barton & Sunnyhurst/Gordon Dean Ave
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			4.51	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Sunnyhurst Ave SB	
West	West	Barton Street EB	
South	South	Gordon Dean Avenue NB	
East	East	Barton Street WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	55.00	25.00	
West	3.50	8.00	30.00	20.00	55.00	25.00	
South	3.50	4.50	30.00	20.00	55.00	25.00	
East	3.50	8.00	30.00	20.00	55.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.527	1357.445
West		(calculated)	(calculated)	0.647	2016.168
South		(calculated)	(calculated)	0.527	1357.445
East		(calculated)	(calculated)	0.647	2016.168

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	16.00	100.000
West	ONE HOUR	✓	1049.00	100.000
South	ONE HOUR	✓	152.00	100.000
East	ONE HOUR	✓	563.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	10.000	0.000	6.000
	West	10.000	0.000	235.000	804.000
	South	0.000	136.000	0.000	16.000
	East	1.000	535.000	27.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.63	0.00	0.38
From	West	0.01	0.00	0.22	0.77
	South	0.00	0.89	0.00	0.11
	East	0.00	0.95	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.020	1.200
	West	1.250	1.000	1.020	1.090
	South	1.020	1.020	1.000	1.020
	East	1.000	1.050	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	2.0	20.0
	West	25.0	0.0	2.0	9.0
	South	2.0	2.0	0.0	2.0
	East	0.0	5.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.02	4.22	0.02	~1	A
West	0.62	5.17	1.65	2.00	A
South	0.20	5.50	0.25	~1	A
East	0.34	3.00	0.52	1.00	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	12.05	12.00	523.84	0.00	994.96	0.012	0.01	3.661	A
West	789.74	786.81	24.77	0.00	1858.37	0.425	0.73	3.352	A
South	114.43	113.91	615.04	0.00	983.67	0.116	0.13	4.136	A
East	423.86	422.67	109.42	0.00	1853.07	0.229	0.30	2.514	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	14.38	14.37	627.00	0.00	942.23	0.015	0.02	3.879	A
West	943.03	941.87	29.65	0.00	1855.28	0.508	1.02	3.936	A
South	136.64	136.47	736.25	0.00	915.26	0.149	0.17	4.621	A
East	506.13	505.80	131.08	0.00	1839.23	0.275	0.38	2.699	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	17.62	17.60	767.69	0.00	870.32	0.020	0.02	4.221	A
West	1154.97	1152.53	36.30	0.00	1851.07	0.624	1.63	5.137	A
South	167.36	167.04	900.93	0.00	822.30	0.204	0.25	5.491	A
East	619.88	619.33	160.44	0.00	1820.48	0.341	0.51	2.995	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	17.62	17.62	768.51	0.00	869.90	0.020	0.02	4.223	A
West	1154.97	1154.93	36.33	0.00	1851.05	0.624	1.65	5.171	A
South	167.36	167.35	902.80	0.00	821.25	0.204	0.25	5.504	A
East	619.88	619.87	160.74	0.00	1820.29	0.341	0.52	2.998	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	14.38	14.40	628.30	0.00	941.57	0.015	0.02	3.882	A
West	943.03	945.45	29.70	0.00	1855.25	0.508	1.04	3.967	A
South	136.64	136.96	739.04	0.00	913.68	0.150	0.18	4.636	A
East	506.13	506.66	131.55	0.00	1838.93	0.275	0.38	2.702	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	12.05	12.06	525.98	0.00	993.87	0.012	0.01	3.665	A
West	789.74	790.94	24.86	0.00	1858.31	0.425	0.74	3.378	A
South	114.43	114.61	618.27	0.00	981.85	0.117	0.13	4.153	A
East	423.86	424.19	110.09	0.00	1852.65	0.229	0.30	2.522	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.73	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.30	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.02	0.00	0.00	1.00	2.00			N/A	N/A
South	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This			

East	0.38	~1	~1	~1	~1	may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.63	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.51	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.65	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.52	0.00	0.00	0.00	1.00			N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.02	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.04	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.74	0.00	0.00	0.00	1.00			N/A	N/A
South	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.30	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Barton & Jones.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 1:49:29 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.12	~1	5.41	0.11	A	7.56	A
Leg West	0.84	1.00	5.49	0.46	A		
Leg South	0.28	~1	4.56	0.22	A		
Leg East	2.12	3.00	10.07	0.68	B		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 1:49:28 PM

File summary

Title	Barton & Jones
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			7.56	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Barton Street EB	
South	South	Jones Road NB	
East	East	Barton Street WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	75.00	100.000
West	ONE HOUR	✓	502.00	100.000
South	ONE HOUR	✓	201.00	100.000
East	ONE HOUR	✓	698.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	30.000	24.000	21.000
	West	42.000	0.000	34.000	426.000
	South	79.000	77.000	0.000	45.000
	East	74.000	576.000	48.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.40	0.32	0.28
	West	0.08	0.00	0.07	0.85
From	South	0.39	0.38	0.00	0.22
	East	0.11	0.83	0.07	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.330	1.050	1.060
	West	1.000	1.000	1.000	1.080
	South	1.030	1.000	1.000	1.000
	East	1.030	1.090	1.220	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	33.0	5.0	6.0
	West	0.0	0.0	0.0	8.0
	South	3.0	0.0	0.0	0.0
	East	3.0	9.0	22.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.11	5.41	0.12	~1	A
West	0.46	5.49	0.84	1.00	A
South	0.22	4.56	0.28	~1	A
East	0.68	10.07	2.12	3.00	B

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	56.46	56.19	524.59	0.00	881.53	0.064	0.07	4.361	A
West	377.93	376.17	69.63	0.00	1228.13	0.308	0.44	4.217	A
South	151.32	150.70	366.42	0.00	1116.88	0.135	0.16	3.724	A
East	525.49	522.23	148.43	0.00	1162.85	0.452	0.82	5.592	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	67.42	67.34	628.78	0.00	825.16	0.082	0.09	4.750	A
West	451.29	450.72	83.45	0.00	1219.59	0.370	0.58	4.679	A
South	180.70	180.51	439.05	0.00	1072.33	0.169	0.20	4.035	A
East	627.49	626.00	177.81	0.00	1147.11	0.547	1.19	6.889	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	82.58	82.44	768.51	0.00	749.56	0.110	0.12	5.394	A
West	552.71	551.71	102.07	0.00	1208.09	0.458	0.83	5.477	A
South	221.31	221.00	537.42	0.00	1012.00	0.219	0.28	4.548	A
East	768.51	764.94	217.68	0.00	1125.73	0.683	2.08	9.878	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	82.58	82.57	771.69	0.00	747.82	0.110	0.12	5.410	A
West	552.71	552.69	102.38	0.00	1207.89	0.458	0.84	5.494	A
South	221.31	221.30	538.38	0.00	1011.41	0.219	0.28	4.555	A
East	768.51	768.38	218.00	0.00	1125.56	0.683	2.12	10.068	B

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	67.42	67.56	633.48	0.00	822.60	0.082	0.09	4.770	A
West	451.29	452.27	83.93	0.00	1219.28	0.370	0.59	4.699	A
South	180.70	181.00	440.56	0.00	1071.41	0.169	0.20	4.044	A
East	627.49	631.04	178.31	0.00	1146.84	0.547	1.23	7.028	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	56.46	56.55	529.23	0.00	879.02	0.064	0.07	4.378	A
West	377.93	378.51	70.17	0.00	1227.79	0.308	0.45	4.241	A
South	151.32	151.51	368.71	0.00	1115.48	0.136	0.16	3.734	A
East	525.49	527.07	149.26	0.00	1162.41	0.452	0.83	5.679	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.82	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.58	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.20	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A

						small or very big.			
East	1.19	0.00	0.00	2.00	3.00			N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.83	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	2.08	0.00	0.00	0.00	3.00			N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.84	0.00	0.00	0.00	1.00			N/A	N/A
South	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	2.12	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.59	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.20	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	1.23	0.00	0.00	2.00	3.00			N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.83	0.00	0.00	1.00	2.00			N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Barton & Jones.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 1:49:46 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.19	~1	4.62	0.16	A	10.26	B
Leg West	3.61	11.00	14.72	0.79	B		
Leg South	0.21	~1	5.44	0.18	A		
Leg East	0.86	1.00	5.50	0.47	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 1:49:45 PM

File summary

Title	Barton & Jones
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			10.26	B

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Barton Street EB	
South	South	Jones Road NB	
East	East	Barton Street WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	132.00	100.000
West	ONE HOUR	✓	825.00	100.000
South	ONE HOUR	✓	129.00	100.000
East	ONE HOUR	✓	517.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	44.000	57.000	31.000
	West	10.000	0.000	81.000	734.000
	South	30.000	55.000	0.000	44.000
	East	21.000	442.000	54.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.33	0.43	0.23

	West	0.01	0.00	0.10	0.89
From	South	0.23	0.43	0.00	0.34
	East	0.04	0.85	0.10	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.030	1.040	1.200
	West	1.250	1.000	1.040	1.100
	South	1.040	1.000	1.000	1.000
	East	1.370	1.050	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	3.0	4.0	20.0
	West	25.0	0.0	4.0	10.0
	South	4.0	0.0	0.0	0.0
	East	37.0	5.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.16	4.62	0.19	~1	A
West	0.79	14.72	3.61	11.00	B
South	0.18	5.44	0.21	~1	A
East	0.47	5.50	0.86	1.00	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	99.38	98.95	412.90	0.00	1032.26	0.096	0.11	3.855	A
West	621.10	616.71	106.43	0.00	1179.06	0.527	1.10	6.353	A
South	97.12	96.68	579.40	0.00	977.49	0.099	0.11	4.085	A
East	389.22	387.41	71.18	0.00	1242.84	0.313	0.45	4.200	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	118.67	118.55	494.72	0.00	986.41	0.120	0.14	4.148	A
West	741.66	739.24	127.51	0.00	1167.26	0.635	1.70	8.362	A
South	115.97	115.82	694.50	0.00	904.50	0.128	0.15	4.565	A
East	464.77	464.19	85.28	0.00	1234.82	0.376	0.60	4.669	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	145.34	145.14	605.55	0.00	924.30	0.157	0.19	4.619	A
West	908.34	901.18	156.10	0.00	1151.26	0.789	3.49	14.002	B
South	142.03	141.77	846.79	0.00	807.91	0.176	0.21	5.400	A
East	569.23	568.18	104.34	0.00	1223.99	0.465	0.86	5.480	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	145.34	145.33	606.64	0.00	923.69	0.157	0.19	4.624	A
West	908.34	907.88	156.34	0.00	1151.13	0.789	3.61	14.722	B
South	142.03	142.02	852.87	0.00	804.07	0.177	0.21	5.437	A
East	569.23	569.21	104.59	0.00	1223.84	0.465	0.86	5.498	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	118.67	118.86	496.43	0.00	985.45	0.120	0.14	4.154	A
West	741.66	748.93	127.89	0.00	1167.05	0.636	1.79	8.755	A
South	115.97	116.23	703.32	0.00	898.92	0.129	0.15	4.602	A
East	464.77	465.79	85.66	0.00	1234.59	0.376	0.61	4.688	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	99.38	99.50	415.46	0.00	1030.82	0.096	0.11	3.865	A
West	621.10	623.73	107.05	0.00	1178.72	0.527	1.13	6.516	A
South	97.12	97.27	585.86	0.00	973.41	0.100	0.11	4.110	A
East	389.22	389.82	71.65	0.00	1242.56	0.313	0.46	4.225	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.10	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.70	0.00	0.00	3.00	5.00			N/A	N/A
South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This			

East	0.60	~1	~1	~1	~1	may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	3.49	0.00	0.00	3.00	11.00			N/A	N/A
South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.86	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	3.61	0.00	0.00	0.00	6.00			N/A	N/A
South	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.86	0.00	0.00	0.00	1.00			N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.79	0.00	0.00	4.00	5.00			N/A	N/A
South	0.15	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.61	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.13	0.00	0.00	2.00	3.00			N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Fruitland & Sherwood Park-Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 2:31:48 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.38	~1	4.08	0.27	A	4.57	A
Leg West	0.05	~1	3.35	0.05	A		
Leg South	0.64	1.00	4.90	0.39	A		
Leg East	0.39	~1	4.84	0.28	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 2:31:47 PM

File summary

Title	Fuitland & Sherwood Park / Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			4.57	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Fruitland Road SB	
West	West	Sherwood Park Drive EB	
South	South	Fruitland Road NB	
East	East	Collector B WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	303.00	100.000
West	ONE HOUR	✓	52.00	100.000
South	ONE HOUR	✓	429.00	100.000
East	ONE HOUR	✓	265.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	8.000	219.000	76.000
	West	23.000	0.000	22.000	7.000
	South	410.000	11.000	0.000	8.000
	East	231.000	6.000	28.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.03	0.72	0.25
	West	0.44	0.00	0.42	0.13
	South	0.96	0.03	0.00	0.02
	East	0.87	0.02	0.11	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.330	1.110	1.020
	West	1.000	1.000	1.000	1.020
	South	1.070	1.000	1.000	1.020
	East	1.020	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	33.0	11.0	2.0
	West	0.0	0.0	0.0	2.0
	South	7.0	0.0	0.0	2.0
	East	2.0	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.27	4.08	0.38	~1	A
West	0.05	3.35	0.05	~1	A
South	0.39	4.90	0.64	1.00	A
East	0.28	4.84	0.39	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	228.12	227.20	33.73	0.00	1223.56	0.186	0.23	3.609	A
West	39.15	39.01	242.19	0.00	1202.68	0.033	0.03	3.093	A
South	322.97	321.56	79.50	0.00	1228.10	0.263	0.35	3.966	A
East	199.51	198.65	332.81	0.00	1129.78	0.177	0.21	3.863	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	272.39	272.16	40.41	0.00	1219.97	0.223	0.29	3.798	A
West	46.75	46.72	290.12	0.00	1172.78	0.040	0.04	3.196	A
South	385.66	385.24	95.22	0.00	1219.44	0.316	0.46	4.313	A
East	238.23	237.97	398.72	0.00	1089.97	0.219	0.28	4.224	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	333.61	333.25	49.47	0.00	1215.10	0.275	0.38	4.080	A
West	57.25	57.21	355.23	0.00	1132.15	0.051	0.05	3.348	A
South	472.34	471.63	116.59	0.00	1207.67	0.391	0.64	4.887	A
East	291.77	291.33	488.13	0.00	1035.95	0.282	0.39	4.831	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	333.61	333.61	49.54	0.00	1215.06	0.275	0.38	4.083	A
West	57.25	57.25	355.63	0.00	1131.90	0.051	0.05	3.349	A
South	472.34	472.33	116.71	0.00	1207.61	0.391	0.64	4.895	A
East	291.77	291.76	488.84	0.00	1035.52	0.282	0.39	4.839	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	272.39	272.75	40.53	0.00	1219.90	0.223	0.29	3.801	A
West	46.75	46.79	290.76	0.00	1172.38	0.040	0.04	3.197	A
South	385.66	386.36	95.41	0.00	1219.34	0.316	0.47	4.326	A
East	238.23	238.67	399.85	0.00	1089.28	0.219	0.28	4.234	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	228.12	228.35	33.92	0.00	1223.45	0.186	0.23	3.620	A
West	39.15	39.18	243.43	0.00	1201.91	0.033	0.03	3.095	A
South	322.97	323.40	79.88	0.00	1227.89	0.263	0.36	3.981	A
East	199.51	199.77	334.70	0.00	1128.64	0.177	0.22	3.876	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.29	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.46	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A

						small or very big.			
East	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.64	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.39	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.38	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.64	0.00	0.00	0.00	1.00			N/A	N/A
East	0.39	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.29	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.47	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.23	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.03	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.36	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Fruitland & Sherwood Park-Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 2:32:21 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	1.84	2.00	7.95	0.65	A	6.54	A
Leg West	0.07	~1	4.45	0.07	A		
Leg South	0.63	1.00	5.17	0.39	A		
Leg East	0.21	~1	4.05	0.17	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 2:32:20 PM

File summary

Title	Fuitland & Sherwood Park / Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			6.54	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Fruitland Road SB	
West	West	Sherwood Park Drive EB	
South	South	Fruitland Road NB	
East	East	Collector B WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	766.00	100.000
West	ONE HOUR	✓	52.00	100.000
South	ONE HOUR	✓	401.00	100.000
East	ONE HOUR	✓	167.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	35.000	489.000	242.000
	West	25.000	0.000	20.000	7.000
	South	352.000	21.000	0.000	28.000
	East	144.000	7.000	16.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.05	0.64	0.32

From	West	0.48	0.00	0.38	0.13
	South	0.88	0.05	0.00	0.07
	East	0.86	0.04	0.10	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.030	1.020
	West	1.000	1.000	1.000	1.020
	South	1.040	1.000	1.000	1.020
	East	1.020	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	3.0	2.0
	West	0.0	0.0	0.0	2.0
	South	4.0	0.0	0.0	2.0
	East	2.0	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.65	7.95	1.84	2.00	A
West	0.07	4.45	0.07	~1	A
South	0.39	5.17	0.63	1.00	A
East	0.17	4.05	0.21	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	576.68	573.55	32.99	0.00	1304.92	0.442	0.78	4.902	A
West	39.15	38.99	559.34	0.00	1022.38	0.038	0.04	3.660	A
South	301.89	300.55	205.19	0.00	1192.97	0.253	0.34	4.028	A
East	125.73	125.24	298.30	0.00	1155.58	0.109	0.12	3.492	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	688.62	687.32	39.51	0.00	1301.19	0.529	1.11	5.850	A
West	46.75	46.70	670.28	0.00	956.64	0.049	0.05	3.956	A
South	360.49	360.07	245.88	0.00	1169.84	0.308	0.44	4.444	A
East	150.13	150.00	357.38	0.00	1120.87	0.134	0.15	3.707	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	843.38	840.54	48.38	0.00	1296.14	0.651	1.82	7.851	A
West	57.25	57.18	819.73	0.00	868.09	0.066	0.07	4.439	A
South	441.51	440.77	300.74	0.00	1138.66	0.388	0.63	5.153	A
East	183.87	183.66	437.48	0.00	1073.82	0.171	0.21	4.043	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	843.38	843.30	48.44	0.00	1296.10	0.651	1.84	7.946	A
West	57.25	57.25	822.38	0.00	866.52	0.066	0.07	4.448	A
South	441.51	441.50	301.65	0.00	1138.13	0.388	0.63	5.167	A
East	183.87	183.87	438.19	0.00	1073.40	0.171	0.21	4.046	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	688.62	691.42	39.62	0.00	1301.13	0.529	1.14	5.930	A
West	46.75	46.82	674.23	0.00	954.30	0.049	0.05	3.968	A
South	360.49	361.22	247.25	0.00	1169.06	0.308	0.45	4.459	A
East	150.13	150.33	358.51	0.00	1120.21	0.134	0.16	3.714	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	576.68	578.04	33.17	0.00	1304.82	0.442	0.80	4.962	A
West	39.15	39.20	563.69	0.00	1019.80	0.038	0.04	3.673	A
South	301.89	302.32	206.74	0.00	1192.09	0.253	0.34	4.049	A
East	125.73	125.86	300.06	0.00	1154.55	0.109	0.12	3.499	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.78	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	1.11	0.00	0.00	1.00	2.00			N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This			

East	0.15	~1	~1	~1	~1	may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	1.82	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.63	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	1.84	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.63	0.00	0.00	0.00	1.00			N/A	N/A
East	0.21	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	1.14	0.00	0.00	1.00	2.00			N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.80	0.00	0.00	1.00	1.00			N/A	N/A
West	0.04	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.34	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: GDA & Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 2:59:50 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.10	~1	3.23	0.09	A	3.37	A
Leg West	0.08	~1	3.17	0.07	A		
Leg South	0.08	~1	3.06	0.08	A		
Leg East	0.28	~1	3.59	0.22	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 2:59:50 PM

File summary

Title	Gordon Dean & Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			3.37	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Gordon Dean Avenue SB	
West	West	Collector B WB	
South	South	Gordon Dean Avenue NB	
East	East	Collector B WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	97.00	100.000
West	ONE HOUR	✓	78.00	100.000
South	ONE HOUR	✓	89.00	100.000
East	ONE HOUR	✓	260.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	0.000	54.000	43.000
	West	0.000	0.000	29.000	49.000
	South	54.000	10.000	0.000	25.000
	East	98.000	88.000	74.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.00	0.56	0.44
From	West	0.00	0.00	0.37	0.63
	South	0.61	0.11	0.00	0.28
	East	0.38	0.34	0.28	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.020	1.020	1.020
	West	1.020	1.000	1.020	1.020
	South	1.020	1.020	1.000	1.020
	East	1.020	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	2.0	2.0	2.0
	West	2.0	0.0	2.0	2.0
	South	2.0	2.0	0.0	2.0
	East	2.0	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.09	3.23	0.10	~1	A
West	0.07	3.17	0.08	~1	A
South	0.08	3.06	0.08	~1	A
East	0.22	3.59	0.28	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	73.03	72.78	129.03	0.00	1256.15	0.058	0.06	3.042	A
West	58.72	58.53	128.29	0.00	1256.58	0.047	0.05	3.004	A
South	67.00	66.79	69.03	0.00	1290.88	0.052	0.05	2.940	A
East	195.74	195.04	48.03	0.00	1303.03	0.150	0.18	3.247	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	87.20	87.15	154.51	0.00	1241.40	0.070	0.08	3.118	A
West	70.12	70.08	153.62	0.00	1241.92	0.056	0.06	3.071	A
South	80.01	79.96	82.65	0.00	1282.99	0.062	0.07	2.991	A
East	233.73	233.56	57.50	0.00	1297.55	0.180	0.22	3.383	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	106.80	106.72	189.21	0.00	1221.32	0.087	0.10	3.229	A
West	85.88	85.82	188.12	0.00	1221.95	0.070	0.08	3.168	A
South	97.99	97.92	101.22	0.00	1272.25	0.077	0.08	3.065	A
East	286.27	286.01	70.42	0.00	1290.07	0.222	0.28	3.585	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	106.80	106.80	189.37	0.00	1221.23	0.087	0.10	3.229	A
West	85.88	85.88	188.27	0.00	1221.86	0.070	0.08	3.168	A
South	97.99	97.99	101.29	0.00	1272.20	0.077	0.08	3.065	A
East	286.27	286.26	70.46	0.00	1290.05	0.222	0.28	3.585	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	87.20	87.28	154.79	0.00	1241.24	0.070	0.08	3.121	A
West	70.12	70.18	153.88	0.00	1241.77	0.056	0.06	3.074	A
South	80.01	80.08	82.78	0.00	1282.92	0.062	0.07	2.992	A
East	233.73	233.99	57.58	0.00	1297.50	0.180	0.22	3.385	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	73.03	73.08	129.60	0.00	1255.82	0.058	0.06	3.045	A
West	58.72	58.77	128.84	0.00	1256.26	0.047	0.05	3.008	A
South	67.00	67.05	69.31	0.00	1290.71	0.052	0.05	2.943	A
East	195.74	195.91	48.22	0.00	1302.92	0.150	0.18	3.251	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A

						small or very big.			
East	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

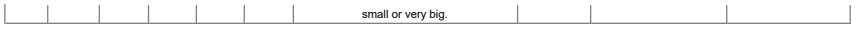
Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.28	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.22	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A


small or very big.

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: GDA & Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:00:07 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.17	~1	3.40	0.15	A	3.40	A
Leg West	0.11	~1	3.34	0.10	A		
Leg South	0.18	~1	3.50	0.15	A		
Leg East	0.18	~1	3.35	0.15	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:00:07 PM

File summary

Title	Gordon Dean & Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			3.40	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Gordon Dean Avenue SB	
West	West	Collector B WB	
South	South	Gordon Dean Avenue NB	
East	East	Collector B WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	166.00	100.000
West	ONE HOUR	✓	111.00	100.000
South	ONE HOUR	✓	166.00	100.000
East	ONE HOUR	✓	175.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	0.000	67.000	99.000
	West	0.000	0.000	20.000	91.000
	South	67.000	32.000	0.000	67.000
	East	68.000	69.000	38.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.00	0.40	0.60
	West	0.00	0.00	0.18	0.82
From	South	0.40	0.19	0.00	0.40
	East	0.39	0.39	0.22	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.020	1.020	1.020
	West	1.020	1.000	1.020	1.020
	South	1.020	1.020	1.000	1.020
	East	1.020	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	2.0	2.0	2.0
	West	2.0	0.0	2.0	2.0
	South	2.0	2.0	0.0	2.0
	East	2.0	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.15	3.40	0.17	~1	A
West	0.10	3.34	0.11	~1	A
South	0.15	3.50	0.18	~1	A
East	0.15	3.35	0.18	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	124.97	124.54	104.28	0.00	1270.47	0.098	0.11	3.142	A
West	83.57	83.28	153.05	0.00	1242.25	0.067	0.07	3.106	A
South	124.97	124.53	142.55	0.00	1248.33	0.100	0.11	3.201	A
East	131.75	131.30	74.27	0.00	1287.85	0.102	0.11	3.110	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	149.23	149.13	124.87	0.00	1258.56	0.119	0.13	3.244	A
West	99.79	99.72	183.27	0.00	1224.76	0.081	0.09	3.199	A
South	149.23	149.12	170.69	0.00	1232.04	0.121	0.14	3.323	A
East	157.32	157.22	88.94	0.00	1279.36	0.123	0.14	3.207	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	182.77	182.62	152.92	0.00	1242.33	0.147	0.17	3.396	A
West	122.21	122.12	224.42	0.00	1200.94	0.102	0.11	3.336	A
South	182.77	182.61	209.02	0.00	1209.85	0.151	0.18	3.504	A
East	192.68	192.52	108.91	0.00	1267.80	0.152	0.18	3.347	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	182.77	182.77	153.04	0.00	1242.25	0.147	0.17	3.397	A
West	122.21	122.21	224.61	0.00	1200.84	0.102	0.11	3.336	A
South	182.77	182.77	209.19	0.00	1209.76	0.151	0.18	3.504	A
East	192.68	192.68	109.00	0.00	1267.74	0.152	0.18	3.347	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	149.23	149.38	125.08	0.00	1258.44	0.119	0.14	3.245	A
West	99.79	99.88	183.57	0.00	1224.58	0.081	0.09	3.200	A
South	149.23	149.39	170.97	0.00	1231.88	0.121	0.14	3.325	A
East	157.32	157.47	89.09	0.00	1279.27	0.123	0.14	3.211	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	124.97	125.08	104.73	0.00	1270.21	0.098	0.11	3.143	A
West	83.57	83.63	153.71	0.00	1241.87	0.067	0.07	3.110	A
South	124.97	125.08	143.16	0.00	1247.97	0.100	0.11	3.208	A
East	131.75	131.85	74.60	0.00	1287.66	0.102	0.11	3.116	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very			

						small or very big.			
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

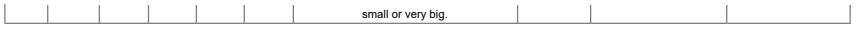
Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very			


small or very big.

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Jones & Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:07:15 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.12	~1	3.15	0.11	A	3.18	A
Leg West	0.08	~1	3.09	0.08	A		
Leg South	0.16	~1	3.25	0.14	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:07:15 PM

File summary

Title	Jones & Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South			3.18	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Collector B EB	
South	South	Jones Road NB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	

South	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	123.00	100.000
West	ONE HOUR	✓	87.00	100.000
South	ONE HOUR	✓	158.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.000	17.000	106.000
	West	29.000	0.000	58.000
	South	124.000	34.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.00	0.14	0.86
	West	0.33	0.00	0.67
	South	0.78	0.22	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	1.000	1.020	1.050
	West	1.020	1.000	1.020
	South	1.050	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.0	2.0	5.0
	West	2.0	0.0	2.0
	South	5.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.11	3.15	0.12	~1	A
West	0.08	3.09	0.08	~1	A
South	0.14	3.25	0.16	~1	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	92.60	92.29	25.51	0.00	1283.54	0.072	0.08	3.022	A
West	65.50	65.28	79.54	0.00	1283.44	0.051	0.05	2.955	A
South	118.95	118.55	21.76	0.00	1288.50	0.092	0.10	3.077	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	110.57	110.51	30.55	0.00	1280.69	0.086	0.09	3.075	A
West	78.21	78.16	95.23	0.00	1274.09	0.061	0.07	3.009	A
South	142.04	141.95	26.05	0.00	1286.07	0.110	0.12	3.146	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	135.43	135.33	37.41	0.00	1276.82	0.106	0.12	3.153	A
West	95.79	95.72	116.63	0.00	1261.35	0.076	0.08	3.087	A
South	173.96	173.83	31.91	0.00	1282.76	0.136	0.16	3.246	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	135.43	135.43	37.43	0.00	1276.80	0.106	0.12	3.153	A
West	95.79	95.79	116.71	0.00	1261.30	0.076	0.08	3.088	A
South	173.96	173.96	31.93	0.00	1282.75	0.136	0.16	3.246	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	110.57	110.67	30.59	0.00	1280.67	0.086	0.09	3.078	A
West	78.21	78.28	95.37	0.00	1274.01	0.061	0.07	3.012	A
South	142.04	142.17	26.09	0.00	1286.05	0.110	0.12	3.146	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	92.60	92.67	25.62	0.00	1283.48	0.072	0.08	3.025	A
West	65.50	65.54	79.86	0.00	1283.25	0.051	0.05	2.955	A
South	118.95	119.04	21.85	0.00	1288.45	0.092	0.10	3.080	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This			

West	0.08	~1	~1	~1	~1	may be because the mean queue is very small or very big.		N/A	N/A
South	0.16	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Jones & Collector B.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:07:44 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.14	~1	3.22	0.13	A	3.19	A
Leg West	0.08	~1	3.11	0.07	A		
Leg South	0.18	~1	3.20	0.15	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:07:44 PM

File summary

Title	Jones & Collector B
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South			3.19	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Collector B EB	
South	South	Jones Road NB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	

South	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	146.00	100.000
West	ONE HOUR	✓	82.00	100.000
South	ONE HOUR	✓	182.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.000	14.000	132.000
	West	10.000	0.000	72.000
	South	101.000	81.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.00	0.10	0.90
	West	0.12	0.00	0.88
	South	0.55	0.45	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	1.000	1.020	1.020
	West	1.020	1.000	1.020
	South	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To		
		North	West	South
From	North	0.0	2.0	2.0
	West	2.0	0.0	2.0
	South	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.13	3.22	0.14	~1	A
West	0.07	3.11	0.08	~1	A
South	0.15	3.20	0.18	~1	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	109.92	109.55	60.78	0.00	1295.65	0.085	0.09	3.035	A
West	61.73	61.53	99.04	0.00	1273.51	0.048	0.05	2.970	A
South	137.02	136.56	7.50	0.00	1326.49	0.103	0.11	3.025	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	131.25	131.17	72.77	0.00	1288.71	0.102	0.11	3.109	A
West	73.72	73.67	118.59	0.00	1262.19	0.058	0.06	3.028	A
South	163.61	163.51	8.98	0.00	1325.63	0.123	0.14	3.097	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	160.75	160.63	89.12	0.00	1279.25	0.126	0.14	3.217	A
West	90.28	90.22	145.23	0.00	1246.78	0.072	0.08	3.112	A
South	200.39	200.24	11.00	0.00	1324.46	0.151	0.18	3.201	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	160.75	160.75	89.18	0.00	1279.21	0.126	0.14	3.217	A
West	90.28	90.28	145.33	0.00	1246.72	0.072	0.08	3.112	A
South	200.39	200.38	11.01	0.00	1324.46	0.151	0.18	3.201	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	131.25	131.37	72.88	0.00	1288.65	0.102	0.11	3.110	A
West	73.72	73.78	118.77	0.00	1262.09	0.058	0.06	3.031	A
South	163.61	163.76	9.00	0.00	1325.62	0.123	0.14	3.100	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	109.92	110.00	61.03	0.00	1295.51	0.085	0.09	3.038	A
West	61.73	61.78	99.45	0.00	1273.27	0.048	0.05	2.970	A
South	137.02	137.12	7.53	0.00	1326.47	0.103	0.12	3.026	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
						Percentiles could not be calculated. This			

West	0.08	~1	~1	~1	~1	may be because the mean queue is very small or very big.		N/A	N/A
South	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.11	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.06	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.14	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.05	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Highway 8 & GDA.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:02:11 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.35	~1	5.11	0.26	A	5.49	A
Leg West	0.82	1.00	5.15	0.45	A		
Leg East	1.07	?	5.94	0.52	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:02:11 PM

File summary

Title	Highway 8 & Gordon Dean
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,East			5.49	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Gordon Dean Avenue SB	
West	West	Highway 8 EB	
East	East	Highway 8 WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	

East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	223.00	100.000
West	ONE HOUR	✓	524.00	100.000
East	ONE HOUR	✓	593.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.000	189.000	34.000
	West	56.000	0.000	468.000
	East	13.000	580.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.00	0.85	0.15
	West	0.11	0.00	0.89
	East	0.02	0.98	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	1.000	1.020	1.020
	West	1.020	1.000	1.050
	East	1.020	1.050	1.000

Truck Percentages - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.0	2.0	2.0
	West	2.0	0.0	5.0
	East	2.0	5.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.26	5.11	0.35	~1	A
West	0.45	5.15	0.82	1.00	A
East	0.52	5.94	1.07	?	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	167.89	167.15	434.55	0.00	1071.93	0.157	0.18	3.975	A
West	394.50	392.73	25.48	0.00	1282.40	0.308	0.44	4.038	A
East	446.44	444.29	41.97	0.00	1270.01	0.352	0.54	4.348	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	200.47	200.24	520.69	0.00	1020.61	0.196	0.24	4.387	A
West	471.07	470.52	30.53	0.00	1279.55	0.368	0.58	4.447	A
East	533.10	532.36	50.28	0.00	1265.33	0.421	0.72	4.906	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	245.53	245.12	637.26	0.00	951.16	0.258	0.35	5.097	A
West	576.94	575.98	37.37	0.00	1275.69	0.452	0.82	5.137	A
East	652.91	651.54	61.55	0.00	1258.99	0.519	1.06	5.913	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	245.53	245.52	638.56	0.00	950.38	0.258	0.35	5.106	A
West	576.94	576.92	37.43	0.00	1275.66	0.452	0.82	5.151	A
East	652.91	652.88	61.66	0.00	1258.93	0.519	1.07	5.939	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	200.47	200.88	522.72	0.00	1019.40	0.197	0.25	4.401	A
West	471.07	472.00	30.63	0.00	1279.50	0.368	0.59	4.463	A
East	533.10	534.44	50.44	0.00	1265.24	0.421	0.73	4.936	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	167.89	168.12	437.39	0.00	1070.24	0.157	0.19	3.992	A
West	394.50	395.06	25.63	0.00	1282.31	0.308	0.45	4.061	A
East	446.44	447.20	42.22	0.00	1269.87	0.352	0.55	4.379	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.44	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.54	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.24	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.58	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.72	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.82	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	1.06	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.35	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.82	0.00	0.00	0.00	1.00			N/A	N/A

East	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.25	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.59	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.73	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.19	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.45	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.55	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Highway 8 & GDA.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:02:33 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.18	~1	4.65	0.16	A	9.60	A
Leg West	3.16	8.00	11.59	0.76	B		
Leg East	1.64	1.00	7.89	0.62	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:02:33 PM

File summary

Title	Highway 8 & Gordon Dean
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,East			9.60	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Gordon Dean Avenue SB	
West	West	Highway 8 EB	
East	East	Highway 8 WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	

East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	130.00	100.000
West	ONE HOUR	✓	912.00	100.000
East	ONE HOUR	✓	687.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.000	103.000	27.000
	West	186.000	0.000	726.000
	East	39.000	648.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.00	0.79	0.21
	West	0.20	0.00	0.80
	East	0.06	0.94	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	1.000	1.020	1.020
	West	1.020	1.000	1.020
	East	1.020	1.020	1.000

Truck Percentages - Intersection 1 (for whole period)

		To		
		North	West	East
From	North	0.0	2.0	2.0
	West	2.0	0.0	2.0
	East	2.0	2.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.16	4.65	0.18	~1	A
West	0.76	11.59	3.16	8.00	B
East	0.62	7.89	1.64	1.00	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	97.87	97.46	485.21	0.00	1050.01	0.093	0.10	3.777	A
West	686.60	682.32	20.24	0.00	1319.11	0.521	1.07	5.617	A
East	517.21	514.41	139.16	0.00	1250.29	0.414	0.70	4.873	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	116.87	116.75	581.44	0.00	994.31	0.118	0.13	4.102	A
West	819.87	817.69	24.25	0.00	1316.80	0.623	1.62	7.181	A
East	617.60	616.44	166.77	0.00	1234.31	0.500	0.99	5.816	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	143.13	142.93	711.08	0.00	919.28	0.156	0.18	4.636	A
West	1004.13	998.25	29.69	0.00	1313.65	0.764	3.09	11.205	B
East	756.40	753.88	203.59	0.00	1213.00	0.624	1.62	7.797	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	143.13	143.13	713.39	0.00	917.95	0.156	0.18	4.645	A
West	1004.13	1003.83	29.73	0.00	1313.62	0.764	3.16	11.590	B
East	756.40	756.32	204.73	0.00	1212.34	0.624	1.64	7.890	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	116.87	117.07	584.89	0.00	992.32	0.118	0.13	4.113	A
West	819.87	825.78	24.31	0.00	1316.76	0.623	1.68	7.419	A
East	617.60	620.09	168.41	0.00	1233.36	0.501	1.02	5.895	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	97.87	97.99	488.99	0.00	1047.82	0.093	0.10	3.789	A
West	686.60	688.94	20.35	0.00	1319.05	0.521	1.10	5.736	A
East	517.21	518.42	140.51	0.00	1249.51	0.414	0.71	4.933	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.07	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.70	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.62	0.00	0.00	3.00	5.00			N/A	N/A
East	0.99	0.00	0.00	1.00	1.00			N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	3.09	0.00	0.00	1.00	8.00			N/A	N/A
East	1.62	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.18	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	3.16	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	1.64	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.68	0.00	0.00	3.00	5.00			N/A	N/A
East	1.02	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.10	0.00	0.00	2.00	3.00			N/A	N/A
East	0.71	0.00	0.00	0.00	1.00			N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Highway 8 & Jones.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:04:39 PM

Summary of intersection performance

	AM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.13	~1	4.84	0.11	A	5.33	A
Leg West	0.71	1.00	4.87	0.42	A		
Leg South	0.01	~1	3.60	0.01	A		
Leg East	1.02	?	5.83	0.51	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour " model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:04:38 PM

File summary

Title	Highway 8 & Jones
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, AM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, AM Peak Hour	Total 2026	AM Peak Hour		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			5.33	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Highway 8 WB	
South	South	Jones Road NB	
East	East	Highway 8 WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	86.00	100.000
West	ONE HOUR	✓	480.00	100.000
South	ONE HOUR	✓	10.00	100.000
East	ONE HOUR	✓	578.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	48.000	0.000	38.000
	West	61.000	0.000	2.000	417.000
	South	4.000	5.000	0.000	1.000
	East	69.000	509.000	0.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.56	0.00	0.44
	West	0.13	0.00	0.00	0.87
From	South	0.40	0.50	0.00	0.10
	East	0.12	0.88	0.00	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.310	1.000	1.080
	West	1.110	1.000	1.500	1.040
	South	1.000	1.000	1.000	1.000
	East	1.000	1.050	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	31.0	0.0	8.0
	West	11.0	0.0	50.0	4.0
	South	0.0	0.0	0.0	0.0
	East	0.0	5.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.11	4.84	0.13	~1	A
West	0.42	4.87	0.71	1.00	A
South	0.01	3.60	0.01	~1	A
East	0.51	5.83	1.02	?	A

Main Results for each time segment

Main results: (08:00-08:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	64.75	64.45	385.13	0.00	929.78	0.070	0.07	4.159	A
West	361.37	359.80	28.48	0.00	1274.87	0.283	0.39	3.928	A
South	7.53	7.50	386.77	0.00	1122.13	0.007	0.01	3.229	A
East	435.15	433.08	52.48	0.00	1268.32	0.343	0.52	4.300	A

Main results: (08:15-08:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	77.31	77.23	461.46	0.00	891.41	0.087	0.09	4.421	A
West	431.51	431.04	34.13	0.00	1271.51	0.339	0.51	4.282	A
South	8.99	8.98	463.37	0.00	1075.53	0.008	0.01	3.374	A
East	519.61	518.91	62.86	0.00	1262.01	0.412	0.69	4.841	A

Main results: (08:30-08:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	94.69	94.56	564.78	0.00	839.47	0.113	0.13	4.833	A
West	528.49	527.69	41.78	0.00	1266.95	0.417	0.71	4.865	A
South	11.01	11.00	567.28	0.00	1012.31	0.011	0.01	3.594	A
East	636.39	635.09	76.96	0.00	1253.44	0.508	1.02	5.810	A

Main results: (08:45-09:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	94.69	94.69	565.90	0.00	838.90	0.113	0.13	4.836	A
West	528.49	528.48	41.84	0.00	1266.92	0.417	0.71	4.874	A
South	11.01	11.01	568.11	0.00	1011.80	0.011	0.01	3.596	A
East	636.39	636.36	77.07	0.00	1253.38	0.508	1.02	5.834	A

Main results: (09:00-09:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	77.31	77.44	463.20	0.00	890.53	0.087	0.10	4.429	A
West	431.51	432.29	34.22	0.00	1271.46	0.339	0.52	4.293	A
South	8.99	9.00	464.71	0.00	1074.72	0.008	0.01	3.377	A
East	519.61	520.88	63.04	0.00	1261.90	0.412	0.71	4.866	A

Main results: (09:15-09:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	64.75	64.83	387.61	0.00	928.53	0.070	0.08	4.168	A
West	361.37	361.85	28.64	0.00	1274.77	0.283	0.40	3.946	A
South	7.53	7.54	388.98	0.00	1120.79	0.007	0.01	3.233	A
East	435.15	435.87	52.77	0.00	1268.14	0.343	0.53	4.330	A

Queue Variation Results for each time segment

Queue Variation results: (08:00-08:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.07	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.39	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.52	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:15-08:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.09	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.51	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very		N/A	N/A

						small or very big.			
East	0.69	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:30-08:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.71	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	1.02	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (08:45-09:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.71	0.00	0.00	0.00	1.00			N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	1.02	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:00-09:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.52	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.71	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (09:15-09:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.08	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.40	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.01	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
East	0.53	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Junctions 8

ARCADY 8 - Roundabout Module

Version: 8.0.5.523 [19102,19/06/2015]
© Copyright TRL Limited, 2018

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: 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

Filename: Highway 8 & Jones.arc8
Path: C:\Users\Matt\OneDrive - Paradigm Transportation Solutions Limited 1\Projects\Arcady Projects\170112 Block 1 TA
Report generation date: 16-Feb-18 3:04:54 PM

Summary of intersection performance

	PM Peak Hour						
	Queue (Veh)	95% Queue (Veh)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - Total 2026						
Leg North	0.17	~1	4.28	0.15	A	6.50	A
Leg West	1.66	2.00	7.54	0.63	A		
Leg South	0.00	~1	0.00	0.00	A		
Leg East	1.04	?	5.70	0.51	A		

Values shown are the maximum values over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

"D1 - Total 2021, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D2 - Total 2021, PM Peak Hour" model duration: 4:00 PM - 5:30 PM
"D3 - Total 2026, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D4 - Total 2026, PM Peak Hour " model duration: 4:00 PM - 5:30 PM
"D5 - Total 2031, AM Peak Hour" model duration: 8:00 AM - 9:30 AM
"D6 - Total 2031, PM Peak Hour" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.5.523 at 16-Feb-18 3:04:53 PM

File summary

Title	Highway 8 & Jones
Location	Hamilton
Site Number	
Date	16-Aug-17
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	170112
Analyst	Paradigm Tranpsportation Solutions Limited
Description	

Analysis Options

Vehicle Length (m)	Do Queue Variations	Calculate Residual Capacity	Residual Capacity Criteria Type	V/C Ratio Threshold	Average Delay Threshold (s)	Queue Threshold (PCE)
5.75	✓		N/A	0.85	36.00	20.00

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	Veh	Veh	perHour	s	-Min	perMin

(Default Analysis Set) - Total 2026, PM Peak Hour

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
(Default Analysis Set)	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
Total 2026, PM Peak Hour	Total 2026	PM Peak Hour		ONE HOUR	16:00	17:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	(untitled)	Roundabout	North,West,South,East			6.50	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Leg	Name	Description
North	North	Jones Road SB	
West	West	Highway 8 WB	
South	South	Jones Road NB	
East	East	Highway 8 WB	

Capacity Options

Leg	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
North	0.00	99999.00
West	0.00	99999.00
South	0.00	99999.00
East	0.00	99999.00

Roundabout Geometry

Leg	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
North	3.50	4.50	30.00	20.00	40.00	25.00	
West	3.50	4.50	30.00	20.00	40.00	25.00	
South	3.50	4.50	30.00	20.00	40.00	25.00	
East	3.50	4.50	30.00	20.00	40.00	25.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
North		(calculated)	(calculated)	0.579	1357.445
West		(calculated)	(calculated)	0.579	1357.445
South		(calculated)	(calculated)	0.579	1357.445
East		(calculated)	(calculated)	0.579	1357.445

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
		✓	✓	Truck Percentages	2.00				✓	✓

Entry Flows

General Flows Data

Leg	Profile Type	Use Turning Counts	Average Demand Flow (Veh/hr)	Flow Scaling Factor (%)
North	ONE HOUR	✓	130.00	100.000
West	ONE HOUR	✓	726.00	100.000
South	ONE HOUR	✓	3.00	100.000
East	ONE HOUR	✓	598.00	100.000

Turning Proportions

Turning Counts / Proportions (Veh/hr) - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.000	77.000	4.000	49.000
	West	60.000	0.000	2.000	664.000
	South	1.000	2.000	0.000	0.000
	East	25.000	572.000	1.000	0.000

Turning Proportions (Veh) - Intersection 1 (for whole period)

		To			
		North	West	South	East
	North	0.00	0.59	0.03	0.38

	West	0.08	0.00	0.00	0.91
From	South	0.33	0.67	0.00	0.00
	East	0.04	0.96	0.00	0.00

Vehicle Mix

Average PCE Per Vehicle - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	1.000	1.000	1.000	1.000
	West	1.110	1.000	1.000	1.030
	South	1.000	1.000	1.000	1.000
	East	1.000	1.020	1.000	1.000

Truck Percentages - Intersection 1 (for whole period)

		To			
		North	West	South	East
From	North	0.0	0.0	0.0	0.0
	West	11.0	0.0	0.0	3.0
	South	0.0	0.0	0.0	0.0
	East	0.0	2.0	0.0	0.0

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max Delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
North	0.15	4.28	0.17	~1	A
West	0.63	7.54	1.66	2.00	A
South	0.00	0.00	0.00	~1	A
East	0.51	5.70	1.04	?	A

Main Results for each time segment

Main results: (16:00-16:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	97.87	97.48	429.37	0.00	1103.98	0.089	0.10	3.577	A
West	546.57	543.64	40.49	0.00	1287.00	0.425	0.73	4.825	A
South	0.00	0.00	578.89	0.00	1010.91	0.000	0.00	0.000	A
East	450.21	448.11	44.93	0.00	1303.64	0.345	0.52	4.198	A

Main results: (16:15-16:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	116.87	116.76	514.43	0.00	1053.77	0.111	0.12	3.842	A
West	652.66	651.49	48.50	0.00	1282.53	0.509	1.02	5.694	A
South	0.00	0.00	693.70	0.00	942.18	0.000	0.00	0.000	A
East	537.59	536.88	53.84	0.00	1298.02	0.414	0.70	4.726	A

Main results: (16:30-16:45)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	143.13	142.95	629.62	0.00	985.77	0.145	0.17	4.270	A
West	799.34	796.87	59.38	0.00	1276.45	0.626	1.64	7.467	A
South	0.00	0.00	848.56	0.00	849.48	0.000	0.00	0.000	A
East	658.41	657.10	65.86	0.00	1290.45	0.510	1.03	5.672	A

Main results: (16:45-17:00)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	143.13	143.13	630.86	0.00	985.04	0.145	0.17	4.275	A
West	799.34	799.27	59.45	0.00	1276.41	0.626	1.66	7.542	A
South	0.00	0.00	851.02	0.00	848.01	0.000	0.00	0.000	A
East	658.41	658.38	66.06	0.00	1290.33	0.510	1.04	5.696	A

Main results: (17:00-17:15)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	116.87	117.04	516.35	0.00	1052.64	0.111	0.13	3.848	A
West	652.66	655.09	48.62	0.00	1282.46	0.509	1.05	5.759	A
South	0.00	0.00	697.40	0.00	939.97	0.000	0.00	0.000	A
East	537.59	538.88	54.14	0.00	1297.84	0.414	0.71	4.752	A

Main results: (17:15-17:30)

Leg	Total Demand (Veh/hr)	Entry Flow (Veh/hr)	Circulating Flow (Veh/hr)	Pedestrian Demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	End Queue (Veh)	Delay (s)	LOS
North	97.87	97.98	432.08	0.00	1102.38	0.089	0.10	3.586	A
West	546.57	547.79	40.70	0.00	1286.88	0.425	0.75	4.878	A
South	0.00	0.00	583.21	0.00	1008.33	0.000	0.00	0.000	A
East	450.21	450.93	45.27	0.00	1303.43	0.345	0.53	4.227	A

Queue Variation Results for each time segment

Queue Variation results: (16:00-16:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.73	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	0.52	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:15-16:30)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.12	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.02	0.00	0.00	1.00	2.00			N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	0.70	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:30-16:45)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.64	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	1.03	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (16:45-17:00)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.17	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.66	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	1.04	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:00-17:15)

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.13	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	1.05	?	?	?	?	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	0.71	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Queue Variation results: (17:15-17:30)

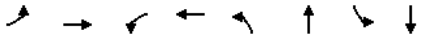
Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile Message	Marker Message	Probability Of Reaching Or Exceeding Marker	Probability Of Exactly Reaching Marker
North	0.10	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A
West	0.75	0.00	0.00	1.00	1.00			N/A	N/A
South	0.00	~1	~1	~1	~1			N/A	N/A
East	0.53	~1	~1	~1	~1	Percentiles could not be calculated. This may be because the mean queue is very small or very big.		N/A	N/A

Appendix K

2031 Background Traffic Operations Reports

Queues
1: Fruitland Road & Barton Street

07-20-2017

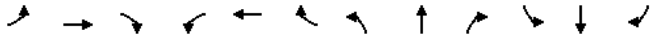


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	354	37	702	74	439	190	533
v/c Ratio	1.34	0.27	0.11	0.55	0.39	0.62	0.70	0.72
Control Delay	199.1	9.2	9.6	9.7	16.9	14.9	29.9	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	199.1	9.2	9.6	9.7	16.9	14.9	29.9	14.3
Queue Length 50th (m)	~35.4	9.0	1.8	16.2	4.1	26.0	12.3	20.1
Queue Length 95th (m)	#72.3	16.1	6.1	28.6	13.6	49.3	#39.8	#64.2
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	232	1314	336	1281	192	712	272	744
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	1.34	0.27	0.11	0.55	0.39	0.62	0.70	0.72

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

07-20-2017

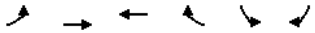


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	302	24	34	459	187	68	360	44	175	199	292
Future Volume (vph)	285	302	24	34	459	187	68	360	44	175	199	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.99		1.00	0.96		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1660	3252		1478	2957		1585	1757		1661	1565	
Flt Permitted	0.33	1.00		0.54	1.00		0.29	1.00		0.39	1.00	
Satd. Flow (perm)	580	3252		840	2957		481	1757		680	1565	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	328	26	37	499	203	74	391	48	190	216	317
RTOR Reduction (vph)	0	13	0	0	98	0	0	10	0	0	118	0
Lane Group Flow (vph)	310	341	0	37	604	0	74	429	0	190	415	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Effective Green, g (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	232	1300		336	1182		192	702		272	626	
v/s Ratio Prot		0.10			0.20			0.24			0.27	
v/s Ratio Perm	c0.53			0.04			0.15			c0.28		
v/c Ratio	1.34	0.26		0.11	0.51		0.39	0.61		0.70	0.66	
Uniform Delay, d1	13.5	9.0		8.5	10.2		9.6	10.7		11.2	11.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	177.6	0.5		0.7	1.6		5.8	3.9		13.9	5.5	
Delay (s)	191.1	9.5		9.1	11.8		15.3	14.7		25.1	16.5	
Level of Service	F	A		A	B		B	B		C	B	
Approach Delay (s)		94.3			11.6			14.8			18.8	
Approach LOS		F			B			B			B	

Intersection Summary					
HCM 2000 Control Delay	35.0	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	1.02				
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	9.0		
Intersection Capacity Utilization	82.2%	ICU Level of Service	E		
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
2: Barton Street & Sunnyhurst Avenue

07-20-2017



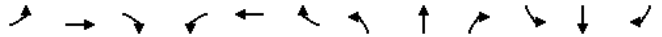
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	508	652	17	7	8
Future Volume (Veh/h)	8	508	652	17	7	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	552	709	18	8	9
Pedestrians					1	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	728				1289	719
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	728				1289	719
tC, single (s)	4.4				6.6	6.4
tC, 2 stage (s)						
tF (s)	2.5				3.7	3.5
p0 queue free %	99				95	98
cM capacity (veh/h)	749				164	404

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	561	727	17
Volume Left	9	0	8
Volume Right	0	18	9
cSH	749	1700	239
Volume to Capacity	0.01	0.43	0.07
Queue Length 95th (m)	0.3	0.0	1.8
Control Delay (s)	0.3	0.0	21.2
Lane LOS	A		C
Approach Delay (s)	0.3	0.0	21.2
Approach LOS			C

Intersection Summary				
Average Delay		0.4		
Intersection Capacity Utilization		45.3%	ICU Level of Service	A
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

07-20-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	436	20	39	609	80	34	89	24	24	27	34
Future Volume (Veh/h)	48	436	20	39	609	80	34	89	24	24	27	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	474	22	42	662	87	37	97	26	26	29	37
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	749			498			1432	1424	487	1453	1392	706
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	749			498			1432	1424	487	1453	1392	706
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			96			52	20	96	18	77	90
cM capacity (veh/h)	869			969			78	121	584	32	126	388

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	548	791	160	92
Volume Left	52	42	37	26
Volume Right	22	87	26	37
cSH	869	969	121	81
Volume to Capacity	0.06	0.04	1.32	1.14
Queue Length 95th (m)	1.5	1.1	84.4	53.0
Control Delay (s)	1.6	1.1	258.0	236.4
Lane LOS	A	A	F	F
Approach Delay (s)	1.6	1.1	258.0	236.4
Approach LOS			F	F

Intersection Summary				
Average Delay		40.7		
Intersection Capacity Utilization		62.3%	ICU Level of Service	B
Analysis Period (min)		15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road

07-20-2017

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	25	13	422	222	8
Future Volume (Veh/h)	24	25	13	422	222	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	27	14	459	241	9
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	736	250	254			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	736	250	254			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	97	99			
cM capacity (veh/h)	384	792	1319			

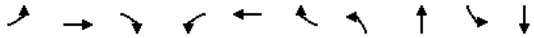
Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	53	14	459	250
Volume Left	26	14	0	0
Volume Right	27	0	0	9
cSH	520	1319	1700	1700
Volume to Capacity	0.10	0.01	0.27	0.15
Queue Length 95th (m)	2.7	0.3	0.0	0.0
Control Delay (s)	12.7	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.7	0.2		0.0
Approach LOS	B			

Intersection Summary				
Average Delay			1.0	
Intersection Capacity Utilization			32.2%	ICU Level of Service
Analysis Period (min)			15	

A

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	238	449	20	11	534	121	30	87	90	178
v/c Ratio	0.55	0.43	0.02	0.02	0.51	0.15	0.14	0.25	0.40	0.43
Control Delay	13.7	8.2	0.9	5.6	9.3	2.1	19.3	17.3	24.3	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.7	8.2	0.9	5.6	9.3	2.1	19.3	17.3	24.3	8.0
Queue Length 50th (m)	12.5	21.3	0.0	0.4	27.2	0.3	2.5	6.2	8.0	1.2
Queue Length 95th (m)	37.8	44.8	1.0	2.3	57.2	6.0	8.3	15.8	19.1	14.2
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	432	1050	827	520	1040	829	515	851	561	783
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	0.55	0.43	0.02	0.02	0.51	0.15	0.06	0.10	0.16	0.23

Intersection Summary

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	219	413	18	10	491	111	28	66	14	83	13	151
Future Volume (vph)	219	413	18	10	491	111	28	66	14	83	13	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1317	1582	1759		1586	1456	
Flt Permitted	0.41	1.00	1.00	0.48	1.00	1.00	0.64	1.00		0.70	1.00	
Satd. Flow (perm)	728	1766	1358	875	1749	1317	1074	1759		1170	1456	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	238	449	20	11	534	121	30	72	15	90	14	164
RTOR Reduction (vph)	0	0	8	0	0	46	0	12	0	0	132	0
Lane Group Flow (vph)	238	449	12	11	534	75	30	75	0	90	46	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	33.8	33.8	33.8	33.8	33.8	33.8	11.0	11.0		11.0	11.0	
Effective Green, g (s)	33.8	33.8	33.8	33.8	33.8	33.8	11.0	11.0		11.0	11.0	
Actuated g/C Ratio	0.60	0.60	0.60	0.60	0.60	0.60	0.19	0.19		0.19	0.19	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	433	1052	809	521	1042	785	208	341		226	282	
v/s Ratio Prot		0.25			0.31			0.04			0.03	
v/s Ratio Perm	c0.33		0.01	0.01		0.06	0.03			c0.08		
v/c Ratio	0.55	0.43	0.01	0.02	0.51	0.10	0.14	0.22		0.40	0.16	
Uniform Delay, d1	6.9	6.2	4.7	4.7	6.7	4.9	18.9	19.2		20.0	19.0	
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	5.0	1.3	0.0	0.1	1.8	0.2	0.3	0.3		1.2	0.3	
Delay (s)	11.8	7.5	4.7	4.8	8.5	5.1	19.3	19.6		21.1	19.3	
Level of Service	B	A	A	A	A	A	B	B		C	B	
Approach Delay (s)		8.9			7.8			19.5			19.9	
Approach LOS		A			A			B			B	

Intersection Summary				
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	80.5%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

07-20-2017

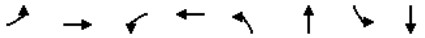
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	436	3	0	560	71	6	4	1	20	0	18
Future Volume (Veh/h)	59	436	3	0	560	71	6	4	1	20	0	18
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	64	474	3	0	609	77	7	4	1	22	0	20
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	687			477			1232	1290	476	1254	1254	648
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	687			477			1232	1290	476	1254	1254	648
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	93			100			95	97	100	83	100	95
cM capacity (veh/h)	866			1096			139	153	593	133	161	422

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	64	477	0	686	7	5	22	20
Volume Left	64	0	0	0	7	0	22	0
Volume Right	0	3	0	77	0	1	0	20
cSH	866	1700	1700	1700	139	179	133	422
Volume to Capacity	0.07	0.28	0.00	0.40	0.05	0.03	0.17	0.05
Queue Length 95th (m)	1.9	0.0	0.0	0.0	1.3	0.7	4.6	1.2
Control Delay (s)	9.5	0.0	0.0	0.0	32.2	25.7	37.3	14.0
Lane LOS	A				D	D	E	B
Approach Delay (s)	1.1		0.0		29.5		26.2	
Approach LOS					D		D	

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	54.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Queues
1: Fruitland Road & Barton Street

07-20-2017

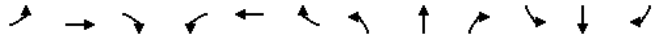


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	686	71	574	53	358	249	730
v/c Ratio	1.21	0.47	0.29	0.40	0.70	0.48	0.75	0.99
Control Delay	147.5	18.6	20.7	15.7	70.2	20.3	38.8	56.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	147.5	18.6	20.7	15.7	70.2	20.3	38.8	56.3
Queue Length 50th (m)	~80.8	43.1	8.2	30.7	7.6	43.7	37.1	123.4
Queue Length 95th (m)	#135.1	58.7	19.2	44.3	#29.7	68.8	#79.1	#204.2
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	299	1452	244	1444	76	753	330	739
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	1.21	0.47	0.29	0.40	0.70	0.48	0.75	0.99

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

07-20-2017



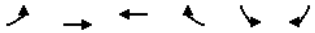
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	528	103	65	379	149	49	281	49	229	453	219
Future Volume (vph)	332	528	103	65	379	149	49	281	49	229	453	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.96		1.00	0.98		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)	1693	3309		1661	3225		1646	1737		1600	1675	
Flt Permitted	0.39	1.00		0.32	1.00		0.10	1.00		0.46	1.00	
Satd. Flow (perm)	692	3309		564	3225		179	1737		768	1675	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	574	112	71	412	162	53	305	53	249	492	238
RTOR Reduction (vph)	0	18	0	0	46	0	0	7	0	0	19	0
Lane Group Flow (vph)	361	668	0	71	528	0	53	351	0	249	711	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Effective Green, g (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	299	1433		244	1397		76	746		330	720	
v/s Ratio Prot		0.20			0.16			0.20			c0.42	
v/s Ratio Perm	c0.52			0.13			0.30			0.32		
v/c Ratio	1.21	0.47		0.29	0.38		0.70	0.47		0.75	0.99	
Uniform Delay, d1	25.5	18.1		16.5	17.3		20.9	18.3		21.6	25.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	120.5	1.1		3.0	0.8		24.3	0.5		9.4	30.0	
Delay (s)	146.0	19.2		19.5	18.1		45.2	18.8		31.1	55.4	
Level of Service	F	B		B	B		D	B		C	E	
Approach Delay (s)		62.9			18.2			22.2			49.2	
Approach LOS		E			B			C			D	

Intersection Summary					
HCM 2000 Control Delay	43.8	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	1.10				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	110.5%	ICU Level of Service		H	
Analysis Period (min)	15				

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
2: Barton Street & Sunnyhurst Avenue

07-20-2017



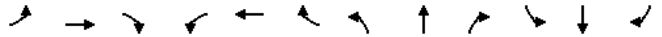
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	789	549	1	7	11
Future Volume (Veh/h)	11	789	549	1	7	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	858	597	1	8	12
Pedestrians					2	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	600				1482	600
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	600				1482	600
tC, single (s)	4.3				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.4				3.7	3.3
p0 queue free %	99				94	98
cM capacity (veh/h)	873				124	504

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	870	598	20
Volume Left	12	0	8
Volume Right	0	1	12
cSH	873	1700	226
Volume to Capacity	0.01	0.35	0.09
Queue Length 95th (m)	0.3	0.0	2.3
Control Delay (s)	0.4	0.0	22.5
Lane LOS	A		C
Approach Delay (s)	0.4	0.0	22.5
Approach LOS			C

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

07-20-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	757	32	32	451	22	32	34	31	35	65	49
Future Volume (Veh/h)	11	757	32	32	451	22	32	34	31	35	65	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	823	35	35	490	24	35	37	34	38	71	53
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	515			858			1526	1450	840	1490	1455	504
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	515			858			1526	1450	840	1490	1455	504
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			96			23	70	91	39	41	91
cM capacity (veh/h)	942			791			45	122	368	62	121	565

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	870	549	106	162
Volume Left	12	35	35	38
Volume Right	35	24	34	53
cSH	942	791	91	125
Volume to Capacity	0.01	0.04	1.17	1.29
Queue Length 95th (m)	0.3	1.1	58.6	83.4
Control Delay (s)	0.3	1.2	231.5	245.1
Lane LOS	A	A	F	F
Approach Delay (s)	0.3	1.2	231.5	245.1
Approach LOS			F	F

Intersection Summary			
Average Delay		38.7	
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road

07-20-2017

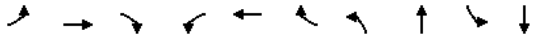
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	24	23	24	354	507	35
Future Volume (Veh/h)	24	23	24	354	507	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	25	26	385	551	38
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1011	574	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1011	574	593			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	95	97			
cM capacity (veh/h)	260	520	990			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	51	26	385	589
Volume Left	26	26	0	0
Volume Right	25	0	0	38
cSH	344	990	1700	1700
Volume to Capacity	0.15	0.03	0.23	0.35
Queue Length 95th (m)	4.1	0.6	0.0	0.0
Control Delay (s)	17.3	8.7	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	17.3	0.6		0.0
Approach LOS	C			

Intersection Summary				
Average Delay		1.1		
Intersection Capacity Utilization		38.8%	ICU Level of Service	A
Analysis Period (min)		15		

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	249	663	41	30	623	108	20	35	167	411
v/c Ratio	0.85	0.70	0.05	0.11	0.65	0.13	0.14	0.07	0.49	0.75
Control Delay	45.7	17.8	3.3	10.9	16.1	4.2	17.7	12.2	22.8	20.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	17.8	3.3	10.9	16.1	4.2	17.7	12.2	22.8	20.0
Queue Length 50th (m)	20.8	48.4	0.0	1.5	43.7	1.0	1.7	2.2	15.8	23.4
Queue Length 95th (m)	#77.7	#136.0	4.2	7.5	#112.4	9.6	6.2	7.4	30.6	50.7
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	293	949	845	266	958	809	237	815	578	811
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	0.85	0.70	0.05	0.11	0.65	0.13	0.08	0.04	0.29	0.51

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	229	610	38	28	573	99	18	24	8	154	72	306
Future Volume (vph)	229	610	38	28	573	99	18	24	8	154	72	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1614	1766		1631	1566	
Flt Permitted	0.31	1.00	1.00	0.27	1.00	1.00	0.30	1.00		0.73	1.00	
Satd. Flow (perm)	556	1801	1561	505	1818	1459	516	1766		1260	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	249	663	41	30	623	108	20	26	9	167	78	333
RTOR Reduction (vph)	0	0	19	0	0	41	0	7	0	0	126	0
Lane Group Flow (vph)	249	663	22	30	623	67	20	28	0	167	285	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	31.3	31.3	31.3	31.3	31.3	31.3	16.0	16.0		16.0	16.0	
Effective Green, g (s)	31.3	31.3	31.3	31.3	31.3	31.3	16.0	16.0		16.0	16.0	
Actuated g/C Ratio	0.53	0.53	0.53	0.53	0.53	0.53	0.27	0.27		0.27	0.27	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	293	952	825	267	961	771	139	477		340	423	
v/s Ratio Prot		0.37			0.34			0.02			c0.18	
v/s Ratio Perm	c0.45		0.01	0.06		0.05	0.04			0.13		
v/c Ratio	0.85	0.70	0.03	0.11	0.65	0.09	0.14	0.06		0.49	0.67	
Uniform Delay, d1	11.9	10.4	6.7	7.0	10.0	6.9	16.4	16.0		18.2	19.3	
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	25.3	4.2	0.1	0.9	3.4	0.2	0.5	0.1		1.1	4.2	
Delay (s)	37.2	14.6	6.7	7.8	13.4	7.1	16.9	16.1		19.3	23.5	
Level of Service	D	B	A	A	B	A	B	B		B	C	
Approach Delay (s)		20.2			12.3			16.4			22.3	
Approach LOS		C			B			B			C	

Intersection Summary				
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.79			
Actuated Cycle Length (s)	59.2	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	86.3%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

07-20-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	37	721	3	1	605	10	3	1	0	45	4	72
Future Volume (Veh/h)	37	721	3	1	605	10	3	1	0	45	4	72
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	40	784	3	1	658	11	3	1	0	49	4	78
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	669			787			1606	1536	786	1530	1532	664
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	669			787			1606	1536	786	1530	1532	664
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			100			96	99	100	47	96	83
cM capacity (veh/h)	880			841			67	112	396	93	112	464

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	40	787	1	669	3	1	49	82
Volume Left	40	0	1	0	3	0	49	0
Volume Right	0	3	0	11	0	0	0	78
cSH	880	1700	841	1700	67	112	93	403
Volume to Capacity	0.05	0.46	0.00	0.39	0.04	0.01	0.53	0.20
Queue Length 95th (m)	1.1	0.0	0.0	0.0	1.1	0.2	18.8	6.0
Control Delay (s)	9.3	0.0	9.3	0.0	61.3	37.5	81.0	16.2
Lane LOS	A		A		F	E	F	C
Approach Delay (s)	0.4		0.0		55.4		40.4	
Approach LOS					F		E	

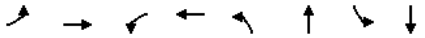
Intersection Summary				
Average Delay	3.6			
Intersection Capacity Utilization	54.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix L

2031 Total Traffic Operations Reports

Queues
1: Fruitland Road & Barton Street

08-16-2017

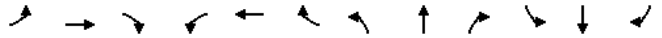


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	461	49	990	228	595	216	574
v/c Ratio	1.76	0.29	0.14	0.66	2.02	0.90	2.08	0.90
Control Delay	387.0	13.3	13.9	17.9	509.6	45.1	537.5	42.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	387.0	13.3	13.9	17.9	509.6	45.1	537.5	42.2
Queue Length 50th (m)	~84.9	23.1	4.7	60.9	~65.4	99.2	~62.7	85.3
Queue Length 95th (m)	#106.5	33.5	11.5	82.8	#92.9	#165.4	#90.7	#152.0
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	176	1569	360	1496	113	662	104	639
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	1.76	0.29	0.14	0.66	2.02	0.90	2.08	0.90

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-16-2017

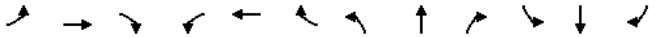


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	631	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	631	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.95		1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3173		1477	2945		1585	1757		1661	1577	
Flt Permitted	0.21	1.00		0.47	1.00		0.18	1.00		0.16	1.00	
Satd. Flow (perm)	359	3173		737	2945		303	1757		278	1577	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	686	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	17	0	0	56	0	0	5	0	0	49	0
Lane Group Flow (vph)	310	444	0	49	934	0	228	590	0	216	525	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	44.0	44.0		44.0	44.0		33.7	33.7		33.7	33.7	
Effective Green, g (s)	44.0	44.0		44.0	44.0		33.7	33.7		33.7	33.7	
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.37	0.37		0.37	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	175	1551		360	1439		113	657		104	590	
v/s Ratio Prot		0.14			0.32			0.34			0.33	
v/s Ratio Perm	c0.86			0.07			0.75			c0.78		
v/c Ratio	1.77	0.29		0.14	0.65		2.02	0.90		2.08	0.89	
Uniform Delay, d1	23.0	13.7		12.6	17.2		28.1	26.5		28.1	26.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	369.3	0.5		0.8	2.3		487.6	15.0		516.0	15.2	
Delay (s)	392.3	14.1		13.4	19.5		515.8	41.5		544.1	41.6	
Level of Service	F	B		B	B		F	D		F	D	
Approach Delay (s)		166.2			19.2			172.9			179.0	
Approach LOS		F			B			F			F	

Intersection Summary					
HCM 2000 Control Delay	126.1	HCM 2000 Level of Service	F		
HCM 2000 Volume to Capacity ratio	1.90				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.3		
Intersection Capacity Utilization	106.6%	ICU Level of Service	G		
Analysis Period (min)	15				
c Critical Lane Group					

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

08-16-2017



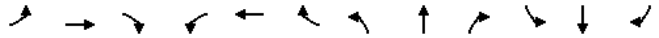
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	530	68	9	712	17	226	0	28	7	0	8
Future Volume (Veh/h)	8	530	68	9	712	17	226	0	28	7	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	576	74	10	774	18	246	0	30	8	0	9
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	793			650			1443	1444	613	1465	1472	784
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	793			650			1443	1444	613	1465	1472	784
tC, single (s)	4.4			4.1			7.1	6.5	6.2	7.3	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			99			0	100	94	91	100	98
cM capacity (veh/h)	706			946			106	130	496	89	125	370

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	659	802	276	17
Volume Left	9	10	246	8
Volume Right	74	18	30	9
cSH	706	946	116	149
Volume to Capacity	0.01	0.01	2.37	0.11
Queue Length 95th (m)	0.3	0.3	193.8	3.0
Control Delay (s)	0.3	0.3	702.5	32.2
Lane LOS	A	A	F	D
Approach Delay (s)	0.3	0.3	702.5	32.2
Approach LOS			F	D

Intersection Summary				
Average Delay	111.1			
Intersection Capacity Utilization	71.3%	ICU Level of Service	C	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

08-16-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	467	37	50	623	80	81	89	48	24	27	34
Future Volume (Veh/h)	48	467	37	50	623	80	81	89	48	24	27	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	508	40	54	677	87	88	97	52	26	29	37
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	764			550			1514	1506	530	1561	1482	720
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	764			550			1514	1506	530	1561	1482	720
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			94			0	9	91	0	73	90
cM capacity (veh/h)	858			925			65	106	552	16	109	380

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	600	818	237	92
Volume Left	52	54	88	26
Volume Right	40	87	52	37
cSH	858	925	100	45
Volume to Capacity	0.06	0.06	2.36	2.04
Queue Length 95th (m)	1.5	1.5	170.1	76.0
Control Delay (s)	1.6	1.5	710.4	677.1
Lane LOS	A	A	F	F
Approach Delay (s)	1.6	1.5	710.4	677.1
Approach LOS			F	F

Intersection Summary				
Average Delay	133.3			
Intersection Capacity Utilization	74.4%	ICU Level of Service	D	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

08-16-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	7	25	28	6	231	13	459	8	76	245	9
Future Volume (Veh/h)	26	7	25	28	6	231	13	459	8	76	245	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	8	27	30	7	251	14	499	9	83	266	10
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1222	977	275	994	978	504	280			508		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1222	977	275	994	978	504	280			508		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	65	97	96	85	97	56	99			92		
cM capacity (veh/h)	80	230	766	197	230	572	1290			1067		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	63	288	14	508	83	276
Volume Left	28	30	14	0	83	0
Volume Right	27	251	0	9	0	10
cSH	150	464	1290	1700	1067	1700
Volume to Capacity	0.42	0.62	0.01	0.30	0.08	0.16
Queue Length 95th (m)	14.8	33.1	0.3	0.0	2.0	0.0
Control Delay (s)	45.2	24.7	7.8	0.0	8.7	0.0
Lane LOS	E	C	A		A	
Approach Delay (s)	45.2	24.7	0.2		2.0	
Approach LOS	E	C				

Intersection Summary					
Average Delay		8.7			
Intersection Capacity Utilization		55.3%	ICU Level of Service		B
Analysis Period (min)		15			

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	255	523	20	11	776	125	30	89	95	231
v/c Ratio	1.05	0.51	0.02	0.02	0.76	0.16	0.15	0.24	0.39	0.60
Control Delay	93.3	9.9	1.0	6.4	17.0	3.5	18.9	16.7	23.4	17.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	93.3	9.9	1.0	6.4	17.0	3.5	18.9	16.7	23.4	17.4
Queue Length 50th (m)	~26.2	26.5	0.0	0.4	49.8	1.7	2.5	6.3	8.5	11.1
Queue Length 95th (m)	#75.2	62.6	1.1	2.6	#138.9	9.1	8.2	15.8	19.6	28.8
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	242	1028	811	443	1018	800	464	846	555	747
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	1.05	0.51	0.02	0.02	0.76	0.16	0.06	0.11	0.17	0.31

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.

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

08-16-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	481	18	10	714	115	28	68	14	87	14	199
Future Volume (vph)	235	481	18	10	714	115	28	68	14	87	14	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1317	1582	1761		1586	1453	
Flt Permitted	0.24	1.00	1.00	0.41	1.00	1.00	0.59	1.00		0.70	1.00	
Satd. Flow (perm)	416	1766	1358	762	1749	1317	977	1761		1168	1453	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	523	20	11	776	125	30	74	15	95	15	216
RTOR Reduction (vph)	0	0	8	0	0	33	0	12	0	0	85	0
Lane Group Flow (vph)	255	523	12	11	776	92	30	77	0	95	146	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	33.2	33.2	33.2	33.2	33.2	33.2	11.8	11.8		11.8	11.8	
Effective Green, g (s)	33.2	33.2	33.2	33.2	33.2	33.2	11.8	11.8		11.8	11.8	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58	0.58	0.21	0.21		0.21	0.21	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	242	1030	792	444	1020	768	202	365		242	301	
v/s Ratio Prot		0.30			0.44			0.04			c0.10	
v/s Ratio Perm	c0.61		0.01	0.01		0.07	0.03			0.08		
v/c Ratio	1.05	0.51	0.01	0.02	0.76	0.12	0.15	0.21		0.39	0.49	
Uniform Delay, d1	11.8	7.0	5.0	5.0	8.9	5.3	18.4	18.7		19.5	19.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	72.7	1.8	0.0	0.1	5.3	0.3	0.3	0.3		1.1	1.2	
Delay (s)	84.5	8.8	5.0	5.1	14.2	5.6	18.8	19.0		20.5	21.1	
Level of Service	F	A	A	A	B	A	B	B		C	C	
Approach Delay (s)		32.9			12.9			18.9			20.9	
Approach LOS		C			B			B			C	

Intersection Summary				
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.90			
Actuated Cycle Length (s)	56.9	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	92.3%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

08-16-2017

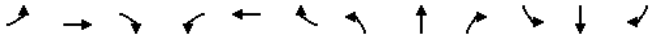
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	467	3	0	574	78	6	4	1	41	0	50
Future Volume (Veh/h)	68	467	3	0	574	78	6	4	1	41	0	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	508	3	0	624	85	7	4	1	45	0	54
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	710			511			1336	1368	510	1326	1326	668
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	710			511			1336	1368	510	1326	1326	668
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	91			100			93	97	100	62	100	87
cM capacity (veh/h)	848			1065			107	135	568	117	143	411

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	74	511	0	709	7	5	45	54
Volume Left	74	0	0	0	7	0	45	0
Volume Right	0	3	0	85	0	1	0	54
cSH	848	1700	1700	1700	107	159	117	411
Volume to Capacity	0.09	0.30	0.00	0.42	0.07	0.03	0.38	0.13
Queue Length 95th (m)	2.3	0.0	0.0	0.0	1.7	0.8	12.7	3.6
Control Delay (s)	9.6	0.0	0.0	0.0	41.0	28.3	53.8	15.1
Lane LOS	A				E	D	F	C
Approach Delay (s)	1.2		0.0		35.7		32.7	
Approach LOS					E		D	

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	57.7%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
7: Gordon Dean Avenue & Collector Road B

08-16-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	0	49	29	74	88	98	10	54	25	43	54	0
Future Volume (veh/h)	0	49	29	74	88	98	10	54	25	43	54	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	53	32	80	96	107	11	59	27	47	59	0
Approach Volume (veh/h)		85			283			97			106	
Crossing Volume (veh/h)		186			70			100			187	
High Capacity (veh/h)		1197			1311			1281			1196	
High v/c (veh/h)		0.07			0.22			0.08			0.09	
Low Capacity (veh/h)		991			1094			1067			990	
Low v/c (veh/h)		0.09			0.26			0.09			0.11	

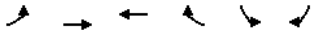
Intersection Summary				
Maximum v/c High	0.22			
Maximum v/c Low	0.26			
Intersection Capacity Utilization	39.9%	ICU Level of Service	A	

HCM Unsignalized Intersection Capacity Analysis
8: Jones Road & Collector Road B

08-16-2017

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Right Turn Channelized						
Traffic Volume (veh/h)	29	58	34	139	113	17
Future Volume (veh/h)	29	58	34	139	113	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	63	37	151	123	18
Approach Volume (veh/h)	95			188	141	
Crossing Volume (veh/h)	123			32	37	
High Capacity (veh/h)	1258			1351	1345	
High v/c (veh/h)	0.08			0.14	0.10	
Low Capacity (veh/h)	1046			1130	1125	
Low v/c (veh/h)	0.09			0.17	0.13	

Intersection Summary				
Maximum v/c High	0.14			
Maximum v/c Low	0.17			
Intersection Capacity Utilization	31.3%	ICU Level of Service	A	



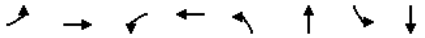
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	56	527	650	13	34	189
Future Volume (Veh/h)	56	527	650	13	34	189
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	61	573	707	14	37	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		346				
pX, platoon unblocked					0.85	
vC, conflicting volume	721				1409	714
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	721				1393	714
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				70	53
cM capacity (veh/h)	890				125	435

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	634	721	242
Volume Left	61	0	37
Volume Right	0	14	205
cSH	890	1700	315
Volume to Capacity	0.07	0.42	0.77
Queue Length 95th (m)	1.8	0.0	47.9
Control Delay (s)	1.8	0.0	45.8
Lane LOS	A		E
Approach Delay (s)	1.8	0.0	45.8
Approach LOS			E

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		

Queues
1: Fruitland Road & Barton Street

08-16-2017



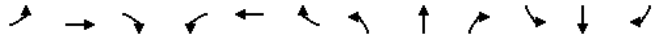
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	1028	111	740	138	468	353	867
v/c Ratio	1.59	0.71	0.89	0.51	1.82	0.62	1.42	1.17
Control Delay	309.7	22.6	84.3	17.5	437.1	23.8	235.5	115.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	309.7	22.6	84.3	17.5	437.1	23.8	235.5	115.9
Queue Length 50th (m)	~94.7	73.1	18.0	43.4	~38.2	62.3	~87.2	~187.5
Queue Length 95th (m)	#149.0	97.0	#52.2	60.2	#62.5	95.7	#140.8	#261.5
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	227	1453	125	1445	76	749	249	742
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	1.59	0.71	0.89	0.51	1.82	0.62	1.42	1.17

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-16-2017

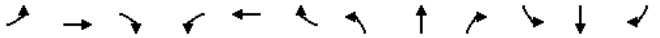


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	350	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	350	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		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	
Frt	1.00	0.96		1.00	0.96		1.00	0.97		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)	1693	3264		1661	3216		1646	1720		1600	1692	
Flt Permitted	0.29	1.00		0.16	1.00		0.10	1.00		0.34	1.00	
Satd. Flow (perm)	524	3264		288	3216		179	1720		581	1692	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	380	88	353	629	238
RTOR Reduction (vph)	0	38	0	0	52	0	0	9	0	0	15	0
Lane Group Flow (vph)	361	990	0	111	688	0	138	459	0	353	852	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Effective Green, g (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Actuated g/C Ratio	0.43	0.43		0.43	0.43		0.43	0.43		0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	227	1414		124	1393		76	739		249	727	
v/s Ratio Prot		0.30			0.21			0.27			0.50	
v/s Ratio Perm	c0.69			0.38			c0.77			0.61		
v/c Ratio	1.59	0.70		0.90	0.49		1.82	0.62		1.42	1.17	
Uniform Delay, d1	25.5	20.7		23.6	18.4		25.6	19.9		25.6	25.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	285.5	2.9		56.4	1.3		413.9	1.6		209.9	91.4	
Delay (s)	311.0	23.7		80.0	19.6		439.5	21.6		235.6	117.1	
Level of Service	F	C		F	B		F	C		F	F	
Approach Delay (s)		98.3			27.5			116.7			151.3	
Approach LOS		F			C			F			F	

Intersection Summary

HCM 2000 Control Delay	102.2	HCM 2000 Level of Service		F	
HCM 2000 Volume to Capacity ratio	1.69				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	120.9%	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												
Traffic Volume (veh/h)	11	854	235	27	588	1	136	0	16	7	0	11
Future Volume (Veh/h)	11	854	235	27	588	1	136	0	16	7	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	928	255	29	639	1	148	0	17	8	0	12
Pedestrians											2	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	642			1183			1789	1780	1056	1796	1906	642
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642			1183			1789	1780	1056	1796	1906	642
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			95			0	100	94	84	100	97
cM capacity (veh/h)	841			597			59	78	276	50	65	477

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1195	669	165	20
Volume Left	12	29	148	8
Volume Right	255	1	17	12
cSH	841	597	64	108
Volume to Capacity	0% 0.01	0.05	2.57	0.19

TABLE P.2: 2017 PM BASE YEAR TRAFFIC OPERATIONS (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	B	B	>	**B**	B	B	>	**B**	C	C	>	**C**	C	D	>	**D**	**C**
			Delay	18	12	>	**15**	12	12	>	**12**	22	22	>	**22**	21	37	>	**35**	**22**
			V/C	0.52	0.17	>		0.09	0.19	>		0.29	0.38	>		0.26	0.84	>		**0.65**
			Q	62	23	>		12	25	>		12	45	>		20	109	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	18	-	>		23	-	>		23	-	>		30	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A		**A**		A	>	**A**					B		>	**B**	**A**
			Delay	<	0		**0**		0	>	**0**					12		>	**12**	**0**
			V/C	<	0.01				0.21	>						0.03		>		
			Q	<	0				0	>						1		>		
			Ex	<	-				-	>						-		>		
			Avail.	<	-				-	>						-		>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	C	>	**C**	<	C	>	**C**	**A**
			Delay	<	0	>	**0**	<	1	>	**1**	<	16	>	**16**	<	17	>	**17**	**4**
			V/C	<	0.01	>		<	0.01	>		<	0.18	>		<	0.27	>		
			Q	<	0	>		<	0	>		<	5	>		<	9	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	B		>	**B**					A	A		**A**		A	>	**A**	**A**
			Delay	13		>	**13**					8	0		**1**		0	>	**0**	**1**
			V/C	0.07		>						0.02	0.16				0.25	>		
			Q	2		>						0	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						20	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	A	A	A	**A**	A	A	A	**A**	B	B	>	**B**	C	B	>	**B**	**B**
			Delay	8	8	5	**8**	5	8	5	**7**	18	18	>	**18**	21	20	>	**20**	**11**
			V/C	0.35	0.45	0.02		0.05	0.42	0.05		0.09	0.05	>		0.45	0.32	>		**0.45**
			Q	23	50	2		4	46	5		5	6	>		24	22	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	52	-	8		56	-	30		20	-	>		1	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	D	C	>	**D**	D	B	>	**C**	**A**
			Delay	9	0	>	**0**	9	0	>	**0**	28	22	>	**26**	28	12	>	**18**	**2**
			V/C	0.03	0.33	>		0.00	0.28	>		0.01	0.00	>		0.18	0.11	>		
			Q	1	0	>		0	0	>		0	0	>		5	3	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	79	-	>		35	-	>		25	-	>		10	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.3: PHASE 2 ROAD NETWORK
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 1 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	B	>	**F**	B	C	>	**C**	F	C	>	**F**	F	C	>	**F**	**F**
			Delay	474	15	>	**200**	15	22	>	**21**	356	34	>	**123**	362	34	>	**124**	**110**
			V/C	1.95	0.30	>		0.14	0.68	>		1.66	0.85	>		1.67	0.84	>		**1.82**
			Q	112	35	>		12	88	>		84	158	>		81	145	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-32	-	>		23	-	>		-49	-	>		-31	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	E	>	**E**	**F**
			Delay	<	0	>	**0**	<	1	>	**1**	<	851	>	**851**	<	39	>	**39**	**151**
			V/C	<	0.01	>		<	0.04	>		<	2.71	>		<	0.14	>		
			Q	<	0	>		<	1	>		<	235	>		<	4	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	2	>	**2**	<	1	>	**1**	<	824	>	**824**	<	787	>	**787**	**149**
			V/C	<	0.06	>		<	0.05	>		<	2.60	>		<	2.26	>		
			Q	<	2	>		<	1	>		<	175	>		<	79	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	<	E	>	**E**	<	F	>	**F**	A	A	>	**A**	A	A	>	**A**	**F**
			Delay	<	46	>	**46**	<	588	>	**588**	8	0	>	**0**	9	0	>	**2**	**209**
			V/C	<	0.42	>		<	2.21	>		0.01	0.36	>		0.08	0.16	>		
			Q	<	15	>		<	350	>		0	0	>		2	0	>		
			Ex	<	-	>		<	-	>		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	>		20	-	>		18	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	C	A	A	**B**	A	A	A	**A**	C	C	>	**C**	D	C	>	**D**	**B**
			Delay	21	8	5	**13**	5	9	6	**9**	30	27	>	**28**	39	34	>	**36**	**19**
			V/C	0.74	0.40	0.01		0.02	0.51	0.13		0.37	0.21	>		0.71	0.65	>		**0.73**
			Q	99	67	2		3	90	9		13	22	>		48	56	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-24	-	8		57	-	26		12	-	>		-23	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	E	D	>	**E**	E	C	>	**D**	**A**
			Delay	10	0	>	**1**	0	0	>	**0**	42	29	>	**37**	46	15	>	**26**	**2**
			V/C	0.09	0.31	>		0.00	0.42	>		0.07	0.03	>		0.24	0.13	>		
			Q	2	0	>		0	0	>		2	1	>		7	4	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		23	-	>		8	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.4: PHASE 2 ROAD NETWORK
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 1 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	C	>	**F**	F	C	>	**C**	F	B	>	**F**	F	F	>	**F**	**F**
			Delay	377	26	>	**117**	118	21	>	**34**	439	20	>	**115**	177	93	>	**117**	**100**
			V/C	1.74	0.74	>		1.02	0.52	>		1.82	0.59	>		1.28	1.11	>		**1.77**
			Q	153	102	>		55	63	>		62	91	>		136	254	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-73	-	>		-20	-	>		-27	-	>		-86	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	1	>	**1**	<	3	>	**3**	<	Err	>	**Err**	<	69	>	**69**	**947**
			V/C	<	0.01	>		<	0.12	>		<	3.24	>		<	0.26	>		
			Q	<	0	>		<	3	>		<	Err	>		<	8	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	0	>	**0**	<	2	>	**2**	<	Err	>	**Err**	<	484	>	**484**	**923**
			V/C	<	0.01	>		<	0.07	>		<	4.44	>		<	1.81	>		
			Q	<	0	>		<	2	>		<	Err	>		<	108	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	<	F	>	**F**	<	F	>	**F**	A	A	>	**A**	B	A	>	**A**	**F**
			Delay	<	223	>	**223**	<	Err	>	**Err**	9	0	>	**0**	11	0	>	**3**	**1679**
			V/C	<	1.00	>		<	5.06	>		0.03	0.45	>		0.30	0.38	>		
			Q	<	39	>		<	Err	>		1	0	>		10	0	>		
			Ex	<	-	>		<	-	>		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	>		19	-	>		10	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	F	B	A	**F**	A	B	A	**B**	C	C	>	**C**	D	E	>	**E**	**E**
			Delay	191	13	7	**85**	8	12	8	**11**	32	29	>	**30**	54	64	>	**61**	**55**
			V/C	1.35	0.61	0.03		0.09	0.56	0.17		0.29	0.07	>		0.85	0.92	>		**1.23**
			Q	127	118	4		6	102	12		11	13	>		91	130	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-52	-	6		54	-	23		14	-	>		-66	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	F	E	>	**F**	F	C	>	**F**	**A**
			Delay	10	0	>	**1**	9	0	>	**0**	88	47	>	**78**	139	18	>	**60**	**6**
			V/C	0.08	0.48	>		0.00	0.43	>		0.06	0.01	>		0.73	0.26	>		
			Q	2	0	>		0	0	>		2	0	>		27	8	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		23	-	>		-12	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.5: PHASE 2 ROAD NETWORK
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 2 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	B	>	**F**	B	C	>	**C**	F	D	>	**E**	F	D	>	**F**	**F**
			Delay	539	15	>	**222**	14	22	>	**21**	152	35	>	**59**	387	43	>	**149**	**105**
			V/C	2.09	0.28	>		0.14	0.71	>		1.12	0.80	>		1.73	0.87	>		**1.93**
			Q	126	38	>		13	106	>		68	146	>		124	157	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-46	-	>		22	-	>		-33	-	>		-74	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	E	>	**E**	**F**
			Delay	<	0	>	**0**	<	0	>	**0**	<	Err	>	**Err**	<	37	>	**37**	**1561**
			V/C	<	0.01	>		<	0.01	>		<	3.04	>		<	0.13	>		
			Q	<	0	>		<	0	>		<	Err	>		<	4	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	2	>	**2**	<	2	>	**2**	<	Err	>	**Err**	<	775	>	**775**	**1635**
			V/C	<	0.06	>		<	0.06	>		<	3.24	>		<	2.23	>		
			Q	<	2	>		<	2	>		<	Err	>		<	79	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	C		>	**C**					A	A		**A**		A	>	**A**	**A**
			Delay	15		>	**15**					8	0		**0**		0	>	**0**	**1**
			V/C	0.15		>						0.01	0.29				0.17	>		
			Q	4		>						0	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						20	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	B	A	A	**A**	A	A	A	**A**	C	C	>	**C**	D	C	>	**D**	**B**
			Delay	19	6	4	**10**	4	9	4	**9**	34	34	>	**34**	39	33	>	**35**	**14**
			V/C	0.71	0.42	0.01		0.02	0.65	0.11		0.25	0.30	>		0.57	0.20	>		**0.68**
			Q	80	63	1		2	126	9		13	26	>		33	21	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-5	-	9		58	-	26		12	-	>		-8	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	B	A	>	**A**	A	A	>	**A**	F	D	>	**F**	F	D	>	**F**	**B**
			Delay	10	0	>	**2**	0	0	>	**0**	258	34	>	**165**	129	32	>	**52**	**13**
			V/C	0.17	0.28	>		0.00	0.42	>		0.35	0.04	>		0.81	0.70	>		
			Q	5	0	>		0	0	>		8	1	>		35	42	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	75	-	>		35	-	>		17	-	>		-20	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.6: PHASE 2 ROAD NETWORK
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 2 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	C	>	**F**	D	C	>	**C**	F	C	>	**D**	F	E	>	**F**	**F**
			Delay	470	23	>	**146**	48	22	>	**25**	126	23	>	**37**	290	71	>	**149**	**103**
			V/C	1.94	0.63	>		0.72	0.57	>		0.97	0.57	>		1.54	1.03	>		**1.74**
			Q	136	96	>		50	81	>		42	93	>		180	236	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-56	-	>		-15	-	>		-7	-	>		-130	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	1	>	**1**	<	2	>	**2**	<	Err	>	**Err**	<	59	>	**59**	**1229**
			V/C	<	0.01	>		<	0.05	>		<	5.94	>		<	0.23	>		
			Q	<	0	>		<	1	>		<	Err	>		<	7	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	0	>	**0**	<	2	>	**2**	<	Err	>	**Err**	<	553	>	**553**	**959**
			V/C	<	0.01	>		<	0.09	>		<	5.30	>		<	1.95	>		
			Q	<	0	>		<	2	>		<	Err	>		<	113	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	C		>	**C**					A	A		**A**		A	>	**A**	**A**
			Delay	23		>	**23**					9	0		**1**		0	>	**0**	**2**
			V/C	0.25		>						0.03	0.26				0.38	>		
			Q	8		>						1	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						19	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	D	B	A	**C**	A	B	A	**B**	C	C	>	**C**	D	D	>	**D**	**C**
			Delay	45	18	6	**23**	8	13	6	**12**	32	28	>	**30**	40	47	>	**44**	**24**
			V/C	0.90	0.80	0.03		0.15	0.66	0.11		0.27	0.08	>		0.68	0.81	>		**0.87**
			Q	108	247	5		8	152	12		10	12	>		55	82	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-33	-	5		52	-	23		15	-	>		-30	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	B	A	>	**A**	A	A	>	**A**	F	F	>	**F**	F	D	>	**F**	**E**
			Delay	12	0	>	**3**	9	0	>	**0**	538	121	>	**434**	1131	30	>	**306**	**46**
			V/C	0.36	0.47	>		0.00	0.43	>		0.33	0.03	>		2.82	0.62	>		
			Q	13	0	>		0	0	>		6	1	>		74	32	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	67	-	>		35	-	>		19	-	>		-59	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.7: PHASE 2 ROAD NETWORK
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 3 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	B	>	**F**	B	C	>	**C**	F	D	>	**F**	F	D	>	**F**	**F**
			Delay	444	16	>	**188**	15	22	>	**22**	387	37	>	**134**	395	38	>	**135**	**112**
			V/C	1.88	0.29	>		0.14	0.67	>		1.73	0.85	>		1.74	0.85	>		**1.81**
			Q	119	38	>		13	95	>		92	171	>		89	159	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-39	-	>		22	-	>		-57	-	>		-39	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	D	>	**D**	**F**
			Delay	<	0	>	**0**	<	0	>	**0**	<	707	>	**707**	<	32	>	**32**	**112**
			V/C	<	0.01	>		<	0.01	>		<	2.38	>		<	0.11	>		
			Q	<	0	>		<	0	>		<	195	>		<	3	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	2	>	**2**	<	2	>	**2**	<	710	>	**710**	<	677	>	**677**	**133**
			V/C	<	0.06	>		<	0.06	>		<	2.36	>		<	2.04	>		
			Q	<	2	>		<	2	>		<	170	>		<	76	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	<	E	>	**E**	<	F	>	**F**	A	A	>	**A**	A	A	>	**A**	**F**
			Delay	<	48	>	**48**	<	383	>	**383**	8	0	>	**0**	9	0	>	**2**	**129**
			V/C	<	0.43	>		<	1.75	>		0.01	0.33	>		0.08	0.16	>		
			Q	<	16	>		<	258	>		0	0	>		2	0	>		
			Ex	<	-	>		<	-	>		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	>		20	-	>		18	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	B	A	A	**B**	A	A	A	**A**	C	C	>	**C**	C	D	>	**D**	**B**
			Delay	18	8	5	**12**	5	9	5	**8**	31	27	>	**28**	29	37	>	**35**	**17**
			V/C	0.70	0.40	0.01		0.02	0.50	0.10		0.36	0.23	>		0.41	0.69	>		**0.70**
			Q	96	67	2		3	91	8		12	22	>		27	56	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-21	-	8		57	-	27		13	-	>		-2	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	E	D	>	**D**	F	C	>	**E**	**A**
			Delay	10	0	>	**1**	0	0	>	**0**	39	27	>	**34**	71	15	>	**47**	**5**
			V/C	0.09	0.28	>		0.00	0.42	>		0.06	0.03	>		0.60	0.13	>		
			Q	2	0	>		0	0	>		2	1	>		24	4	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		24	-	>		-9	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE P.8: PHASE 2 ROAD NETWORK
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 3 (WITH SIGNAL OPTIMIZATION)

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	F	C	>	**F**	F	C	>	**C**	F	B	>	**F**	F	F	>	**F**	**F**
			Delay	377	26	>	**117**	118	21	>	**34**	439	20	>	**115**	177	93	>	**117**	**100**
			V/C	1.74	0.74	>		1.02	0.52	>		1.82	0.59	>		1.28	1.11	>		**1.77**
			Q	153	102	>		55	63	>		62	91	>		136	254	>		
			Ex	80	-	>		35	-	>		35	-	>		50	-	>		
			Avail.	-73	-	>		-20	-	>		-27	-	>		-86	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	E	>	**E**	**F**
			Delay	<	1	>	**1**	<	1	>	**1**	<	848	>	**848**	<	46	>	**46**	**70**
			V/C	<	0.01	>		<	0.05	>		<	2.57	>		<	0.19	>		
			Q	<	0	>		<	1	>		<	131	>		<	5	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TWSC	LOS	<	A	>	**A**	<	A	>	**A**	<	F	>	**F**	<	F	>	**F**	**F**
			Delay	<	0	>	**0**	<	2	>	**2**	<	Err	>	**Err**	<	495	>	**495**	**848**
			V/C	<	0.01	>		<	0.08	>		<	3.20	>		<	1.83	>		
			Q	<	0	>		<	2	>		<	Err	>		<	109	>		
			Ex	<	-	>		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	>		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TWSC	LOS	<	F	>	**F**	<	F	>	**F**	A	A	>	**A**	B	A	>	**A**	**F**
			Delay	<	299	>	**299**	<	Err	>	**Err**	9	0	>	**0**	10	0	>	**3**	**1528**
			V/C	<	1.16	>		<	3.38	>		0.03	0.39	>		0.28	0.38	>		
			Q	<	44	>		<	Err	>		1	0	>		9	0	>		
			Ex	<	-	>		<	-	>		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	>		19	-	>		11	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	F	B	A	**F**	A	B	A	**B**	C	C	>	**C**	C	E	>	**D**	**E**
			Delay	211	14	7	**93**	8	13	8	**12**	31	28	>	**29**	34	59	>	**53**	**59**
			V/C	1.39	0.62	0.03		0.09	0.57	0.09		0.29	0.07	>		0.56	0.91	>		**1.25**
			Q	134	125	5		7	108	9		11	13	>		53	129	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-59	-	5		53	-	26		14	-	>		-28	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	F	E	>	**F**	F	C	>	**F**	**A**
			Delay	10	0	>	**1**	9	0	>	**0**	78	46	>	**70**	201	18	>	**99**	**10**
			V/C	0.08	0.47	>		0.00	0.43	>		0.06	0.01	>		1.01	0.25	>		
			Q	2	0	>		0	0	>		1	0	>		43	8	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		24	-	>		-28	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

Appendix Q

Phase 2 Road Network – 2031 Total Traffic Operations Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	202	185	17	17	228	98	48	255	26	102	141	207
Future Volume (vph)	202	185	17	17	228	98	48	255	26	102	141	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Frt		0.988			0.955			0.986			0.911	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3245	0	1479	2949	0	1586	1764	0	1662	1565	0
Flt Permitted	0.539			0.615			0.272			0.393		
Satd. Flow (perm)	941	3245	0	956	2949	0	454	1764	0	687	1565	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13			94			7			103	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	220	201	18	18	248	107	52	277	28	111	153	225
Shared Lane Traffic (%)												
Lane Group Flow (vph)	220	219	0	18	355	0	52	305	0	111	378	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

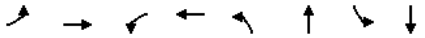
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	45.0	45.0		45.0	45.0		45.0	45.0		45.0	45.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	54.5	54.5		54.5	54.5		23.2	23.2		23.2	23.2	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.26	0.26		0.26	0.26	
v/c Ratio	0.39	0.11		0.03	0.19		0.45	0.66		0.63	0.79	
Control Delay	13.6	8.5		10.1	7.1		38.1	35.4		43.9	33.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	13.6	8.5		10.1	7.1		38.1	35.4		43.9	33.7	
LOS	B	A		B	A		D	D		D	C	
Approach Delay		11.1			7.2			35.8			36.0	
Approach LOS		B			A			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 2 (2%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 22.9		Intersection LOS: C	
Intersection Capacity Utilization 91.8%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

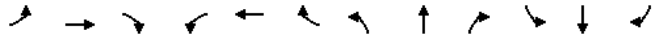


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	220	219	18	355	52	305	111	378
v/c Ratio	0.39	0.11	0.03	0.19	0.45	0.66	0.63	0.79
Control Delay	13.6	8.5	10.1	7.1	38.1	35.4	43.9	33.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	8.5	10.1	7.1	38.1	35.4	43.9	33.7
Queue Length 50th (m)	18.5	7.4	1.2	9.7	8.0	49.0	18.0	47.6
Queue Length 95th (m)	46.0	16.5	5.2	21.4	17.2	64.8	31.7	69.0
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	569	1969	578	1822	195	762	295	731
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	0.39	0.11	0.03	0.19	0.27	0.40	0.38	0.52

Intersection Summary

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



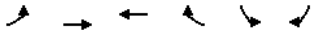
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	202	185	17	17	228	98	48	255	26	102	141	207
Future Volume (vph)	202	185	17	17	228	98	48	255	26	102	141	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.99		1.00	0.95		1.00	0.99		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1658	3244		1477	2949		1585	1764		1661	1565	
Flt Permitted	0.54	1.00		0.61	1.00		0.27	1.00		0.39	1.00	
Satd. Flow (perm)	941	3244		956	2949		454	1764		687	1565	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	201	18	18	248	107	52	277	28	111	153	225
RTOR Reduction (vph)	0	5	0	0	37	0	0	5	0	0	76	0
Lane Group Flow (vph)	220	214	0	18	318	0	52	300	0	111	302	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	54.5	54.5		54.5	54.5		23.2	23.2		23.2	23.2	
Effective Green, g (s)	54.5	54.5		54.5	54.5		23.2	23.2		23.2	23.2	
Actuated g/C Ratio	0.61	0.61		0.61	0.61		0.26	0.26		0.26	0.26	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	569	1964		578	1785		117	454		177	403	
v/s Ratio Prot		0.07			0.11			0.17			c0.19	
v/s Ratio Perm	c0.23			0.02			0.11			0.16		
v/c Ratio	0.39	0.11		0.03	0.18		0.44	0.66		0.63	0.75	
Uniform Delay, d1	9.1	7.5		7.1	7.8		28.0	29.9		29.6	30.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	0.1		0.1	0.2		2.7	3.6		6.8	7.4	
Delay (s)	11.1	7.6		7.2	8.1		30.7	33.5		36.3	38.1	
Level of Service	B	A		A	A		C	C		D	D	
Approach Delay (s)		9.4			8.0			33.1			37.7	
Approach LOS		A			A			C			D	

Intersection Summary				
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.49			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.3	
Intersection Capacity Utilization	91.8%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
2: Barton Street & Sunnyhurst Avenue

02-06-2018

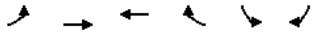


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	6	304	323	12	5	6
Future Volume (vph)	6	304	323	12	5	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.995		0.921	
Flt Protected		0.999			0.980	
Satd. Flow (prot)	0	1722	1658	0	1402	0
Flt Permitted		0.999			0.980	
Satd. Flow (perm)	0	1722	1658	0	1402	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		363.5	360.5		165.9	
Travel Time (s)		21.8	21.6		11.9	
Confl. Peds. (#/hr)	1			1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	10%	17%	20%	17%
Adj. Flow (vph)	7	330	351	13	5	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	337	364	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.3	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.8%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Barton Street & Sunnyhurst Avenue

02-06-2018



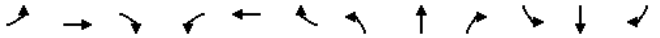
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	304	323	12	5	6
Future Volume (Veh/h)	6	304	323	12	5	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	330	351	13	5	7
Pedestrians					1	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	365				702	358
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	365				702	358
tC, single (s)	4.4				6.6	6.4
tC, 2 stage (s)						
tF (s)	2.5				3.7	3.5
p0 queue free %	99				99	99
cM capacity (veh/h)	1041				375	653

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	337	364	12
Volume Left	7	0	5
Volume Right	0	13	7
cSH	1041	1700	499
Volume to Capacity	0.01	0.21	0.02
Queue Length 95th (m)	0.2	0.0	0.6
Control Delay (s)	0.2	0.0	12.4
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	12.4
Approach LOS			B

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street

02-06-2018

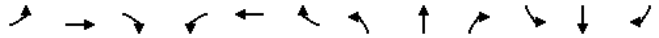


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	253	14	9	293	39	24	63	14	17	19	24
Future Volume (vph)	34	253	14	9	293	39	24	63	14	17	19	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.994			0.985			0.981			0.946	
Flt Protected		0.994			0.999			0.988			0.986	
Satd. Flow (prot)	0	1700	0	0	1663	0	0	1747	0	0	1471	0
Flt Permitted		0.994			0.999			0.988			0.986	
Satd. Flow (perm)	0	1700	0	0	1663	0	0	1747	0	0	1471	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			926.9			262.0	
Travel Time (s)		21.6			8.1			66.7			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	37	275	15	10	318	42	26	68	15	18	21	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	327	0	0	370	0	0	109	0	0	65	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.5%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-06-2018



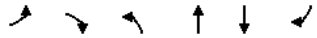
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	34	253	14	9	293	39	24	63	14	17	19	24
Future Volume (Veh/h)	34	253	14	9	293	39	24	63	14	17	19	24
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	275	15	10	318	42	26	68	15	18	21	26
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	360			292			754	738	284	764	725	339
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	360			292			754	738	284	764	725	339
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	97			99			91	79	98	93	94	96
cM capacity (veh/h)	1210			1162			290	330	758	252	334	638

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	327	370	109	65
Volume Left	37	10	26	18
Volume Right	15	42	15	26
cSH	1210	1162	346	372
Volume to Capacity	0.03	0.01	0.32	0.17
Queue Length 95th (m)	0.8	0.2	10.6	5.0
Control Delay (s)	1.2	0.3	20.1	16.7
Lane LOS	A	A	C	C
Approach Delay (s)	1.2	0.3	20.1	16.7
Approach LOS			C	C

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	44.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	17	18	9	299	157	6
Future Volume (vph)	17	18	9	299	157	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	20.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.929				0.995	
Flt Protected	0.977		0.950			
Satd. Flow (prot)	1667	0	1745	1717	1634	0
Flt Permitted	0.977		0.950			
Satd. Flow (perm)	1667	0	1745	1717	1634	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	187.5			547.7	493.1	
Travel Time (s)	13.5			39.4	35.5	
Confl. Peds. (#/hr)			4			4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	7%	11%	33%
Adj. Flow (vph)	18	20	10	325	171	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	0	10	325	178	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.3			3.3	3.3	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.7%		ICU Level of Service A	
Analysis Period (min) 15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	18	9	299	157	6
Future Volume (Veh/h)	17	18	9	299	157	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	20	10	325	171	7
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	524	178	182			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	524	178	182			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	98	99			
cM capacity (veh/h)	512	867	1401			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	38	10	325	178
Volume Left	18	10	0	0
Volume Right	20	0	0	7
cSH	653	1401	1700	1700
Volume to Capacity	0.06	0.01	0.19	0.10
Queue Length 95th (m)	1.5	0.2	0.0	0.0
Control Delay (s)	10.9	7.6	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.9	0.2		0.0
Approach LOS	B			

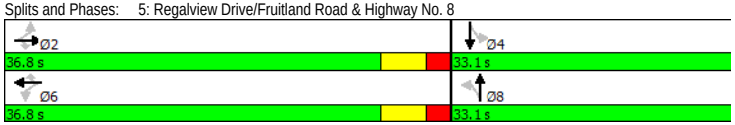
Intersection Summary				
Average Delay		0.9		
Intersection Capacity Utilization		25.7%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	293	13	7	348	79	20	47	10	59	9	107
Future Volume (vph)	155	293	13	7	348	79	20	47	10	59	9	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00				0.98	
Frt			0.850			0.850		0.973			0.862	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1678	1766	1358	1745	1749	1346	1586	1756	0	1586	1455	0
Flt Permitted	0.537			0.568			0.676			0.717		
Satd. Flow (perm)	948	1766	1358	1043	1749	1317	1125	1756	0	1197	1455	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			86		11			116	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			530.2			289.3			547.7	
Travel Time (s)		17.6			31.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	168	318	14	8	378	86	22	51	11	64	10	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	168	318	14	8	378	86	22	62	0	64	126	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	36.8	36.8	36.8	36.8	36.8	36.8	33.1	33.1		33.1	33.1	
Total Split (%)	52.6%	52.6%	52.6%	52.6%	52.6%	52.6%	47.4%	47.4%		47.4%	47.4%	
Maximum Green (s)	31.0	31.0	31.0	31.0	31.0	31.0	27.0	27.0		27.0	27.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	35.7	35.7	35.7	35.7	35.7	35.7	10.3	10.3		10.3	10.3	
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67	0.67	0.19	0.19		0.19	0.19	
v/c Ratio	0.26	0.27	0.02	0.01	0.32	0.09	0.10	0.18		0.28	0.34	
Control Delay	7.0	6.1	0.3	5.0	6.5	1.8	18.9	17.0		22.0	8.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	7.0	6.1	0.3	5.0	6.5	1.8	18.9	17.0		22.0	8.2	
LOS	A	A	A	A	A	A	B	B		C	A	
Approach Delay		6.3			5.6			17.5			12.8	
Approach LOS		A			A			B			B	

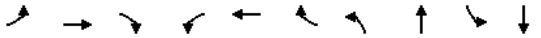
Intersection Summary			
Area Type:	Other		
Cycle Length: 69.9			
Actuated Cycle Length: 53.4			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.34			
Intersection Signal Delay: 7.8		Intersection LOS: A	
Intersection Capacity Utilization 60.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8



Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018

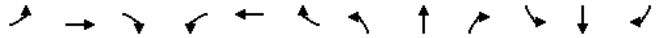


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	168	318	14	8	378	86	22	62	64	126
v/c Ratio	0.26	0.27	0.02	0.01	0.32	0.09	0.10	0.18	0.28	0.34
Control Delay	7.0	6.1	0.3	5.0	6.5	1.8	18.9	17.0	22.0	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	6.1	0.3	5.0	6.5	1.8	18.9	17.0	22.0	8.2
Queue Length 50th (m)	7.2	13.8	0.0	0.3	17.1	0.0	1.8	4.3	5.6	0.8
Queue Length 95th (m)	17.6	27.0	0.4	1.6	32.9	4.3	6.8	12.4	14.5	11.9
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	634	1182	924	698	1170	910	568	892	604	792
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	0.26	0.27	0.02	0.01	0.32	0.09	0.04	0.07	0.11	0.16

Intersection Summary

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	293	13	7	348	79	20	47	10	59	9	107
Future Volume (vph)	155	293	13	7	348	79	20	47	10	59	9	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1676	1766	1358	1745	1749	1317	1582	1757		1586	1456	
Flt Permitted	0.54	1.00	1.00	0.57	1.00	1.00	0.68	1.00		0.72	1.00	
Satd. Flow (perm)	948	1766	1358	1043	1749	1317	1126	1757		1196	1456	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	168	318	14	8	378	86	22	51	11	64	10	116
RTOR Reduction (vph)	0	0	5	0	0	32	0	9	0	0	99	0
Lane Group Flow (vph)	168	318	9	8	378	54	22	53	0	64	27	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	34.6	34.6	34.6	34.6	34.6	34.6	8.2	8.2		8.2	8.2	
Effective Green, g (s)	34.6	34.6	34.6	34.6	34.6	34.6	8.2	8.2		8.2	8.2	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63	0.63	0.15	0.15		0.15	0.15	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	599	1117	858	659	1106	833	168	263		179	218	
v/s Ratio Prot		0.18			c0.22			0.03			0.02	
v/s Ratio Perm	0.18		0.01	0.01		0.04	0.02			c0.05		
v/c Ratio	0.28	0.28	0.01	0.01	0.34	0.07	0.13	0.20		0.36	0.13	
Uniform Delay, d1	4.5	4.5	3.7	3.7	4.7	3.9	20.2	20.4		20.9	20.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.6	0.0	0.0	0.8	0.2	0.4	0.4		1.2	0.3	
Delay (s)	5.7	5.1	3.7	3.8	5.6	4.0	20.5	20.8		22.1	20.4	
Level of Service	A	A	A	A	A	A	C	C		C	C	
Approach Delay (s)		5.3			5.2			20.7			21.0	
Approach LOS		A			A			C			C	

Intersection Summary					
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.34				
Actuated Cycle Length (s)	54.7	Sum of lost time (s)		11.9	
Intersection Capacity Utilization	60.8%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	309	2	0	397	50	4	3	1	14	0	13
Future Volume (vph)	42	309	2	0	397	50	4	3	1	14	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.983			0.962			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1760	0	1837	1729	0	1745	1767	0	1616	1192	0
Flt Permitted	0.950						0.950			0.950		
Satd. Flow (perm)	1572	1760	0	1837	1729	0	1745	1767	0	1616	1192	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			926.9	
Travel Time (s)		22.8			22.7			14.1			66.7	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	46	336	2	0	432	54	4	3	1	15	0	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	338	0	0	486	0	4	4	0	15	14	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.7%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	309	2	0	397	50	4	3	1	14	0	13
Future Volume (Veh/h)	42	309	2	0	397	50	4	3	1	14	0	13
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	336	2	0	432	54	4	3	1	15	0	14
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	487			338			875	916	337	890	890	460
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	487			338			875	916	337	890	890	460
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	96			100			98	99	100	94	100	97
cM capacity (veh/h)	1030			1232			256	262	710	245	271	545

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	46	338	0	486	4	4	15	14
Volume Left	46	0	0	0	4	0	15	0
Volume Right	0	2	0	54	0	1	0	14
cSH	1030	1700	1700	1700	256	311	245	545
Volume to Capacity	0.04	0.20	0.00	0.29	0.02	0.01	0.06	0.03
Queue Length 95th (m)	1.1	0.0	0.0	0.0	0.4	0.3	1.6	0.6
Control Delay (s)	8.7	0.0	0.0	0.0	19.3	16.7	20.6	11.8
Lane LOS	A				C	C	C	B
Approach Delay (s)	1.0		0.0		18.0		16.4	
Approach LOS					C		C	

Intersection Summary				
Average Delay	1.1			
Intersection Capacity Utilization	44.7%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	220	73	41	231	88	35	199	21	80	321	155
Future Volume (vph)	235	220	73	41	231	88	35	199	21	80	321	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	0.99		1.00	0.99		1.00	1.00		1.00	0.99	
Frt		0.963			0.959			0.986			0.951	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3269	0	1662	3230	0	1646	1760	0	1601	1675	0
Flt Permitted	0.544			0.559			0.215			0.559		
Satd. Flow (perm)	969	3269	0	977	3230	0	372	1760	0	941	1675	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		63			78			7			34	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	255	239	79	45	251	96	38	216	23	87	349	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	318	0	45	347	0	38	239	0	87	517	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

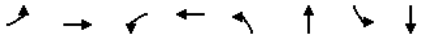
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	45.0	45.0		45.0	45.0		45.0	45.0		45.0	45.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	39.0	39.0		39.0	39.0		38.7	38.7		38.7	38.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	46.1	46.1		46.1	46.1		31.6	31.6		31.6	31.6	
Actuated g/C Ratio	0.51	0.51		0.51	0.51		0.35	0.35		0.35	0.35	
v/c Ratio	0.52	0.19		0.09	0.21		0.29	0.38		0.26	0.85	
Control Delay	21.3	10.9		14.4	10.6		25.2	21.9		21.1	38.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.3	10.9		14.4	10.6		25.2	21.9		21.1	38.2	
LOS	C	B		B	B		C	C		C	D	
Approach Delay		15.5			11.1			22.3			35.7	
Approach LOS		B			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 2 (2%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 22.2		Intersection LOS: C	
Intersection Capacity Utilization 97.9%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

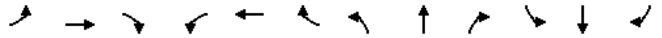


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	255	318	45	347	38	239	87	517
v/c Ratio	0.52	0.19	0.09	0.21	0.29	0.38	0.26	0.85
Control Delay	21.3	10.9	14.4	10.6	25.2	21.9	21.1	38.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.3	10.9	14.4	10.6	25.2	21.9	21.1	38.2
Queue Length 50th (m)	29.8	12.5	4.1	13.3	4.9	30.7	11.0	79.5
Queue Length 95th (m)	62.3	23.3	11.6	24.7	12.3	44.6	20.3	108.5
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	495	1704	500	1691	159	760	404	739
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	0.52	0.19	0.09	0.21	0.24	0.31	0.22	0.70

Intersection Summary

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

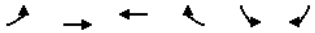
02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	220	73	41	231	88	35	199	21	80	321	155
Future Volume (vph)	235	220	73	41	231	88	35	199	21	80	321	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		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	
Frt	1.00	0.96		1.00	0.96		1.00	0.99		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)	1692	3268		1660	3228		1642	1759		1600	1675	
Flt Permitted	0.54	1.00		0.56	1.00		0.21	1.00		0.56	1.00	
Satd. Flow (perm)	968	3268		977	3228		372	1759		941	1675	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	239	79	45	251	96	38	216	23	87	349	168
RTOR Reduction (vph)	0	31	0	0	38	0	0	5	0	0	22	0
Lane Group Flow (vph)	255	287	0	45	309	0	38	234	0	87	495	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	46.1	46.1		46.1	46.1		31.6	31.6		31.6	31.6	
Effective Green, g (s)	46.1	46.1		46.1	46.1		31.6	31.6		31.6	31.6	
Actuated g/C Ratio	0.51	0.51		0.51	0.51		0.35	0.35		0.35	0.35	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	495	1673		500	1653		130	617		330	588	
v/s Ratio Prot		0.09			0.10			0.13			c0.30	
v/s Ratio Perm	c0.26			0.05			0.10			0.09		
v/c Ratio	0.52	0.17		0.09	0.19		0.29	0.38		0.26	0.84	
Uniform Delay, d1	14.5	11.7		11.2	11.8		21.1	21.9		20.9	26.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	0.2		0.4	0.3		1.3	0.4		0.4	10.6	
Delay (s)	18.3	12.0		11.6	12.1		22.4	22.3		21.3	37.4	
Level of Service	B	B		B	B		C	C		C	D	
Approach Delay (s)		14.8			12.0			22.3			35.1	
Approach LOS		B			B			C			D	

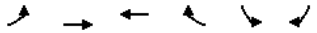
Intersection Summary					
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	97.9%	ICU Level of Service		F	
Analysis Period (min)	15				

c Critical Lane Group



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	8	309	329	1	5	8
Future Volume (vph)	8	309	329	1	5	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.913	
Flt Protected		0.999			0.982	
Satd. Flow (prot)	0	1677	1749	0	1537	0
Flt Permitted		0.999			0.982	
Satd. Flow (perm)	0	1677	1749	0	1537	0
Link Speed (k/h)		60	60		50	
Link Distance (m)		363.5	360.5		165.9	
Travel Time (s)		21.8	21.6		11.9	
Confl. Peds. (#/hr)	2			2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	5%	0%	20%	0%
Adj. Flow (vph)	9	336	358	1	5	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	345	359	0	14	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.3	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.7%		ICU Level of Service A	
Analysis Period (min) 15			



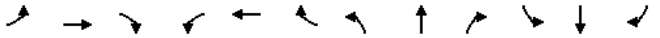
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	309	329	1	5	8
Future Volume (Veh/h)	8	309	329	1	5	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	336	358	1	5	9
Pedestrians					2	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	361				714	360
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	361				714	360
tC, single (s)	4.3				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.4				3.7	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	1079				368	687

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	345	359	14
Volume Left	9	0	5
Volume Right	0	1	9
cSH	1079	1700	525
Volume to Capacity	0.01	0.21	0.03
Queue Length 95th (m)	0.2	0.0	0.7
Control Delay (s)	0.3	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street

02-06-2018

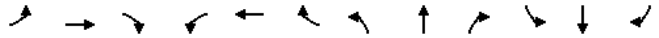


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	286	23	13	258	8	23	24	18	25	46	35
Future Volume (vph)	8	286	23	13	258	8	23	24	18	25	46	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.990			0.996			0.962			0.955	
Flt Protected		0.999			0.998			0.983			0.988	
Satd. Flow (prot)	0	1652	0	0	1727	0	0	1712	0	0	1613	0
Flt Permitted		0.999			0.998			0.983			0.988	
Satd. Flow (perm)	0	1652	0	0	1727	0	0	1712	0	0	1613	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			926.9			262.0	
Travel Time (s)		21.6			8.1			66.7			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	9	311	25	14	280	9	25	26	20	27	50	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	345	0	0	303	0	0	71	0	0	115	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	34.1%	ICU Level of Service A	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-06-2018



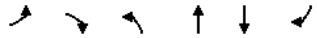
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	286	23	13	258	8	23	24	18	25	46	35
Future Volume (Veh/h)	8	286	23	13	258	8	23	24	18	25	46	35
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	311	25	14	280	9	25	26	20	27	50	38
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	290			336			718	660	324	688	668	286
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	290			336			718	660	324	688	668	286
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			99			91	93	97	91	86	95
cM capacity (veh/h)	1150			1235			290	373	722	306	369	749

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	345	303	71	115
Volume Left	9	14	25	27
Volume Right	25	9	20	38
cSH	1150	1235	387	419
Volume to Capacity	0.01	0.01	0.18	0.27
Queue Length 95th (m)	0.2	0.3	5.3	8.8
Control Delay (s)	0.3	0.5	16.4	16.8
Lane LOS	A	A	C	C
Approach Delay (s)	0.3	0.5	16.4	16.8
Approach LOS			C	C

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	34.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	17	16	17	251	359	25
Future Volume (vph)	17	16	17	251	359	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	20.0			0.0
Storage Lanes	1	0	1			0
Taper Length (m)	7.5		7.5			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.934				0.991	
Flt Protected	0.975		0.950			
Satd. Flow (prot)	1673	0	1745	1766	1770	0
Flt Permitted	0.975		0.950			
Satd. Flow (perm)	1673	0	1745	1766	1770	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	187.5			547.7	493.1	
Travel Time (s)	13.5			39.4	35.5	
Confl. Peds. (#/hr)			4			4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	4%	3%	0%
Adj. Flow (vph)	18	17	18	273	390	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	0	18	273	417	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.3			3.3	3.3	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25	15	25			15
Sign Control	Stop			Free	Free	

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



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	16	17	251	359	25
Future Volume (Veh/h)	17	16	17	251	359	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	17	18	273	390	27
Pedestrians	4					
Lane Width (m)	3.3					
Walking Speed (m/s)	1.2					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	716	408	421			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	716	408	421			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	97	98			
cM capacity (veh/h)	392	646	1145			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	35	18	273	417
Volume Left	18	18	0	0
Volume Right	17	0	0	27
cSH	485	1145	1700	1700
Volume to Capacity	0.07	0.02	0.16	0.25
Queue Length 95th (m)	1.9	0.4	0.0	0.0
Control Delay (s)	13.0	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	13.0	0.5		0.0
Approach LOS	B			

Intersection Summary				
Average Delay		0.8		
Intersection Capacity Utilization		30.4%	ICU Level of Service	A
Analysis Period (min)		15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	162	432	27	20	406	70	13	17	6	109	51	217
Future Volume (vph)	162	432	27	20	406	70	13	17	6	109	51	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.958			0.878	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1616	1760	0	1631	1564	0
Flt Permitted	0.479			0.457			0.457			0.741		
Satd. Flow (perm)	871	1801	1561	839	1818	1459	776	1760	0	1272	1564	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			76		7			236	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			530.2			289.3			547.7	
Travel Time (s)		17.6			31.8			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	176	470	29	22	441	76	14	18	7	118	55	236
Shared Lane Traffic (%)												
Lane Group Flow (vph)	176	470	29	22	441	76	14	25	0	118	291	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

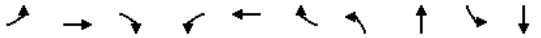
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	37.7	37.7	37.7	37.7	37.7	37.7	32.2	32.2		32.2	32.2	
Total Split (%)	53.9%	53.9%	53.9%	53.9%	53.9%	53.9%	46.1%	46.1%		46.1%	46.1%	
Maximum Green (s)	31.9	31.9	31.9	31.9	31.9	31.9	26.1	26.1		26.1	26.1	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	32.5	32.5	32.5	32.5	32.5	32.5	11.4	11.4		11.4	11.4	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58	0.58	0.20	0.20		0.20	0.20	
v/c Ratio	0.35	0.45	0.03	0.05	0.42	0.09	0.09	0.07		0.45	0.57	
Control Delay	9.1	8.7	1.5	6.1	8.4	2.2	18.8	14.7		25.2	10.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	9.1	8.7	1.5	6.1	8.4	2.2	18.8	14.7		25.2	10.1	
LOS	A	A	A	A	A	A	B	B		C	B	
Approach Delay		8.5			7.4			16.2			14.5	
Approach LOS		A			A			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 69.9			
Actuated Cycle Length: 55.8			
Natural Cycle: 60			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 9.8		Intersection LOS: A	
Intersection Capacity Utilization 70.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018

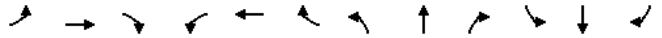


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	176	470	29	22	441	76	14	25	118	291
v/c Ratio	0.35	0.45	0.03	0.05	0.42	0.09	0.09	0.07	0.45	0.57
Control Delay	9.1	8.7	1.5	6.1	8.4	2.2	18.8	14.7	25.2	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	8.7	1.5	6.1	8.4	2.2	18.8	14.7	25.2	10.1
Queue Length 50th (m)	7.9	22.8	0.0	0.8	20.8	0.0	1.2	1.5	10.9	4.8
Queue Length 95th (m)	22.6	50.1	1.9	3.8	46.0	4.6	5.1	6.4	23.8	22.3
Internal Link Dist (m)		269.2			506.2			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	506	1047	928	488	1057	880	363	828	595	858
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	0.35	0.45	0.03	0.05	0.42	0.09	0.04	0.03	0.20	0.34

Intersection Summary

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	162	432	27	20	406	70	13	17	6	109	51	217
Future Volume (vph)	162	432	27	20	406	70	13	17	6	109	51	217
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1613	1760		1631	1566	
Flt Permitted	0.48	1.00	1.00	0.46	1.00	1.00	0.46	1.00		0.74	1.00	
Satd. Flow (perm)	872	1801	1561	839	1818	1459	776	1760		1272	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	470	29	22	441	76	14	18	7	118	55	236
RTOR Reduction (vph)	0	0	12	0	0	32	0	6	0	0	188	0
Lane Group Flow (vph)	176	470	17	22	441	44	14	19	0	118	103	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	32.4	32.4	32.4	32.4	32.4	32.4	11.4	11.4		11.4	11.4	
Effective Green, g (s)	32.4	32.4	32.4	32.4	32.4	32.4	11.4	11.4		11.4	11.4	
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58	0.58	0.20	0.20		0.20	0.20	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	507	1047	908	488	1057	848	158	360		260	320	
v/s Ratio Prot		c0.26			0.24			0.01			0.07	
v/s Ratio Perm	0.20		0.01	0.03		0.03	0.02			c0.09		
v/c Ratio	0.35	0.45	0.02	0.05	0.42	0.05	0.09	0.05		0.45	0.32	
Uniform Delay, d1	6.1	6.6	4.9	5.0	6.4	5.0	17.9	17.8		19.4	18.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	1.4	0.0	0.2	1.2	0.1	0.2	0.1		1.3	0.6	
Delay (s)	8.0	8.0	5.0	5.2	7.6	5.1	18.2	17.9		20.7	19.5	
Level of Service	A	A	A	A	A	A	B	B		C	B	
Approach Delay (s)		7.9			7.2			18.0			19.8	
Approach LOS		A			A			B			B	

Intersection Summary					
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.45				
Actuated Cycle Length (s)	55.7	Sum of lost time (s)		11.9	
Intersection Capacity Utilization	70.7%	ICU Level of Service		C	
Analysis Period (min)	15				

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	511	2	1	429	7	2	1	0	32	3	51
Future Volume (vph)	26	511	2	1	429	7	2	1	0	32	3	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.997						0.858	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1576	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1576	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			926.9	
Travel Time (s)		22.8			22.7			14.1			66.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	28	555	2	1	466	8	2	1	0	35	3	55
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	557	0	1	474	0	2	1	0	35	58	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.1%		ICU Level of Service A	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	511	2	1	429	7	2	1	0	32	3	51
Future Volume (Veh/h)	26	511	2	1	429	7	2	1	0	32	3	51
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	555	2	1	466	8	2	1	0	35	3	55
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	474			557			1136	1088	556	1084	1085	470
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	474			557			1136	1088	556	1084	1085	470
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			99	100	100	82	99	91
cM capacity (veh/h)	1043			1024			159	211	534	191	212	598

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	28	557	1	474	2	1	35	58
Volume Left	28	0	1	0	2	0	35	0
Volume Right	0	2	0	8	0	0	0	55
cSH	1043	1700	1024	1700	159	211	191	546
Volume to Capacity	0.03	0.33	0.00	0.28	0.01	0.00	0.18	0.11
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.3	0.1	5.2	2.8
Control Delay (s)	8.5	0.0	8.5	0.0	28.0	22.1	28.0	12.4
Lane LOS	A		A		D	C	D	B
Approach Delay (s)	0.4		0.0		26.0		18.2	
Approach LOS					D		C	

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	42.1%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Frt		0.977			0.954			0.983			0.917	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3175	0	1479	2945	0	1586	1756	0	1662	1577	0
Flt Permitted	0.196			0.470			0.208			0.187		
Satd. Flow (perm)	343	3175	0	731	2945	0	347	1756	0	327	1577	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32			105			8			82	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	461	0	49	991	0	228	595	0	216	574	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

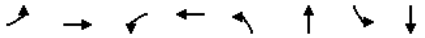
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	48.0	48.0		48.0	48.0		42.0	42.0		42.0	42.0	
Total Split (%)	53.3%	53.3%		53.3%	53.3%		46.7%	46.7%		46.7%	46.7%	
Maximum Green (s)	42.0	42.0		42.0	42.0		35.7	35.7		35.7	35.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	42.0	42.0		42.0	42.0		35.7	35.7		35.7	35.7	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.40	0.40		0.40	0.40	
v/c Ratio	1.94	0.31		0.14	0.69		1.66	0.85		1.67	0.85	
Control Delay	465.3	14.5		15.2	19.8		353.3	37.9		359.3	35.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	465.3	14.5		15.2	19.8		353.3	37.9		359.3	35.1	
LOS	F	B		B	B		F	D		F	D	
Approach Delay		195.8			19.6			125.3			123.8	
Approach LOS		F			B			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.94			
Intersection Signal Delay: 108.7		Intersection LOS: F	
Intersection Capacity Utilization 106.6%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

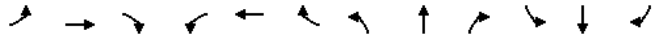


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	461	49	991	228	595	216	574
v/c Ratio	1.94	0.31	0.14	0.69	1.66	0.85	1.67	0.85
Control Delay	465.3	14.5	15.2	19.8	353.3	37.9	359.3	35.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	465.3	14.5	15.2	19.8	353.3	37.9	359.3	35.1
Queue Length 50th (m)	~88.0	24.3	4.9	64.5	~60.9	95.2	~57.8	81.4
Queue Length 95th (m)	#112.7	35.3	12.1	87.8	#83.7	#157.7	#80.9	#145.0
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	160	1498	341	1430	137	701	129	675
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	1.94	0.31	0.14	0.69	1.66	0.85	1.67	0.85

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.95		1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3173		1477	2945		1585	1757		1661	1577	
Flt Permitted	0.20	1.00		0.47	1.00		0.21	1.00		0.19	1.00	
Satd. Flow (perm)	342	3173		730	2945		347	1757		327	1577	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	17	0	0	56	0	0	5	0	0	49	0
Lane Group Flow (vph)	310	444	0	49	935	0	228	590	0	216	525	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		35.7	35.7		35.7	35.7	
Effective Green, g (s)	42.0	42.0		42.0	42.0		35.7	35.7		35.7	35.7	
Actuated g/C Ratio	0.47	0.47		0.47	0.47		0.40	0.40		0.40	0.40	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	159	1480		340	1374		137	696		129	625	
v/s Ratio Prot		0.14			0.32			0.34			0.33	
v/s Ratio Perm	c0.91			0.07			0.66			c0.66		
v/c Ratio	1.95	0.30		0.14	0.68		1.66	0.85		1.67	0.84	
Uniform Delay, d1	24.0	14.9		13.7	18.8		27.1	24.7		27.1	24.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	449.5	0.5		0.9	2.7		328.8	9.4		334.9	9.7	
Delay (s)	473.5	15.4		14.6	21.5		356.0	34.1		362.0	34.2	
Level of Service	F	B		B	C		F	C		F	C	
Approach Delay (s)		199.6			21.2			123.3			123.8	
Approach LOS		F			C			F			F	

Intersection Summary					
HCM 2000 Control Delay	109.6	HCM 2000 Level of Service		F	
HCM 2000 Volume to Capacity ratio	1.82				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	106.6%	ICU Level of Service		G	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Future Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.984			0.997			0.971			0.929	
Flt Protected		0.999			0.998			0.962			0.977	
Satd. Flow (prot)	0	1709	0	0	1665	0	0	1716	0	0	1408	0
Flt Permitted		0.999			0.998			0.962			0.977	
Satd. Flow (perm)	0	1709	0	0	1665	0	0	1716	0	0	1408	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	572	78	34	770	18	251	0	70	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	659	0	0	822	0	0	321	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 86.6%		ICU Level of Service E	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

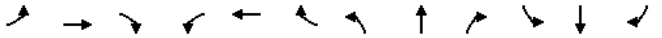
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	526	72	31	708	17	231	0	64	7	0	8
Future Volume (Veh/h)	8	526	72	31	708	17	231	0	64	7	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	572	78	34	770	18	251	0	70	8	0	9
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	789			650			1485	1486	611	1547	1516	780
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	789			650			1485	1486	611	1547	1516	780
tC, single (s)	4.4			4.1			7.1	6.5	6.2	7.3	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			96			0	100	86	89	100	98
cM capacity (veh/h)	708			946			98	120	497	70	115	372

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	659	822	321	17
Volume Left	9	34	251	8
Volume Right	78	18	70	9
cSH	708	946	118	123
Volume to Capacity	0.01	0.04	2.71	0.14
Queue Length 95th (m)	0.3	0.9	235.4	3.7
Control Delay (s)	0.3	0.9	851.3	39.0
Lane LOS	A	A	F	E
Approach Delay (s)	0.3	0.9	851.3	39.0
Approach LOS			F	E

Intersection Summary				
Average Delay		151.1		
Intersection Capacity Utilization		86.6%	ICU Level of Service	E
Analysis Period (min)		15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street

02-06-2018

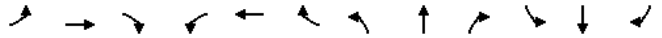


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Future Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.986			0.980			0.946	
Flt Protected		0.996			0.997			0.979			0.986	
Satd. Flow (prot)	0	1694	0	0	1655	0	0	1740	0	0	1470	0
Flt Permitted		0.996			0.997			0.979			0.986	
Satd. Flow (perm)	0	1694	0	0	1655	0	0	1740	0	0	1470	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	524	59	47	685	87	100	97	35	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	635	0	0	819	0	0	232	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	482	54	43	630	80	92	89	32	24	27	34
Future Volume (Veh/h)	48	482	54	43	630	80	92	89	32	24	27	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	524	59	47	685	87	100	97	35	26	29	37
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	772			585			1534	1526	556	1564	1512	728
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	772			585			1534	1526	556	1564	1512	728
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			95			0	7	93	0	72	90
cM capacity (veh/h)	852			897			63	104	534	14	105	376

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	635	819	232	92
Volume Left	52	47	100	26
Volume Right	59	87	35	37
cSH	852	897	89	41
Volume to Capacity	0.06	0.05	2.60	2.26
Queue Length 95th (m)	1.6	1.3	174.5	79.1
Control Delay (s)	1.6	1.4	824.0	787.1
Lane LOS	A	A	F	F
Approach Delay (s)	1.6	1.4	824.0	787.1
Approach LOS			F	F

Intersection Summary				
Average Delay	149.4			
Intersection Capacity Utilization	73.8%	ICU Level of Service	D	
Analysis Period (min)	15			

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Future Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.935			0.941			0.973			0.995	
Flt Protected		0.978			0.973		0.950			0.950		
Satd. Flow (prot)	0	1680	0	0	1682	0	1745	1684	0	1745	1635	0
Flt Permitted		0.978			0.973		0.950			0.950		
Satd. Flow (perm)	0	1680	0	0	1682	0	1745	1684	0	1745	1635	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			493.1	
Travel Time (s)		13.5			37.2			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	28	4	30	315	4	249	16	501	108	79	270	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	62	0	0	568	0	16	609	0	79	280	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	81.3%	ICU Level of Service D	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	4	28	290	4	229	15	461	99	73	248	9
Future Volume (Veh/h)	26	4	28	290	4	229	15	461	99	73	248	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	4	30	315	4	249	16	501	108	79	270	10
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1221	1078	279	1047	1029	555	284			609		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1221	1078	279	1047	1029	555	284			609		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	64	98	96	0	98	53	99			92		
cM capacity (veh/h)	77	200	762	182	213	535	1286			979		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	62	568	16	609	79	280
Volume Left	28	315	16	0	79	0
Volume Right	30	249	0	108	0	10
cSH	147	257	1286	1700	979	1700
Volume to Capacity	0.42	2.21	0.01	0.36	0.08	0.16
Queue Length 95th (m)	14.9	350.0	0.3	0.0	2.1	0.0
Control Delay (s)	46.4	588.3	7.8	0.0	9.0	0.0
Lane LOS	E	F	A		A	
Approach Delay (s)	46.4	588.3	0.2		2.0	
Approach LOS	E	F				

Intersection Summary				
Average Delay	209.3			
Intersection Capacity Utilization	81.3%	ICU Level of Service	D	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Future Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00				0.98	
Frt			0.850			0.850		0.975			0.855	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1678	1766	1358	1745	1749	1346	1586	1761	0	1586	1443	0
Flt Permitted	0.386			0.459			0.229			0.699		
Satd. Flow (perm)	681	1766	1358	843	1749	1316	382	1761	0	1167	1443	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			38			147		11			305	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	320	458	20	11	566	163	30	74	15	176	15	426
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	458	20	11	566	163	30	89	0	176	441	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

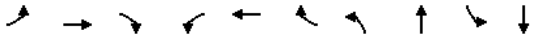
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	57.9	57.9	57.9	57.9	57.9	57.9	32.1	32.1		32.1	32.1	
Total Split (%)	64.3%	64.3%	64.3%	64.3%	64.3%	64.3%	35.7%	35.7%		35.7%	35.7%	
Maximum Green (s)	52.1	52.1	52.1	52.1	52.1	52.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	52.3	52.3	52.3	52.3	52.3	52.3	17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.64	0.64	0.21	0.21		0.21	0.21	
v/c Ratio	0.74	0.41	0.02	0.02	0.51	0.18	0.37	0.23		0.71	0.80	
Control Delay	25.1	9.6	1.3	7.5	11.0	2.4	40.1	24.1		45.1	21.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.1	9.6	1.3	7.5	11.0	2.4	40.1	24.1		45.1	21.6	
LOS	C	A	A	A	B	A	D	C		D	C	
Approach Delay		15.6			9.0			28.1			28.3	
Approach LOS		B			A			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 81.8			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 17.6		Intersection LOS: B	
Intersection Capacity Utilization 84.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



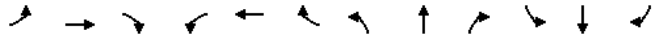
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	320	458	20	11	566	163	30	89	176	441
v/c Ratio	0.74	0.41	0.02	0.02	0.51	0.18	0.37	0.23	0.71	0.80
Control Delay	25.1	9.6	1.3	7.5	11.0	2.4	40.1	24.1	45.1	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.1	9.6	1.3	7.5	11.0	2.4	40.1	24.1	45.1	21.6
Queue Length 50th (m)	31.1	31.9	0.0	0.6	43.2	0.8	4.2	10.5	26.7	19.4
Queue Length 95th (m)	#98.6	66.6	1.6	3.1	89.5	9.3	12.6	22.3	48.1	56.2
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	435	1130	882	539	1118	895	122	569	372	668
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	0.74	0.41	0.02	0.02	0.51	0.18	0.25	0.16	0.47	0.66

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Future Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1316	1583	1761		1586	1444	
Flt Permitted	0.39	1.00	1.00	0.46	1.00	1.00	0.23	1.00		0.70	1.00	
Satd. Flow (perm)	680	1766	1358	843	1749	1316	381	1761		1168	1444	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	320	458	20	11	566	163	30	74	15	176	15	426
RTOR Reduction (vph)	0	0	7	0	0	53	0	9	0	0	240	0
Lane Group Flow (vph)	320	458	13	11	566	110	30	80	0	176	201	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	52.4	52.4	52.4	52.4	52.4	52.4	17.5	17.5		17.5	17.5	
Effective Green, g (s)	52.4	52.4	52.4	52.4	52.4	52.4	17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.64	0.64	0.64	0.64	0.64	0.64	0.21	0.21		0.21	0.21	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	435	1131	869	540	1120	843	81	376		249	308	
v/s Ratio Prot		0.26			0.32			0.05			0.14	
v/s Ratio Perm	c0.47		0.01	0.01		0.08	0.08			c0.15		
v/c Ratio	0.74	0.40	0.01	0.02	0.51	0.13	0.37	0.21		0.71	0.65	
Uniform Delay, d1	10.0	7.1	5.3	5.4	7.8	5.8	27.4	26.5		29.8	29.4	
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	10.6	1.1	0.0	0.1	1.6	0.3	2.8	0.3		8.8	4.9	
Delay (s)	20.6	8.2	5.4	5.4	9.4	6.1	30.3	26.8		38.6	34.3	
Level of Service	C	A	A	A	A	A	C	C		D	C	
Approach Delay (s)		13.1			8.6			27.7			35.5	
Approach LOS		B			A			C			D	

Intersection Summary				
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.73			
Actuated Cycle Length (s)	81.8	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	84.1%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	482	3	0	581	70	6	4	1	25	0	48
Future Volume (vph)	68	482	3	0	581	70	6	4	1	25	0	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.984			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1760	0	1837	1730	0	1745	1782	0	1616	1192	0
Flt Permitted	0.950						0.950			0.950		
Satd. Flow (perm)	1572	1760	0	1837	1730	0	1745	1782	0	1616	1192	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	74	524	3	0	632	76	7	4	1	27	0	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	527	0	0	708	0	7	5	0	27	52	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

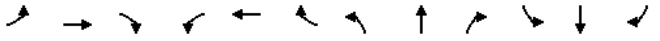
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 56.7%		ICU Level of Service B	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

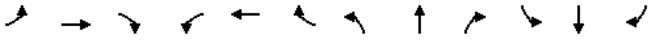
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	482	3	0	581	70	6	4	1	25	0	48
Future Volume (Veh/h)	68	482	3	0	581	70	6	4	1	25	0	48
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	524	3	0	632	76	7	4	1	27	0	52
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	709			527			1358	1382	526	1346	1346	671
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	709			527			1358	1382	526	1346	1346	671
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	91			100			93	97	100	76	100	87
cM capacity (veh/h)	849			1050			104	132	556	113	139	409

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	74	527	0	708	7	5	27	52
Volume Left	74	0	0	0	7	0	27	0
Volume Right	0	3	0	76	0	1	0	52
cSH	849	1700	1700	1700	104	156	113	409
Volume to Capacity	0.09	0.31	0.00	0.42	0.07	0.03	0.24	0.13
Queue Length 95th (m)	2.3	0.0	0.0	0.0	1.7	0.8	6.9	3.5
Control Delay (s)	9.6	0.0	0.0	0.0	42.2	28.8	46.4	15.1
Lane LOS	A				E	D	E	C
Approach Delay (s)	1.2		0.0		36.6		25.8	
Approach LOS					E		D	

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	56.7%	ICU Level of Service		B
Analysis Period (min)	15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	0.99		1.00	0.99			1.00		1.00	0.99	
Frt		0.962			0.955			0.972			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3266	0	1662	3215	0	1646	1721	0	1601	1692	0
Flt Permitted	0.284			0.152			0.098			0.362		
Satd. Flow (perm)	506	3266	0	266	3215	0	170	1721	0	610	1692	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		64			88			17			28	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	1028	0	111	740	0	138	467	0	353	867	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	



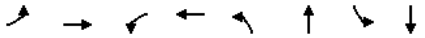
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	43.0	43.0		43.0	43.0		47.0	47.0		47.0	47.0	
Total Split (%)	47.8%	47.8%		47.8%	47.8%		52.2%	52.2%		52.2%	52.2%	
Maximum Green (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.45	0.45		0.45	0.45	
v/c Ratio	1.74	0.74		1.02	0.54		1.82	0.59		1.28	1.11	
Control Delay	373.7	25.1		123.6	19.2		436.8	21.6		178.4	92.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	373.7	25.1		123.6	19.2		436.8	21.6		178.4	92.7	
LOS	F	C		F	B		F	C		F	F	
Approach Delay		115.7			32.8			116.3			117.5	
Approach LOS		F			C			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.82			
Intersection Signal Delay: 99.0		Intersection LOS: F	
Intersection Capacity Utilization 120.9%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

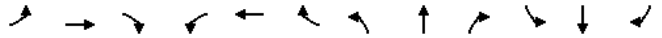


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	1028	111	740	138	467	353	867
v/c Ratio	1.74	0.74	1.02	0.54	1.82	0.59	1.28	1.11
Control Delay	373.7	25.1	123.6	19.2	436.8	21.6	178.4	92.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	373.7	25.1	123.6	19.2	436.8	21.6	178.4	92.7
Queue Length 50th (m)	~98.3	76.7	~20.4	45.7	~38.1	59.1	~82.3	~180.0
Queue Length 95th (m)	#152.6	101.6	#55.2	63.3	#62.3	91.1	#135.8	#254.0
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	208	1380	109	1373	76	787	275	780
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	1.74	0.74	1.02	0.54	1.82	0.59	1.28	1.11

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		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	
Frt	1.00	0.96		1.00	0.96		1.00	0.97		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)	1693	3264		1661	3216		1646	1720		1600	1692	
Flt Permitted	0.28	1.00		0.15	1.00		0.10	1.00		0.36	1.00	
Satd. Flow (perm)	506	3264		266	3216		170	1720		609	1692	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
RTOR Reduction (vph)	0	38	0	0	52	0	0	9	0	0	15	0
Lane Group Flow (vph)	361	990	0	111	688	0	138	458	0	353	852	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Effective Green, g (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.45	0.45		0.45	0.45	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	208	1341		109	1322		76	777		275	765	
v/s Ratio Prot		0.30			0.21			0.27			0.50	
v/s Ratio Perm	c0.71			0.42			c0.81			0.58		
v/c Ratio	1.74	0.74		1.02	0.52		1.82	0.59		1.28	1.11	
Uniform Delay, d1	26.5	22.4		26.5	19.9		24.6	18.4		24.6	24.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	350.3	3.7		91.2	1.5		413.9	1.1		152.4	68.2	
Delay (s)	376.8	26.1		117.7	21.3		438.5	19.6		177.1	92.9	
Level of Service	F	C		F	C		F	B		F	F	
Approach Delay (s)		117.2			33.9			115.1			117.3	
Approach LOS		F			C			F			F	

Intersection Summary					
HCM 2000 Control Delay	99.5	HCM 2000 Level of Service		F	
HCM 2000 Volume to Capacity ratio	1.77				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	120.9%	ICU Level of Service		H	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Future Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971						0.965			0.919	
Flt Protected		0.999			0.995			0.964			0.980	
Satd. Flow (prot)	0	1662	0	0	1749	0	0	1709	0	0	1532	0
Flt Permitted		0.999			0.995			0.964			0.980	
Satd. Flow (perm)	0	1662	0	0	1749	0	0	1709	0	0	1532	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	927	257	71	638	1	149	0	52	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1196	0	0	710	0	0	201	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 97.5%		ICU Level of Service F	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	853	236	65	587	1	137	0	48	7	0	11
Future Volume (Veh/h)	11	853	236	65	587	1	137	0	48	7	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	927	257	71	638	1	149	0	52	8	0	12
Pedestrians											2	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	641			1184			1872	1862	1056	1914	1990	640
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	641			1184			1872	1862	1056	1914	1990	640
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			88			0	100	81	76	100	97
cM capacity (veh/h)	841			597			49	64	276	33	53	478

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1196	710	201	20
Volume Left	12	71	149	8
Volume Right	257	1	52	12
cSH	841	597	62	76
Volume to Capacity	0.01	0.12	3.24	0.26
Queue Length 95th (m)	0.3	3.2	Err	7.6
Control Delay (s)	0.5	3.2	Err	68.8
Lane LOS	A	A	F	F
Approach Delay (s)	0.5	3.2	Err	68.8
Approach LOS			F	F

Intersection Summary				
Average Delay		946.9		
Intersection Capacity Utilization		97.5%	ICU Level of Service	F
Analysis Period (min)		15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street

02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Future Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.984			0.995			0.966			0.956	
Flt Protected		0.999			0.996			0.974			0.988	
Satd. Flow (prot)	0	1649	0	0	1719	0	0	1713	0	0	1615	0
Flt Permitted		0.999			0.996			0.974			0.988	
Satd. Flow (perm)	0	1649	0	0	1719	0	0	1713	0	0	1615	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	857	117	48	539	24	90	37	43	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	986	0	0	611	0	0	170	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 77.0%		ICU Level of Service D	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	788	108	44	496	22	83	34	40	35	65	49
Future Volume (Veh/h)	11	788	108	44	496	22	83	34	40	35	65	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	857	117	48	539	24	90	37	43	38	71	53
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	564			974			1676	1600	916	1649	1646	553
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	564			974			1676	1600	916	1649	1646	553
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			93			0	62	87	8	21	90
cM capacity (veh/h)	902			716			23	97	333	41	90	530

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	986	611	170	162
Volume Left	12	48	90	38
Volume Right	117	24	43	53
cSH	902	716	38	90
Volume to Capacity	0.01	0.07	4.44	1.81
Queue Length 95th (m)	0.3	1.7	Err	108.3
Control Delay (s)	0.4	1.8	Err	483.8
Lane LOS	A	A	F	F
Approach Delay (s)	0.4	1.8	Err	483.8
Approach LOS			F	F

Intersection Summary				
Average Delay	922.6			
Intersection Capacity Utilization	77.0%	ICU Level of Service	D	
Analysis Period (min)	15			

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Future Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.931			0.942			0.936			0.990	
Flt Protected		0.977			0.972		0.950			0.950		
Satd. Flow (prot)	0	1671	0	0	1682	0	1745	1681	0	1745	1769	0
Flt Permitted		0.977			0.972		0.950			0.950		
Satd. Flow (perm)	0	1671	0	0	1682	0	1745	1681	0	1745	1769	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			493.1	
Travel Time (s)		13.5			36.9			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	30	1	32	201	1	150	33	434	323	257	602	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	352	0	33	757	0	257	644	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 87.4%		ICU Level of Service E	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	1	29	185	1	138	30	399	297	236	554	39
Future Volume (Veh/h)	28	1	29	185	1	138	30	399	297	236	554	39
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	1	32	201	1	150	33	434	323	257	602	42
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1792	1964	627	1810	1824	596	648			757		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1792	1964	627	1810	1824	596	648			757		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	9	98	93	0	98	70	97			70		
cM capacity (veh/h)	33	43	486	42	53	508	944			863		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	63	352	33	757	257	644
Volume Left	30	201	33	0	257	0
Volume Right	32	150	0	323	0	42
cSH	63	70	944	1700	863	1700
Volume to Capacity	1.00	5.06	0.03	0.45	0.30	0.38
Queue Length 95th (m)	38.9	Err	0.9	0.0	10.0	0.0
Control Delay (s)	222.9	Err	8.9	0.0	10.9	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	222.9	Err	0.4		3.1	
Approach LOS	F	F				

Intersection Summary				
Average Delay	1679.4			
Intersection Capacity Utilization	87.4%	ICU Level of Service	E	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Future Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.965			0.872	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1616	1772	0	1631	1551	0
Flt Permitted	0.326			0.290			0.167			0.732		
Satd. Flow (perm)	593	1801	1561	533	1818	1459	284	1772	0	1256	1551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			177		9			281	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	505	699	41	30	642	222	20	30	9	260	83	479
Shared Lane Traffic (%)												
Lane Group Flow (vph)	505	699	41	30	642	222	20	39	0	260	562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

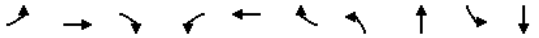
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	67.9	67.9	67.9	67.9	67.9	67.9	32.1	32.1		32.1	32.1	
Total Split (%)	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	32.1%	32.1%		32.1%	32.1%	
Maximum Green (s)	62.1	62.1	62.1	62.1	62.1	62.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	62.2	62.2	62.2	62.2	62.2	62.2	24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63	0.63	0.24	0.24		0.24	0.24	
v/c Ratio	1.34	0.61	0.04	0.09	0.56	0.22	0.29	0.09		0.85	0.95	
Control Delay	193.9	14.2	3.2	8.5	13.0	2.7	42.3	23.7		60.5	45.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	193.9	14.2	3.2	8.5	13.0	2.7	42.3	23.7		60.5	45.7	
LOS	F	B	A	A	B	A	D	C		E	D	
Approach Delay		86.7			10.3			30.0			50.4	
Approach LOS		F			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 98.1			
Natural Cycle: 110			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.34			
Intersection Signal Delay: 53.1		Intersection LOS: D	
Intersection Capacity Utilization 103.0%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	505	699	41	30	642	222	20	39	260	562
v/c Ratio	1.34	0.61	0.04	0.09	0.56	0.22	0.29	0.09	0.85	0.95
Control Delay	193.9	14.2	3.2	8.5	13.0	2.7	42.3	23.7	60.5	45.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	193.9	14.2	3.2	8.5	13.0	2.7	42.3	23.7	60.5	45.7
Queue Length 50th (m)	~137.0	81.0	0.5	2.3	70.4	3.3	3.3	4.6	49.6	60.8
Queue Length 95th (m)	#126.5	117.8	4.4	6.3	102.0	12.3	11.0	13.0	#91.3	#129.9
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	376	1141	1002	337	1152	989	75	476	333	618
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	1.34	0.61	0.04	0.09	0.56	0.22	0.27	0.08	0.78	0.91

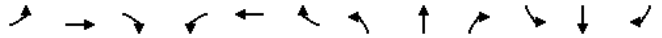
Intersection Summary

~ 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.

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Future Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.87	
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)	1728	1801	1561	1745	1818	1459	1614	1773		1631	1552	
Flt Permitted	0.33	1.00	1.00	0.29	1.00	1.00	0.17	1.00		0.73	1.00	
Satd. Flow (perm)	592	1801	1561	533	1818	1459	283	1773		1256	1552	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	505	699	41	30	642	222	20	30	9	260	83	479
RTOR Reduction (vph)	0	0	12	0	0	65	0	7	0	0	212	0
Lane Group Flow (vph)	505	699	29	30	642	157	20	32	0	260	350	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	62.2	62.2	62.2	62.2	62.2	62.2	24.0	24.0		24.0	24.0	
Effective Green, g (s)	62.2	62.2	62.2	62.2	62.2	62.2	24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63	0.63	0.24	0.24		0.24	0.24	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	375	1141	989	337	1152	925	69	433		307	379	
v/s Ratio Prot		0.39			0.35			0.02			c0.23	
v/s Ratio Perm	c0.85		0.02	0.06		0.11	0.07			0.21		
v/c Ratio	1.35	0.61	0.03	0.09	0.56	0.17	0.29	0.07		0.85	0.92	
Uniform Delay, d1	17.9	10.7	6.7	7.0	10.2	7.4	30.1	28.5		35.3	36.1	
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	172.8	2.5	0.1	0.5	1.9	0.4	2.3	0.1		18.9	27.6	
Delay (s)	190.8	13.2	6.7	7.5	12.1	7.8	32.4	28.6		54.2	63.7	
Level of Service	F	B	A	A	B	A	C	C		D	E	
Approach Delay (s)		85.0			10.9			29.9			60.7	
Approach LOS		F			B			C			E	

Intersection Summary				
HCM 2000 Control Delay	55.4	HCM 2000 Level of Service	E	
HCM 2000 Volume to Capacity ratio	1.23			
Actuated Cycle Length (s)	98.1	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	103.0%	ICU Level of Service	G	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	754	3	1	654	14	3	1	0	47	4	85
Future Volume (vph)	65	754	3	1	654	14	3	1	0	47	4	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.997						0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1572	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1572	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	71	820	3	1	711	15	3	1	0	51	4	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	823	0	1	726	0	3	1	0	51	96	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 62.5%		ICU Level of Service B	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	754	3	1	654	14	3	1	0	47	4	85
Future Volume (Veh/h)	65	754	3	1	654	14	3	1	0	47	4	85
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	820	3	1	711	15	3	1	0	51	4	92
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	726			823			1770	1692	822	1683	1686	718
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	726			823			1770	1692	822	1683	1686	718
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			100			94	99	100	27	95	79
cM capacity (veh/h)	837			816			47	86	377	70	87	432

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	71	823	1	726	3	1	51	96
Volume Left	71	0	1	0	3	0	51	0
Volume Right	0	3	0	15	0	0	0	92
cSH	837	1700	816	1700	47	86	70	371
Volume to Capacity	0.08	0.48	0.00	0.43	0.06	0.01	0.73	0.26
Queue Length 95th (m)	2.2	0.0	0.0	0.0	1.6	0.3	26.7	8.1
Control Delay (s)	9.7	0.0	9.4	0.0	87.5	47.3	138.8	18.1
Lane LOS	A		A		F	E	F	C
Approach Delay (s)	0.8		0.0		77.5		59.9	
Approach LOS					F		F	

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Future Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Frt		0.987			0.952			0.980			0.914	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3239	0	1479	2936	0	1586	1748	0	1662	1571	0
Flt Permitted	0.167			0.464			0.189			0.224		
Satd. Flow (perm)	292	3239	0	722	2936	0	315	1748	0	392	1571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14			114			9			77	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	432	41	53	759	357	129	448	70	247	233	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	473	0	53	1116	0	129	518	0	247	550	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

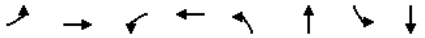
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	57.0	57.0		57.0	57.0		43.0	43.0		43.0	43.0	
Total Split (%)	57.0%	57.0%		57.0%	57.0%		43.0%	43.0%		43.0%	43.0%	
Maximum Green (s)	51.0	51.0		51.0	51.0		36.7	36.7		36.7	36.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	51.0	51.0		51.0	51.0		36.7	36.7		36.7	36.7	
Actuated g/C Ratio	0.51	0.51		0.51	0.51		0.37	0.37		0.37	0.37	
v/c Ratio	2.09	0.29		0.14	0.72		1.12	0.80		1.73	0.88	
Control Delay	535.4	14.2		14.3	20.0		154.1	38.9		380.1	42.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	535.4	14.2		14.3	20.0		154.1	38.9		380.1	42.8	
LOS	F	B		B	C		F	D		F	D	
Approach Delay		220.5			19.8			61.9			147.3	
Approach LOS		F			B			E			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 2.09			
Intersection Signal Delay: 104.0		Intersection LOS: F	
Intersection Capacity Utilization 108.8%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

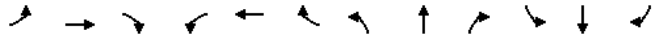


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	473	53	1116	129	518	247	550
v/c Ratio	2.09	0.29	0.14	0.72	1.12	0.80	1.73	0.88
Control Delay	535.4	14.2	14.3	20.0	154.1	38.9	380.1	42.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	535.4	14.2	14.3	20.0	154.1	38.9	380.1	42.8
Queue Length 50th (m)	~71.4	26.9	5.5	80.1	~30.4	91.9	~74.7	91.2
Queue Length 95th (m)	#126.3	37.5	12.8	105.8	#68.0	#146.4	#123.8	#156.5
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	148	1658	368	1553	115	647	143	625
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	2.09	0.29	0.14	0.72	1.12	0.80	1.73	0.88

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Future Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.99		1.00	0.95		1.00	0.98		1.00	0.91	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3239		1477	2936		1585	1747		1661	1570	
Flt Permitted	0.17	1.00		0.46	1.00		0.19	1.00		0.22	1.00	
Satd. Flow (perm)	291	3239		721	2936		316	1747		392	1570	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	432	41	53	759	357	129	448	70	247	233	317
RTOR Reduction (vph)	0	7	0	0	56	0	0	6	0	0	49	0
Lane Group Flow (vph)	310	466	0	53	1060	0	129	512	0	247	501	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	51.0	51.0		51.0	51.0		36.7	36.7		36.7	36.7	
Effective Green, g (s)	51.0	51.0		51.0	51.0		36.7	36.7		36.7	36.7	
Actuated g/C Ratio	0.51	0.51		0.51	0.51		0.37	0.37		0.37	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	148	1651		367	1497		115	641		143	576	
v/s Ratio Prot		0.14			0.36			0.29			0.32	
v/s Ratio Perm	c1.06			0.07			0.41			c0.63		
v/c Ratio	2.09	0.28		0.14	0.71		1.12	0.80		1.73	0.87	
Uniform Delay, d1	24.5	14.0		13.0	18.8		31.6	28.3		31.6	29.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	514.8	0.4		0.8	2.9		120.4	6.9		354.8	13.5	
Delay (s)	539.3	14.5		13.8	21.6		152.1	35.3		386.5	42.9	
Level of Service	F	B		B	C		F	D		F	D	
Approach Delay (s)		222.3			21.3			58.6			149.4	
Approach LOS		F			C			E			F	

Intersection Summary					
HCM 2000 Control Delay	104.8	HCM 2000 Level of Service		F	
HCM 2000 Volume to Capacity ratio	1.93				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	108.8%	ICU Level of Service		G	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Future Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.975			0.997			0.986			0.929	
Flt Protected		0.999			0.999			0.957			0.977	
Satd. Flow (prot)	0	1700	0	0	1663	0	0	1733	0	0	1408	0
Flt Permitted		0.999			0.999			0.957			0.977	
Satd. Flow (perm)	0	1700	0	0	1663	0	0	1733	0	0	1408	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	593	138	10	827	18	268	0	30	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	740	0	0	855	0	0	298	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 75.2%		ICU Level of Service D	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	546	127	9	761	17	247	0	28	7	0	8
Future Volume (Veh/h)	8	546	127	9	761	17	247	0	28	7	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	593	138	10	827	18	268	0	30	8	0	9
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	846			731			1545	1546	662	1567	1606	837
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	846			731			1545	1546	662	1567	1606	837
tC, single (s)	4.4			4.1			7.1	6.5	6.2	7.3	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			99			0	100	94	89	100	97
cM capacity (veh/h)	672			883			90	113	465	75	104	345

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	740	855	298	17
Volume Left	9	10	268	8
Volume Right	138	18	30	9
cSH	672	883	98	128
Volume to Capacity	0.01	0.01	3.04	0.13
Queue Length 95th (m)	0.3	0.3	Err	3.6
Control Delay (s)	0.4	0.3	Err	37.4
Lane LOS	A	A	F	E
Approach Delay (s)	0.4	0.3	Err	37.4
Approach LOS			F	E

Intersection Summary				
Average Delay		1560.7		
Intersection Capacity Utilization		75.2%	ICU Level of Service	D
Analysis Period (min)		15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Future Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.986			0.976			0.946	
Flt Protected		0.996			0.997			0.976			0.986	
Satd. Flow (prot)	0	1694	0	0	1653	0	0	1732	0	0	1470	0
Flt Permitted		0.996			0.997			0.976			0.986	
Satd. Flow (perm)	0	1694	0	0	1653	0	0	1732	0	0	1470	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	508	58	54	677	87	141	97	52	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	618	0	0	818	0	0	290	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 78.2%		ICU Level of Service D	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	467	53	50	623	80	130	89	48	24	27	34
Future Volume (Veh/h)	48	467	53	50	623	80	130	89	48	24	27	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	508	58	54	677	87	141	97	52	26	29	37
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	764			568			1523	1515	539	1570	1500	720
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	764			568			1523	1515	539	1570	1500	720
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			94			0	8	90	0	73	90
cM capacity (veh/h)	858			911			64	105	546	14	106	380

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	618	818	290	92
Volume Left	52	54	141	26
Volume Right	58	87	52	37
cSH	858	911	90	41
Volume to Capacity	0.06	0.06	3.24	2.23
Queue Length 95th (m)	1.5	1.5	Err	78.8
Control Delay (s)	1.6	1.5	Err	774.7
Lane LOS	A	A	F	F
Approach Delay (s)	1.6	1.5	Err	774.7
Approach LOS			F	F

Intersection Summary				
Average Delay	1635.4			
Intersection Capacity Utilization	78.2%	ICU Level of Service	D	
Analysis Period (min)	15			

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	28	0	0	0	15	460	0	0	248	13
Future Volume (vph)	29	0	28	0	0	0	15	460	0	0	248	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.935									0.993	
Flt Protected		0.975					0.950					
Satd. Flow (prot)	0	1674	0	0	1837	0	1745	1717	0	1837	1627	0
Flt Permitted		0.975					0.950					
Satd. Flow (perm)	0	1674	0	0	1837	0	1745	1717	0	1837	1627	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			493.1	
Travel Time (s)		13.5			37.2			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	32	0	30	0	0	0	16	500	0	0	270	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	62	0	0	0	0	16	500	0	0	284	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

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

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	0	28	0	0	0	15	460	0	0	248	13
Future Volume (Veh/h)	29	0	28	0	0	0	15	460	0	0	248	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	0	30	0	0	0	16	500	0	0	270	14
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	813	813	281	832	820	500	288			500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	813	813	281	832	820	500	288			500		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	100	96	100	100	100	99			100		
cM capacity (veh/h)	295	310	760	276	307	575	1282			1075		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	62	0	16	500	0	284
Volume Left	32	0	16	0	0	0
Volume Right	30	0	0	0	0	14
cSH	419	1700	1282	1700	1700	1700
Volume to Capacity	0.15	0.00	0.01	0.29	0.00	0.17
Queue Length 95th (m)	4.1	0.0	0.3	0.0	0.0	0.0
Control Delay (s)	15.1	0.0	7.8	0.0	0.0	0.0
Lane LOS	C	A	A			
Approach Delay (s)	15.1	0.0	0.2		0.0	
Approach LOS	C	A				

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	34.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Future Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						0.98	1.00				0.98	
Frt			0.850			0.850		0.975			0.861	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1678	1766	1358	1745	1749	1346	1586	1761	0	1586	1451	0
Flt Permitted	0.277			0.431			0.474			0.699		
Satd. Flow (perm)	489	1766	1358	792	1749	1316	788	1761	0	1167	1451	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			82		10			186	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	246	532	20	11	807	129	30	74	15	101	15	186
Shared Lane Traffic (%)												
Lane Group Flow (vph)	246	532	20	11	807	129	30	89	0	101	201	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

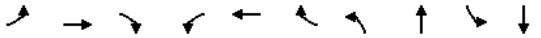
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	67.9	67.9	67.9	67.9	67.9	67.9	32.1	32.1		32.1	32.1	
Total Split (%)	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	32.1%	32.1%		32.1%	32.1%	
Maximum Green (s)	62.1	62.1	62.1	62.1	62.1	62.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71	0.15	0.15		0.15	0.15	
v/c Ratio	0.70	0.42	0.02	0.02	0.65	0.13	0.25	0.32		0.57	0.53	
Control Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1		47.5	12.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1		47.5	12.0	
LOS	C	A	A	A	B	A	D	C		D	B	
Approach Delay		11.7			9.3			33.5			23.9	
Approach LOS		B			A			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 88.5			
Natural Cycle: 100			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 93.7%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



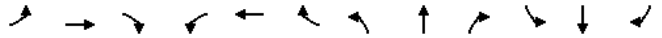
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	246	532	20	11	807	129	30	89	101	201
v/c Ratio	0.70	0.42	0.02	0.02	0.65	0.13	0.25	0.32	0.57	0.53
Control Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1	47.5	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1	47.5	12.0
Queue Length 50th (m)	20.5	31.6	0.0	0.5	62.0	2.0	4.7	12.5	16.7	2.3
Queue Length 95th (m)	#80.2	63.4	1.4	2.4	126.4	8.7	12.9	26.1	33.0	21.0
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	349	1260	979	565	1248	962	231	524	342	558
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	0.70	0.42	0.02	0.02	0.65	0.13	0.13	0.17	0.30	0.36

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Future Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1316	1580	1761		1586	1453	
Flt Permitted	0.28	1.00	1.00	0.43	1.00	1.00	0.47	1.00		0.70	1.00	
Satd. Flow (perm)	488	1766	1358	791	1749	1316	789	1761		1168	1453	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	532	20	11	807	129	30	74	15	101	15	186
RTOR Reduction (vph)	0	0	6	0	0	23	0	8	0	0	158	0
Lane Group Flow (vph)	246	532	14	11	807	106	30	81	0	101	43	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Effective Green, g (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71	0.15	0.15		0.15	0.15	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	348	1261	969	564	1249	939	119	266		176	220	
v/s Ratio Prot		0.30			0.46			0.05			0.03	
v/s Ratio Perm	c0.50		0.01	0.01		0.08	0.04			c0.09		
v/c Ratio	0.71	0.42	0.01	0.02	0.65	0.11	0.25	0.30		0.57	0.20	
Uniform Delay, d1	7.3	5.2	3.7	3.7	6.7	3.9	33.1	33.4		34.9	32.8	
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	11.5	1.0	0.0	0.1	2.6	0.2	1.1	0.6		4.5	0.4	
Delay (s)	18.8	6.2	3.7	3.7	9.3	4.2	34.2	34.0		39.4	33.3	
Level of Service	B	A	A	A	A	A	C	C		D	C	
Approach Delay (s)		10.0			8.5			34.1			35.3	
Approach LOS		B			A			C			D	

Intersection Summary				
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	93.7%	ICU Level of Service	F	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Future Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.980			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1759	0	1837	1725	0	1745	1782	0	1616	1192	0
Flt Permitted	0.950						0.950			0.950		
Satd. Flow (perm)	1572	1759	0	1837	1725	0	1745	1782	0	1616	1192	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	143	477	3	0	614	93	7	4	1	75	0	290
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	480	0	0	707	0	7	5	0	75	290	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

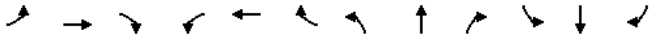
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 68.8%		ICU Level of Service C	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

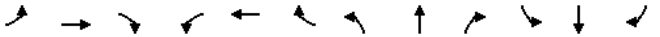
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	132	439	3	0	565	86	6	4	1	69	0	267
Future Volume (Veh/h)	132	439	3	0	565	86	6	4	1	69	0	267
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	477	3	0	614	93	7	4	1	75	0	290
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	708			480			1668	1472	478	1428	1428	662
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	708			480			1668	1472	478	1428	1428	662
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	83			100			65	96	100	19	100	30
cM capacity (veh/h)	850			1093			20	106	591	92	113	415

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	143	480	0	707	7	5	75	290
Volume Left	143	0	0	0	7	0	75	0
Volume Right	0	3	0	93	0	1	0	290
cSH	850	1700	1700	1700	20	127	92	415
Volume to Capacity	0.17	0.28	0.00	0.42	0.35	0.04	0.81	0.70
Queue Length 95th (m)	4.8	0.0	0.0	0.0	7.9	1.0	34.7	41.8
Control Delay (s)	10.1	0.0	0.0	0.0	257.6	34.4	128.5	31.5
Lane LOS	B				F	D	F	D
Approach Delay (s)	2.3		0.0		164.6		51.5	
Approach LOS					F		F	

Intersection Summary				
Average Delay	13.0			
Intersection Capacity Utilization	68.8%	ICU Level of Service	C	
Analysis Period (min)	15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Future Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	0.99			1.00		1.00	0.99	
Frt		0.979			0.955			0.969			0.953	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3320	0	1662	3214	0	1646	1712	0	1601	1679	0
Flt Permitted	0.233			0.197			0.094			0.377		
Satd. Flow (perm)	415	3320	0	344	3214	0	163	1712	0	635	1679	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24			87			17			29	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	820	136	112	610	262	67	336	89	418	518	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	956	0	112	872	0	67	425	0	418	756	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	



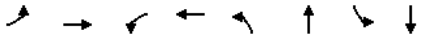
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	51.0	51.0		51.0	51.0		49.0	49.0		49.0	49.0	
Total Split (%)	51.0%	51.0%		51.0%	51.0%		49.0%	49.0%		49.0%	49.0%	
Maximum Green (s)	45.0	45.0		45.0	45.0		42.7	42.7		42.7	42.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	45.0	45.0		45.0	45.0		42.7	42.7		42.7	42.7	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.43	0.43		0.43	0.43	
v/c Ratio	1.94	0.63		0.73	0.58		0.97	0.57		1.54	1.03	
Control Delay	464.7	22.9		52.4	20.2		135.8	24.6		287.5	70.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	464.7	22.9		52.4	20.2		135.8	24.6		287.5	70.3	
LOS	F	C		D	C		F	C		F	E	
Approach Delay		144.0			23.8			39.7			147.6	
Approach LOS		F			C			D			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.94			
Intersection Signal Delay: 102.3		Intersection LOS: F	
Intersection Capacity Utilization 113.3%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

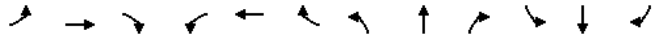


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	956	112	872	67	425	418	756
v/c Ratio	1.94	0.63	0.73	0.58	0.97	0.57	1.54	1.03
Control Delay	464.7	22.9	52.4	20.2	135.8	24.6	287.5	70.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	464.7	22.9	52.4	20.2	135.8	24.6	287.5	70.3
Queue Length 50th (m)	~114.3	74.7	18.1	60.9	13.0	61.6	~120.6	~162.7
Queue Length 95th (m)	#135.9	96.4	#49.8	80.6	#41.9	92.9	#180.3	#235.9
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	186	1507	154	1494	69	740	271	733
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	1.94	0.63	0.73	0.58	0.97	0.57	1.54	1.03

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Future Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.95		1.00	0.97		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)	1693	3319		1661	3214		1646	1711		1600	1678	
Flt Permitted	0.23	1.00		0.20	1.00		0.09	1.00		0.38	1.00	
Satd. Flow (perm)	415	3319		345	3214		162	1711		635	1678	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	820	136	112	610	262	67	336	89	418	518	238
RTOR Reduction (vph)	0	13	0	0	48	0	0	10	0	0	17	0
Lane Group Flow (vph)	361	943	0	112	824	0	67	415	0	418	739	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	45.0	45.0		45.0	45.0		42.7	42.7		42.7	42.7	
Effective Green, g (s)	45.0	45.0		45.0	45.0		42.7	42.7		42.7	42.7	
Actuated g/C Ratio	0.45	0.45		0.45	0.45		0.43	0.43		0.43	0.43	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	186	1493		155	1446		69	730		271	716	
v/s Ratio Prot		0.28			0.26			0.24			0.44	
v/s Ratio Perm	c0.87			0.32			0.41			c0.66		
v/c Ratio	1.94	0.63		0.72	0.57		0.97	0.57		1.54	1.03	
Uniform Delay, d1	27.5	21.1		22.4	20.3		28.0	21.7		28.6	28.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	442.5	2.0		25.2	1.6		97.9	1.0		261.7	42.3	
Delay (s)	470.0	23.2		47.6	22.0		125.9	22.7		290.4	71.0	
Level of Service	F	C		D	C		F	C		F	E	
Approach Delay (s)		145.6			24.9			36.8			149.1	
Approach LOS		F			C			D			F	

Intersection Summary					
HCM 2000 Control Delay	103.2	HCM 2000 Level of Service		F	
HCM 2000 Volume to Capacity ratio	1.74				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		12.3	
Intersection Capacity Utilization	113.3%	ICU Level of Service		H	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Future Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.965						0.992			0.919	
Flt Protected					0.998			0.955			0.980	
Satd. Flow (prot)	0	1660	0	0	1749	0	0	1740	0	0	1532	0
Flt Permitted					0.998			0.955			0.980	
Satd. Flow (perm)	0	1660	0	0	1749	0	0	1740	0	0	1532	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	976	348	29	687	1	273	0	17	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1336	0	0	717	0	0	290	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 99.1%		ICU Level of Service F	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	898	320	27	632	1	251	0	16	7	0	11
Future Volume (Veh/h)	11	898	320	27	632	1	251	0	16	7	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	976	348	29	687	1	273	0	17	8	0	12
Pedestrians											2	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	690			1324			1932	1922	1150	1938	2096	690
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	690			1324			1932	1922	1150	1938	2096	690
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			95			0	100	93	79	100	97
cM capacity (veh/h)	805			528			47	63	244	39	49	448

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1336	717	290	20
Volume Left	12	29	273	8
Volume Right	348	1	17	12
cSH	805	528	49	86
Volume to Capacity	0.01	0.05	5.94	0.23
Queue Length 95th (m)	0.4	1.4	Err	6.6
Control Delay (s)	0.7	1.6	Err	59.3
Lane LOS	A	A	F	F
Approach Delay (s)	0.7	1.6	Err	59.3
Approach LOS			F	F

Intersection Summary				
Average Delay	1228.5			
Intersection Capacity Utilization	99.1%	ICU Level of Service	F	
Analysis Period (min)	15			

Lanes, Volumes, Timings
3: Jones Road & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Future Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.981			0.995			0.961			0.956	
Flt Protected		0.999			0.995			0.975			0.988	
Satd. Flow (prot)	0	1646	0	0	1719	0	0	1707	0	0	1615	0
Flt Permitted		0.999			0.995			0.975			0.988	
Satd. Flow (perm)	0	1646	0	0	1719	0	0	1707	0	0	1615	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	849	139	61	526	24	90	37	51	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1000	0	0	611	0	0	178	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 84.9%		ICU Level of Service E	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	781	128	56	484	22	83	34	47	35	65	49
Future Volume (Veh/h)	11	781	128	56	484	22	83	34	47	35	65	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	849	139	61	526	24	90	37	51	38	71	53
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	551			988			1692	1616	918	1673	1673	540
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	551			988			1692	1616	918	1673	1673	540
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			91			0	60	85	0	17	90
cM capacity (veh/h)	912			708			19	92	332	37	85	539

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1000	611	178	162
Volume Left	12	61	90	38
Volume Right	139	24	51	53
cSH	912	708	34	83
Volume to Capacity	0.01	0.09	5.30	1.95
Queue Length 95th (m)	0.3	2.3	Err	113.4
Control Delay (s)	0.4	2.3	Err	553.4
Lane LOS	A	A	F	F
Approach Delay (s)	0.4	2.3	Err	553.4
Approach LOS			F	F

Intersection Summary				
Average Delay		959.1		
Intersection Capacity Utilization		84.9%	ICU Level of Service	E
Analysis Period (min)		15		

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	29	0	0	0	30	400	0	0	554	40
Future Volume (vph)	29	0	29	0	0	0	30	400	0	0	554	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.932									0.990	
Flt Protected		0.976					0.950					
Satd. Flow (prot)	0	1671	0	0	1837	0	1745	1766	0	1837	1769	0
Flt Permitted		0.976					0.950					
Satd. Flow (perm)	0	1671	0	0	1837	0	1745	1766	0	1837	1769	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			493.1	
Travel Time (s)		13.5			36.9			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	32	0	32	0	0	0	33	435	0	0	602	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	0	0	0	0	33	435	0	0	645	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	41.7%	ICU Level of Service A	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	0	29	0	0	0	30	400	0	0	554	40
Future Volume (Veh/h)	29	0	29	0	0	0	30	400	0	0	554	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	0	32	0	0	0	33	435	0	0	602	43
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1128	1128	628	1135	1150	435	649			435		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1128	1128	628	1135	1150	435	649			435		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	100	93	100	100	100	97			100		
cM capacity (veh/h)	177	198	485	164	192	625	944			1135		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	64	0	33	435	0	645
Volume Left	32	0	33	0	0	0
Volume Right	32	0	0	0	0	43
cSH	260	1700	944	1700	1700	1700
Volume to Capacity	0.25	0.00	0.03	0.26	0.00	0.38
Queue Length 95th (m)	7.6	0.0	0.9	0.0	0.0	0.0
Control Delay (s)	23.4	0.0	9.0	0.0	0.0	0.0
Lane LOS	C	A	A			
Approach Delay (s)	23.4	0.0	0.6		0.0	
Approach LOS	C	A				

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	41.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Future Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.965			0.879	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1616	1772	0	1631	1565	0
Flt Permitted	0.257			0.165			0.197			0.732		
Satd. Flow (perm)	467	1801	1561	303	1818	1459	335	1772	0	1256	1565	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			81		9			197	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	272	933	41	30	774	133	20	30	9	190	83	349
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	933	41	30	774	133	20	39	0	190	432	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	65.0	65.0	65.0	65.0	65.0	65.0	35.0	35.0		35.0	35.0	
Total Split (%)	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	35.0%	35.0%		35.0%	35.0%	
Maximum Green (s)	59.2	59.2	59.2	59.2	59.2	59.2	28.9	28.9		28.9	28.9	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	59.6	59.6	59.6	59.6	59.6	59.6	20.3	20.3		20.3	20.3	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65	0.22	0.22		0.22	0.22	
v/c Ratio	0.90	0.80	0.04	0.15	0.66	0.14	0.27	0.10		0.69	0.87	
Control Delay	51.7	20.4	3.6	10.8	14.8	4.0	38.4	22.6		45.5	36.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	51.7	20.4	3.6	10.8	14.8	4.0	38.4	22.6		45.5	36.3	
LOS	D	C	A	B	B	A	D	C		D	D	
Approach Delay		26.7			13.1			28.0			39.1	
Approach LOS		C			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 91.8			
Natural Cycle: 100			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 25.0		Intersection LOS: C	
Intersection Capacity Utilization 100.5%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	272	933	41	30	774	133	20	39	190	432
v/c Ratio	0.90	0.80	0.04	0.15	0.66	0.14	0.27	0.10	0.69	0.87
Control Delay	51.7	20.4	3.6	10.8	14.8	4.0	38.4	22.6	45.5	36.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	20.4	3.6	10.8	14.8	4.0	38.4	22.6	45.5	36.3
Queue Length 50th (m)	38.6	114.6	0.4	2.0	79.7	3.2	3.1	4.4	32.4	43.3
Queue Length 95th (m)	#108.3	#246.7	4.8	7.9	152.0	12.1	10.2	12.4	55.3	81.8
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	302	1168	1024	196	1179	974	106	567	397	630
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	0.90	0.80	0.04	0.15	0.66	0.14	0.19	0.07	0.48	0.69

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Future Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1613	1773		1631	1565	
Flt Permitted	0.26	1.00	1.00	0.17	1.00	1.00	0.20	1.00		0.73	1.00	
Satd. Flow (perm)	467	1801	1561	304	1818	1459	335	1773		1256	1565	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	933	41	30	774	133	20	30	9	190	83	349
RTOR Reduction (vph)	0	0	12	0	0	28	0	7	0	0	153	0
Lane Group Flow (vph)	272	933	29	30	774	105	20	32	0	190	279	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	59.5	59.5	59.5	59.5	59.5	59.5	20.3	20.3		20.3	20.3	
Effective Green, g (s)	59.5	59.5	59.5	59.5	59.5	59.5	20.3	20.3		20.3	20.3	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65	0.22	0.22		0.22	0.22	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	303	1168	1012	197	1179	946	74	392		278	346	
v/s Ratio Prot		0.52			0.43			0.02			c0.18	
v/s Ratio Perm	c0.58		0.02	0.10		0.07	0.06			0.15		
v/c Ratio	0.90	0.80	0.03	0.15	0.66	0.11	0.27	0.08		0.68	0.81	
Uniform Delay, d1	13.5	11.7	5.8	6.3	9.8	6.1	29.6	28.3		32.8	33.8	
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	31.1	5.8	0.1	1.6	2.9	0.2	2.0	0.1		6.8	12.8	
Delay (s)	44.6	17.5	5.8	7.9	12.7	6.3	31.5	28.4		39.5	46.6	
Level of Service	D	B	A	A	B	A	C	C		D	D	
Approach Delay (s)		23.0			11.7			29.5			44.4	
Approach LOS		C			B			C			D	

Intersection Summary				
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	91.7	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	100.5%	ICU Level of Service	G	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Future Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988						0.853	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1567	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1567	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	303	795	3	1	668	58	3	1	0	76	4	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	798	0	1	726	0	3	1	0	76	227	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 73.9%		ICU Level of Service D	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	279	731	3	1	615	53	3	1	0	70	4	205
Future Volume (Veh/h)	279	731	3	1	615	53	3	1	0	70	4	205
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	303	795	3	1	668	58	3	1	0	76	4	223
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	726			798			2298	2130	796	2100	2103	697
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	726			798			2298	2130	796	2100	2103	697
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	64			100			67	97	100	0	88	50
cM capacity (veh/h)	837			833			9	32	390	27	33	444

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	303	798	1	726	3	1	76	227
Volume Left	303	0	1	0	3	0	76	0
Volume Right	0	3	0	58	0	0	0	223
cSH	837	1700	833	1700	9	32	27	365
Volume to Capacity	0.36	0.47	0.00	0.43	0.33	0.03	2.82	0.62
Queue Length 95th (m)	13.3	0.0	0.0	0.0	6.0	0.8	73.8	32.0
Control Delay (s)	11.7	0.0	9.3	0.0	537.9	121.1	1131.0	29.8
Lane LOS	B		A		F	F	F	D
Approach Delay (s)	3.2		0.0		433.7		306.0	
Approach LOS					F		F	

Intersection Summary				
Average Delay	45.9			
Intersection Capacity Utilization	73.9%	ICU Level of Service	D	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00	0.99		1.00	1.00		1.00	0.99	
Frt		0.977			0.954			0.983			0.917	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3175	0	1479	2945	0	1586	1756	0	1662	1577	0
Flt Permitted	0.198			0.465			0.201			0.180		
Satd. Flow (perm)	346	3175	0	723	2945	0	335	1756	0	315	1577	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			97			7			74	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	461	0	49	991	0	228	595	0	216	574	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

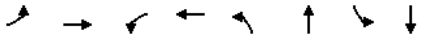
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	54.0	54.0		54.0	54.0		46.0	46.0		46.0	46.0	
Total Split (%)	54.0%	54.0%		54.0%	54.0%		46.0%	46.0%		46.0%	46.0%	
Maximum Green (s)	48.0	48.0		48.0	48.0		39.7	39.7		39.7	39.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	48.0	48.0		48.0	48.0		39.7	39.7		39.7	39.7	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.40	0.40		0.40	0.40	
v/c Ratio	1.87	0.30		0.14	0.68		1.73	0.85		1.73	0.86	
Control Delay	434.8	15.4		16.0	20.7		381.8	40.4		383.7	38.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	434.8	15.4		16.0	20.7		381.8	40.4		383.7	38.3	
LOS	F	B		B	C		F	D		F	D	
Approach Delay		184.0			20.5			135.0			132.8	
Approach LOS		F			C			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.87			
Intersection Signal Delay: 110.7		Intersection LOS: F	
Intersection Capacity Utilization 106.6%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018

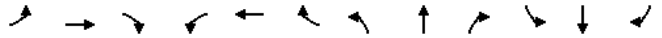


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	461	49	991	228	595	216	574
v/c Ratio	1.87	0.30	0.14	0.68	1.73	0.85	1.73	0.86
Control Delay	434.8	15.4	16.0	20.7	381.8	40.4	383.7	38.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	434.8	15.4	16.0	20.7	381.8	40.4	383.7	38.3
Queue Length 50th (m)	~96.9	26.9	5.4	71.4	~69.0	107.3	~65.5	93.4
Queue Length 95th (m)	#119.2	38.1	12.7	95.0	#91.5	#170.8	#88.8	#158.7
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	166	1539	347	1464	132	701	125	670
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	1.87	0.30	0.14	0.68	1.73	0.85	1.73	0.86

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	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	
Frt	1.00	0.98		1.00	0.95		1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1661	3173		1477	2945		1585	1757		1661	1577	
Flt Permitted	0.20	1.00		0.47	1.00		0.20	1.00		0.18	1.00	
Satd. Flow (perm)	345	3173		724	2945		335	1757		314	1577	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	15	0	0	50	0	0	4	0	0	45	0
Lane Group Flow (vph)	310	446	0	49	941	0	228	591	0	216	529	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.0	48.0		48.0	48.0		39.7	39.7		39.7	39.7	
Effective Green, g (s)	48.0	48.0		48.0	48.0		39.7	39.7		39.7	39.7	
Actuated g/C Ratio	0.48	0.48		0.48	0.48		0.40	0.40		0.40	0.40	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	165	1523		347	1413		132	697		124	626	
v/s Ratio Prot		0.14			0.32			0.34			0.34	
v/s Ratio Perm	c0.90			0.07			0.68			c0.69		
v/c Ratio	1.88	0.29		0.14	0.67		1.73	0.85		1.74	0.85	
Uniform Delay, d1	26.0	15.7		14.5	19.9		30.1	27.4		30.1	27.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	417.5	0.5		0.9	2.5		357.0	9.4		365.0	10.2	
Delay (s)	443.5	16.2		15.4	22.4		387.1	36.8		395.2	37.6	
Level of Service	F	B		B	C		F	D		F	D	
Approach Delay (s)		188.0			22.0			133.8			135.4	
Approach LOS		F			C			F			F	

Intersection Summary					
HCM 2000 Control Delay	112.4	HCM 2000 Level of Service	F		
HCM 2000 Volume to Capacity ratio	1.81				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.3		
Intersection Capacity Utilization	106.6%	ICU Level of Service	G		
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Future Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.985			0.997			0.985			0.929	
Flt Protected		0.999			0.999			0.957			0.977	
Satd. Flow (prot)	0	1710	0	0	1663	0	0	1731	0	0	1408	0
Flt Permitted		0.999			0.999			0.957			0.977	
Satd. Flow (perm)	0	1710	0	0	1663	0	0	1731	0	0	1408	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	576	74	10	774	18	247	0	30	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	659	0	0	802	0	0	277	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 71.3%		ICU Level of Service C	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	530	68	9	712	17	227	0	28	7	0	8
Future Volume (Veh/h)	8	530	68	9	712	17	227	0	28	7	0	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	576	74	10	774	18	247	0	30	8	0	9
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	793			650			1443	1444	613	1465	1472	784
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	793			650			1443	1444	613	1465	1472	784
tC, single (s)	4.4			4.1			7.1	6.5	6.2	7.3	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.5			2.2			3.5	4.0	3.3	3.7	4.0	3.5
p0 queue free %	99			99			0	100	94	91	100	98
cM capacity (veh/h)	706			946			106	130	496	89	125	370

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	659	802	277	17
Volume Left	9	10	247	8
Volume Right	74	18	30	9
cSH	706	946	116	149
Volume to Capacity	0.01	0.01	2.38	0.11
Queue Length 95th (m)	0.3	0.3	194.8	3.0
Control Delay (s)	0.3	0.3	706.7	32.2
Lane LOS	A	A	F	D
Approach Delay (s)	0.3	0.3	706.7	32.2
Approach LOS			F	D

Intersection Summary				
Average Delay		112.1		
Intersection Capacity Utilization		71.3%	ICU Level of Service	C
Analysis Period (min)		15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Future Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.986			0.970			0.946	
Flt Protected		0.996			0.997			0.982			0.986	
Satd. Flow (prot)	0	1698	0	0	1653	0	0	1728	0	0	1470	0
Flt Permitted		0.996			0.997			0.982			0.986	
Satd. Flow (perm)	0	1698	0	0	1653	0	0	1728	0	0	1470	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	508	40	54	677	87	88	97	52	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	600	0	0	818	0	0	237	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	467	37	50	623	80	81	89	48	24	27	34
Future Volume (Veh/h)	48	467	37	50	623	80	81	89	48	24	27	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	508	40	54	677	87	88	97	52	26	29	37
Pedestrians								2				
Lane Width (m)								3.3				
Walking Speed (m/s)								1.2				
Percent Blockage								0				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	764			550			1514	1506	530	1561	1482	720
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	764			550			1514	1506	530	1561	1482	720
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	94			94			0	9	91	0	73	90
cM capacity (veh/h)	858			925			65	106	552	16	109	380

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	600	818	237	92
Volume Left	52	54	88	26
Volume Right	40	87	52	37
cSH	858	925	100	45
Volume to Capacity	0.06	0.06	2.36	2.04
Queue Length 95th (m)	1.5	1.5	170.1	76.0
Control Delay (s)	1.6	1.5	710.4	677.1
Lane LOS	A	A	F	F
Approach Delay (s)	1.6	1.5	710.4	677.1
Approach LOS			F	F

Intersection Summary				
Average Delay	133.3			
Intersection Capacity Utilization	74.4%	ICU Level of Service	D	
Analysis Period (min)	15			

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Future Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.942			0.931			0.982			0.995	
Flt Protected		0.978			0.977		0.950			0.950		
Satd. Flow (prot)	0	1692	0	0	1671	0	1745	1695	0	1745	1635	0
Flt Permitted		0.978			0.977		0.950			0.950		
Satd. Flow (perm)	0	1692	0	0	1671	0	1745	1695	0	1745	1635	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			493.1	
Travel Time (s)		13.5			37.2			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	28	8	27	236	7	251	14	499	70	83	266	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	494	0	14	569	0	83	276	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 75.4%		ICU Level of Service D	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	7	25	217	6	231	13	459	64	76	245	9
Future Volume (Veh/h)	26	7	25	217	6	231	13	459	64	76	245	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	8	27	236	7	251	14	499	70	83	266	10
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1222	1038	275	1025	1008	534	280			569		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1222	1038	275	1025	1008	534	280			569		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	64	96	96	0	97	54	99			92		
cM capacity (veh/h)	77	211	766	187	219	550	1290			1013		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	63	494	14	569	83	276
Volume Left	28	236	14	0	83	0
Volume Right	27	251	0	70	0	10
cSH	145	282	1290	1700	1013	1700
Volume to Capacity	0.43	1.75	0.01	0.33	0.08	0.16
Queue Length 95th (m)	15.5	257.7	0.3	0.0	2.1	0.0
Control Delay (s)	47.7	382.6	7.8	0.0	8.9	0.0
Lane LOS	E	F	A		A	
Approach Delay (s)	47.7	382.6	0.2		2.1	
Approach LOS	E	F				

Intersection Summary				
Average Delay	128.7			
Intersection Capacity Utilization	75.4%	ICU Level of Service	D	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Future Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00				0.98	
Frt			0.850			0.850		0.975			0.855	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1678	1766	1358	1745	1749	1346	1586	1761	0	1586	1443	0
Flt Permitted	0.389			0.462			0.255			0.699		
Satd. Flow (perm)	687	1766	1358	849	1749	1316	425	1761	0	1167	1443	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			38			112		11			301	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	316	462	20	11	571	125	30	74	15	95	15	422
Shared Lane Traffic (%)												
Lane Group Flow (vph)	316	462	20	11	571	125	30	89	0	95	437	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

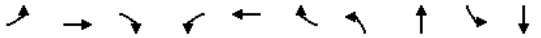
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	57.9	57.9	57.9	57.9	57.9	57.9	32.1	32.1		32.1	32.1	
Total Split (%)	64.3%	64.3%	64.3%	64.3%	64.3%	64.3%	35.7%	35.7%		35.7%	35.7%	
Maximum Green (s)	52.1	52.1	52.1	52.1	52.1	52.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	52.4	52.4	52.4	52.4	52.4	52.4	15.7	15.7		15.7	15.7	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65	0.20	0.20		0.20	0.20	
v/c Ratio	0.70	0.40	0.02	0.02	0.50	0.14	0.36	0.25		0.42	0.83	
Control Delay	22.3	8.9	1.3	7.2	10.2	2.4	39.5	24.9		33.1	24.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.3	8.9	1.3	7.2	10.2	2.4	39.5	24.9		33.1	24.3	
LOS	C	A	A	A	B	A	D	C		C	C	
Approach Delay		14.0			8.8			28.5			25.9	
Approach LOS		B			A			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 80.1			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 16.0		Intersection LOS: B	
Intersection Capacity Utilization 84.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



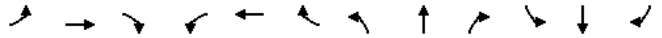
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	316	462	20	11	571	125	30	89	95	437
v/c Ratio	0.70	0.40	0.02	0.02	0.50	0.14	0.36	0.25	0.42	0.83
Control Delay	22.3	8.9	1.3	7.2	10.2	2.4	39.5	24.9	33.1	24.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	8.9	1.3	7.2	10.2	2.4	39.5	24.9	33.1	24.3
Queue Length 50th (m)	26.5	28.3	0.0	0.5	38.3	0.6	4.2	10.5	13.3	19.4
Queue Length 95th (m)	#96.4	67.3	1.6	3.1	90.6	8.1	12.3	22.3	26.7	56.0
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	449	1155	901	555	1144	899	138	582	381	673
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	0.70	0.40	0.02	0.02	0.50	0.14	0.22	0.15	0.25	0.65

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Future Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1317	1583	1761		1586	1444	
Flt Permitted	0.39	1.00	1.00	0.46	1.00	1.00	0.25	1.00		0.70	1.00	
Satd. Flow (perm)	687	1766	1358	848	1749	1317	425	1761		1168	1444	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	316	462	20	11	571	125	30	74	15	95	15	422
RTOR Reduction (vph)	0	0	7	0	0	39	0	9	0	0	242	0
Lane Group Flow (vph)	316	462	13	11	571	86	30	80	0	95	195	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	52.4	52.4	52.4	52.4	52.4	52.4	15.7	15.7		15.7	15.7	
Effective Green, g (s)	52.4	52.4	52.4	52.4	52.4	52.4	15.7	15.7		15.7	15.7	
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.65	0.65	0.20	0.20		0.20	0.20	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	449	1156	889	555	1145	862	83	345		229	283	
v/s Ratio Prot		0.26			0.33			0.05			c0.14	
v/s Ratio Perm	c0.46		0.01	0.01		0.07	0.07			0.08		
v/c Ratio	0.70	0.40	0.01	0.02	0.50	0.10	0.36	0.23		0.41	0.69	
Uniform Delay, d1	8.8	6.4	4.8	4.8	7.1	5.1	27.8	27.1		28.1	29.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.9	1.0	0.0	0.1	1.6	0.2	2.7	0.3		1.2	6.8	
Delay (s)	17.8	7.5	4.8	4.9	8.6	5.3	30.5	27.4		29.4	36.7	
Level of Service	B	A	A	A	A	A	C	C		C	D	
Approach Delay (s)		11.5			8.0			28.2			35.4	
Approach LOS		B			A			C			D	

Intersection Summary				
HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	84.1%	ICU Level of Service	E	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Future Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.980			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1759	0	1837	1725	0	1745	1782	0	1616	1192	0
Flt Permitted	0.950						0.950			0.950		
Satd. Flow (perm)	1572	1759	0	1837	1725	0	1745	1782	0	1616	1192	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	74	477	3	0	614	93	7	4	1	75	0	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	480	0	0	707	0	7	5	0	75	54	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	59.2%	ICU Level of Service B	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	439	3	0	565	86	6	4	1	69	0	50
Future Volume (Veh/h)	68	439	3	0	565	86	6	4	1	69	0	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	477	3	0	614	93	7	4	1	75	0	54
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	708			480			1294	1334	478	1290	1290	662
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	708			480			1294	1334	478	1290	1290	662
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	91			100			94	97	100	40	100	87
cM capacity (veh/h)	850			1093			114	142	591	124	151	415

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	74	480	0	707	7	5	75	54
Volume Left	74	0	0	0	7	0	75	0
Volume Right	0	3	0	93	0	1	0	54
cSH	850	1700	1700	1700	114	167	124	415
Volume to Capacity	0.09	0.28	0.00	0.42	0.06	0.03	0.60	0.13
Queue Length 95th (m)	2.3	0.0	0.0	0.0	1.5	0.7	24.4	3.6
Control Delay (s)	9.6	0.0	0.0	0.0	38.6	27.2	70.5	15.0
Lane LOS	A				E	D	F	B
Approach Delay (s)	1.3		0.0		33.8		47.3	
Approach LOS					D		E	

Intersection Summary				
Average Delay	5.1			
Intersection Capacity Utilization	59.2%	ICU Level of Service	B	
Analysis Period (min)	15			

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00	0.99		1.00	0.99			1.00		1.00	0.99	
Frt		0.962			0.955			0.972			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3266	0	1662	3215	0	1646	1721	0	1601	1692	0
Flt Permitted	0.284			0.152			0.098			0.362		
Satd. Flow (perm)	506	3266	0	266	3215	0	170	1721	0	610	1692	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		64			88			17			28	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	1028	0	111	740	0	138	467	0	353	867	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-06-2018

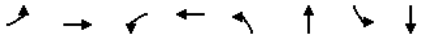
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		15.0	15.0		15.0	15.0	
Minimum Split (s)	32.0	32.0		32.0	32.0		34.3	34.3		34.3	34.3	
Total Split (s)	43.0	43.0		43.0	43.0		47.0	47.0		47.0	47.0	
Total Split (%)	47.8%	47.8%		47.8%	47.8%		52.2%	52.2%		52.2%	52.2%	
Maximum Green (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	19.0	19.0		19.0	19.0		21.0	21.0		21.0	21.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.45	0.45		0.45	0.45	
v/c Ratio	1.74	0.74		1.02	0.54		1.82	0.59		1.28	1.11	
Control Delay	373.7	25.1		123.6	19.2		436.8	21.6		178.4	92.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	373.7	25.1		123.6	19.2		436.8	21.6		178.4	92.7	
LOS	F	C		F	B		F	C		F	F	
Approach Delay		115.7			32.8			116.3			117.5	
Approach LOS		F			C			F			F	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.82			
Intersection Signal Delay: 99.0		Intersection LOS: F	
Intersection Capacity Utilization 120.9%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-06-2018



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	1028	111	740	138	467	353	867
v/c Ratio	1.74	0.74	1.02	0.54	1.82	0.59	1.28	1.11
Control Delay	373.7	25.1	123.6	19.2	436.8	21.6	178.4	92.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	373.7	25.1	123.6	19.2	436.8	21.6	178.4	92.7
Queue Length 50th (m)	~98.3	76.7	~20.4	45.7	~38.1	59.1	~82.3	~180.0
Queue Length 95th (m)	#152.6	101.6	#55.2	63.3	#62.3	91.1	#135.8	#254.0
Internal Link Dist (m)		201.8		131.4		469.1		155.3
Turn Bay Length (m)	80.0		35.0		35.0		50.0	
Base Capacity (vph)	208	1380	109	1373	76	787	275	780
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	1.74	0.74	1.02	0.54	1.82	0.59	1.28	1.11

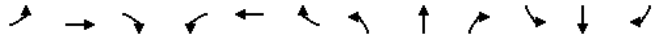
Intersection Summary

~ 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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		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	
Frt	1.00	0.96		1.00	0.96		1.00	0.97		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)	1693	3264		1661	3216		1646	1720		1600	1692	
Flt Permitted	0.28	1.00		0.15	1.00		0.10	1.00		0.36	1.00	
Satd. Flow (perm)	506	3264		266	3216		170	1720		609	1692	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
RTOR Reduction (vph)	0	38	0	0	52	0	0	9	0	0	15	0
Lane Group Flow (vph)	361	990	0	111	688	0	138	458	0	353	852	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Effective Green, g (s)	37.0	37.0		37.0	37.0		40.7	40.7		40.7	40.7	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.45	0.45		0.45	0.45	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.3	6.3		6.3	6.3	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	208	1341		109	1322		76	777		275	765	
v/s Ratio Prot		0.30			0.21			0.27			0.50	
v/s Ratio Perm	c0.71			0.42			c0.81			0.58		
v/c Ratio	1.74	0.74		1.02	0.52		1.82	0.59		1.28	1.11	
Uniform Delay, d1	26.5	22.4		26.5	19.9		24.6	18.4		24.6	24.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	350.3	3.7		91.2	1.5		413.9	1.1		152.4	68.2	
Delay (s)	376.8	26.1		117.7	21.3		438.5	19.6		177.1	92.9	
Level of Service	F	C		F	C		F	B		F	F	
Approach Delay (s)		117.2			33.9			115.1			117.3	
Approach LOS		F			C			F			F	

Intersection Summary

HCM 2000 Control Delay	99.5	HCM 2000 Level of Service		F		
HCM 2000 Volume to Capacity ratio	1.77					
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.3		
Intersection Capacity Utilization	120.9%	ICU Level of Service		H		
Analysis Period (min)	15					

c Critical Lane Group

Lanes, Volumes, Timings
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Future Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.971						0.986			0.919	
Flt Protected		0.999			0.998			0.957			0.980	
Satd. Flow (prot)	0	1661	0	0	1749	0	0	1733	0	0	1532	0
Flt Permitted		0.999			0.998			0.957			0.980	
Satd. Flow (perm)	0	1661	0	0	1749	0	0	1733	0	0	1532	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	928	255	29	639	1	148	0	17	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1195	0	0	669	0	0	165	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 85.0%		ICU Level of Service E	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	854	235	27	588	1	136	0	16	7	0	11
Future Volume (Veh/h)	11	854	235	27	588	1	136	0	16	7	0	11
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	928	255	29	639	1	148	0	17	8	0	12
Pedestrians											2	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	642			1183			1789	1780	1056	1796	1906	642
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	642			1183			1789	1780	1056	1796	1906	642
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			95			0	100	94	84	100	97
cM capacity (veh/h)	841			597			59	78	276	50	65	477

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1195	669	165	20
Volume Left	12	29	148	8
Volume Right	255	1	17	12
cSH	841	597	64	108
Volume to Capacity	0.01	0.05	2.57	0.19
Queue Length 95th (m)	0.3	1.2	130.9	5.2
Control Delay (s)	0.5	1.3	848.0	45.8
Lane LOS	A	A	F	E
Approach Delay (s)	0.5	1.3	848.0	45.8
Approach LOS			F	E

Intersection Summary				
Average Delay		69.5		
Intersection Capacity Utilization		85.0%	ICU Level of Service	E
Analysis Period (min)		15		

Lanes, Volumes, Timings
3: Jones Road & Barton Street 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Future Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.987			0.995			0.954			0.956	
Flt Protected		0.999			0.995			0.980			0.988	
Satd. Flow (prot)	0	1652	0	0	1719	0	0	1700	0	0	1615	0
Flt Permitted		0.999			0.995			0.980			0.988	
Satd. Flow (perm)	0	1652	0	0	1719	0	0	1700	0	0	1615	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	849	91	61	526	24	63	37	51	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	952	0	0	611	0	0	151	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 82.2%		ICU Level of Service E	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
3: Jones Road & Barton Street 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	781	84	56	484	22	58	34	47	35	65	49
Future Volume (Veh/h)	11	781	84	56	484	22	58	34	47	35	65	49
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	849	91	61	526	24	63	37	51	38	71	53
Pedestrians		1									1	
Lane Width (m)		3.3									3.3	
Walking Speed (m/s)		1.2									1.2	
Percent Blockage		0									0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	551			940			1668	1592	894	1649	1625	540
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	551			940			1668	1592	894	1649	1625	540
tC, single (s)	4.3			4.1			7.1	6.5	6.2	7.3	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.4			2.2			3.5	4.0	3.3	3.7	4.0	3.3
p0 queue free %	99			92			0	61	85	4	22	90
cM capacity (veh/h)	912			737			24	96	343	40	92	539

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	952	611	151	162
Volume Left	12	61	63	38
Volume Right	91	24	51	53
cSH	912	737	47	88
Volume to Capacity	0.01	0.08	3.20	1.83
Queue Length 95th (m)	0.3	2.2	Err	109.2
Control Delay (s)	0.4	2.2	Err	494.8
Lane LOS	A	A	F	F
Approach Delay (s)	0.4	2.2	Err	494.8
Approach LOS			F	F

Intersection Summary				
Average Delay		848.4		
Intersection Capacity Utilization		82.2%	ICU Level of Service	E
Analysis Period (min)		15		

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Future Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.946			0.928			0.947			0.990	
Flt Protected		0.977			0.978		0.950			0.950		
Satd. Flow (prot)	0	1698	0	0	1667	0	1745	1695	0	1745	1769	0
Flt Permitted		0.977			0.978		0.950			0.950		
Satd. Flow (perm)	0	1698	0	0	1667	0	1745	1695	0	1745	1769	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			493.1	
Travel Time (s)		13.5			36.9			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	30	8	25	130	8	157	26	427	233	263	596	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	295	0	26	660	0	263	638	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	28	7	23	120	7	144	24	393	214	242	548	39
Future Volume (Veh/h)	28	7	23	120	7	144	24	393	214	242	548	39
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	8	25	130	8	157	26	427	233	263	596	42
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1787	1859	621	1746	1764	544	642			660		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1787	1859	621	1746	1764	544	642			660		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	4	85	95	0	87	71	97			72		
cM capacity (veh/h)	31	52	489	44	59	543	949			938		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	63	295	26	660	263	638
Volume Left	30	130	26	0	263	0
Volume Right	25	157	0	233	0	42
cSH	54	87	949	1700	938	1700
Volume to Capacity	1.16	3.38	0.03	0.39	0.28	0.38
Queue Length 95th (m)	43.6	Err	0.7	0.0	9.2	0.0
Control Delay (s)	298.7	Err	8.9	0.0	10.3	0.0
Lane LOS	F	F	A		B	
Approach Delay (s)	298.7	Err	0.3		3.0	
Approach LOS	F	F				

Intersection Summary				
Average Delay	1527.7			
Intersection Capacity Utilization	76.5%	ICU Level of Service	D	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Future Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor											0.98	
Frt			0.850			0.850		0.965			0.872	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1616	1772	0	1631	1551	0
Flt Permitted	0.320			0.284			0.163			0.732		
Satd. Flow (perm)	582	1801	1561	522	1818	1459	277	1772	0	1256	1551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			89		9			272	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	504	700	41	30	643	118	20	30	9	178	83	478
Shared Lane Traffic (%)												
Lane Group Flow (vph)	504	700	41	30	643	118	20	39	0	178	561	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

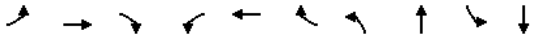
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	66.0	66.0	66.0	66.0	66.0	66.0	34.0	34.0		34.0	34.0	
Total Split (%)	66.0%	66.0%	66.0%	66.0%	66.0%	66.0%	34.0%	34.0%		34.0%	34.0%	
Maximum Green (s)	60.2	60.2	60.2	60.2	60.2	60.2	27.9	27.9		27.9	27.9	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	60.4	60.4	60.4	60.4	60.4	60.4	24.6	24.6		24.6	24.6	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62	0.62	0.25	0.25		0.25	0.25	
v/c Ratio	1.39	0.62	0.04	0.09	0.57	0.13	0.29	0.09		0.56	0.94	
Control Delay	214.4	15.1	3.6	9.3	13.8	3.2	40.5	22.5		38.6	43.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	214.4	15.1	3.6	9.3	13.8	3.2	40.5	22.5		38.6	43.8	
LOS	F	B	A	A	B	A	D	C		D	D	
Approach Delay		95.4			12.1			28.6			42.6	
Approach LOS		F			B			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 96.9			
Natural Cycle: 120			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 1.39			
Intersection Signal Delay: 57.0		Intersection LOS: E	
Intersection Capacity Utilization 102.9%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	504	700	41	30	643	118	20	39	178	561
v/c Ratio	1.39	0.62	0.04	0.09	0.57	0.13	0.29	0.09	0.56	0.94
Control Delay	214.4	15.1	3.6	9.3	13.8	3.2	40.5	22.5	38.6	43.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	214.4	15.1	3.6	9.3	13.8	3.2	40.5	22.5	38.6	43.8
Queue Length 50th (m)	~140.4	86.1	0.5	2.4	74.8	2.2	3.2	4.5	30.5	61.0
Queue Length 95th (m)	#133.9	125.0	4.7	6.7	108.4	9.3	10.8	12.6	52.7	#128.6
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	362	1122	985	325	1132	942	80	517	362	641
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	1.39	0.62	0.04	0.09	0.57	0.13	0.25	0.08	0.49	0.88

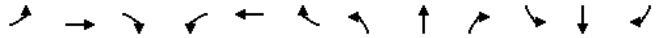
Intersection Summary

~ 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.

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-06-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Future Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.87	
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)	1728	1801	1561	1745	1818	1459	1614	1773		1631	1552	
Flt Permitted	0.32	1.00	1.00	0.28	1.00	1.00	0.16	1.00		0.73	1.00	
Satd. Flow (perm)	581	1801	1561	521	1818	1459	276	1773		1256	1552	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	504	700	41	30	643	118	20	30	9	178	83	478
RTOR Reduction (vph)	0	0	13	0	0	34	0	7	0	0	203	0
Lane Group Flow (vph)	504	700	28	30	643	84	20	32	0	178	358	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	60.4	60.4	60.4	60.4	60.4	60.4	24.6	24.6		24.6	24.6	
Effective Green, g (s)	60.4	60.4	60.4	60.4	60.4	60.4	24.6	24.6		24.6	24.6	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62	0.62	0.25	0.25		0.25	0.25	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	362	1122	973	324	1133	909	70	450		318	394	
v/s Ratio Prot		0.39			0.35			0.02			c0.23	
v/s Ratio Perm	c0.87		0.02	0.06		0.06	0.07			0.14		
v/c Ratio	1.39	0.62	0.03	0.09	0.57	0.09	0.29	0.07		0.56	0.91	
Uniform Delay, d1	18.3	11.2	7.0	7.3	10.6	7.3	29.1	27.5		31.4	35.1	
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	192.7	2.6	0.1	0.6	2.1	0.2	2.2	0.1		2.1	24.1	
Delay (s)	210.9	13.9	7.1	7.9	12.7	7.5	31.3	27.5		33.6	59.2	
Level of Service	F	B	A	A	B	A	C	C		C	E	
Approach Delay (s)		93.4			11.7			28.8			53.0	
Approach LOS		F			B			C			D	

Intersection Summary

HCM 2000 Control Delay	58.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	96.9	Sum of lost time (s)	11.9
Intersection Capacity Utilization	102.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-06-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Future Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988						0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1572	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1572	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	71	795	3	1	668	58	3	1	0	76	4	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	798	0	1	726	0	3	1	0	76	96	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 62.5%		ICU Level of Service B	
Analysis Period (min) 15			

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-06-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	731	3	1	615	53	3	1	0	70	4	85
Future Volume (Veh/h)	65	731	3	1	615	53	3	1	0	70	4	85
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	795	3	1	668	58	3	1	0	76	4	92
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	726			798			1702	1666	796	1636	1639	697
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	726			798			1702	1666	796	1636	1639	697
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			100			94	99	100	0	96	79
cM capacity (veh/h)	837			833			53	89	390	75	93	444

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	71	798	1	726	3	1	76	96
Volume Left	71	0	1	0	3	0	76	0
Volume Right	0	3	0	58	0	0	0	92
cSH	837	1700	833	1700	53	89	75	384
Volume to Capacity	0.08	0.47	0.00	0.43	0.06	0.01	1.01	0.25
Queue Length 95th (m)	2.2	0.0	0.0	0.0	1.4	0.3	43.0	7.8
Control Delay (s)	9.7	0.0	9.3	0.0	77.7	45.8	201.2	17.5
Lane LOS	A		A		F	E	F	C
Approach Delay (s)	0.8		0.0		69.7		98.6	
Approach LOS					F		F	

Intersection Summary				
Average Delay	10.1			
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Appendix R

Phase 2 Road Network with Intersection Improvements – 2031 Total Traffic Operations Summary Tables

TABLE R.1: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 1

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	C	B	B	**B**	C	C	C	**C**	E	D	>	**D**	D	C	>	**C**	**C**
			Delay	22	13	12	**16**	26	34	30	**33**	60	36	>	**42**	47	30	>	**35**	**32**
			V/C	0.73	0.23	0.06		0.21	0.75	0.48		0.91	0.74	>		0.85	0.49	>		**0.83**
			Q	80	33	7		16	81	49		54	65	>		47	37	>		
			Ex	80	-	-		35	-	-		35	-	>		50	-	>		
			Avail.	1	-	-		19	-	-		-19	-	>		4	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	A	B	A	**A**	A	B	>	**B**	D	C	>	**D**	<	C	>	**C**	**B**
			Delay	6	10	6	**10**	6	16	>	**16**	43	24	>	**39**	<	24	>	**24**	**18**
			V/C	0.04	0.53	0.05		0.08	0.76	>		0.80	0.04	>		<	0.01	>		**0.77**
			Q	3	80	5		6	151	>		69	0	>		<	2	>		
			Ex	-	-	-		-	-	>		-	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		-	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	<	B	A	**B**	A	B	>	**B**	<	C	>	**C**	<	C	>	**C**	**B**
			Delay	<	19	7	**18**	8	19	>	**18**	<	30	>	**30**	<	22	>	**22**	**20**
			V/C	<	0.77	0.04		0.15	0.80	>		<	0.60	>		<	0.19	>		**0.74**
			Q	<	107	4		8	149	>		<	49	>		<	17	>		
			Ex	<	-	-		-	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		-	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	<	B	>	**B**	<	C	B	**C**	A	B	A	**B**	B	B	>	**B**	**B**
			Delay	<	15	>	**15**	<	30	15	**24**	8	15	8	**13**	11	11	>	**11**	**16**
			V/C	<	0.10	>		<	0.81	0.17		0.03	0.60	0.07		0.23	0.35	>		**0.68**
			Q	<	9	>		<	65	13		4	75	7		14	38	>		
			Ex	<	-	>		<	-	-		20	-	-		20	-	>		
			Avail.	<	-	>		<	-	-		16	-	-		6	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	D	A	A	**C**	B	C	B	**C**	D	C	>	**C**	D	C	>	**D**	**C**
			Delay	43	8	5	**22**	13	23	14	**21**	36	31	>	**32**	46	32	>	**36**	**26**
			V/C	0.72	0.39	0.01		0.03	0.68	0.18		0.42	0.23	>		0.74	0.40	>		**0.70**
			Q	48	67	2		5	139	21		14	25	>		54	35	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	27	-	8		55	-	14		11	-	>		-29	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	E	D	>	**E**	E	C	>	**D**	**A**
			Delay	10	0	>	**1**	0	0	>	**0**	42	29	>	**37**	46	15	>	**26**	**2**
			V/C	0.09	0.31	>		0.00	0.42	>		0.07	0.03	>		0.24	0.13	>		
			Q	2	0	>		0	0	>		2	1	>		7	4	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		23	-	>		8	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds
Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage
TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control
RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE R.2: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 1

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	C	C	C	**C**	C	D	C	**D**	D	D	>	**D**	D	D	>	**D**	**D**
			Delay	29	31	26	**29**	27	38	33	**35**	45	47	>	**46**	49	46	>	**47**	**38**
			V/C	0.77	0.58	0.22		0.38	0.53	0.15		0.70	0.68	>		0.89	0.84	>		**0.87**
			Q	90	108	30		27	83	21		31	69	>		91	117	>		
			Ex	80	-	-		35	-	-		35	-	>		50	-	>		
			Avail.	-10	-	-		8	-	-		4	-	>		-41	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	A	B	A	**B**	A	A	>	**A**	C	C	>	**C**	<	C	>	**C**	**B**
			Delay	5	17	5	**15**	9	9	>	**9**	32	25	>	**31**	<	25	>	**25**	**14**
			V/C	0.04	0.84	0.16		0.32	0.55	>		0.60	0.03	>		<	0.01	>		**0.78**
			Q	3	203	8		14	85	>		36	0	>		<	2	>		
			Ex	-	-	-		-	-	>		-	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		-	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	<	B	A	**B**	A	A	>	**A**	<	D	>	**D**	<	C	>	**C**	**B**
			Delay	<	15	5	**13**	6	8	>	**8**	<	40	>	**40**	<	33	>	**33**	**16**
			V/C	<	0.78	0.08		0.17	0.49	>		<	0.69	>		<	0.55	>		**0.76**
			Q	<	190	5		8	69	>		<	43	>		<	38	>		
			Ex	<	-	-		-	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		-	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	<	C	>	**C**	<	D	C	**D**	A	A	A	**A**	A	A	>	**A**	**B**
			Delay	<	26	>	**26**	<	44	26	**37**	6	8	6	**7**	10	10	>	**10**	**14**
			V/C	<	0.14	>		<	0.78	0.10		0.08	0.38	0.21		0.45	0.56	>		**0.62**
			Q	<	14	>		<	59	14		6	50	9		39	87	>		
			Ex	<	-	>		<	-	-		20	-	-		20	-	>		
			Avail.	<	-	>		<	-	-		14	-	-		-19	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	D	B	A	**C**	B	D	B	**C**	C	C	>	**C**	D	D	>	**D**	**C**
			Delay	49	14	7	**28**	17	38	18	**33**	27	25	>	**25**	45	42	>	**43**	**33**
			V/C	0.88	0.64	0.03		0.10	0.88	0.26		0.25	0.07	>		0.82	0.81	>		**0.86**
			Q	76	121	4		10	180	30		10	12	>		78	103	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-1	-	6		50	-	5		15	-	>		-53	-	>		
	6 - Highway No. 8 & Jones Road	TWSC	LOS	A	A	>	**A**	A	A	>	**A**	F	E	>	**F**	F	C	>	**F**	**A**
			Delay	10	0	>	**1**	9	0	>	**0**	88	47	>	**78**	139	18	>	**60**	**6**
			V/C	0.08	0.48	>		0.00	0.43	>		0.06	0.01	>		0.73	0.26	>		
			Q	2	0	>		0	0	>		2	0	>		27	8	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	78	-	>		35	-	>		23	-	>		-12	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE R.3: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 2

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	C	B	>	**B**	C	C	C	**C**	D	D	>	**D**	E	C	C	**D**	**C**
			Delay	23	13	>	**17**	25	32	26	**29**	41	41	>	**41**	66	26	24	**38**	**31**
			V/C	0.75	0.27	>		0.20	0.69	0.31		0.61	0.73	>		0.93	0.40	0.22		**0.87**
			Q	72	40	>		19	103	31		41	64	>		67	52	17		
			Ex	80	-	>		35	-	-		35	-	>		50	-	-		
			Avail.	8	-	>		16	-	-		-6	-	>		-17	-	-		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	A	B	A	**A**	A	B	>	**B**	D	C	>	**D**	<	C	>	**C**	**B**
			Delay	7	11	6	**10**	6	20	>	**20**	46	22	>	**43**	<	22	>	**22**	**20**
			V/C	0.05	0.56	0.09		0.03	0.84	>		0.84	0.02	>		<	0.01	>		**0.84**
			Q	3	80	6		2	181	>		75	0	>		<	2	>		
			Ex	-	-	-		-	-	>		-	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		-	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	B	B	A	**B**	A	C	>	**C**	<	C	>	**C**	<	C	>	**C**	**C**
			Delay	11	13	8	**12**	10	22	>	**21**	<	35	>	**35**	<	22	>	**22**	**20**
			V/C	0.24	0.53	0.04		0.16	0.81	>		<	0.69	>		<	0.18	>		**0.77**
			Q	11	73	5		10	152	>		<	73	>		<	18	>		
			Ex	-	-	-		-	-	>		<	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	B		>	**B**					A	A		**A**		A	>	**A**	**A**
			Delay	15		>	**15**					8	0		**1**		0	>	**0**	**1**
			V/C	0.15		>						0.01	0.29				0.17	>		
			Q	4		>						8	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						12	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	B	A	A	**A**	A	A	A	**A**	C	C	>	**C**	D	C	>	**D**	**B**
			Delay	19	6	4	**10**	4	9	4	**9**	34	34	>	**34**	39	33	>	**35**	**14**
			V/C	0.71	0.42	0.01		0.02	0.65	0.11		0.25	0.30	>		0.57	0.20	>		**0.68**
			Q	80	63	1		2	126	9		13	26	>		33	21	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-5	-	9		58	-	26		12	-	>		-8	-	>		
	6 - Highway No. 8 & Jones Road	TCS	LOS	D	B	>	**B**	A	C	>	**C**	B	B	>	**B**	B	B	>	**B**	**A**
			Delay	41	13	>	**19**	0	21	>	**21**	15	15	>	**15**	17	20	>	**19**	**20**
			V/C	0.79	0.54	>		0.00	0.81	>		0.02	0.01	>		0.20	0.38	>		**0.65**
			Q	44	60	>		0	126	>		3	2	>		15	26	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	36	-	>		35	-	>		22	-	>		0	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE R.4: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 2

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	D	D	>	**D**	C	D	D	**D**	D	D	>	**D**	D	C	C	**D**	**D**
			Delay	35	38	>	**37**	33	51	38	**45**	48	52	>	**52**	50	30	21	**36**	**41**
			V/C	0.80	0.77	>		0.51	0.78	0.18		0.49	0.73	>		0.91	0.68	0.16		**0.9**
			Q	127	159	>		29	98	22		29	65	>		117	128	14		
			Ex	80	-	>		35	-	-		35	-	>		50	-	-		
			Avail.	-47	-	>		7	-	-		6	-	>		-67	-	-		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	A	C	A	**C**	A	A	>	**A**	D	C	>	**D**	<	C	>	**C**	**C**
			Delay	7	29	8	**23**	8	10	>	**9**	50	26	>	**48**	<	26	>	**26**	**22**
			V/C	0.04	0.92	0.22		0.20	0.63	>		0.84	0.01	>		<	0.01	>		**0.90**
			Q	3	255	10		3	77	>		84	0	>		<	3	>		
			Ex	-	-	-		-	-	>		-	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		-	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	A	A	B	**A**	A	A	>	**A**	<	D	>	**D**	<	D	>	**D**	**B**
			Delay	6	10	11	**10**	8	9	>	**9**	<	45	>	**45**	<	38	>	**38**	**15**
			V/C	0.03	0.76	0.09		0.22	0.48	>		<	0.65	>		<	0.50	>		**0.74**
			Q	1	54	3		10	65	>		<	55	>		<	43	>		
			Ex	-	-	-		-	-	>		<	-	>		<	-	>		
			Avail.	-	-	-		-	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	C		>	**C**					A	A		**A**		A	>	**A**	**A**
			Delay	23		>	**23**					9	0		**1**		0	>	**0**	**2**
			V/C	0.25		>						0.03	0.26				0.38	>		
			Q	8		>						1	0				0	>		
			Ex	-		>						20	-				-	>		
			Avail.	-		>						19	-				-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	C	B	A	**B**	B	C	B	**C**	C	C	>	**C**	D	D	>	**D**	**C**
			Delay	28	16	6	**19**	13	28	12	**25**	33	30	>	**31**	43	50	>	**48**	**27**
			V/C	0.80	0.78	0.03		0.14	0.83	0.13		0.28	0.09	>		0.72	0.82	>		**0.83**
			Q	67	206	4		10	216	18		11	13	>		58	92	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	8	-	6		51	-	17		14	-	>		-33	-	>		
	6 - Highway No. 8 & Jones Road	TCS	LOS	C	B	>	**B**	B	C	>	**C**	C	C	>	**C**	D	D	>	**D**	**A**
			Delay	23	11	>	**14**	12	27	>	**27**	34	33	>	**34**	38	36	>	**36**	**22**
			V/C	0.76	0.64	>		0.00	0.79	>		0.02	0.00	>		0.30	0.16	>		**0.65**
			Q	50	114	>		1	202	>		3	2	>		27	21	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	30	-	>		34	-	>		22	-	>		-12	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE R.5: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 AM TOTAL TRAFFIC OPERATIONS – SCENARIO 3

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	C	B	B	**B**	C	C	C	**C**	E	D	>	**D**	E	D	>	**D**	**C**
			Delay	22	13	12	**16**	25	31	25	**29**	56	41	>	**45**	58	36	>	**42**	**33**
			V/C	0.73	0.22	0.06		0.18	0.64	0.23		0.89	0.76	>		0.88	0.53	>		**0.84**
			Q	61	34	8		18	94	21		58	73	>		47	41	>		
			Ex	80	-	-		35	-	-		35	-	>		50	-	>		
			Avail.	20	-	-		17	-	-		-23	-	>		4	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	<	B	A	**B**	<	B	>	**B**	<	C	>	**C**	<	B	>	**B**	**B**
			Delay	<	11	6	**11**	<	20	>	**20**	<	34	>	**34**	<	19	>	**19**	**19**
			V/C	<	0.59	0.05		<	0.84	>		<	0.76	>		<	0.01	>		**0.81**
			Q	<	79	5		<	161	>		<	58	>		<	1	>		
			Ex	<	-	-		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	<	B	A	**B**	<	C	>	**C**	<	D	>	**D**	<	C	>	**C**	**C**
			Delay	<	13	7	**13**	<	23	>	**23**	<	38	>	**38**	<	28	>	**28**	**22**
			V/C	<	0.60	0.03		<	0.84	>		<	0.61	>		<	0.20	>		**0.78**
			Q	<	87	4		<	198	>		<	62	>		<	21	>		
			Ex	<	-	-		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	<	B	>	**B**	<	C	B	**C**	A	B	>	**B**	A	A	>	**A**	**B**
			Delay	<	18	>	**18**	<	31	18	**24**	7	12	>	**12**	9	9	>	**9**	**16**
			V/C	<	0.12	>		<	0.75	0.16		0.02	0.60	>		0.23	0.31	>		**0.65**
			Q	<	11	>		<	52	15		3	80	>		14	33	>		
			Ex	<	-	>		<	-	-		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	-		17	-	>		6	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	D	A	A	**B**	B	B	B	**B**	C	C	>	**C**	C	C	>	**C**	**C**
			Delay	36	6	4	**18**	11	19	12	**18**	35	32	>	**32**	34	32	>	**33**	**22**
			V/C	0.63	0.38	0.01		0.02	0.65	0.14		0.38	0.28	>		0.49	0.36	>		**0.61**
			Q	42	61	2		5	143	18		13	25	>		30	30	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	33	-	8		55	-	17		12	-	>		-5	-	>		
	6 - Highway No. 8 & Jones Road	TCS	LOS	B	B	>	**B**	A	B	>	**B**	C	C	>	**C**	C	C	>	**C**	**A**
			Delay	11	11	>	**11**	0	16	>	**16**	24	24	>	**24**	27	25	>	**26**	**15**
			V/C	0.28	0.45	>		0.00	0.68	>		0.02	0.01	>		0.22	0.05	>		**0.54**
			Q	15	67	>		0	119	>		4	3	>		23	0	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	65	-	>		35	-	>		21	-	>		-8	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

TABLE R.6: PHASE 2 ROAD NETWORK WITH INTERSECTION IMPROVEMENTS
2031 PM TOTAL TRAFFIC OPERATIONS – SCENARIO 3

Analysis Period	Intersection	Control Type	MOE	Direction / Movement / Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
PM Peak Hour	1 - Barton Street & Fruitland Road	TCS	LOS	C	C	C	**C**	C	D	C	**C**	E	D	>	**D**	D	D	>	**D**	**D**
			Delay	28	30	24	**28**	27	37	32	**34**	71	46	>	**52**	55	44	>	**47**	**39**
			V/C	0.76	0.57	0.17		0.38	0.52	0.15		0.85	0.67	>		0.92	0.83	>		**0.89**
			Q	89	106	18		27	80	20		41	67	>		92	114	>		
			Ex	80	-	-		35	-	-		35	-	>		50	-	>		
			Avail.	-9	-	-		8	-	-		-6	-	>		-42	-	>		
	2 - Barton Street & Sunnyhurst Avenue	TCS	LOS	<	B	A	**B**	<	A	>	**A**	<	D	>	**D**	<	C	>	**C**	**B**
			Delay	<	16	5	**14**	<	8	>	**8**	<	35	>	**35**	<	28	>	**28**	**14**
			V/C	<	0.83	0.16		<	0.59	>		<	0.59	>		<	0.01	>		**0.78**
			Q	<	213	8		<	78	>		<	36	>		<	3	>		
			Ex	<	-	-		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		<	-	>		<	-	>		<	-	>		
	3 - Barton Street & Jones Road	TCS	LOS	<	B	B	**B**	<	C	>	**C**	<	C	>	**C**	<	C	>	**C**	**B**
			Delay	<	14	12	**13**	<	21	>	**21**	<	31	>	**31**	<	31	>	**31**	**19**
			V/C	<	0.84	0.06		<	0.81	>		<	0.41	>		<	0.43	>		**0.73**
			Q	<	85	3		<	142	>		<	35	>		<	37	>		
			Ex	<	-	-		<	-	>		<	-	>		<	-	>		
			Avail.	<	-	-		<	-	>		<	-	>		<	-	>		
	4 - Fruitland Road & Sherwood Park Road	TCS	LOS	<	C	>	**C**	<	C	C	**C**	A	A	>	**A**	B	A	>	**B**	**B**
			Delay	<	23	>	**23**	<	28	23	**25**	5	10	>	**10**	18	9	>	**12**	**13**
			V/C	<	0.16	>		<	0.57	0.10		0.06	0.59	>		0.68	0.57	>		**0.66**
			Q	<	13	>		<	32	13		5	86	>		69	85	>		
			Ex	<	-	>		<	-	-		20	-	>		20	-	>		
			Avail.	<	-	>		<	-	-		15	-	>		-49	-	>		
	5 - Highway No. 8 & Fruitland Road/ Regalview Drive	TCS	LOS	E	B	A	**C**	B	D	B	**C**	C	C	>	**C**	D	E	>	**E**	**D**
			Delay	58	13	7	**31**	18	36	18	**32**	33	29	>	**30**	36	64	>	**57**	**38**
			V/C	0.90	0.61	0.03		0.10	0.84	0.11		0.29	0.07	>		0.58	0.92	>		**0.88**
			Q	83	118	4		10	184	15		11	13	>		54	130	>		
			Ex	75	-	10		60	-	35		25	-	>		25	-	>		
			Avail.	-8	-	6		50	-	20		14	-	>		-29	-	>		
	6 - Highway No. 8 & Jones Road	TCS	LOS	B	C	>	**B**	A	B	>	**B**	B	B	>	**B**	B	B	>	**B**	**A**
			Delay	10	21	>	**20**	7	16	>	**16**	16	16	>	**16**	18	17	>	**18**	**18**
			V/C	0.37	0.85	>		0.01	0.77	>		0.01	0.00	>		0.19	0.07	>		**0.62**
			Q	13	120	>		0	100	>		3	1	>		22	12	>		
			Ex	80	-	>		35	-	>		25	-	>		15	-	>		
			Avail.	67	-	>		35	-	>		22	-	>		-7	-	>		

MOE - Measure of Effectiveness
LOS - Level of Service
Delay - Average Delay per Vehicle in Seconds

Q - 95th Percentile Queue Length
Ex. - Existing Available Storage
Avail. - Available Storage

TCS - Traffic Control Signal
TWSC - Two-Way Stop Control
AWSC - All-Way Stop Control

RBT - Roundabout
< - Shared Left Lane
> - Shared Right Lane

Appendix S

Phase 2 Road Network with Intersection Improvements – 2031 Total Traffic Operations Reports

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street

02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		20.0	35.0		20.0	50.0		20.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	1.00		0.99	1.00	1.00		1.00	0.99	
Frt			0.850			0.850		0.983			0.917	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3323	1323	1479	3144	1358	1586	3336	0	1662	2996	0
Flt Permitted	0.217			0.522			0.280			0.262		
Satd. Flow (perm)	379	3323	1294	812	3144	1338	467	3336	0	458	2996	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76			165		16			298	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			141.7			179.3	
Travel Time (s)		13.5			9.3			10.2			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	389	72	49	687	304	228	595	0	216	574	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street

02-16-2018

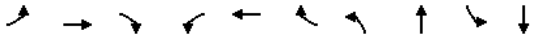
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	8.0	32.0	32.0	32.0	32.0	32.0	8.0	34.3		8.0	34.3	
Total Split (s)	12.0	44.0	44.0	32.0	32.0	32.0	11.0	35.0		11.0	35.0	
Total Split (%)	13.3%	48.9%	48.9%	35.6%	35.6%	35.6%	12.2%	38.9%		12.2%	38.9%	
Maximum Green (s)	9.0	38.0	38.0	26.0	26.0	26.0	8.0	28.7		8.0	28.7	
Yellow Time (s)	3.0	3.7	3.7	3.7	3.7	3.7	3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.3	2.3	2.3	2.3	2.3	0.0	3.0		0.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		19.0	19.0	19.0	19.0	19.0		21.0			21.0	
Pedestrian Calls (#/hr)		0	0	0	0	0		0			0	
Act Effct Green (s)	48.5	45.5	45.5	26.3	26.3	26.3	32.5	21.2		32.5	21.2	
Actuated g/C Ratio	0.54	0.51	0.51	0.29	0.29	0.29	0.36	0.24		0.36	0.24	
v/c Ratio	0.71	0.23	0.10	0.21	0.75	0.60	0.85	0.75		0.79	0.62	
Control Delay	25.7	13.7	3.8	27.1	34.9	17.9	49.5	36.8		41.7	16.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	25.7	13.7	3.8	27.1	34.9	17.9	49.5	36.8		41.7	16.7	
LOS	C	B	A	C	C	B	D	D		D	B	
Approach Delay		17.6			29.6			40.3			23.5	
Approach LOS		B			C			D			C	

Intersection Summary		
Area Type:	Other	
Cycle Length: 90		
Actuated Cycle Length: 90		
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green		
Natural Cycle: 85		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.85		
Intersection Signal Delay: 28.1	Intersection LOS: C	
Intersection Capacity Utilization 85.1%	ICU Level of Service E	
Analysis Period (min) 15		

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018



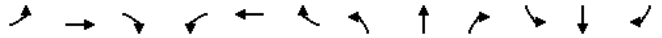
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	389	72	49	687	304	228	595	216	574
v/c Ratio	0.71	0.23	0.10	0.21	0.75	0.60	0.85	0.75	0.79	0.62
Control Delay	25.7	13.7	3.8	27.1	34.9	17.9	49.5	36.8	41.7	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.7	13.7	3.8	27.1	34.9	17.9	49.5	36.8	41.7	16.7
Queue Length 50th (m)	29.9	19.7	0.0	6.7	59.6	20.4	28.9	51.7	26.9	22.5
Queue Length 95th (m)	#79.5	32.9	7.1	16.4	80.8	48.8	#53.6	64.7	#46.5	36.5
Internal Link Dist (m)		201.8			131.4			117.7		155.3
Turn Bay Length (m)	80.0			35.0		20.0	35.0		50.0	
Base Capacity (vph)	435	1680	691	237	918	507	268	1074	272	1158
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	0.71	0.23	0.10	0.21	0.75	0.60	0.85	0.55	0.79	0.50

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	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	0.98		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3323	1294	1477	3144	1338	1586	3338		1662	2996	
Flt Permitted	0.22	1.00	1.00	0.52	1.00	1.00	0.28	1.00		0.26	1.00	
Satd. Flow (perm)	380	3323	1294	812	3144	1338	468	3338		459	2996	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	0	36	0	0	117	0	12	0	0	228	0
Lane Group Flow (vph)	310	389	36	49	687	187	228	583	0	216	346	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	45.5	45.5	45.5	26.3	26.3	26.3	29.2	21.2		29.2	21.2	
Effective Green, g (s)	45.5	45.5	45.5	26.3	26.3	26.3	29.2	21.2		29.2	21.2	
Actuated g/C Ratio	0.51	0.51	0.51	0.29	0.29	0.29	0.32	0.24		0.32	0.24	
Clearance Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	422	1679	654	237	918	390	251	786		255	705	
v/s Ratio Prot	c0.13	0.12			0.22		c0.08	0.17		0.08	0.12	
v/s Ratio Perm	c0.24		0.03	0.06		0.14	c0.21			0.20		
v/c Ratio	0.73	0.23	0.06	0.21	0.75	0.48	0.91	0.74		0.85	0.49	
Uniform Delay, d1	15.2	12.5	11.3	24.0	28.9	26.2	26.3	31.9		25.1	29.7	
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	6.5	0.3	0.2	2.0	5.6	4.2	33.1	3.8		22.0	0.5	
Delay (s)	21.8	12.8	11.5	26.0	34.4	30.4	59.5	35.7		47.2	30.3	
Level of Service	C	B	B	C	C	C	E	D		D	C	
Approach Delay (s)		16.3			32.8			42.2			34.9	
Approach LOS		B			C			D			C	

Intersection Summary				
HCM 2000 Control Delay	31.8	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.3	
Intersection Capacity Utilization	85.1%	ICU Level of Service	E	
Analysis Period (min)	15			

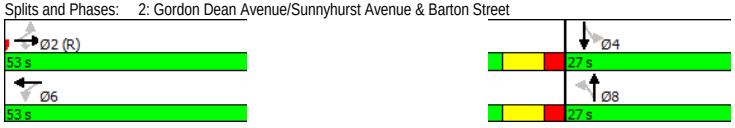
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Future Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	15.0		0.0	0.0		0.0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					1.00							
Frt			0.850		0.997			0.850			0.929	
Flt Protected	0.950			0.950			0.950				0.977	
Satd. Flow (prot)	1312	1733	1561	1745	1661	0	1745	1561	0	0	1408	0
Flt Permitted	0.237			0.376			0.746				0.893	
Satd. Flow (perm)	327	1733	1561	691	1661	0	1370	1561	0	0	1287	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			78		3			308			41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	572	78	34	770	18	251	0	70	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	572	78	34	788	0	251	70	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	53.0	53.0	53.0	53.0	53.0		27.0	27.0		27.0	27.0	
Total Split (%)	66.3%	66.3%	66.3%	66.3%	66.3%		33.8%	33.8%		33.8%	33.8%	
Maximum Green (s)	47.0	47.0	47.0	47.0	47.0		21.0	21.0		21.0	21.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	Max	Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	49.7	49.7	49.7	49.7	49.7		18.3	18.3			18.3	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62		0.23	0.23			0.23	
v/c Ratio	0.04	0.53	0.08	0.08	0.76		0.80	0.12			0.05	
Control Delay	7.8	11.5	2.1	7.6	18.2		48.9	0.4			2.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay	7.8	11.5	2.1	7.6	18.2		48.9	0.4			2.6	
LOS	A	B	A	A	B		D	A			A	
Approach Delay		10.3			17.7			38.3			2.6	
Approach LOS		B			B			D			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 18.5		Intersection LOS: B	
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street



Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

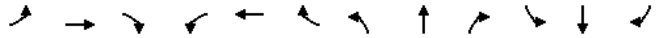
02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	9	572	78	34	788	251	70	17
v/c Ratio	0.04	0.53	0.08	0.08	0.76	0.80	0.12	0.05
Control Delay	7.8	11.5	2.1	7.6	18.2	48.9	0.4	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	11.5	2.1	7.6	18.2	48.9	0.4	2.6
Queue Length 50th (m)	0.5	49.4	0.0	2.1	86.2	36.9	0.0	0.0
Queue Length 95th (m)	2.6	79.8	5.1	6.1	#150.7	#68.7	0.0	1.8
Internal Link Dist (m)		339.5			336.5		482.8	141.9
Turn Bay Length (m)	15.0			15.0		15.0		
Base Capacity (vph)	203	1077	1000	429	1034	359	636	368
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	0.53	0.08	0.08	0.76	0.70	0.11	0.05

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

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Future Volume (vph)	8	526	72	31	708	17	231	0	64	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
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			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	0.85	1.00	1.00		1.00	0.85			0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1311	1733	1561	1745	1661		1745	1561			1407	
Flt Permitted	0.24	1.00	1.00	0.38	1.00		0.75	1.00			0.89	
Satd. Flow (perm)	328	1733	1561	690	1661		1371	1561			1286	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	572	78	34	770	18	251	0	70	8	0	9
RTOR Reduction (vph)	0	0	30	0	1	0	0	54	0	0	13	0
Lane Group Flow (vph)	9	572	48	34	787	0	251	16	0	0	4	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	49.7	49.7	49.7	49.7	49.7		18.3	18.3			18.3	
Effective Green, g (s)	49.7	49.7	49.7	49.7	49.7		18.3	18.3			18.3	
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62		0.23	0.23			0.23	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	203	1076	969	428	1031		313	357			294	
v/s Ratio Prot		0.33			c0.47			0.01				
v/s Ratio Perm	0.03		0.03	0.05			c0.18				0.00	
v/c Ratio	0.04	0.53	0.05	0.08	0.76		0.80	0.04			0.01	
Uniform Delay, d1	5.9	8.6	5.9	6.0	10.9		29.1	24.0			23.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.4	1.9	0.1	0.4	5.4		13.7	0.1			0.0	
Delay (s)	6.3	10.4	6.0	6.4	16.3		42.9	24.1			23.9	
Level of Service	A	B	A	A	B		D	C			C	
Approach Delay (s)		9.9			15.9			38.8			23.9	
Approach LOS		A			B			D			C	

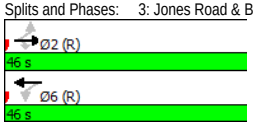
Intersection Summary					
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.77				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	67.8%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Future Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	15.0		0.0	15.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		1	1		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98	1.00								
Frt			0.850		0.983			0.980			0.946	
Flt Protected		0.996		0.950				0.979			0.986	
Satd. Flow (prot)	0	1705	1561	1430	1667	0	0	1740	0	0	1470	0
Flt Permitted		0.768		0.357				0.818			0.884	
Satd. Flow (perm)	0	1315	1524	537	1667	0	0	1454	0	0	1318	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			59		15			12			37	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	524	59	47	685	87	100	97	35	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	576	59	47	772	0	0	232	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	46.0	46.0	46.0	46.0	46.0		24.0	24.0		24.0	24.0	
Total Split (%)	65.7%	65.7%	65.7%	65.7%	65.7%		34.3%	34.3%		34.3%	34.3%	
Maximum Green (s)	40.0	40.0	40.0	40.0	40.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		40.0	40.0	40.0	40.0			18.0			18.0	
Actuated g/C Ratio		0.57	0.57	0.57	0.57			0.26			0.26	
v/c Ratio		0.77	0.07	0.15	0.81			0.61			0.25	
Control Delay		20.3	2.3	8.7	20.2			29.5			15.7	
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0	
Total Delay		20.3	2.3	8.7	20.2			29.5			15.7	
LOS		C	A	A	C			C			B	
Approach Delay		18.7			19.5			29.5			15.7	
Approach LOS		B			B			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 20.3		Intersection LOS: C	
Intersection Capacity Utilization 93.7%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street



Queues
3: Jones Road & Barton Street

02-16-2018

Lane Group	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	576	59	47	772	232	92
v/c Ratio	0.77	0.07	0.15	0.81	0.61	0.25
Control Delay	20.3	2.3	8.7	20.2	29.5	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.3	2.3	8.7	20.2	29.5	15.7
Queue Length 50th (m)	54.7	0.0	2.8	74.8	26.6	5.9
Queue Length 95th (m)	#107.3	4.3	7.8	#149.1	49.1	17.0
Internal Link Dist (m)	336.5			110.2	480.6	238.0
Turn Bay Length (m)			15.0			
Base Capacity (vph)	751	896	306	959	382	366
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	0.77	0.07	0.15	0.81	0.61	0.25

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Future Volume (vph)	48	482	54	43	630	80	92	89	32	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.98	1.00	1.00			1.00			1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.98			0.98			0.95	
Flt Protected		1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)		1704	1524	1428	1667			1739			1470	
Flt Permitted		0.77	1.00	0.36	1.00			0.82			0.88	
Satd. Flow (perm)		1314	1524	536	1667			1453			1317	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	524	59	47	685	87	100	97	35	26	29	37
RTOR Reduction (vph)	0	0	25	0	6	0	0	9	0	0	27	0
Lane Group Flow (vph)	0	576	34	47	766	0	0	223	0	0	65	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		40.0	40.0	40.0	40.0			18.0			18.0	
Effective Green, g (s)		40.0	40.0	40.0	40.0			18.0			18.0	
Actuated g/C Ratio		0.57	0.57	0.57	0.57			0.26			0.26	
Clearance Time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		750	870	306	952			373			338	
v/s Ratio Prot					c0.46							
v/s Ratio Perm		0.44	0.02	0.09				c0.15			0.05	
v/c Ratio		0.77	0.04	0.15	0.80			0.60			0.19	
Uniform Delay, d1		11.5	6.6	7.0	11.9			22.8			20.3	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		7.4	0.1	1.1	7.2			6.9			1.3	
Delay (s)		18.9	6.7	8.1	19.1			29.7			21.6	
Level of Service		B	A	A	B			C			C	
Approach Delay (s)		17.7			18.4			29.7			21.6	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	19.8	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.74				
Actuated Cycle Length (s)	70.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	93.7%	ICU Level of Service		F	
Analysis Period (min)	15				

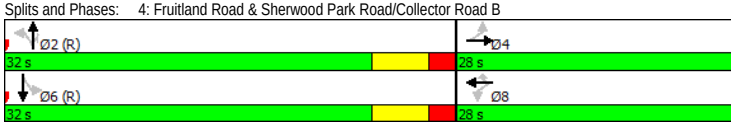
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Future Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		40.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		1	1		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				1.00	
Frt		0.935				0.850			0.850		0.995	
Flt Protected		0.978			0.953		0.950			0.950		
Satd. Flow (prot)	0	1680	0	0	1750	1561	1745	1717	1531	1745	1633	0
Flt Permitted		0.786			0.683		0.588			0.382		
Satd. Flow (perm)	0	1350	0	0	1254	1561	1075	1717	1531	702	1633	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		30				242			108		4	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			351.5	
Travel Time (s)		13.5			37.2			39.4			25.3	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	28	4	30	315	4	249	16	501	108	79	270	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	62	0	0	319	249	16	501	108	79	280	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0	20.0	20.0	20.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	26.0	26.0	26.0	26.0	26.0	
Total Split (s)	28.0	28.0		28.0	28.0	28.0	32.0	32.0	32.0	32.0	32.0	
Total Split (%)	46.7%	46.7%		46.7%	46.7%	46.7%	53.3%	53.3%	53.3%	53.3%	53.3%	
Maximum Green (s)	22.0	22.0		22.0	22.0	22.0	26.0	26.0	26.0	26.0	26.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0	0	0	0	
Act Effct Green (s)		18.9			18.9	18.9	29.1	29.1	29.1	29.1	29.1	
Actuated g/C Ratio		0.32			0.32	0.32	0.48	0.48	0.48	0.48	0.48	
v/c Ratio		0.14			0.81	0.38	0.03	0.60	0.14	0.23	0.35	
Control Delay		8.9			35.6	4.3	10.0	16.2	3.1	12.9	12.1	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		8.9			35.6	4.3	10.0	16.2	3.1	12.9	12.1	
LOS		A			D	A	A	B	A	B	B	
Approach Delay		8.9			21.9			13.8			12.3	
Approach LOS		A			C			B			B	

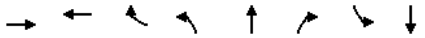
Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 16.1		Intersection LOS: B	
Intersection Capacity Utilization 78.9%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: Fruitland Road & Sherwood Park Road/Collector Road B



Queues
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018



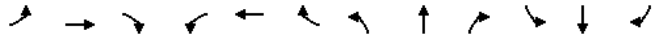
Lane Group	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	62	319	249	16	501	108	79	280
v/c Ratio	0.14	0.81	0.38	0.03	0.60	0.14	0.23	0.35
Control Delay	8.9	35.6	4.3	10.0	16.2	3.1	12.9	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.9	35.6	4.3	10.0	16.2	3.1	12.9	12.1
Queue Length 50th (m)	2.4	31.8	0.5	1.0	41.9	0.0	5.3	19.7
Queue Length 95th (m)	9.1	#65.3	13.0	4.0	74.9	7.3	14.3	37.6
Internal Link Dist (m)	163.5	492.4			523.7			327.5
Turn Bay Length (m)			40.0	20.0			20.0	
Base Capacity (vph)	514	459	725	521	832	797	340	793
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	0.69	0.34	0.03	0.60	0.14	0.23	0.35

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Future Volume (vph)	26	4	28	290	4	229	15	461	99	73	248	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
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	1.00	
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.93			1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.98			0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1679			1750	1561	1737	1717	1531	1745	1633	
Flt Permitted		0.79			0.68	1.00	0.59	1.00	1.00	0.38	1.00	
Satd. Flow (perm)		1349			1255	1561	1075	1717	1531	702	1633	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	4	30	315	4	249	16	501	108	79	270	10
RTOR Reduction (vph)	0	21	0	0	0	166	0	0	56	0	2	0
Lane Group Flow (vph)	0	41	0	0	319	83	16	501	52	79	278	0
Confl. Peds. (#/hr)							4					4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		18.9			18.9	18.9	29.1	29.1	29.1	29.1	29.1	
Effective Green, g (s)		18.9			18.9	18.9	29.1	29.1	29.1	29.1	29.1	
Actuated g/C Ratio		0.31			0.31	0.31	0.49	0.49	0.49	0.49	0.49	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		424			395	491	521	832	742	340	792	
v/s Ratio Prot								c0.29			0.17	
v/s Ratio Perm		0.03			c0.25	0.05	0.01		0.03	0.11		
v/c Ratio		0.10			0.81	0.17	0.03	0.60	0.07	0.23	0.35	
Uniform Delay, d1		14.5			18.9	14.9	8.1	11.2	8.2	9.0	9.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1			11.5	0.2	0.1	3.2	0.2	1.6	1.2	
Delay (s)		14.6			30.4	15.0	8.2	14.5	8.4	10.6	10.8	
Level of Service		B			C	B	A	B	A	B	B	
Approach Delay (s)		14.6			23.6			13.3			10.8	
Approach LOS		B			C			B			B	

Intersection Summary				
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	78.9%	ICU Level of Service	D	
Analysis Period (min)	15			

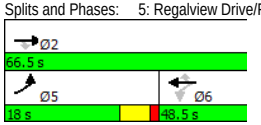
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Future Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	2		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.99	1.00				0.98	
Frt			0.850			0.850		0.975			0.855	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3255	1766	1358	1745	1749	1346	1586	1761	0	1586	1442	0
Flt Permitted	0.950			0.499			0.214			0.699		
Satd. Flow (perm)	3251	1766	1358	916	1749	1328	357	1761	0	1167	1442	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			98		10			408	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	320	458	20	11	566	163	30	74	15	176	15	426
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	458	20	11	566	163	30	89	0	176	441	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		6.6			6.6			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	18.0	66.5	66.5	48.5	48.5	48.5	33.0	33.0		33.0	33.0	
Total Split (%)	18.1%	66.8%	66.8%	48.7%	48.7%	48.7%	33.2%	33.2%		33.2%	33.2%	
Maximum Green (s)	13.5	60.7	60.7	42.7	42.7	42.7	26.9	26.9		26.9	26.9	
Yellow Time (s)	3.5	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	1.0	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	12.6	60.9	60.9	43.9	43.9	43.9	18.7	18.7		18.7	18.7	
Actuated g/C Ratio	0.14	0.66	0.66	0.48	0.48	0.48	0.20	0.20		0.20	0.20	
v/c Ratio	0.72	0.39	0.02	0.03	0.68	0.24	0.42	0.24		0.74	0.71	
Control Delay	48.6	9.1	1.4	15.9	25.2	8.2	48.8	27.8		52.6	11.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	48.6	9.1	1.4	15.9	25.2	8.2	48.8	27.8		52.6	11.6	
LOS	D	A	A	B	C	A	D	C		D	B	
Approach Delay		24.7			21.3			33.1			23.3	
Approach LOS		C			C			C			C	

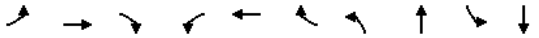
Intersection Summary			
Area Type:	Other		
Cycle Length: 99.5			
Actuated Cycle Length: 91.6			
Natural Cycle: 80			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 23.7		Intersection LOS: C	
Intersection Capacity Utilization 78.9%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8



Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



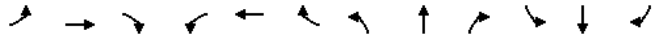
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	320	458	20	11	566	163	30	89	176	441
v/c Ratio	0.72	0.39	0.02	0.03	0.68	0.24	0.42	0.24	0.74	0.71
Control Delay	48.6	9.1	1.4	15.9	25.2	8.2	48.8	27.8	52.6	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.6	9.1	1.4	15.9	25.2	8.2	48.8	27.8	52.6	11.6
Queue Length 50th (m)	29.2	34.0	0.0	1.1	79.4	6.5	4.9	12.3	30.7	5.0
Queue Length 95th (m)	#48.1	66.8	1.8	4.7	138.7	21.2	14.3	25.0	53.5	34.7
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	481	1174	914	438	837	686	105	526	343	712
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	0.67	0.39	0.02	0.03	0.68	0.24	0.29	0.17	0.51	0.62

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Future Volume (vph)	294	421	18	10	521	150	28	68	14	162	14	392
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	0.97	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	1.00	1.00	1.00	0.99	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	3255	1766	1358	1745	1749	1328	1583	1761		1586	1443	
Flt Permitted	0.95	1.00	1.00	0.50	1.00	1.00	0.21	1.00		0.70	1.00	
Satd. Flow (perm)	3255	1766	1358	917	1749	1328	356	1761		1168	1443	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	320	458	20	11	566	163	30	74	15	176	15	426
RTOR Reduction (vph)	0	0	7	0	0	51	0	8	0	0	325	0
Lane Group Flow (vph)	320	458	13	11	566	112	30	81	0	176	116	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Actuated Green, G (s)	12.6	61.0	61.0	43.9	43.9	43.9	18.7	18.7		18.7	18.7	
Effective Green, g (s)	12.6	61.0	61.0	43.9	43.9	43.9	18.7	18.7		18.7	18.7	
Actuated g/C Ratio	0.14	0.67	0.67	0.48	0.48	0.48	0.20	0.20		0.20	0.20	
Clearance Time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	447	1176	904	439	838	636	72	359		238	294	
v/s Ratio Prot	c0.10	0.26			c0.32			0.05			0.08	
v/s Ratio Perm			0.01	0.01		0.08	0.08			c0.15		
v/c Ratio	0.72	0.39	0.01	0.03	0.68	0.18	0.42	0.23		0.74	0.40	
Uniform Delay, d1	37.8	6.9	5.2	12.6	18.4	13.6	31.7	30.4		34.2	31.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.4	1.0	0.0	0.1	4.3	0.6	3.9	0.3		11.4	0.9	
Delay (s)	43.2	7.9	5.2	12.7	22.7	14.2	35.6	30.7		45.6	32.4	
Level of Service	D	A	A	B	C	B	D	C		D	C	
Approach Delay (s)		22.0			20.7			32.0			36.2	
Approach LOS		C			C			C			D	

Intersection Summary				
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.70			
Actuated Cycle Length (s)	91.6	Sum of lost time (s)	16.4	
Intersection Capacity Utilization	78.9%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	482	3	0	581	70	6	4	1	25	0	48
Future Volume (vph)	68	482	3	0	581	70	6	4	1	25	0	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.999			0.984			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1760	0	1837	1730	0	1745	1782	0	1616	1192	0
Flt Permitted	0.950						0.950			0.950		
Satd. Flow (perm)	1572	1760	0	1837	1730	0	1745	1782	0	1616	1192	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	74	524	3	0	632	76	7	4	1	27	0	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	527	0	0	708	0	7	5	0	27	52	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	56.7%	ICU Level of Service B	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	482	3	0	581	70	6	4	1	25	0	48
Future Volume (Veh/h)	68	482	3	0	581	70	6	4	1	25	0	48
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	74	524	3	0	632	76	7	4	1	27	0	52
Pedestrians											1	
Lane Width (m)											3.3	
Walking Speed (m/s)											1.2	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	709			527			1358	1382	526	1346	1346	671
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	709			527			1358	1382	526	1346	1346	671
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.2	6.5	6.5
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.6	4.0	3.6
p0 queue free %	91			100			93	97	100	76	100	87
cM capacity (veh/h)	849			1050			104	132	556	113	139	409

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	74	527	0	708	7	5	27	52
Volume Left	74	0	0	0	7	0	27	0
Volume Right	0	3	0	76	0	1	0	52
cSH	849	1700	1700	1700	104	156	113	409
Volume to Capacity	0.09	0.31	0.00	0.42	0.07	0.03	0.24	0.13
Queue Length 95th (m)	2.3	0.0	0.0	0.0	1.7	0.8	6.9	3.5
Control Delay (s)	9.6	0.0	0.0	0.0	42.2	28.8	46.4	15.1
Lane LOS	A				E	D	E	C
Approach Delay (s)	1.2		0.0		36.6		25.8	
Approach LOS					E		D	

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	56.7%	ICU Level of Service	B	
Analysis Period (min)	15			

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		50.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	1.00		0.99	1.00	1.00		1.00	0.99	
Frt			0.850			0.850		0.972			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3388	1561	1662	3388	1516	1646	3269	0	1601	3213	0
Flt Permitted	0.309			0.327			0.201			0.275		
Satd. Flow (perm)	551	3388	1526	572	3388	1495	347	3269	0	463	3213	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			213			220		22			51	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			142.5			179.3	
Travel Time (s)		13.5			9.3			10.3			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	765	263	111	520	220	138	467	0	353	867	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-16-2018

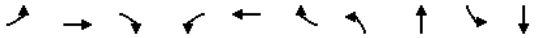
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	1	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	8.0	32.0	32.0	8.0	32.0	32.0	8.0	34.3		8.0	34.3	
Total Split (s)	26.0	46.0	46.0	12.0	32.0	32.0	12.6	36.0		26.0	49.4	
Total Split (%)	21.7%	38.3%	38.3%	10.0%	26.7%	26.7%	10.5%	30.0%		21.7%	41.2%	
Maximum Green (s)	23.0	40.0	40.0	9.0	26.0	26.0	9.6	29.7		23.0	43.1	
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.3	2.3	0.0	2.3	2.3	0.0	3.0		0.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0	6.0	3.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		19.0	19.0		19.0	19.0		21.0			21.0	
Pedestrian Calls (#/hr)		0	0		0	0		0			0	
Act Effct Green (s)	61.5	46.6	46.6	46.6	34.7	34.7	37.0	24.4		52.5	36.8	
Actuated g/C Ratio	0.51	0.39	0.39	0.39	0.29	0.29	0.31	0.20		0.44	0.31	
v/c Ratio	0.75	0.58	0.36	0.37	0.53	0.37	0.66	0.69		0.87	0.85	
Control Delay	30.5	32.6	8.3	21.8	40.4	7.1	37.5	47.2		45.5	45.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	30.5	32.6	8.3	21.8	40.4	7.1	37.5	47.2		45.5	45.0	
LOS	C	C	A	C	D	A	D	D		D	D	
Approach Delay		27.4			29.4			45.0			45.1	
Approach LOS		C			C			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 35.8		Intersection LOS: D	
Intersection Capacity Utilization 87.8%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018



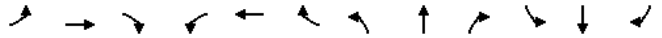
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	765	263	111	520	220	138	467	353	867
v/c Ratio	0.75	0.58	0.36	0.37	0.53	0.37	0.66	0.69	0.87	0.85
Control Delay	30.5	32.6	8.3	21.8	40.4	7.1	37.5	47.2	45.5	45.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	32.6	8.3	21.8	40.4	7.1	37.5	47.2	45.5	45.0
Queue Length 50th (m)	54.2	79.5	7.9	14.1	58.7	0.0	20.4	54.5	61.3	99.8
Queue Length 95th (m)	#90.1	108.2	29.9	27.3	83.3	20.9	31.1	69.0	#90.6	117.0
Internal Link Dist (m)		201.8			131.4			118.5		155.3
Turn Bay Length (m)	80.0		50.0	35.0			35.0		50.0	
Base Capacity (vph)	506	1314	722	312	978	588	211	825	420	1186
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	0.71	0.58	0.36	0.36	0.53	0.37	0.65	0.57	0.84	0.73

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

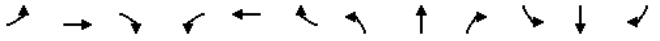
02-16-2018



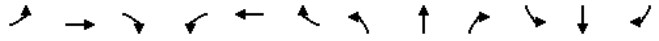
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	3.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	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	0.97		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)	1694	3388	1526	1661	3388	1495	1645	3268		1601	3213	
Flt Permitted	0.31	1.00	1.00	0.33	1.00	1.00	0.20	1.00		0.28	1.00	
Satd. Flow (perm)	551	3388	1526	572	3388	1495	348	3268		464	3213	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
RTOR Reduction (vph)	0	0	130	0	0	157	0	18	0	0	35	0
Lane Group Flow (vph)	361	765	133	111	520	63	138	449	0	353	832	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	58.5	46.5	46.5	43.6	34.6	34.6	33.7	24.4		49.2	36.9	
Effective Green, g (s)	58.5	46.5	46.5	43.6	34.6	34.6	33.7	24.4		49.2	36.9	
Actuated g/C Ratio	0.49	0.39	0.39	0.36	0.29	0.29	0.28	0.20		0.41	0.31	
Clearance Time (s)	3.0	6.0	6.0	3.0	6.0	6.0	3.0	6.3		3.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	467	1312	591	289	976	431	198	664		396	987	
v/s Ratio Prot	c0.13	0.23		0.03	0.15		0.05	0.14		c0.16	0.26	
v/s Ratio Perm	c0.24		0.09	0.11		0.04	0.14			c0.20		
v/c Ratio	0.77	0.58	0.22	0.38	0.53	0.15	0.70	0.68		0.89	0.84	
Uniform Delay, d1	21.2	29.1	24.7	26.1	35.9	31.7	34.4	44.2		27.8	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	7.8	1.9	0.9	0.9	2.1	0.7	10.2	2.7		21.4	6.6	
Delay (s)	28.9	31.0	25.5	27.0	38.0	32.5	44.6	46.9		49.2	45.5	
Level of Service	C	C	C	C	D	C	D	D		D	D	
Approach Delay (s)		29.4			35.1			46.4			46.6	
Approach LOS		C			D			D			D	

Intersection Summary				
HCM 2000 Control Delay	38.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.87			
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.3	
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	SBR
Lane Configurations												
Traffic Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Future Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00							
Frt			0.850					0.850			0.919	
Flt Protected	0.950			0.950			0.950				0.980	
Satd. Flow (prot)	1396	1685	1561	1745	1749	0	1745	1561	0	0	1532	0
Flt Permitted	0.353			0.184			0.744				0.895	
Satd. Flow (perm)	518	1685	1561	338	1749	0	1366	1561	0	0	1399	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			257					143			44	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	927	257	71	638	1	149	0	52	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	927	257	71	639	0	149	52	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	51.0	51.0	51.0	51.0	51.0		24.0	24.0		24.0	24.0	
Total Split (%)	68.0%	68.0%	68.0%	68.0%	68.0%		32.0%	32.0%		32.0%	32.0%	
Maximum Green (s)	45.0	45.0	45.0	45.0	45.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	Max	Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	49.4	49.4	49.4	49.4	49.4		13.6	13.6			13.6	
Actuated g/C Ratio	0.66	0.66	0.66	0.66	0.66		0.18	0.18			0.18	
v/c Ratio	0.04	0.84	0.23	0.32	0.56		0.60	0.13			0.07	
Control Delay	6.0	20.0	1.5	11.7	9.9		38.1	0.7			3.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay	6.0	20.0	1.5	11.7	9.9		38.1	0.7			3.4	
LOS	A	C	A	B	A		D	A			A	
Approach Delay		15.9			10.1			28.4			3.4	
Approach LOS		B			B			C			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 15.0		Intersection LOS: B	
Intersection Capacity Utilization 78.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018

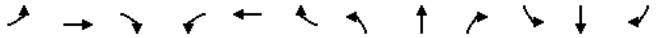
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	12	927	257	71	639	149	52	20
v/c Ratio	0.04	0.84	0.23	0.32	0.56	0.60	0.13	0.07
Control Delay	6.0	20.0	1.5	11.7	9.9	38.1	0.7	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	20.0	1.5	11.7	9.9	38.1	0.7	3.4
Queue Length 50th (m)	0.5	89.1	0.0	3.9	43.5	20.7	0.0	0.0
Queue Length 95th (m)	2.7	#202.6	8.1	14.4	85.2	36.2	0.0	2.3
Internal Link Dist (m)		339.5			336.5		467.1	141.9
Turn Bay Length (m)								
Base Capacity (vph)	341	1109	1115	222	1151	327	483	369
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	0.84	0.23	0.32	0.56	0.46	0.11	0.05

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Future Volume (vph)	11	853	236	65	587	1	137	0	48	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
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			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	0.85	1.00	1.00		1.00	0.85			0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1394	1685	1561	1745	1749		1745	1561			1532	
Flt Permitted	0.35	1.00	1.00	0.18	1.00		0.74	1.00			0.89	
Satd. Flow (perm)	518	1685	1561	338	1749		1367	1561			1399	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	927	257	71	638	1	149	0	52	8	0	12
RTOR Reduction (vph)	0	0	88	0	0	0	0	43	0	0	16	0
Lane Group Flow (vph)	12	927	169	71	639	0	149	9	0	0	4	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	49.4	49.4	49.4	49.4	49.4		13.6	13.6			13.6	
Effective Green, g (s)	49.4	49.4	49.4	49.4	49.4		13.6	13.6			13.6	
Actuated g/C Ratio	0.66	0.66	0.66	0.66	0.66		0.18	0.18			0.18	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	341	1109	1028	222	1152		247	283			253	
v/s Ratio Prot		c0.55			0.37			0.01				
v/s Ratio Perm	0.02		0.11	0.21			c0.11				0.00	
v/c Ratio	0.04	0.84	0.16	0.32	0.55		0.60	0.03			0.01	
Uniform Delay, d1	4.5	9.7	4.9	5.5	6.9		28.2	25.3			25.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.2	7.5	0.3	3.8	1.9		4.1	0.0			0.0	
Delay (s)	4.7	17.2	5.2	9.3	8.8		32.3	25.3			25.2	
Level of Service	A	B	A	A	A		C	C			C	
Approach Delay (s)		14.5			8.9			30.5			25.2	
Approach LOS		B			A			C			C	

Intersection Summary					
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.78				
Actuated Cycle Length (s)	75.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	78.3%	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 Configurations												
Traffic Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Future Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00			1.00	
Frt			0.850		0.994			0.966			0.956	
Flt Protected		0.999		0.950				0.974			0.988	
Satd. Flow (prot)	0	1665	1501	1745	1715	0	0	1713	0	0	1608	0
Flt Permitted		0.992		0.225				0.716			0.879	
Satd. Flow (perm)	0	1653	1501	413	1715	0	0	1259	0	0	1430	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			117		5			19			28	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	857	117	48	539	24	90	37	43	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	869	117	48	563	0	0	170	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	57.5	57.5	57.5	57.5	57.5		24.0	24.0		24.0	24.0	
Total Split (%)	70.6%	70.6%	70.6%	70.6%	70.6%		29.4%	29.4%		29.4%	29.4%	
Maximum Green (s)	51.5	51.5	51.5	51.5	51.5		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		55.0	55.0	55.0	55.0			14.5			14.5	
Actuated g/C Ratio		0.67	0.67	0.67	0.67			0.18			0.18	
v/c Ratio		0.78	0.11	0.17	0.49			0.71			0.59	
Control Delay		16.6	1.5	7.7	8.7			44.2			33.6	
Queue Delay		0.0	0.0	0.0	0.0			0.0			0.0	
Total Delay		16.6	1.5	7.7	8.7			44.2			33.6	
LOS		B	A	A	A			D			C	
Approach Delay		14.8			8.6			44.2			33.6	
Approach LOS		B			A			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 81.5			
Actuated Cycle Length: 81.5			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 75.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street

Queues
3: Jones Road & Barton Street

02-16-2018

Lane Group	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	869	117	48	563	170	162
v/c Ratio	0.78	0.11	0.17	0.49	0.71	0.59
Control Delay	16.6	1.5	7.7	8.7	44.2	33.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.6	1.5	7.7	8.7	44.2	33.6
Queue Length 50th (m)	84.9	0.0	2.5	38.3	23.3	20.0
Queue Length 95th (m)	#189.5	5.4	8.2	69.0	43.0	37.9
Internal Link Dist (m)	336.5			110.2	469.1	238.0
Turn Bay Length (m)						
Base Capacity (vph)	1116	1051	278	1159	292	337
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	0.78	0.11	0.17	0.49	0.58	0.48

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Future Volume (vph)	11	788	108	44	496	22	83	34	40	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Lane Util. Factor		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	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00			1.00	
Frt		1.00	0.85	1.00	0.99			0.97			0.96	
Flt Protected		1.00	1.00	0.95	1.00			0.97			0.99	
Satd. Flow (prot)		1665	1501	1745	1714			1712			1608	
Flt Permitted		0.99	1.00	0.22	1.00			0.72			0.88	
Satd. Flow (perm)		1653	1501	413	1714			1258			1431	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	857	117	48	539	24	90	37	43	38	71	53
RTOR Reduction (vph)	0	0	38	0	2	0	0	16	0	0	23	0
Lane Group Flow (vph)	0	869	79	48	561	0	0	154	0	0	139	0
Confl. Peds. (#/hr)	1					1	1					1
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		55.0	55.0	55.0	55.0			14.5			14.5	
Effective Green, g (s)		55.0	55.0	55.0	55.0			14.5			14.5	
Actuated g/C Ratio		0.67	0.67	0.67	0.67			0.18			0.18	
Clearance Time (s)		6.0	6.0	6.0	6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1115	1012	278	1156			223			254	
v/s Ratio Prot					0.33							
v/s Ratio Perm		c0.53	0.05	0.12				c0.12			0.10	
v/c Ratio		0.78	0.08	0.17	0.49			0.69			0.55	
Uniform Delay, d1		9.1	4.5	4.9	6.4			31.4			30.5	
Progression Factor		1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2		5.4	0.2	1.3	1.5			8.9			2.4	
Delay (s)		14.5	4.7	6.2	7.9			40.3			32.9	
Level of Service		B	A	A	A			D			C	
Approach Delay (s)		13.3			7.7			40.3			32.9	
Approach LOS		B			A			D			C	

Intersection Summary

HCM 2000 Control Delay	15.6	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.76				
Actuated Cycle Length (s)	81.5	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	75.8%	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 Configurations												
Traffic Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Future Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		1	1		1	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				1.00	
Frt		0.931				0.850			0.850		0.990	
Flt Protected		0.977			0.953		0.950			0.950		
Satd. Flow (prot)	0	1671	0	0	1750	1561	1745	1766	1561	1745	1765	0
Flt Permitted		0.787			0.681		0.340			0.480		
Satd. Flow (perm)	0	1346	0	0	1251	1561	623	1766	1561	882	1765	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		32				150			323		8	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			350.7	
Travel Time (s)		13.5			36.9			39.4			25.3	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	30	1	32	201	1	150	33	434	323	257	602	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	202	150	33	434	323	257	644	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

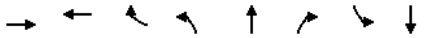
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	4	4		8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0	20.0	20.0	20.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	26.0	26.0	26.0	26.0	26.0	
Total Split (s)	25.0	25.0		25.0	25.0	25.0	55.0	55.0	55.0	55.0	55.0	
Total Split (%)	31.3%	31.3%		31.3%	31.3%	31.3%	68.8%	68.8%	68.8%	68.8%	68.8%	
Maximum Green (s)	19.0	19.0		19.0	19.0	19.0	49.0	49.0	49.0	49.0	49.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0	0	0	0	
Act Effct Green (s)		16.5			16.5	16.5	51.5	51.5	51.5	51.5	51.5	
Actuated g/C Ratio		0.21			0.21	0.21	0.64	0.64	0.64	0.64	0.64	
v/c Ratio		0.21			0.78	0.34	0.08	0.38	0.29	0.45	0.57	
Control Delay		16.4			51.3	7.0	6.9	8.5	1.6	11.1	10.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		16.4			51.3	7.0	6.9	8.5	1.6	11.1	10.9	
LOS		B			D	A	A	A	A	B	B	
Approach Delay		16.4			32.4			5.6			11.0	
Approach LOS		B			C			A			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 12.7		Intersection LOS: B	
Intersection Capacity Utilization 80.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: Fruitland Road & Sherwood Park Road/Collector Road B

Queues
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018

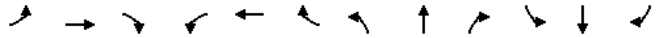


Lane Group	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	63	202	150	33	434	323	257	644
v/c Ratio	0.21	0.78	0.34	0.08	0.38	0.29	0.45	0.57
Control Delay	16.4	51.3	7.0	6.9	8.5	1.6	11.1	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.4	51.3	7.0	6.9	8.5	1.6	11.1	10.9
Queue Length 50th (m)	3.9	29.8	0.0	1.9	31.1	0.0	19.6	53.9
Queue Length 95th (m)	13.8	#59.0	14.0	5.6	50.3	9.0	39.0	86.5
Internal Link Dist (m)	163.5	488.2			523.7			326.7
Turn Bay Length (m)				20.0			20.0	
Base Capacity (vph)	344	297	485	401	1136	1120	567	1139
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	0.18	0.68	0.31	0.08	0.38	0.29	0.45	0.57

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

HCM Signalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Future Volume (vph)	28	1	29	185	1	138	30	399	297	236	554	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
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	1.00	
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		0.93			1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.98			0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1671			1750	1561	1740	1766	1561	1745	1766	
Flt Permitted		0.79			0.68	1.00	0.34	1.00	1.00	0.48	1.00	
Satd. Flow (perm)		1346			1251	1561	622	1766	1561	882	1766	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	1	32	201	1	150	33	434	323	257	602	42
RTOR Reduction (vph)	0	25	0	0	0	119	0	0	115	0	3	0
Lane Group Flow (vph)	0	38	0	0	202	31	33	434	208	257	641	0
Confl. Peds. (#/hr)							4					4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2		2	6		
Actuated Green, G (s)		16.5			16.5	16.5	51.5	51.5	51.5	51.5	51.5	
Effective Green, g (s)		16.5			16.5	16.5	51.5	51.5	51.5	51.5	51.5	
Actuated g/C Ratio		0.21			0.21	0.21	0.64	0.64	0.64	0.64	0.64	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		277			258	321	400	1136	1004	567	1136	
v/s Ratio Prot								0.25			c0.36	
v/s Ratio Perm		0.03			c0.16	0.02	0.05		0.13	0.29		
v/c Ratio		0.14			0.78	0.10	0.08	0.38	0.21	0.45	0.56	
Uniform Delay, d1		25.9			30.1	25.7	5.4	6.7	5.9	7.2	8.0	
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.2			14.3	0.1	0.4	1.0	0.5	2.6	2.0	
Delay (s)		26.2			44.4	25.8	5.8	7.7	6.3	9.8	10.0	
Level of Service		C			D	C	A	A	A	A	B	
Approach Delay (s)		26.2			36.5			7.1			9.9	
Approach LOS		C			D			A			A	

Intersection Summary					
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.62				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	80.2%	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 Configurations												
Traffic Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Future Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	2		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.965			0.872	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3351	1801	1561	1745	1818	1459	1616	1772	0	1631	1552	0
Flt Permitted	0.950			0.399			0.183			0.732		
Satd. Flow (perm)	3351	1801	1561	733	1818	1459	311	1772	0	1256	1552	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			38			120		9			325	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	505	699	41	30	642	222	20	30	9	260	83	479
Shared Lane Traffic (%)												
Lane Group Flow (vph)	505	699	41	30	642	222	20	39	0	260	562	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		6.6			6.6			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

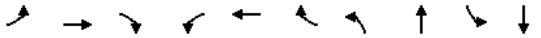
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	18.0	57.9	57.9	39.9	39.9	39.9	32.1	32.1		32.1	32.1	
Total Split (%)	20.0%	64.3%	64.3%	44.3%	44.3%	44.3%	35.7%	35.7%		35.7%	35.7%	
Maximum Green (s)	15.0	52.1	52.1	34.1	34.1	34.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.0	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	14.8	52.2	52.2	34.4	34.4	34.4	21.8	21.8		21.8	21.8	
Actuated g/C Ratio	0.17	0.61	0.61	0.40	0.40	0.40	0.25	0.25		0.25	0.25	
v/c Ratio	0.88	0.64	0.04	0.10	0.88	0.34	0.26	0.09		0.82	0.88	
Control Delay	53.6	15.1	3.2	19.1	41.2	10.7	34.1	19.9		51.2	29.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	53.6	15.1	3.2	19.1	41.2	10.7	34.1	19.9		51.2	29.8	
LOS	D	B	A	B	D	B	C	B		D	C	
Approach Delay		30.4			32.9			24.7			36.6	
Approach LOS		C			C			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 86			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 32.7		Intersection LOS: C	
Intersection Capacity Utilization 96.6%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



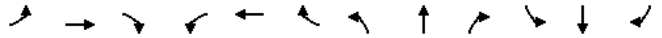
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	505	699	41	30	642	222	20	39	260	562
v/c Ratio	0.88	0.64	0.04	0.10	0.88	0.34	0.26	0.09	0.82	0.88
Control Delay	53.6	15.1	3.2	19.1	41.2	10.7	34.1	19.9	51.2	29.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.6	15.1	3.2	19.1	41.2	10.7	34.1	19.9	51.2	29.8
Queue Length 50th (m)	45.9	77.1	0.2	3.4	106.8	11.8	2.8	3.9	42.3	41.3
Queue Length 95th (m)	#76.0	121.1	4.4	9.7	#180.0	29.6	9.6	11.5	#77.9	#102.7
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	585	1094	963	293	727	656	94	543	380	697
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	0.86	0.64	0.04	0.10	0.88	0.34	0.21	0.07	0.68	0.81

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Future Volume (vph)	465	643	38	28	591	204	18	28	8	239	76	441
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	0.97	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.87	
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)	3351	1801	1561	1745	1818	1459	1614	1773		1631	1552	
Flt Permitted	0.95	1.00	1.00	0.40	1.00	1.00	0.18	1.00		0.73	1.00	
Satd. Flow (perm)	3351	1801	1561	733	1818	1459	312	1773		1256	1552	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	505	699	41	30	642	222	20	30	9	260	83	479
RTOR Reduction (vph)	0	0	15	0	0	72	0	7	0	0	243	0
Lane Group Flow (vph)	505	699	26	30	642	150	20	32	0	260	319	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Actuated Green, G (s)	14.8	52.3	52.3	34.5	34.5	34.5	21.8	21.8		21.8	21.8	
Effective Green, g (s)	14.8	52.3	52.3	34.5	34.5	34.5	21.8	21.8		21.8	21.8	
Actuated g/C Ratio	0.17	0.61	0.61	0.40	0.40	0.40	0.25	0.25		0.25	0.25	
Clearance Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	576	1095	949	294	729	585	79	449		318	393	
v/s Ratio Prot	c0.15	0.39			c0.35			0.02			0.21	
v/s Ratio Perm			0.02	0.04		0.10	0.06			c0.21		
v/c Ratio	0.88	0.64	0.03	0.10	0.88	0.26	0.25	0.07		0.82	0.81	
Uniform Delay, d1	34.7	10.8	6.7	16.1	23.8	17.2	25.6	24.4		30.2	30.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	14.0	2.9	0.1	0.7	14.4	1.1	1.7	0.1		14.9	12.1	
Delay (s)	48.8	13.6	6.8	16.8	38.2	18.2	27.3	24.5		45.2	42.3	
Level of Service	D	B	A	B	D	B	C	C		D	D	
Approach Delay (s)		27.7			32.5			25.4			43.2	
Approach LOS		C			C			C			D	

Intersection Summary					
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	0.86				
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	14.9		
Intersection Capacity Utilization	96.6%	ICU Level of Service	F		
Analysis Period (min)	15				

c Critical Lane Group

Lanes, Volumes, Timings
6: Jones Road & Highway No. 8 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	754	3	1	654	14	3	1	0	47	4	85
Future Volume (vph)	65	754	3	1	654	14	3	1	0	47	4	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.997						0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1572	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1572	1782	0	1745	1796	0	1745	1837	0	1745	1572	0
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	71	820	3	1	711	15	3	1	0	51	4	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	823	0	1	726	0	3	1	0	51	96	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 62.5%		ICU Level of Service B	
Analysis Period (min) 15			

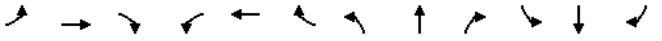
HCM Unsignalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8 02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	754	3	1	654	14	3	1	0	47	4	85
Future Volume (Veh/h)	65	754	3	1	654	14	3	1	0	47	4	85
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	71	820	3	1	711	15	3	1	0	51	4	92
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	726			823			1770	1692	822	1683	1686	718
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	726			823			1770	1692	822	1683	1686	718
tC, single (s)	4.2			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.3			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			100			94	99	100	27	95	79
cM capacity (veh/h)	837			816			47	86	377	70	87	432

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	71	823	1	726	3	1	51	96
Volume Left	71	0	1	0	3	0	51	0
Volume Right	0	3	0	15	0	0	0	92
cSH	837	1700	816	1700	47	86	70	371
Volume to Capacity	0.08	0.48	0.00	0.43	0.06	0.01	0.73	0.26
Queue Length 95th (m)	2.2	0.0	0.0	0.0	1.6	0.3	26.7	8.1
Control Delay (s)	9.7	0.0	9.4	0.0	87.5	47.3	138.8	18.1
Lane LOS	A		A		F	E	F	C
Approach Delay (s)	0.8		0.0		77.5		59.9	
Approach LOS					F		F	

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	62.5%	ICU Level of Service	B	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Future Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.99	1.00	1.00		1.00		0.99
Frt		0.987				0.850		0.980				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3239	0	1479	3144	1358	1586	3321	0	1662	1733	1473
Flt Permitted	0.214			0.481			0.613			0.251		
Satd. Flow (perm)	374	3239	0	748	3144	1338	1022	3321	0	439	1733	1452
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13				323		17				317
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			141.9			179.3	
Travel Time (s)		13.5			9.3			10.2			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	432	41	53	759	357	129	448	70	247	233	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	473	0	53	759	357	129	518	0	247	233	317
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	



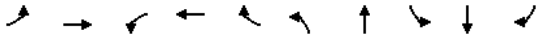
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6		6	8			4		4
Detector Phase	5	2		6	6	6	8	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0	20.0	15.0	15.0		5.0	15.0	15.0
Minimum Split (s)	9.5	32.0		32.0	32.0	32.0	34.3	34.3		9.5	34.3	34.3
Total Split (s)	18.0	53.0		35.0	35.0	35.0	34.3	34.3		12.7	47.0	47.0
Total Split (%)	18.0%	53.0%		35.0%	35.0%	35.0%	34.3%	34.3%		12.7%	47.0%	47.0%
Maximum Green (s)	15.0	47.0		29.0	29.0	29.0	28.0	28.0		9.7	40.7	40.7
Yellow Time (s)	3.0	3.7		3.7	3.7	3.7	3.3	3.3		3.0	3.3	3.3
All-Red Time (s)	0.0	2.3		2.3	2.3	2.3	3.0	3.0		0.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0		6.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		C-Max	C-Max	C-Max	None	None		None	None	None
Walk Time (s)		7.0		7.0	7.0	7.0	7.0	7.0			7.0	7.0
Flash Dont Walk (s)		19.0		19.0	19.0	19.0	21.0	21.0			21.0	21.0
Pedestrian Calls (#/hr)		0		0	0	0	0	0			0	0
Act Effct Green (s)	57.2	54.2		34.9	34.9	34.9	20.8	20.8		36.8	33.5	33.5
Actuated g/C Ratio	0.57	0.54		0.35	0.35	0.35	0.21	0.21		0.37	0.34	0.34
v/c Ratio	0.73	0.27		0.20	0.69	0.53	0.61	0.74		0.88	0.40	0.46
Control Delay	24.6	13.1		28.6	33.5	7.9	47.7	42.1		56.6	27.0	4.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	24.6	13.1		28.6	33.5	7.9	47.7	42.1		56.6	27.0	4.7
LOS	C	B		C	C	A	D	D		E	C	A
Approach Delay		17.6			25.5			43.2			27.3	
Approach LOS		B			C			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 27.5		Intersection LOS: C	
Intersection Capacity Utilization 84.5%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018



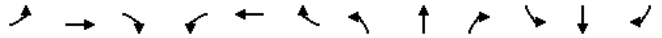
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	310	473	53	759	357	129	518	247	233	317
v/c Ratio	0.73	0.27	0.20	0.69	0.53	0.61	0.74	0.88	0.40	0.46
Control Delay	24.6	13.1	28.6	33.5	7.9	47.7	42.1	56.6	27.0	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.6	13.1	28.6	33.5	7.9	47.7	42.1	56.6	27.0	4.7
Queue Length 50th (m)	30.8	24.7	7.7	71.0	4.7	24.1	51.0	37.2	36.4	0.0
Queue Length 95th (m)	#71.9	40.0	19.2	#102.6	31.0	41.2	64.0	#66.8	52.3	16.9
Internal Link Dist (m)		201.8		131.4			117.9		155.3	
Turn Bay Length (m)	80.0		35.0			35.0		50.0		
Base Capacity (vph)	431	1762	261	1097	677	286	942	280	705	778
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	0.72	0.27	0.20	0.69	0.53	0.45	0.55	0.88	0.33	0.41

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

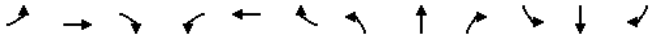
02-16-2018



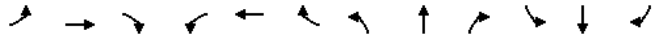
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Future Volume (vph)	285	397	38	49	698	328	119	412	64	227	214	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1662	3239		1477	3144	1338	1584	3320		1662	1733	1452
Flt Permitted	0.21	1.00		0.48	1.00	1.00	0.61	1.00		0.25	1.00	1.00
Satd. Flow (perm)	375	3239		748	3144	1338	1023	3320		439	1733	1452
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	432	41	53	759	357	129	448	70	247	233	317
RTOR Reduction (vph)	0	6	0	0	0	210	0	13	0	0	0	211
Lane Group Flow (vph)	310	467	0	53	759	147	129	505	0	247	233	106
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6		6	8			4		4
Actuated Green, G (s)	54.2	54.2		34.9	34.9	34.9	20.8	20.8		33.5	33.5	33.5
Effective Green, g (s)	54.2	54.2		34.9	34.9	34.9	20.8	20.8		33.5	33.5	33.5
Actuated g/C Ratio	0.54	0.54		0.35	0.35	0.35	0.21	0.21		0.34	0.34	0.34
Clearance Time (s)	3.0	6.0		6.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	413	1755		261	1097	466	212	690		265	580	486
v/s Ratio Prot	c0.12	0.14			0.24			0.15		c0.09	0.13	
v/s Ratio Perm	c0.28			0.07		0.11	0.13			c0.22		0.07
v/c Ratio	0.75	0.27		0.20	0.69	0.31	0.61	0.73		0.93	0.40	0.22
Uniform Delay, d1	15.3	12.3		22.8	27.9	23.8	35.9	37.0		28.7	25.5	23.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	7.5	0.4		1.7	3.6	1.8	4.9	4.0		37.3	0.5	0.2
Delay (s)	22.8	12.6		24.6	31.5	25.6	40.8	41.0		66.0	26.0	24.1
Level of Service	C	B		C	C	C	D	D		E	C	C
Approach Delay (s)		16.6			29.4			40.9			37.6	
Approach LOS		B			C			D			D	

Intersection Summary					
HCM 2000 Control Delay	30.6	HCM 2000 Level of Service	C		
HCM 2000 Volume to Capacity ratio	0.87				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.3		
Intersection Capacity Utilization	84.5%	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	SBR
Lane Configurations												
Traffic Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Future Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor					1.00							
Frt			0.850		0.997			0.850			0.929	
Flt Protected	0.950			0.950			0.950				0.977	
Satd. Flow (prot)	1312	1733	1561	1745	1662	0	1745	1561	0	0	1408	0
Flt Permitted	0.195			0.359			0.746				0.903	
Satd. Flow (perm)	269	1733	1561	659	1662	0	1370	1561	0	0	1301	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			138		3			293			44	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	593	138	10	827	18	268	0	30	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	9	593	138	10	845	0	268	30	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	31.0	31.0		24.0	24.0		24.0	24.0	
Total Split (s)	50.0	50.0	50.0	50.0	50.0		25.0	25.0		25.0	25.0	
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	44.0	44.0	44.0	44.0	44.0		19.0	19.0		19.0	19.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	Max	Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	45.6	45.6	45.6	45.6	45.6		17.4	17.4			17.4	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.61		0.23	0.23			0.23	
v/c Ratio	0.06	0.56	0.14	0.03	0.84		0.84	0.05			0.05	
Control Delay	7.8	11.9	1.7	6.8	22.2		51.6	0.2			2.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay	7.8	11.9	1.7	6.8	22.2		51.6	0.2			2.3	
LOS	A	B	A	A	C		D	A			A	
Approach Delay		9.9			22.0			46.4			2.3	
Approach LOS		A			C			D			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 75			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 21.0		Intersection LOS: C	
Intersection Capacity Utilization 71.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

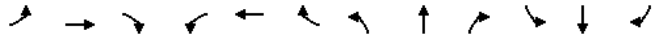
02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	9	593	138	10	845	268	30	17
v/c Ratio	0.06	0.56	0.14	0.03	0.84	0.84	0.05	0.05
Control Delay	7.8	11.9	1.7	6.8	22.2	51.6	0.2	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	11.9	1.7	6.8	22.2	51.6	0.2	2.3
Queue Length 50th (m)	0.5	50.2	0.0	0.6	95.3	37.1	0.0	0.0
Queue Length 95th (m)	2.5	79.7	6.4	2.4	#180.5	#74.7	0.0	1.6
Internal Link Dist (m)		339.5			336.5		482.8	141.9
Turn Bay Length (m)								
Base Capacity (vph)	163	1052	1002	400	1010	347	614	362
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	0.06	0.56	0.14	0.03	0.84	0.77	0.05	0.05

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

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Future Volume (vph)	8	546	127	9	761	17	247	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
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			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	0.85	1.00	1.00		1.00	0.85			0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1312	1733	1561	1745	1661		1745	1561			1407	
Flt Permitted	0.20	1.00	1.00	0.36	1.00		0.75	1.00			0.90	
Satd. Flow (perm)	270	1733	1561	659	1661		1371	1561			1300	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	593	138	10	827	18	268	0	30	8	0	9
RTOR Reduction (vph)	0	0	54	0	1	0	0	23	0	0	13	0
Lane Group Flow (vph)	9	593	84	10	844	0	268	7	0	0	4	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	45.6	45.6	45.6	45.6	45.6		17.4	17.4			17.4	
Effective Green, g (s)	45.6	45.6	45.6	45.6	45.6		17.4	17.4			17.4	
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.61		0.23	0.23			0.23	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	164	1053	949	400	1009		318	362			301	
v/s Ratio Prot		0.34			c0.51			0.00				
v/s Ratio Perm	0.03		0.05	0.02			c0.20				0.00	
v/c Ratio	0.05	0.56	0.09	0.03	0.84		0.84	0.02			0.01	
Uniform Delay, d1	6.0	8.8	6.1	5.9	11.7		27.5	22.2			22.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	
Incremental Delay, d2	0.6	2.2	0.2	0.1	8.2		18.0	0.0			0.0	
Delay (s)	6.6	10.9	6.3	6.0	19.9		45.5	22.2			22.2	
Level of Service	A	B	A	A	B		D	C			C	
Approach Delay (s)		10.0			19.8			43.1			22.2	
Approach LOS		B			B			D			C	

Intersection Summary					
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.84				
Actuated Cycle Length (s)	75.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	71.4%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Future Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98	1.00								
Frt			0.850		0.983			0.976			0.946	
Flt Protected	0.950			0.950				0.976			0.986	
Satd. Flow (prot)	1745	1701	1561	1430	1667	0	0	1732	0	0	1470	0
Flt Permitted	0.210			0.394				0.799			0.876	
Satd. Flow (perm)	386	1701	1523	592	1667	0	0	1418	0	0	1306	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			58		13			14			37	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	508	58	54	677	87	141	97	52	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	508	58	54	764	0	0	290	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		29.0	29.0	
Total Split (s)	51.0	51.0	51.0	51.0	51.0		29.0	29.0		29.0	29.0	
Total Split (%)	63.8%	63.8%	63.8%	63.8%	63.8%		36.3%	36.3%		36.3%	36.3%	
Maximum Green (s)	45.0	45.0	45.0	45.0	45.0		23.0	23.0		23.0	23.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	45.0	45.0	45.0	45.0	45.0			23.0			23.0	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56			0.29			0.29	
v/c Ratio	0.24	0.53	0.07	0.16	0.81			0.70			0.23	
Control Delay	12.4	13.5	2.6	10.0	22.6			34.5			15.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0			0.0	
Total Delay	12.4	13.5	2.6	10.0	22.6			34.5			15.8	
LOS	B	B	A	B	C			C			B	
Approach Delay		12.4			21.7			34.5			15.8	
Approach LOS		B			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 20.3		Intersection LOS: C	
Intersection Capacity Utilization 73.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street

Queues
3: Jones Road & Barton Street

02-16-2018

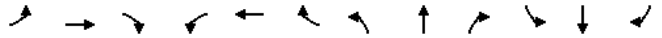
Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	52	508	58	54	764	290	92
v/c Ratio	0.24	0.53	0.07	0.16	0.81	0.70	0.23
Control Delay	12.4	13.5	2.6	10.0	22.6	34.5	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.4	13.5	2.6	10.0	22.6	34.5	15.8
Queue Length 50th (m)	3.9	46.8	0.0	3.8	89.2	39.1	6.5
Queue Length 95th (m)	11.1	73.2	4.7	9.9	#152.3	#73.1	18.0
Internal Link Dist (m)		336.5			110.2	480.6	238.0
Turn Bay Length (m)							
Base Capacity (vph)	217	956	882	333	943	417	401
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.53	0.07	0.16	0.81	0.70	0.23

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Future Volume (vph)	48	467	53	50	623	80	130	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Lane Util. Factor	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	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.98			0.98			0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1745	1701	1523	1428	1667			1732			1470	
Flt Permitted	0.21	1.00	1.00	0.39	1.00			0.80			0.88	
Satd. Flow (perm)	386	1701	1523	593	1667			1418			1306	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	508	58	54	677	87	141	97	52	26	29	37
RTOR Reduction (vph)	0	0	25	0	6	0	0	10	0	0	26	0
Lane Group Flow (vph)	52	508	33	54	758	0	0	280	0	0	66	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	45.0	45.0	45.0	45.0	45.0			23.0			23.0	
Effective Green, g (s)	45.0	45.0	45.0	45.0	45.0			23.0			23.0	
Actuated g/C Ratio	0.56	0.56	0.56	0.56	0.56			0.29			0.29	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	217	956	856	333	937			407			375	
v/s Ratio Prot		0.30			c0.45							
v/s Ratio Perm	0.13		0.02	0.09				c0.20			0.05	
v/c Ratio	0.24	0.53	0.04	0.16	0.81			0.69			0.18	
Uniform Delay, d1	8.8	10.9	7.8	8.4	14.1			25.3			21.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Incremental Delay, d2	2.6	2.1	0.1	1.0	7.5			9.2			1.0	
Delay (s)	11.4	13.0	7.9	9.5	21.6			34.5			22.4	
Level of Service	B	B	A	A	C			C			C	
Approach Delay (s)		12.4			20.8			34.5			22.4	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	20.2	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.77				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	73.0%	ICU Level of Service		D	
Analysis Period (min)	15				

c Critical Lane Group

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	28	0	0	0	15	460	0	0	248	13
Future Volume (vph)	29	0	28	0	0	0	15	460	0	0	248	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.935									0.993	
Flt Protected		0.975					0.950					
Satd. Flow (prot)	0	1674	0	0	1837	0	1745	1717	0	1837	1627	0
Flt Permitted		0.975					0.950					
Satd. Flow (perm)	0	1674	0	0	1837	0	1745	1717	0	1837	1627	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			351.2	
Travel Time (s)		13.5			37.2			39.4			25.3	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	32	0	30	0	0	0	16	500	0	0	270	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	62	0	0	0	0	16	500	0	0	284	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

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

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	0	28	0	0	0	15	460	0	0	248	13
Future Volume (Veh/h)	29	0	28	0	0	0	15	460	0	0	248	13
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	0	30	0	0	0	16	500	0	0	270	14
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	813	813	281	832	820	500	288			500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	813	813	281	832	820	500	288			500		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	89	100	96	100	100	100	99			100		
cM capacity (veh/h)	295	310	760	276	307	575	1282			1075		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	62	0	16	500	0	284
Volume Left	32	0	16	0	0	0
Volume Right	30	0	0	0	0	14
cSH	419	1700	1282	1700	1700	1700
Volume to Capacity	0.15	0.00	0.01	0.29	0.00	0.17
Queue Length 95th (m)	4.1	0.0	0.3	0.0	0.0	0.0
Control Delay (s)	15.1	0.0	7.8	0.0	0.0	0.0
Lane LOS	C	A	A			
Approach Delay (s)	15.1	0.0	0.2		0.0	
Approach LOS	C	A				

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	34.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Future Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						0.98	1.00				0.98	
Frt			0.850			0.850		0.975			0.861	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1678	1766	1358	1745	1749	1346	1586	1761	0	1586	1451	0
Flt Permitted	0.277			0.431			0.474			0.699		
Satd. Flow (perm)	489	1766	1358	792	1749	1316	788	1761	0	1167	1451	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			82		10			186	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	246	532	20	11	807	129	30	74	15	101	15	186
Shared Lane Traffic (%)												
Lane Group Flow (vph)	246	532	20	11	807	129	30	89	0	101	201	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

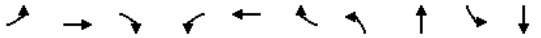
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	27.8	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	67.9	67.9	67.9	67.9	67.9	67.9	32.1	32.1		32.1	32.1	
Total Split (%)	67.9%	67.9%	67.9%	67.9%	67.9%	67.9%	32.1%	32.1%		32.1%	32.1%	
Maximum Green (s)	62.1	62.1	62.1	62.1	62.1	62.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Max	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71	0.15	0.15		0.15	0.15	
v/c Ratio	0.70	0.42	0.02	0.02	0.65	0.13	0.25	0.32		0.57	0.53	
Control Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1		47.5	12.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1		47.5	12.0	
LOS	C	A	A	A	B	A	D	C		D	B	
Approach Delay		11.7			9.3			33.5			23.9	
Approach LOS		B			A			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 88.5			
Natural Cycle: 100			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 13.6		Intersection LOS: B	
Intersection Capacity Utilization 93.7%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



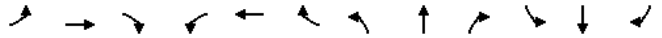
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	246	532	20	11	807	129	30	89	101	201
v/c Ratio	0.70	0.42	0.02	0.02	0.65	0.13	0.25	0.32	0.57	0.53
Control Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1	47.5	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.8	6.9	1.1	4.8	10.5	2.4	37.6	32.1	47.5	12.0
Queue Length 50th (m)	20.5	31.6	0.0	0.5	62.0	2.0	4.7	12.5	16.7	2.3
Queue Length 95th (m)	#80.2	63.4	1.4	2.4	126.4	8.7	12.9	26.1	33.0	21.0
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	349	1260	979	565	1248	962	231	524	342	558
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	0.70	0.42	0.02	0.02	0.65	0.13	0.13	0.17	0.30	0.36

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

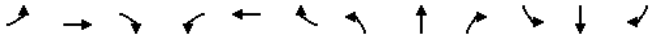
02-16-2018



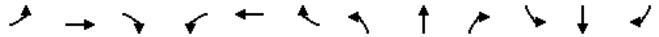
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Future Volume (vph)	226	489	18	10	742	119	28	68	14	93	14	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1316	1580	1761		1586	1453	
Flt Permitted	0.28	1.00	1.00	0.43	1.00	1.00	0.47	1.00		0.70	1.00	
Satd. Flow (perm)	488	1766	1358	791	1749	1316	789	1761		1168	1453	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	246	532	20	11	807	129	30	74	15	101	15	186
RTOR Reduction (vph)	0	0	6	0	0	23	0	8	0	0	158	0
Lane Group Flow (vph)	246	532	14	11	807	106	30	81	0	101	43	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Effective Green, g (s)	63.2	63.2	63.2	63.2	63.2	63.2	13.4	13.4		13.4	13.4	
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.71	0.71	0.15	0.15		0.15	0.15	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	348	1261	969	564	1249	939	119	266		176	220	
v/s Ratio Prot		0.30			0.46			0.05			0.03	
v/s Ratio Perm	c0.50		0.01	0.01		0.08	0.04			c0.09		
v/c Ratio	0.71	0.42	0.01	0.02	0.65	0.11	0.25	0.30		0.57	0.20	
Uniform Delay, d1	7.3	5.2	3.7	3.7	6.7	3.9	33.1	33.4		34.9	32.8	
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	11.5	1.0	0.0	0.1	2.6	0.2	1.1	0.6		4.5	0.4	
Delay (s)	18.8	6.2	3.7	3.7	9.3	4.2	34.2	34.0		39.4	33.3	
Level of Service	B	A	A	A	A	A	C	C		D	C	
Approach Delay (s)		10.0			8.5			34.1			35.3	
Approach LOS		B			A			C			D	

Intersection Summary				
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	11.9	
Intersection Capacity Utilization	93.7%	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 Configurations												
Traffic Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Future Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00							
Frt		0.999			0.980			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1759	0	1837	1720	0	1745	1782	0	1616	1192	0
Flt Permitted	0.219						0.515			0.754		
Satd. Flow (perm)	362	1759	0	1837	1720	0	946	1782	0	1282	1192	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			18			1			218	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	143	477	3	0	614	93	7	4	1	75	0	290
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	480	0	0	707	0	7	5	0	75	290	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	36.0	36.0		36.0	36.0		24.0	24.0		24.0	24.0	
Total Split (%)	60.0%	60.0%		60.0%	60.0%		40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	30.0	30.0		30.0	30.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	30.0	30.0			30.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.50	0.50			0.50		0.30	0.30		0.30	0.30	
v/c Ratio	0.79	0.55			0.81		0.02	0.01		0.20	0.57	
Control Delay	48.1	13.2			22.3		15.3	14.0		17.3	10.3	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	48.1	13.2			22.3		15.3	14.0		17.3	10.3	
LOS	D	B			C		B	B		B	B	
Approach Delay		21.2			22.3			14.8			11.7	
Approach LOS		C			C			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 19.6		Intersection LOS: B	
Intersection Capacity Utilization 83.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 6: Jones Road & Highway No. 8

Queues
6: Jones Road & Highway No. 8

02-16-2018

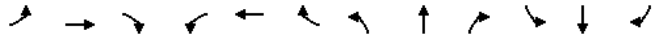
Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	143	480	707	7	5	75	290
v/c Ratio	0.79	0.55	0.81	0.02	0.01	0.20	0.57
Control Delay	48.1	13.2	22.3	15.3	14.0	17.3	10.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.1	13.2	22.3	15.3	14.0	17.3	10.3
Queue Length 50th (m)	12.6	35.2	62.0	0.6	0.4	6.4	6.2
Queue Length 95th (m)	#43.7	59.5	#125.6	3.1	2.4	15.4	26.1
Internal Link Dist (m)		356.0	353.6		172.0		401.0
Turn Bay Length (m)	80.0			25.0		15.0	
Base Capacity (vph)	181	880	869	283	535	384	510
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.55	0.81	0.02	0.01	0.20	0.57

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

02-16-2018



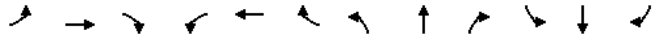
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Future Volume (vph)	132	439	3	0	565	86	6	4	1	69	0	267
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	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	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00			0.98		1.00	0.97		1.00	0.85	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1571	1760			1721		1745	1782		1616	1192	
Flt Permitted	0.22	1.00			1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	363	1760			1721		947	1782		1283	1192	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	143	477	3	0	614	93	7	4	1	75	0	290
RTOR Reduction (vph)	0	1	0	0	9	0	0	1	0	0	153	0
Lane Group Flow (vph)	143	480	0	0	698	0	7	4	0	75	137	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	30.0	30.0			30.0		18.0	18.0		18.0	18.0	
Effective Green, g (s)	30.0	30.0			30.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.50	0.50			0.50		0.30	0.30		0.30	0.30	
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	181	880			860		284	534		384	357	
v/s Ratio Prot		0.27			c0.41			0.00			c0.12	
v/s Ratio Perm	0.39						0.01			0.06		
v/c Ratio	0.79	0.54			0.81		0.02	0.01		0.20	0.38	
Uniform Delay, d1	12.4	10.3			12.6		14.8	14.7		15.6	16.6	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	28.7	2.4			8.2		0.2	0.0		1.1	3.1	
Delay (s)	41.1	12.7			20.8		15.0	14.8		16.7	19.7	
Level of Service	D	B			C		B	B		B	B	
Approach Delay (s)		19.2			20.8			14.9			19.1	
Approach LOS		B			C			B			B	

Intersection Summary

HCM 2000 Control Delay	19.8	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	83.2%	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	SBR
Lane Configurations												
Traffic Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Future Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor	1.00	1.00		1.00		0.99	1.00	1.00		1.00		0.98
Frt		0.979				0.850		0.969				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3320	0	1662	3388	1516	1646	3253	0	1601	1783	1487
Flt Permitted	0.189			0.223			0.472			0.269		
Satd. Flow (perm)	337	3320	0	390	3388	1495	814	3253	0	453	1783	1456
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16				262		26				238
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			139.6			179.3	
Travel Time (s)		13.5			9.3			10.1			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	820	136	112	610	262	67	336	89	418	518	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	956	0	112	610	262	67	425	0	418	518	238
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	2.0
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	2.0
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases	2			6		6	8			4		4
Detector Phase	5	2		1	6	6	8	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0	20.0	15.0	15.0		5.0	15.0	15.0
Minimum Split (s)	9.5	32.0		9.5	32.0	32.0	34.3	34.3		9.5	34.3	34.3
Total Split (s)	21.0	43.3		10.7	33.0	33.0	34.3	34.3		31.7	66.0	66.0
Total Split (%)	17.5%	36.1%		8.9%	27.5%	27.5%	28.6%	28.6%		26.4%	55.0%	55.0%
Maximum Green (s)	18.0	37.3		7.7	27.0	27.0	28.0	28.0		28.7	59.7	59.7
Yellow Time (s)	3.0	3.7		3.0	3.7	3.7	3.3	3.3		3.0	3.3	3.3
All-Red Time (s)	0.0	2.3		0.0	2.3	2.3	3.0	3.0		0.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0		3.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0			7.0	7.0
Flash Dont Walk (s)		19.0			19.0	19.0	21.0	21.0			21.0	21.0
Pedestrian Calls (#/hr)		0			0	0	0	0			0	0
Act Effct Green (s)	59.6	44.2		40.4	28.0	28.0	20.3	20.3		54.4	51.1	51.1
Actuated g/C Ratio	0.50	0.37		0.34	0.23	0.23	0.17	0.17		0.45	0.43	0.43
v/c Ratio	0.79	0.78		0.48	0.77	0.48	0.49	0.75		0.89	0.68	0.31
Control Delay	37.7	39.5		26.9	51.0	7.8	56.5	52.5		46.9	32.5	3.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	37.7	39.5		26.9	51.0	7.8	56.5	52.5		46.9	32.5	3.4
LOS	D	D		C	D	A	E	D		D	C	A
Approach Delay		39.0			36.7			53.1			31.7	
Approach LOS		D			D			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 38.0		Intersection LOS: D	
Intersection Capacity Utilization 96.5%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	361	956	112	610	262	67	425	418	518	238
v/c Ratio	0.79	0.78	0.48	0.77	0.48	0.49	0.75	0.89	0.68	0.31
Control Delay	37.7	39.5	26.9	51.0	7.8	56.5	52.5	46.9	32.5	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.7	39.5	26.9	51.0	7.8	56.5	52.5	46.9	32.5	3.4
Queue Length 50th (m)	58.4	110.0	14.7	75.7	0.0	15.2	50.1	74.1	101.0	0.0
Queue Length 95th (m)	#126.9	#159.0	28.5	98.0	22.3	29.4	64.6	#117.0	128.1	13.6
Internal Link Dist (m)		201.8		131.4			115.6		155.3	
Turn Bay Length (m)	80.0		35.0			35.0		50.0		
Base Capacity (vph)	457	1232	233	790	549	189	778	479	887	843
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	0.79	0.78	0.48	0.77	0.48	0.35	0.55	0.87	0.58	0.28

Intersection Summary

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

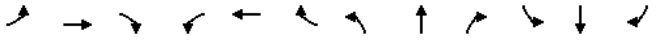
HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-16-2018

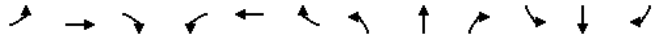
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Future Volume (vph)	332	754	125	103	561	241	62	309	82	385	477	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	0.95		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1694	3319		1662	3388	1495	1639	3251		1601	1783	1456
Flt Permitted	0.19	1.00		0.22	1.00	1.00	0.47	1.00		0.27	1.00	1.00
Satd. Flow (perm)	338	3319		390	3388	1495	815	3251		454	1783	1456
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	820	136	112	610	262	67	336	89	418	518	238
RTOR Reduction (vph)	0	10	0	0	0	201	0	22	0	0	0	137
Lane Group Flow (vph)	361	946	0	112	610	61	67	403	0	418	518	101
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases	2			6		6	8			4		4
Actuated Green, G (s)	56.6	44.2		37.3	27.9	27.9	20.3	20.3		51.1	51.1	51.1
Effective Green, g (s)	56.6	44.2		37.3	27.9	27.9	20.3	20.3		51.1	51.1	51.1
Actuated g/C Ratio	0.47	0.37		0.31	0.23	0.23	0.17	0.17		0.43	0.43	0.43
Clearance Time (s)	3.0	6.0		3.0	6.0	6.0	6.3	6.3		3.0	6.3	6.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	449	1222		220	787	347	137	549		459	759	620
v/s Ratio Prot	c0.17	0.28		0.04	0.18			0.12		c0.21	0.29	
v/s Ratio Perm	c0.21			0.12		0.04	0.08			c0.18		0.07
v/c Ratio	0.80	0.77		0.51	0.78	0.18	0.49	0.73		0.91	0.68	0.16
Uniform Delay, d1	24.9	33.5		30.8	43.1	36.8	45.2	47.3		27.7	27.9	21.3
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	10.0	4.8		1.9	7.3	1.1	2.7	5.1		22.1	2.5	0.1
Delay (s)	35.0	38.3		32.7	50.5	37.9	47.9	52.4		49.8	30.4	21.4
Level of Service	C	D		C	D	D	D	D		D	C	C
Approach Delay (s)		37.4			45.1			51.8			35.5	
Approach LOS		D			D			D			D	

Intersection Summary					
HCM 2000 Control Delay	40.5	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	0.90				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		18.3	
Intersection Capacity Utilization	96.5%	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 Configurations												
Traffic Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Future Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00							
Frt			0.850					0.850			0.919	
Flt Protected	0.950			0.950			0.950				0.980	
Satd. Flow (prot)	1396	1685	1561	1745	1749	0	1745	1561	0	0	1532	0
Flt Permitted	0.299			0.125			0.744				0.924	
Satd. Flow (perm)	439	1685	1561	230	1749	0	1366	1561	0	0	1444	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			348					127			36	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	976	348	29	687	1	273	0	17	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	976	348	29	688	0	273	17	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	60.0	60.0	60.0	60.0	60.0		30.0	30.0		30.0	30.0	
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	54.0	54.0	54.0	54.0	54.0		24.0	24.0		24.0	24.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	56.6	56.6	56.6	56.6	56.6		21.4	21.4			21.4	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63		0.24	0.24			0.24	
v/c Ratio	0.04	0.92	0.31	0.20	0.63		0.84	0.04			0.05	
Control Delay	8.0	31.7	1.7	9.7	10.3		55.6	0.1			4.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Delay	8.0	31.7	1.7	9.7	10.3		55.6	0.1			4.5	
LOS	A	C	A	A	B		E	A			A	
Approach Delay		23.7			10.3			52.3			4.5	
Approach LOS		C			B			D			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.92			
Intersection Signal Delay: 23.0		Intersection LOS: C	
Intersection Capacity Utilization 77.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

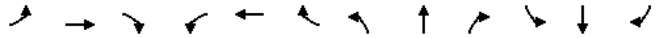
02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBT
Lane Group Flow (vph)	12	976	348	29	688	273	17	20
v/c Ratio	0.04	0.92	0.31	0.20	0.63	0.84	0.04	0.05
Control Delay	8.0	31.7	1.7	9.7	10.3	55.6	0.1	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	31.7	1.7	9.7	10.3	55.6	0.1	4.5
Queue Length 50th (m)	0.8	152.8	0.0	1.4	59.9	45.8	0.0	0.0
Queue Length 95th (m)	3.2	#254.5	10.3	m3.4	76.7	#83.7	0.0	3.3
Internal Link Dist (m)		339.5			336.5		467.1	141.9
Turn Bay Length (m)								
Base Capacity (vph)	276	1060	1111	144	1100	364	509	411
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	0.92	0.31	0.20	0.63	0.75	0.03	0.05

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Future Volume (vph)	11	898	320	27	632	1	251	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
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			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	0.85	1.00	1.00		1.00	0.85			0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	
Satd. Flow (prot)	1394	1685	1561	1745	1749		1745	1561			1532	
Flt Permitted	0.30	1.00	1.00	0.13	1.00		0.74	1.00			0.92	
Satd. Flow (perm)	439	1685	1561	230	1749		1367	1561			1444	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	976	348	29	687	1	273	0	17	8	0	12
RTOR Reduction (vph)	0	0	129	0	0	0	0	13	0	0	15	0
Lane Group Flow (vph)	12	976	219	29	688	0	273	4	0	0	5	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	56.6	56.6	56.6	56.6	56.6		21.4	21.4			21.4	
Effective Green, g (s)	56.6	56.6	56.6	56.6	56.6		21.4	21.4			21.4	
Actuated g/C Ratio	0.63	0.63	0.63	0.63	0.63		0.24	0.24			0.24	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)	276	1059	981	144	1099		325	371			343	
v/s Ratio Prot		c0.58			0.39			0.00				
v/s Ratio Perm	0.03		0.14	0.13			c0.20				0.00	
v/c Ratio	0.04	0.92	0.22	0.20	0.63		0.84	0.01			0.01	
Uniform Delay, d1	6.4	14.7	7.2	7.1	10.2		32.7	26.2			26.2	
Progression Factor	1.00	1.00	1.00	0.74	0.69		1.00	1.00			1.00	
Incremental Delay, d2	0.3	14.2	0.5	2.8	2.4		17.1	0.0			0.0	
Delay (s)	6.7	29.0	7.7	8.0	9.5		49.8	26.2			26.2	
Level of Service	A	C	A	A	A		D	C			C	
Approach Delay (s)		23.2			9.4			48.4			26.2	
Approach LOS		C			A			D			C	

Intersection Summary					
HCM 2000 Control Delay	22.2	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.90				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	77.8%	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 Configurations												
Traffic Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Future Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			1.00			1.00	
Frt			0.850		0.993			0.961			0.956	
Flt Protected	0.950			0.950				0.975			0.988	
Satd. Flow (prot)	1396	1670	1501	1745	1712	0	0	1707	0	0	1608	0
Flt Permitted	0.403			0.227				0.719			0.884	
Satd. Flow (perm)	592	1670	1501	417	1712	0	0	1258	0	0	1439	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139		5			20			24	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	849	139	61	526	24	90	37	51	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	849	139	61	550	0	0	178	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	66.0	66.0	66.0	66.0	66.0		24.0	24.0		24.0	24.0	
Total Split (%)	73.3%	73.3%	73.3%	73.3%	73.3%		26.7%	26.7%		26.7%	26.7%	
Maximum Green (s)	60.0	60.0	60.0	60.0	60.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	60.0	60.0	60.0	60.0	60.0			18.0			18.0	
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67			0.20			0.20	
v/c Ratio	0.03	0.76	0.13	0.22	0.48			0.67			0.53	
Control Delay	6.6	10.0	2.2	8.2	9.0			43.1			34.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0			0.0			0.0	
Total Delay	6.6	10.0	2.2	8.2	9.0			43.1			34.4	
LOS	A	B	A	A	A			D			C	
Approach Delay		8.9			8.9			43.1			34.4	
Approach LOS		A			A			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 14.2		Intersection LOS: B	
Intersection Capacity Utilization 72.5%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street

Queues
3: Jones Road & Barton Street

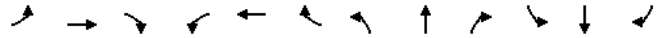
02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	12	849	139	61	550	178	162
v/c Ratio	0.03	0.76	0.13	0.22	0.48	0.67	0.53
Control Delay	6.6	10.0	2.2	8.2	9.0	43.1	34.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.6	10.0	2.2	8.2	9.0	43.1	34.4
Queue Length 50th (m)	0.6	44.1	2.2	3.8	42.8	26.7	22.5
Queue Length 95th (m)	m0.8	m54.1	m2.6	9.9	64.9	#54.8	42.9
Internal Link Dist (m)		336.5			110.2	469.1	238.0
Turn Bay Length (m)							
Base Capacity (vph)	394	1113	1047	278	1143	267	307
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.76	0.13	0.22	0.48	0.67	0.53

Intersection Summary
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Future Volume (vph)	11	781	128	56	484	22	83	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Lane Util. Factor	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	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00			1.00	
Frt	1.00	1.00	0.85	1.00	0.99			0.96			0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.98			0.99	
Satd. Flow (prot)	1395	1670	1501	1745	1713			1707			1608	
Flt Permitted	0.40	1.00	1.00	0.23	1.00			0.72			0.88	
Satd. Flow (perm)	592	1670	1501	417	1713			1259			1439	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	849	139	61	526	24	90	37	51	38	71	53
RTOR Reduction (vph)	0	0	46	0	2	0	0	16	0	0	19	0
Lane Group Flow (vph)	12	849	93	61	548	0	0	162	0	0	143	0
Confl. Peds. (#/hr)	1					1	1					1
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)	60.0	60.0	60.0	60.0	60.0			18.0			18.0	
Effective Green, g (s)	60.0	60.0	60.0	60.0	60.0			18.0			18.0	
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67			0.20			0.20	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0			6.0			6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	394	1113	1000	278	1142			251			287	
v/s Ratio Prot		c0.51			0.32							
v/s Ratio Perm	0.02		0.06	0.15				c0.13			0.10	
v/c Ratio	0.03	0.76	0.09	0.22	0.48			0.65			0.50	
Uniform Delay, d1	5.1	10.2	5.3	5.9	7.4			33.1			32.0	
Progression Factor	1.25	0.72	1.99	1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.1	2.1	0.1	1.8	1.4			12.1			6.0	
Delay (s)	6.4	9.5	10.7	7.7	8.8			45.2			38.0	
Level of Service	A	A	B	A	A			D			D	
Approach Delay (s)		9.6			8.7			45.2			38.0	
Approach LOS		A			A			D			D	

Intersection Summary					
HCM 2000 Control Delay	14.9	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.74				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	72.5%	ICU Level of Service		C	
Analysis Period (min)	15				
c Critical Lane Group					

Lanes, Volumes, Timings
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	29	0	0	0	30	400	0	0	554	40
Future Volume (vph)	29	0	29	0	0	0	30	400	0	0	554	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.932									0.990	
Flt Protected		0.976					0.950					
Satd. Flow (prot)	0	1671	0	0	1837	0	1745	1766	0	1837	1769	0
Flt Permitted		0.976					0.950					
Satd. Flow (perm)	0	1671	0	0	1837	0	1745	1766	0	1837	1769	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			353.6	
Travel Time (s)		13.5			36.9			39.4			25.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	32	0	32	0	0	0	33	435	0	0	602	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	0	0	0	0	33	435	0	0	645	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	41.7%	ICU Level of Service A	
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B 02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	0	29	0	0	0	30	400	0	0	554	40
Future Volume (Veh/h)	29	0	29	0	0	0	30	400	0	0	554	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	0	32	0	0	0	33	435	0	0	602	43
Pedestrians		4										
Lane Width (m)		3.3										
Walking Speed (m/s)		1.2										
Percent Blockage		0										
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1128	1128	628	1135	1150	435	649			435		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1128	1128	628	1135	1150	435	649			435		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	82	100	93	100	100	100	97			100		
cM capacity (veh/h)	177	198	485	164	192	625	944			1135		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	64	0	33	435	0	645
Volume Left	32	0	33	0	0	0
Volume Right	32	0	0	0	0	43
cSH	260	1700	944	1700	1700	1700
Volume to Capacity	0.25	0.00	0.03	0.26	0.00	0.38
Queue Length 95th (m)	7.6	0.0	0.9	0.0	0.0	0.0
Control Delay (s)	23.4	0.0	9.0	0.0	0.0	0.0
Lane LOS	C	A	A			
Approach Delay (s)	23.4	0.0	0.6		0.0	
Approach LOS	C	A				

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	41.7%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Future Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.965			0.879	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1616	1772	0	1631	1565	0
Flt Permitted	0.142			0.225			0.201			0.732		
Satd. Flow (perm)	258	1801	1561	413	1818	1459	341	1772	0	1256	1565	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			67		9			205	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	272	933	41	30	774	133	20	30	9	190	83	349
Shared Lane Traffic (%)												
Lane Group Flow (vph)	272	933	41	30	774	133	20	39	0	190	432	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

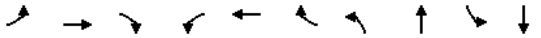
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	14.0	67.9	67.9	53.9	53.9	53.9	32.1	32.1		32.1	32.1	
Total Split (%)	14.0%	67.9%	67.9%	53.9%	53.9%	53.9%	32.1%	32.1%		32.1%	32.1%	
Maximum Green (s)	11.0	62.1	62.1	48.1	48.1	48.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.0	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	65.2	62.4	62.4	48.3	48.3	48.3	19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.69	0.66	0.66	0.51	0.51	0.51	0.21	0.21		0.21	0.21	
v/c Ratio	0.78	0.78	0.04	0.14	0.83	0.17	0.28	0.10		0.72	0.88	
Control Delay	28.8	18.7	3.2	16.2	30.4	8.0	40.9	24.1		49.9	38.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	28.8	18.7	3.2	16.2	30.4	8.0	40.9	24.1		49.9	38.3	
LOS	C	B	A	B	C	A	D	C		D	D	
Approach Delay		20.4			26.8			29.8			41.9	
Approach LOS		C			C			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 94.2			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 27.3		Intersection LOS: C	
Intersection Capacity Utilization 100.5%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



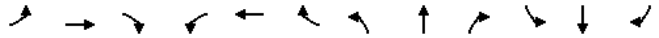
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	272	933	41	30	774	133	20	39	190	432
v/c Ratio	0.78	0.78	0.04	0.14	0.83	0.17	0.28	0.10	0.72	0.88
Control Delay	28.8	18.7	3.2	16.2	30.4	8.0	40.9	24.1	49.9	38.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.8	18.7	3.2	16.2	30.4	8.0	40.9	24.1	49.9	38.3
Queue Length 50th (m)	19.7	118.1	0.4	3.0	124.1	6.4	3.2	4.6	33.8	43.6
Queue Length 95th (m)	#66.8	206.0	4.4	9.5	#216.3	17.7	10.6	13.0	57.8	#91.8
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	350	1192	1044	211	933	781	94	497	347	581
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	0.78	0.78	0.04	0.14	0.83	0.17	0.21	0.08	0.55	0.74

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Future Volume (vph)	250	858	38	28	712	122	18	28	8	175	76	321
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.88	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1801	1561	1745	1818	1459	1613	1773		1631	1565	
Flt Permitted	0.14	1.00	1.00	0.23	1.00	1.00	0.20	1.00		0.73	1.00	
Satd. Flow (perm)	258	1801	1561	413	1818	1459	341	1773		1256	1565	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	272	933	41	30	774	133	20	30	9	190	83	349
RTOR Reduction (vph)	0	0	11	0	0	33	0	7	0	0	162	0
Lane Group Flow (vph)	272	933	30	30	774	100	20	32	0	190	270	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	62.3	62.3	62.3	48.3	48.3	48.3	19.9	19.9		19.9	19.9	
Effective Green, g (s)	62.3	62.3	62.3	48.3	48.3	48.3	19.9	19.9		19.9	19.9	
Actuated g/C Ratio	0.66	0.66	0.66	0.51	0.51	0.51	0.21	0.21		0.21	0.21	
Clearance Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	342	1192	1033	211	933	748	72	374		265	330	
v/s Ratio Prot	0.09	c0.52			0.43			0.02			c0.17	
v/s Ratio Perm	c0.43		0.02	0.07		0.07	0.06			0.15		
v/c Ratio	0.80	0.78	0.03	0.14	0.83	0.13	0.28	0.09		0.72	0.82	
Uniform Delay, d1	16.4	11.2	5.5	12.0	19.4	12.0	31.1	29.8		34.5	35.4	
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	12.0	5.2	0.1	1.4	8.5	0.4	2.1	0.1		8.9	14.6	
Delay (s)	28.4	16.3	5.5	13.4	27.9	12.3	33.2	29.9		43.4	50.0	
Level of Service	C	B	A	B	C	B	C	C		D	D	
Approach Delay (s)		18.6			25.2			31.0			48.0	
Approach LOS		B			C			C			D	

Intersection Summary					
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.83				
Actuated Cycle Length (s)	94.1	Sum of lost time (s)		14.9	
Intersection Capacity Utilization	100.5%	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 Configurations												
Traffic Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Future Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988						0.853	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1567	0
Flt Permitted	0.175			0.364			0.419			0.757		
Satd. Flow (perm)	290	1782	0	669	1782	0	770	1837	0	1390	1567	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					6						223	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	303	795	3	1	668	58	3	1	0	76	4	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	303	798	0	1	726	0	3	1	0	76	227	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	

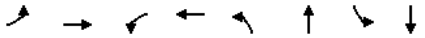
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	5	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	23.0	75.5		52.5	52.5		24.0	24.0		24.0	24.0	
Total Split (%)	23.1%	75.9%		52.8%	52.8%		24.1%	24.1%		24.1%	24.1%	
Maximum Green (s)	20.0	69.5		46.5	46.5		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	0.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)		7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	72.5	69.5		51.1	51.1		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.73	0.70		0.51	0.51		0.18	0.18		0.18	0.18	
v/c Ratio	0.74	0.64		0.00	0.79		0.02	0.00		0.30	0.49	
Control Delay	21.4	11.2		14.0	28.9		34.3	34.0		39.2	9.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.4	11.2		14.0	28.9		34.3	34.0		39.2	9.2	
LOS	C	B		B	C		C	C		D	A	
Approach Delay		14.0			28.8			34.3			16.7	
Approach LOS		B			C			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 99.5			
Actuated Cycle Length: 99.5			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 19.5		Intersection LOS: B	
Intersection Capacity Utilization 83.2%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 6: Jones Road & Highway No. 8

Queues
6: Jones Road & Highway No. 8

02-16-2018



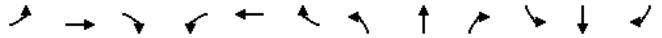
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	303	798	1	726	3	1	76	227
v/c Ratio	0.74	0.64	0.00	0.79	0.02	0.00	0.30	0.49
Control Delay	21.4	11.2	14.0	28.9	34.3	34.0	39.2	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.4	11.2	14.0	28.9	34.3	34.0	39.2	9.2
Queue Length 50th (m)	19.6	77.2	0.1	116.1	0.5	0.2	13.5	0.7
Queue Length 95th (m)	49.6	113.7	1.1	#201.9	3.1	1.7	27.4	20.9
Internal Link Dist (m)		356.0		353.6		172.0		412.5
Turn Bay Length (m)	80.0		35.0		25.0		15.0	
Base Capacity (vph)	468	1244	343	918	139	332	251	466
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	0.65	0.64	0.00	0.79	0.02	0.00	0.30	0.49

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Future Volume (vph)	279	731	3	1	615	53	3	1	0	70	4	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	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	1.00		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1572	1782		1745	1782		1745	1837		1745	1566	
Flt Permitted	0.18	1.00		0.36	1.00		0.42	1.00		0.76	1.00	
Satd. Flow (perm)	290	1782		669	1782		770	1837		1391	1566	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	303	795	3	1	668	58	3	1	0	76	4	223
RTOR Reduction (vph)	0	0	0	0	3	0	0	0	0	0	183	0
Lane Group Flow (vph)	303	798	0	1	723	0	3	1	0	76	44	0
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	69.5	69.5		51.1	51.1		18.0	18.0		18.0	18.0	
Effective Green, g (s)	69.5	69.5		51.1	51.1		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.70	0.70		0.51	0.51		0.18	0.18		0.18	0.18	
Clearance Time (s)	3.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	400	1244		343	915		139	332		251	283	
v/s Ratio Prot	c0.12	0.45			0.41			0.00			0.03	
v/s Ratio Perm	c0.41			0.00			0.00			c0.05		
v/c Ratio	0.76	0.64		0.00	0.79		0.02	0.00		0.30	0.16	
Uniform Delay, d1	14.8	8.2		11.8	19.8		33.5	33.4		35.3	34.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.0	2.5		0.0	6.9		0.3	0.0		3.1	1.2	
Delay (s)	22.8	10.7		11.8	26.7		33.8	33.4		38.4	35.5	
Level of Service	C	B		B	C		C	C		D	D	
Approach Delay (s)		14.1			26.7			33.7			36.2	
Approach LOS		B			C			C			D	

Intersection Summary					
HCM 2000 Control Delay	21.5	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.68				
Actuated Cycle Length (s)	99.5	Sum of lost time (s)		15.0	
Intersection Capacity Utilization	83.2%	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	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	1.00		0.99	1.00	1.00		1.00	0.99	
Frt			0.850			0.850		0.983			0.917	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1662	3323	1323	1479	3144	1358	1586	3336	0	1662	2995	0
Flt Permitted	0.247			0.522			0.214			0.265		
Satd. Flow (perm)	432	3323	1294	812	3144	1338	357	3336	0	463	2995	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			72			304		14			307	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
Shared Lane Traffic (%)												
Lane Group Flow (vph)	310	389	72	49	687	304	228	595	0	216	574	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

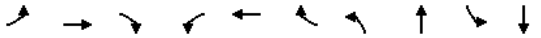
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	9.5	32.0	32.0	32.0	32.0	32.0	9.5	34.3		9.5	34.3	
Total Split (s)	20.0	52.7	52.7	32.7	32.7	32.7	14.0	35.3		12.0	33.3	
Total Split (%)	20.0%	52.7%	52.7%	32.7%	32.7%	32.7%	14.0%	35.3%		12.0%	33.3%	
Maximum Green (s)	17.0	46.7	46.7	26.7	26.7	26.7	11.0	29.0		9.0	27.0	
Yellow Time (s)	3.0	3.7	3.7	3.7	3.7	3.7	3.0	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.3	2.3	2.3	2.3	2.3	0.0	3.0		0.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		19.0	19.0	19.0	19.0	19.0		21.0			21.0	
Pedestrian Calls (#/hr)		0	0	0	0	0		0			0	
Act Effct Green (s)	55.8	52.8	52.8	33.9	33.9	33.9	37.2	22.9		33.2	20.9	
Actuated g/C Ratio	0.56	0.53	0.53	0.34	0.34	0.34	0.37	0.23		0.33	0.21	
v/c Ratio	0.71	0.22	0.10	0.18	0.64	0.46	0.85	0.77		0.83	0.66	
Control Delay	23.2	13.8	3.9	29.2	33.2	6.1	51.4	41.8		49.2	19.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	23.2	13.8	3.9	29.2	33.2	6.1	51.4	41.8		49.2	19.7	
LOS	C	B	A	C	C	A	D	D		D	B	
Approach Delay		16.7			25.1			44.5			27.7	
Approach LOS		B			C			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 28.5		Intersection LOS: C	
Intersection Capacity Utilization 85.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018



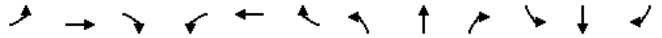
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	310	389	72	49	687	304	228	595	216	574
v/c Ratio	0.71	0.22	0.10	0.18	0.64	0.46	0.85	0.77	0.83	0.66
Control Delay	23.2	13.8	3.9	29.2	33.2	6.1	51.4	41.8	49.2	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.2	13.8	3.9	29.2	33.2	6.1	51.4	41.8	49.2	19.7
Queue Length 50th (m)	32.2	21.1	0.0	7.0	62.3	0.0	33.2	58.8	31.0	25.6
Queue Length 95th (m)	#60.5	34.3	7.5	18.3	#93.6	21.3	#57.5	72.6	#46.5	41.1
Internal Link Dist (m)		201.8			131.4			469.1		155.3
Turn Bay Length (m)	80.0			35.0			35.0		50.0	
Base Capacity (vph)	458	1753	716	275	1067	655	268	977	261	1032
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	0.68	0.22	0.10	0.18	0.64	0.46	0.85	0.61	0.83	0.56

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

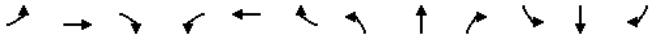
02-16-2018



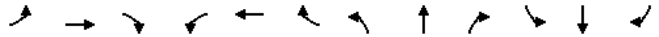
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	632	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	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	0.98		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1662	3323	1294	1477	3144	1338	1586	3338		1662	2996	
Flt Permitted	0.25	1.00	1.00	0.52	1.00	1.00	0.21	1.00		0.26	1.00	
Satd. Flow (perm)	432	3323	1294	811	3144	1338	358	3338		463	2996	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	687	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	0	34	0	0	201	0	11	0	0	243	0
Lane Group Flow (vph)	310	389	38	49	687	103	228	584	0	216	331	0
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	52.8	52.8	52.8	34.0	34.0	34.0	33.9	22.9		29.9	20.9	
Effective Green, g (s)	52.8	52.8	52.8	34.0	34.0	34.0	33.9	22.9		29.9	20.9	
Actuated g/C Ratio	0.53	0.53	0.53	0.34	0.34	0.34	0.34	0.23		0.30	0.21	
Clearance Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	3.0	6.3		3.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	422	1754	683	275	1068	454	256	764		246	626	
v/s Ratio Prot	c0.12	0.12			0.22		c0.10	0.18		0.08	0.11	
v/s Ratio Perm	c0.27		0.03	0.06		0.08	c0.20			0.18		
v/c Ratio	0.73	0.22	0.06	0.18	0.64	0.23	0.89	0.76		0.88	0.53	
Uniform Delay, d1	15.4	12.6	11.5	23.2	27.9	23.6	26.6	36.0		29.9	35.2	
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	6.5	0.3	0.2	1.4	3.0	1.2	29.5	4.6		27.7	0.8	
Delay (s)	21.9	12.9	11.6	24.6	30.9	24.8	56.1	40.6		57.6	36.0	
Level of Service	C	B	B	C	C	C	E	D		E	D	
Approach Delay (s)		16.4			28.8			44.9			41.9	
Approach LOS		B			C			D			D	

Intersection Summary					
HCM 2000 Control Delay	32.9	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.84				
Actuated Cycle Length (s)	100.0	Sum of lost time (s)		18.3	
Intersection Capacity Utilization	85.1%	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	SBR
Lane Configurations												
Traffic Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Future Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00							
Frt			0.850		0.997			0.985			0.929	
Flt Protected		0.999			0.999			0.957			0.977	
Satd. Flow (prot)	0	1724	1561	0	1662	0	0	1731	0	0	1408	0
Flt Permitted		0.988			0.992			0.737			0.850	
Satd. Flow (perm)	0	1705	1561	0	1650	0	0	1333	0	0	1225	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			74		3			50			50	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			506.8			165.9	
Travel Time (s)		21.8			21.6			36.5			11.9	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Adj. Flow (vph)	9	576	74	10	774	18	247	0	30	8	0	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	585	74	0	802	0	0	277	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	41.0	41.0	41.0	41.0	41.0		24.0	24.0		24.0	24.0	
Total Split (%)	63.1%	63.1%	63.1%	63.1%	63.1%		36.9%	36.9%		36.9%	36.9%	
Maximum Green (s)	35.0	35.0	35.0	35.0	35.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	Max	Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		37.7	37.7		37.7			15.3			15.3	
Actuated g/C Ratio		0.58	0.58		0.58			0.24			0.24	
v/c Ratio		0.59	0.08		0.84			0.79			0.05	
Control Delay		12.7	2.4		23.1			35.5			1.2	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		12.7	2.4		23.1			35.5			1.2	
LOS		B	A		C			D			A	
Approach Delay		11.6			23.1			35.5			1.3	
Approach LOS		B			C			D			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 65			
Actuated Cycle Length: 65			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 20.5		Intersection LOS: C	
Intersection Capacity Utilization 79.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

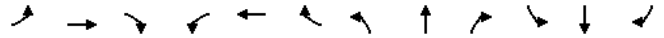
02-16-2018

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	585	74	802	277	17
v/c Ratio	0.59	0.08	0.84	0.79	0.05
Control Delay	12.7	2.4	23.1	35.5	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	12.7	2.4	23.1	35.5	1.2
Queue Length 50th (m)	45.3	0.0	79.2	26.0	0.0
Queue Length 95th (m)	79.0	4.9	#160.9	#57.5	0.9
Internal Link Dist (m)	339.5		336.5	482.8	141.9
Turn Bay Length (m)					
Base Capacity (vph)	987	935	957	405	375
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	0.59	0.08	0.84	0.68	0.05

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

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Future Volume (vph)	8	530	68	9	712	17	227	0	28	7	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.99			0.93	
Flt Protected		1.00	1.00		1.00			0.96			0.98	
Satd. Flow (prot)		1725	1561		1662			1733			1407	
Flt Permitted		0.99	1.00		0.99			0.74			0.85	
Satd. Flow (perm)		1705	1561		1651			1334			1225	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	576	74	10	774	18	247	0	30	8	0	9
RTOR Reduction (vph)	0	0	31	0	1	0	0	38	0	0	13	0
Lane Group Flow (vph)	0	585	43	0	801	0	0	239	0	0	4	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	33%	6%	0%	0%	10%	17%	0%	0%	0%	20%	0%	17%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		37.7	37.7		37.7			15.3			15.3	
Effective Green, g (s)		37.7	37.7		37.7			15.3			15.3	
Actuated g/C Ratio		0.58	0.58		0.58			0.24			0.24	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		988	905		957			314			288	
v/s Ratio Prot												
v/s Ratio Perm		0.34	0.03		c0.49			c0.18			0.00	
v/c Ratio		0.59	0.05		0.84			0.76			0.01	
Uniform Delay, d1		8.7	5.9		11.1			23.1			19.1	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		2.6	0.1		8.6			10.4			0.0	
Delay (s)		11.3	6.0		19.8			33.5			19.1	
Level of Service		B	A		B			C			B	
Approach Delay (s)		10.7			19.8			33.5			19.1	
Approach LOS		B			B			C			B	

Intersection Summary					
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.81				
Actuated Cycle Length (s)	65.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	79.0%	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 Configurations												
Traffic Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Future Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98		1.00							
Frt			0.850		0.986			0.970			0.946	
Flt Protected		0.995			0.997			0.982			0.986	
Satd. Flow (prot)	0	1704	1561	0	1653	0	0	1728	0	0	1470	0
Flt Permitted		0.877			0.935			0.855			0.879	
Satd. Flow (perm)	0	1502	1522	0	1550	0	0	1505	0	0	1310	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			40		13			15			36	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			504.6			262.0	
Travel Time (s)		21.6			8.1			36.3			18.9	
Confl. Peds. (#/hr)			2	2								
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Adj. Flow (vph)	52	508	40	54	677	87	88	97	52	26	29	37
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	560	40	0	818	0	0	237	0	0	92	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	62.0	62.0	62.0	62.0	62.0		28.0	28.0		28.0	28.0	
Total Split (%)	68.9%	68.9%	68.9%	68.9%	68.9%		31.1%	31.1%		31.1%	31.1%	
Maximum Green (s)	56.0	56.0	56.0	56.0	56.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		56.0	56.0		56.0			22.0			22.0	
Actuated g/C Ratio		0.62	0.62		0.62			0.24			0.24	
v/c Ratio		0.60	0.04		0.84			0.63			0.27	
Control Delay		13.6	2.3		23.6			36.7			20.1	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		13.6	2.3		23.6			36.7			20.1	
LOS		B	A		C			D			C	
Approach Delay		12.9			23.6			36.7			20.1	
Approach LOS		B			C			D			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 21.5		Intersection LOS: C	
Intersection Capacity Utilization 100.6%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street

Queues
3: Jones Road & Barton Street

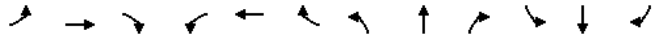
02-16-2018

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	560	40	818	237	92
v/c Ratio	0.60	0.04	0.84	0.63	0.27
Control Delay	13.6	2.3	23.6	36.7	20.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	2.3	23.6	36.7	20.1
Queue Length 50th (m)	55.7	0.0	105.8	36.1	8.1
Queue Length 95th (m)	87.2	3.6	#197.9	61.5	21.2
Internal Link Dist (m)	336.5		110.2	480.6	238.0
Turn Bay Length (m)					
Base Capacity (vph)	934	962	969	379	347
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	0.60	0.04	0.84	0.63	0.27

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

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Future Volume (vph)	48	467	37	50	623	80	81	89	48	24	27	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.98		1.00			1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.99			0.97			0.95	
Flt Protected		1.00	1.00		1.00			0.98			0.99	
Satd. Flow (prot)		1704	1522		1652			1729			1470	
Flt Permitted		0.88	1.00		0.93			0.86			0.88	
Satd. Flow (perm)		1501	1522		1549			1506			1310	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	508	40	54	677	87	88	97	52	26	29	37
RTOR Reduction (vph)	0	0	15	0	5	0	0	11	0	0	27	0
Lane Group Flow (vph)	0	560	25	0	813	0	0	226	0	0	65	0
Confl. Peds. (#/hr)			2	2								
Heavy Vehicles (%)	0%	8%	0%	22%	9%	3%	0%	3%	0%	6%	5%	33%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		56.0	56.0		56.0			22.0			22.0	
Effective Green, g (s)		56.0	56.0		56.0			22.0			22.0	
Actuated g/C Ratio		0.62	0.62		0.62			0.24			0.24	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		933	947		963			368			320	
v/s Ratio Prot												
v/s Ratio Perm		0.37	0.02		c0.52			c0.15			0.05	
v/c Ratio		0.60	0.03		0.84			0.61			0.20	
Uniform Delay, d1		10.3	6.5		13.5			30.2			27.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		2.9	0.1		9.0			7.4			1.4	
Delay (s)		13.1	6.6		22.5			37.7			28.4	
Level of Service		B	A		C			D			C	
Approach Delay (s)		12.7			22.5			37.7			28.4	
Approach LOS		B			C			D			C	

Intersection Summary					
HCM 2000 Control Delay		21.5	HCM 2000 Level of Service		C
HCM 2000 Volume to Capacity ratio		0.78			
Actuated Cycle Length (s)		90.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization		100.6%	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 Configurations												
Traffic Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Future Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				1.00	
Frt		0.942				0.850		0.982			0.995	
Flt Protected		0.978			0.954		0.950			0.950		
Satd. Flow (prot)	0	1692	0	0	1752	1561	1745	1695	0	1745	1633	0
Flt Permitted		0.796			0.686		0.590			0.359		
Satd. Flow (perm)	0	1377	0	0	1260	1561	1078	1695	0	659	1633	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27				251		16			4	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			516.4			547.7			493.1	
Travel Time (s)		13.5			37.2			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Adj. Flow (vph)	28	8	27	236	7	251	14	499	70	83	266	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	243	251	14	569	0	83	276	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	26.0	26.0		26.0	26.0	
Total Split (s)	24.0	24.0		26.0	26.0	26.0	40.0	40.0		40.0	40.0	
Total Split (%)	36.4%	36.4%		39.4%	39.4%	39.4%	60.6%	60.6%		60.6%	60.6%	
Maximum Green (s)	18.0	18.0		20.0	20.0	20.0	34.0	34.0		34.0	34.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		16.0			16.0	16.0	34.1	34.1		34.1	34.1	
Actuated g/C Ratio		0.26			0.26	0.26	0.55	0.55		0.55	0.55	
v/c Ratio		0.17			0.75	0.43	0.02	0.61		0.23	0.31	
Control Delay		12.5			36.6	5.3	7.9	13.6		10.6	9.5	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		12.5			36.6	5.3	7.9	13.6		10.6	9.5	
LOS		B			D	A	A	B		B	A	
Approach Delay		12.5			20.7			13.4			9.8	
Approach LOS		B			C			B			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 66			
Actuated Cycle Length: 62.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 14.9		Intersection LOS: B	
Intersection Capacity Utilization 78.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: Fruitland Road & Sherwood Park Road/Collector Road B

Queues
4: Fruitland Road & Sherwood Park Road/Collector Road B

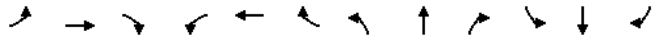
02-16-2018

Lane Group	EBT	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	63	243	251	14	569	83	276
v/c Ratio	0.17	0.75	0.43	0.02	0.61	0.23	0.31
Control Delay	12.5	36.6	5.3	7.9	13.6	10.6	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	36.6	5.3	7.9	13.6	10.6	9.5
Queue Length 50th (m)	3.3	26.8	0.0	0.7	42.7	4.9	16.8
Queue Length 95th (m)	11.3	#51.5	14.6	3.2	80.2	13.8	33.4
Internal Link Dist (m)	163.5	492.4			523.7		469.1
Turn Bay Length (m)				20.0		20.0	
Base Capacity (vph)	463	406	673	591	937	361	898
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.60	0.37	0.02	0.61	0.23	0.31

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

HCM Signalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Future Volume (vph)	26	7	25	217	6	231	13	459	64	76	245	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		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	
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.94			1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.98			0.95	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1693			1752	1561	1737	1695		1745	1632	
Flt Permitted		0.80			0.69	1.00	0.59	1.00		0.36	1.00	
Satd. Flow (perm)		1378			1260	1561	1078	1695		659	1632	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	8	27	236	7	251	14	499	70	83	266	10
RTOR Reduction (vph)	0	20	0	0	0	186	0	7	0	0	2	0
Lane Group Flow (vph)	0	43	0	0	243	65	14	562	0	83	274	0
Confl. Peds. (#/hr)							4					4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	7%	2%	0%	11%	33%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		16.0			16.0	16.0	34.1	34.1		34.1	34.1	
Effective Green, g (s)		16.0			16.0	16.0	34.1	34.1		34.1	34.1	
Actuated g/C Ratio		0.26			0.26	0.26	0.55	0.55		0.55	0.55	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		355			324	402	591	930		361	896	
v/s Ratio Prot								c0.33			0.17	
v/s Ratio Perm		0.03			c0.19	0.04	0.01			0.13		
v/c Ratio		0.12			0.75	0.16	0.02	0.60		0.23	0.31	
Uniform Delay, d1		17.7			21.2	17.9	6.4	9.4		7.2	7.6	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.2			9.4	0.2	0.1	2.9		1.5	0.9	
Delay (s)		17.8			30.6	18.0	6.5	12.4		8.7	8.5	
Level of Service		B			C	B	A	B		A	A	
Approach Delay (s)		17.8			24.2			12.2			8.5	
Approach LOS		B			C			B			A	

Intersection Summary					
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	62.1	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	78.7%	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 Configurations												
Traffic Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Future Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	2		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.98	1.00				0.98	
Frt			0.850			0.850		0.975			0.855	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3255	1766	1358	1745	1749	1346	1586	1761	0	1586	1442	0
Flt Permitted	0.950			0.497			0.284			0.699		
Satd. Flow (perm)	3251	1766	1358	913	1749	1316	473	1761	0	1167	1442	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			70		10			422	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			346.3			289.3			547.7	
Travel Time (s)		17.6			20.8			20.8			39.4	
Confl. Peds. (#/hr)	1					1	3					3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Adj. Flow (vph)	316	462	20	11	571	125	30	74	15	95	15	422
Shared Lane Traffic (%)												
Lane Group Flow (vph)	316	462	20	11	571	125	30	89	0	95	437	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		6.6			6.6			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	20.0	64.5	64.5	44.5	44.5	44.5	35.0	35.0		35.0	35.0	
Total Split (%)	20.1%	64.8%	64.8%	44.7%	44.7%	44.7%	35.2%	35.2%		35.2%	35.2%	
Maximum Green (s)	17.0	58.7	58.7	38.7	38.7	38.7	28.9	28.9		28.9	28.9	
Yellow Time (s)	3.0	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	0.0	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	13.2	58.9	58.9	42.8	42.8	42.8	14.1	14.1		14.1	14.1	
Actuated g/C Ratio	0.16	0.69	0.69	0.50	0.50	0.50	0.17	0.17		0.17	0.17	
v/c Ratio	0.63	0.38	0.02	0.02	0.65	0.18	0.38	0.30		0.49	0.74	
Control Delay	39.8	7.3	1.3	14.5	22.1	8.0	45.4	29.5		40.6	12.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.8	7.3	1.3	14.5	22.1	8.0	45.4	29.5		40.6	12.2	
LOS	D	A	A	B	C	A	D	C		D	B	
Approach Delay		20.0			19.5			33.5			17.3	
Approach LOS		C			B			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 99.5			
Actuated Cycle Length: 85			
Natural Cycle: 80			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 19.9		Intersection LOS: B	
Intersection Capacity Utilization 78.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	316	462	20	11	571	125	30	89	95	437
v/c Ratio	0.63	0.38	0.02	0.02	0.65	0.18	0.38	0.30	0.49	0.74
Control Delay	39.8	7.3	1.3	14.5	22.1	8.0	45.4	29.5	40.6	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.8	7.3	1.3	14.5	22.1	8.0	45.4	29.5	40.6	12.2
Queue Length 50th (m)	25.5	24.9	0.0	0.8	63.9	4.4	4.6	11.9	14.9	2.2
Queue Length 95th (m)	42.2	61.4	1.7	4.7	#143.3	17.9	13.2	24.8	29.6	29.9
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	653	1224	951	459	880	697	161	607	398	770
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	0.48	0.38	0.02	0.02	0.65	0.18	0.19	0.15	0.24	0.57

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Future Volume (vph)	291	425	18	10	525	115	28	68	14	87	14	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	0.97	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	3255	1766	1358	1745	1749	1316	1583	1761		1586	1444	
Flt Permitted	0.95	1.00	1.00	0.50	1.00	1.00	0.28	1.00		0.70	1.00	
Satd. Flow (perm)	3255	1766	1358	913	1749	1316	473	1761		1168	1444	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	316	462	20	11	571	125	30	74	15	95	15	422
RTOR Reduction (vph)	0	0	6	0	0	35	0	8	0	0	352	0
Lane Group Flow (vph)	316	462	14	11	571	90	30	81	0	95	85	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Actuated Green, G (s)	13.1	58.9	58.9	42.8	42.8	42.8	14.1	14.1		14.1	14.1	
Effective Green, g (s)	13.1	58.9	58.9	42.8	42.8	42.8	14.1	14.1		14.1	14.1	
Actuated g/C Ratio	0.15	0.69	0.69	0.50	0.50	0.50	0.17	0.17		0.17	0.17	
Clearance Time (s)	3.0	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	502	1225	942	460	881	663	78	292		193	239	
v/s Ratio Prot	c0.10	0.26			c0.33			0.05			0.06	
v/s Ratio Perm			0.01	0.01		0.07	0.06			c0.08		
v/c Ratio	0.63	0.38	0.01	0.02	0.65	0.14	0.38	0.28		0.49	0.36	
Uniform Delay, d1	33.6	5.4	4.0	10.6	15.5	11.2	31.5	30.9		32.1	31.4	
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	2.5	0.9	0.0	0.1	3.7	0.4	3.1	0.5		2.0	0.9	
Delay (s)	36.1	6.3	4.1	10.7	19.2	11.6	34.7	31.5		34.1	32.3	
Level of Service	D	A	A	B	B	B	C	C		C	C	
Approach Delay (s)		18.0			17.7			32.3			32.6	
Approach LOS		B			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.61			
Actuated Cycle Length (s)	84.9	Sum of lost time (s)	14.9	
Intersection Capacity Utilization	78.8%	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 Configurations												
Traffic Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Future Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00							
Frt		0.999			0.980			0.970			0.850	
Flt Protected	0.950						0.950			0.950		
Satd. Flow (prot)	1572	1759	0	1837	1720	0	1745	1782	0	1616	1192	0
Flt Permitted	0.269						0.722			0.754		
Satd. Flow (perm)	445	1759	0	1837	1720	0	1326	1782	0	1282	1192	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			15			1			287	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			425.0	
Travel Time (s)		22.8			22.7			14.1			30.6	
Confl. Peds. (#/hr)	1					1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Adj. Flow (vph)	74	477	3	0	614	93	7	4	1	75	0	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	74	480	0	0	707	0	7	5	0	75	54	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		30.0	30.0		24.0	24.0	
Total Split (s)	60.0	60.0		60.0	60.0		30.0	30.0		30.0	30.0	
Total Split (%)	66.7%	66.7%		66.7%	66.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	54.0	54.0		54.0	54.0		24.0	24.0		24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	54.0	54.0			54.0		24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.60	0.60			0.60		0.27	0.27		0.27	0.27	
v/c Ratio	0.28	0.45			0.68		0.02	0.01		0.22	0.10	
Control Delay	12.1	11.6			16.1		24.7	22.6		27.9	0.4	
Queue Delay	0.0	0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay	12.1	11.6			16.1		24.7	22.6		27.9	0.4	
LOS	B	B			B		C	C		C	A	
Approach Delay		11.7			16.1			23.8			16.4	
Approach LOS		B			B			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 14.4		Intersection LOS: B	
Intersection Capacity Utilization 77.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 6: Jones Road & Highway No. 8

Queues
6: Jones Road & Highway No. 8

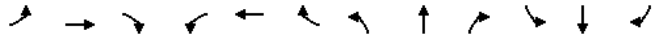
02-16-2018

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	74	480	707	7	5	75	54
v/c Ratio	0.28	0.45	0.68	0.02	0.01	0.22	0.10
Control Delay	12.1	11.6	16.1	24.7	22.6	27.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	11.6	16.1	24.7	22.6	27.9	0.4
Queue Length 50th (m)	5.9	43.9	78.1	0.9	0.5	10.6	0.0
Queue Length 95th (m)	14.7	66.5	119.4	4.4	3.3	22.5	0.0
Internal Link Dist (m)		356.0	353.6		172.0		401.0
Turn Bay Length (m)	80.0			25.0		15.0	
Base Capacity (vph)	267	1055	1038	353	475	341	528
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.45	0.68	0.02	0.01	0.22	0.10

Intersection Summary

HCM Signalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Future Volume (vph)	68	439	3	0	565	86	6	4	1	69	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	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	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00			0.98		1.00	0.97		1.00	0.85	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1571	1760			1720		1745	1782		1616	1192	
Flt Permitted	0.27	1.00			1.00		0.72	1.00		0.75	1.00	
Satd. Flow (perm)	446	1760			1720		1326	1782		1283	1192	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	74	477	3	0	614	93	7	4	1	75	0	54
RTOR Reduction (vph)	0	0	0	0	6	0	0	1	0	0	40	0
Lane Group Flow (vph)	74	480	0	0	701	0	7	4	0	75	14	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	11%	4%	50%	0%	5%	0%	0%	0%	0%	8%	0%	31%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	54.0	54.0			54.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	54.0	54.0			54.0		24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.60	0.60			0.60		0.27	0.27		0.27	0.27	
Clearance Time (s)	6.0	6.0			6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	1056			1032		353	475		342	317	
v/s Ratio Prot		0.27			c0.41			0.00			0.01	
v/s Ratio Perm	0.17						0.01			c0.06		
v/c Ratio	0.28	0.45			0.68		0.02	0.01		0.22	0.05	
Uniform Delay, d1	8.6	9.9			12.2		24.3	24.3		25.7	24.5	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	1.4			3.6		0.1	0.0		1.5	0.3	
Delay (s)	11.2	11.3			15.8		24.4	24.3		27.2	24.8	
Level of Service	B	B			B		C	C		C	C	
Approach Delay (s)		11.3			15.8			24.4			26.2	
Approach LOS		B			B			C			C	

Intersection Summary				
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	77.0%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-16-2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	35.0		0.0	50.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	1.00		0.98	1.00		0.99	1.00	1.00		1.00	0.99	
Frt			0.850			0.850		0.972			0.959	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1694	3388	1561	1662	3388	1516	1646	3269	0	1601	3213	0
Flt Permitted	0.315			0.334			0.207			0.278		
Satd. Flow (perm)	561	3388	1526	584	3388	1495	358	3269	0	468	3213	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			263			220		23			53	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		225.8			155.4			493.1			179.3	
Travel Time (s)		13.5			9.3			35.5			12.9	
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
Shared Lane Traffic (%)												
Lane Group Flow (vph)	361	765	263	111	520	220	138	467	0	353	867	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lanes, Volumes, Timings
1: Fruitland Road & Barton Street 02-16-2018

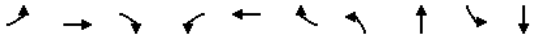
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	1	6	6	3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	9.5	32.0	32.0	9.5	32.0	32.0	9.5	34.3		9.5	34.3	
Total Split (s)	22.0	47.2	47.2	9.8	35.0	35.0	11.0	38.7		24.3	52.0	
Total Split (%)	18.3%	39.3%	39.3%	8.2%	29.2%	29.2%	9.2%	32.3%		20.3%	43.3%	
Maximum Green (s)	19.0	41.2	41.2	6.8	29.0	29.0	6.5	32.4		21.3	45.7	
Yellow Time (s)	3.0	3.7	3.7	3.0	3.7	3.7	3.5	3.3		3.0	3.3	
All-Red Time (s)	0.0	2.3	2.3	0.0	2.3	2.3	1.0	3.0		0.0	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.0	6.0	3.0	6.0	6.0	4.5	6.3		3.0	6.3	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	
Walk Time (s)		7.0	7.0		7.0	7.0		7.0			7.0	
Flash Dont Walk (s)		19.0	19.0		19.0	19.0		21.0			21.0	
Pedestrian Calls (#/hr)		0	0		0	0		0			0	
Act Effct Green (s)	62.4	47.8	47.8	47.3	35.7	35.7	33.0	24.7		51.6	37.3	
Actuated g/C Ratio	0.52	0.40	0.40	0.39	0.30	0.30	0.28	0.21		0.43	0.31	
v/c Ratio	0.74	0.57	0.34	0.36	0.52	0.37	0.82	0.68		0.89	0.84	
Control Delay	30.0	31.4	4.6	21.5	38.9	6.7	62.0	46.4		50.3	43.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	30.0	31.4	4.6	21.5	38.9	6.7	62.0	46.4		50.3	43.6	
LOS	C	C	A	C	D	A	E	D		D	D	
Approach Delay		26.0			28.3			50.0			45.5	
Approach LOS		C			C			D			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 35.9		Intersection LOS: D	
Intersection Capacity Utilization 87.8%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 1: Fruitland Road & Barton Street

Queues
1: Fruitland Road & Barton Street

02-16-2018

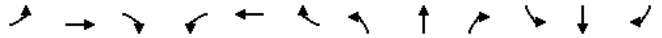


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	361	765	263	111	520	220	138	467	353	867
v/c Ratio	0.74	0.57	0.34	0.36	0.52	0.37	0.82	0.68	0.89	0.84
Control Delay	30.0	31.4	4.6	21.5	38.9	6.7	62.0	46.4	50.3	43.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	31.4	4.6	21.5	38.9	6.7	62.0	46.4	50.3	43.6
Queue Length 50th (m)	52.8	78.0	0.0	13.7	58.7	0.0	21.3	54.2	62.6	99.2
Queue Length 95th (m)	#89.3	106.4	18.3	27.4	80.4	20.1	#40.5	67.3	#91.9	113.7
Internal Link Dist (m)		201.8			131.4			469.1		155.3
Turn Bay Length (m)	80.0			35.0			35.0		50.0	
Base Capacity (vph)	493	1348	765	308	1007	599	168	899	402	1256
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	0.73	0.57	0.34	0.36	0.52	0.37	0.82	0.52	0.88	0.69

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

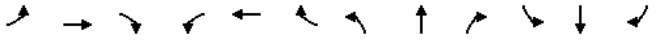
HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

02-16-2018

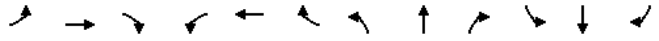


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	349	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	3.0	6.0	6.0	4.5	6.3		3.0	6.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	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	0.97		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)	1694	3388	1526	1661	3388	1495	1645	3268		1601	3213	
Flt Permitted	0.32	1.00	1.00	0.33	1.00	1.00	0.21	1.00		0.28	1.00	
Satd. Flow (perm)	562	3388	1526	584	3388	1495	359	3268		469	3213	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	379	88	353	629	238
RTOR Reduction (vph)	0	0	158	0	0	155	0	18	0	0	36	0
Lane Group Flow (vph)	361	765	105	111	520	65	138	449	0	353	831	0
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	59.3	47.7	47.7	44.2	35.6	35.6	31.2	24.7		48.4	37.4	
Effective Green, g (s)	59.3	47.7	47.7	44.2	35.6	35.6	31.2	24.7		48.4	37.4	
Actuated g/C Ratio	0.49	0.40	0.40	0.37	0.30	0.30	0.26	0.21		0.40	0.31	
Clearance Time (s)	3.0	6.0	6.0	3.0	6.0	6.0	4.5	6.3		3.0	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	472	1346	606	292	1005	443	162	672		384	1001	
v/s Ratio Prot	c0.13	0.23		0.03	0.15		0.05	0.14		c0.16	0.26	
v/s Ratio Perm	c0.25		0.07	0.11		0.04	0.17			c0.21		
v/c Ratio	0.76	0.57	0.17	0.38	0.52	0.15	0.85	0.67		0.92	0.83	
Uniform Delay, d1	20.6	28.1	23.4	25.7	35.1	31.0	38.4	43.9		28.4	38.3	
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	7.2	1.7	0.6	0.8	1.9	0.7	32.6	2.5		26.4	5.8	
Delay (s)	27.9	29.9	24.0	26.5	37.0	31.7	71.0	46.4		54.9	44.1	
Level of Service	C	C	C	C	D	C	E	D		D	D	
Approach Delay (s)		28.2			34.3			52.0			47.2	
Approach LOS		C			C			D			D	

Intersection Summary					
HCM 2000 Control Delay	38.7	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	0.89				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		19.8	
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	SBR
Lane Configurations												
Traffic Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Future Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00							
Frt			0.850					0.986			0.919	
Flt Protected		0.999			0.998			0.957			0.980	
Satd. Flow (prot)	0	1680	1561	0	1749	0	0	1733	0	0	1532	0
Flt Permitted		0.991			0.942			0.734			0.881	
Satd. Flow (perm)	0	1667	1561	0	1651	0	0	1329	0	0	1377	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			255					41			41	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		363.5			360.5			491.1			165.9	
Travel Time (s)		21.8			21.6			35.4			11.9	
Confl. Peds. (#/hr)	2					2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Adj. Flow (vph)	12	928	255	29	639	1	148	0	17	8	0	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	940	255	0	669	0	0	165	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0		24.0	24.0		24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%		30.0%	30.0%		30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	Max	Max		None	None		None	None	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		54.7	54.7		54.7			13.3			13.3	
Actuated g/C Ratio		0.68	0.68		0.68			0.17			0.17	
v/c Ratio		0.83	0.22		0.59			0.65			0.08	
Control Delay		18.7	1.3		9.1			34.7			4.1	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		18.7	1.3		9.1			34.7			4.1	
LOS		B	A		A			C			A	
Approach Delay		15.0			9.1			34.7			4.1	
Approach LOS		B			A			C			A	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 14.6		Intersection LOS: B	
Intersection Capacity Utilization 78.1%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

Queues
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	940	255	669	165	20
v/c Ratio	0.83	0.22	0.59	0.65	0.08
Control Delay	18.7	1.3	9.1	34.7	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	1.3	9.1	34.7	4.1
Queue Length 50th (m)	90.6	0.0	30.8	18.6	0.0
Queue Length 95th (m)	#212.6	7.8	m78.3	36.3	2.7
Internal Link Dist (m)	339.5		336.5	467.1	141.9
Turn Bay Length (m)					
Base Capacity (vph)	1138	1147	1127	330	341
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	0.83	0.22	0.59	0.50	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
2: Gordon Dean Avenue/Sunnyhurst Avenue & Barton Street

02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Future Volume (vph)	11	854	235	27	588	1	136	0	16	7	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.99			0.92	
Flt Protected		1.00	1.00		1.00			0.96			0.98	
Satd. Flow (prot)		1681	1561		1749			1733			1532	
Flt Permitted		0.99	1.00		0.94			0.73			0.88	
Satd. Flow (perm)		1667	1561		1651			1329			1376	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	928	255	29	639	1	148	0	17	8	0	12
RTOR Reduction (vph)	0	0	81	0	0	0	0	34	0	0	17	0
Lane Group Flow (vph)	0	940	174	0	669	0	0	131	0	0	3	0
Confl. Peds. (#/hr)	2					2						
Heavy Vehicles (%)	25%	9%	0%	0%	5%	0%	0%	0%	0%	20%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		54.7	54.7		54.7			13.3			13.3	
Effective Green, g (s)		54.7	54.7		54.7			13.3			13.3	
Actuated g/C Ratio		0.68	0.68		0.68			0.17			0.17	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		1139	1067		1128			220			228	
v/s Ratio Prot												
v/s Ratio Perm		c0.56	0.11		0.41			c0.10			0.00	
v/c Ratio		0.83	0.16		0.59			0.59			0.01	
Uniform Delay, d1		9.2	4.5		6.7			30.9			27.9	
Progression Factor		1.00	1.00		0.95			1.00			1.00	
Incremental Delay, d2		6.9	0.3		1.6			4.3			0.0	
Delay (s)		16.0	4.8		8.0			35.1			27.9	
Level of Service		B	A		A			D			C	
Approach Delay (s)		13.7			8.0			35.1			27.9	
Approach LOS		B			A			D			C	

Intersection Summary					
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.78				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	78.1%	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 Configurations												
Traffic Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Future Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00			1.00			0.99	
Frt			0.850		0.995			0.954			0.956	
Flt Protected		0.999			0.995			0.980			0.988	
Satd. Flow (prot)	0	1665	1501	0	1718	0	0	1700	0	0	1603	0
Flt Permitted		0.991			0.698			0.790			0.904	
Satd. Flow (perm)	0	1652	1501	0	1205	0	0	1370	0	0	1467	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			91		5			30			28	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		360.5			134.2			493.1			262.0	
Travel Time (s)		21.6			8.1			35.5			18.9	
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Adj. Flow (vph)	12	849	91	61	526	24	63	37	51	38	71	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	861	91	0	611	0	0	151	0	0	162	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	2	2	2	6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	56.0	56.0	56.0	56.0	56.0		24.0	24.0		24.0	24.0	
Total Split (%)	70.0%	70.0%	70.0%	70.0%	70.0%		30.0%	30.0%		30.0%	30.0%	
Maximum Green (s)	50.0	50.0	50.0	50.0	50.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0	0.0		0.0			0.0			0.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)		50.0	50.0		50.0			18.0			18.0	
Actuated g/C Ratio		0.62	0.62		0.62			0.22			0.22	
v/c Ratio		0.83	0.09		0.81			0.46			0.46	
Control Delay		14.8	3.2		22.2			26.5			27.0	
Queue Delay		0.0	0.0		0.0			0.0			0.0	
Total Delay		14.8	3.2		22.2			26.5			27.0	
LOS		B	A		C			C			C	
Approach Delay		13.7			22.2			26.5			27.0	
Approach LOS		B			C			C			C	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 80			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 18.6		Intersection LOS: B	
Intersection Capacity Utilization 98.8%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 3: Jones Road & Barton Street

Queues
3: Jones Road & Barton Street

02-16-2018

Lane Group	EBT	EBR	WBT	NBT	SBT
Lane Group Flow (vph)	861	91	611	151	162
v/c Ratio	0.83	0.09	0.81	0.46	0.46
Control Delay	14.8	3.2	22.2	26.5	27.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	3.2	22.2	26.5	27.0
Queue Length 50th (m)	43.1	0.0	65.6	16.5	18.4
Queue Length 95th (m)	m#84.5	m3.1	#141.5	34.5	36.9
Internal Link Dist (m)	336.5		110.2	469.1	238.0
Turn Bay Length (m)					
Base Capacity (vph)	1032	972	755	331	351
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	0.83	0.09	0.81	0.46	0.46

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis
3: Jones Road & Barton Street

02-16-2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Future Volume (vph)	11	781	84	56	484	22	58	34	47	35	65	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.99			0.95			0.96	
Flt Protected		1.00	1.00		1.00			0.98			0.99	
Satd. Flow (prot)		1665	1501		1717			1699			1604	
Flt Permitted		0.99	1.00		0.70			0.79			0.90	
Satd. Flow (perm)		1651	1501		1204			1371			1467	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	12	849	91	61	526	24	63	37	51	38	71	53
RTOR Reduction (vph)	0	0	34	0	2	0	0	23	0	0	22	0
Lane Group Flow (vph)	0	861	57	0	609	0	0	128	0	0	140	0
Confl. Peds. (#/hr)	1					1	1					1
Heavy Vehicles (%)	25%	10%	4%	0%	5%	37%	0%	4%	0%	20%	4%	3%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		50.0	50.0		50.0			18.0			18.0	
Effective Green, g (s)		50.0	50.0		50.0			18.0			18.0	
Actuated g/C Ratio		0.62	0.62		0.62			0.22			0.22	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		1031	938		752			308			330	
v/s Ratio Prot												
v/s Ratio Perm		c0.52	0.04		0.51			0.09			c0.10	
v/c Ratio		0.84	0.06		0.81			0.41			0.43	
Uniform Delay, d1		11.8	5.8		11.4			26.5			26.6	
Progression Factor		0.75	2.04		1.00			1.00			1.00	
Incremental Delay, d2		4.6	0.1		9.2			4.1			4.0	
Delay (s)		13.5	12.0		20.6			30.6			30.5	
Level of Service		B	B		C			C			C	
Approach Delay (s)		13.3			20.6			30.6			30.5	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B		
HCM 2000 Volume to Capacity ratio	0.73				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0		
Intersection Capacity Utilization	98.8%	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 Configurations												
Traffic Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Future Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	20.0		0.0	20.0		0.0
Storage Lanes	0		0	0		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				1.00	
Frt		0.946				0.850		0.947			0.990	
Flt Protected		0.977			0.955		0.950			0.950		
Satd. Flow (prot)	0	1698	0	0	1754	1561	1745	1695	0	1745	1766	0
Flt Permitted		0.799			0.693		0.346			0.332		
Satd. Flow (perm)	0	1388	0	0	1273	1561	634	1695	0	610	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25				157		65			8	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		187.5			512.2			547.7			493.1	
Travel Time (s)		13.5			36.9			39.4			35.5	
Confl. Peds. (#/hr)							4					4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Adj. Flow (vph)	30	8	25	130	8	157	26	427	233	263	596	42
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	63	0	0	138	157	26	660	0	263	638	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	20.0	20.0		20.0	20.0	
Minimum Split (s)	24.0	24.0		24.0	24.0	24.0	26.0	26.0		26.0	26.0	
Total Split (s)	24.0	24.0		24.0	24.0	24.0	46.0	46.0		46.0	46.0	
Total Split (%)	34.3%	34.3%		34.3%	34.3%	34.3%	65.7%	65.7%		65.7%	65.7%	
Maximum Green (s)	18.0	18.0		18.0	18.0	18.0	40.0	40.0		40.0	40.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)		13.0			13.0	13.0	42.9	42.9		42.9	42.9	
Actuated g/C Ratio		0.19			0.19	0.19	0.63	0.63		0.63	0.63	
v/c Ratio		0.22			0.57	0.37	0.07	0.60		0.68	0.57	
Control Delay		16.5			33.4	6.8	6.5	10.3		22.0	10.4	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		16.5			33.4	6.8	6.5	10.3		22.0	10.4	
LOS		B			C	A	A	B		C	B	
Approach Delay		16.5			19.2			10.1			13.8	
Approach LOS		B			B			B			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 67.9			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.68			
Intersection Signal Delay: 13.4		Intersection LOS: B	
Intersection Capacity Utilization 77.7%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: Fruitland Road & Sherwood Park Road/Collector Road B

Queues
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018

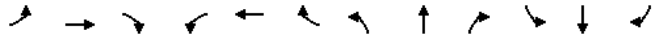
Lane Group	EBT	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	63	138	157	26	660	263	638
v/c Ratio	0.22	0.57	0.37	0.07	0.60	0.68	0.57
Control Delay	16.5	33.4	6.8	6.5	10.3	22.0	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.5	33.4	6.8	6.5	10.3	22.0	10.4
Queue Length 50th (m)	4.0	15.9	0.0	1.1	37.8	18.6	39.5
Queue Length 95th (m)	13.0	31.7	13.1	4.7	85.9	#68.9	84.9
Internal Link Dist (m)	163.5	488.2			523.7		469.1
Turn Bay Length (m)				20.0		20.0	
Base Capacity (vph)	388	339	531	400	1094	384	1117
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.41	0.30	0.07	0.60	0.68	0.57

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: Fruitland Road & Sherwood Park Road/Collector Road B

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Future Volume (vph)	28	7	23	120	7	144	24	393	214	242	548	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Lane Util. Factor		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	
Flpb, ped/bikes		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.95			1.00	0.85	1.00	0.95		1.00	0.99	
Flt Protected		0.98			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1698			1754	1561	1741	1696		1745	1766	
Flt Permitted		0.80			0.69	1.00	0.35	1.00		0.33	1.00	
Satd. Flow (perm)		1389			1272	1561	635	1696		610	1766	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	8	25	130	8	157	26	427	233	263	596	42
RTOR Reduction (vph)	0	20	0	0	0	127	0	24	0	0	3	0
Lane Group Flow (vph)	0	43	0	0	138	30	26	636	0	263	635	0
Confl. Peds. (#/hr)							4					4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	3%	0%
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		13.0			13.0	13.0	42.9	42.9		42.9	42.9	
Effective Green, g (s)		13.0			13.0	13.0	42.9	42.9		42.9	42.9	
Actuated g/C Ratio		0.19			0.19	0.19	0.63	0.63		0.63	0.63	
Clearance Time (s)		6.0			6.0	6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		265			243	298	401	1071		385	1115	
v/s Ratio Prot								0.38			0.36	
v/s Ratio Perm		0.03			c0.11	0.02	0.04			c0.43		
v/c Ratio		0.16			0.57	0.10	0.06	0.59		0.68	0.57	
Uniform Delay, d1		22.9			24.9	22.6	4.8	7.4		8.1	7.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			3.0	0.1	0.3	2.4		9.5	2.1	
Delay (s)		23.2			27.9	22.8	5.1	9.8		17.5	9.3	
Level of Service		C			C	C	A	A		B	A	
Approach Delay (s)		23.2			25.2			9.6			11.7	
Approach LOS		C			C			A			B	

Intersection Summary

HCM 2000 Control Delay	13.4	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.66				
Actuated Cycle Length (s)	67.9	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	77.7%	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 Configurations												
Traffic Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Future Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		10.0	60.0		35.0	25.0		0.0	25.0		0.0
Storage Lanes	2		1	1		1	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor							1.00				0.98	
Frt			0.850			0.850		0.965			0.872	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3351	1801	1561	1745	1818	1459	1616	1772	0	1631	1551	0
Flt Permitted	0.950			0.399			0.167			0.732		
Satd. Flow (perm)	3351	1801	1561	733	1818	1459	284	1772	0	1256	1551	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			34			83		9			280	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		293.2			369.8			289.3			547.7	
Travel Time (s)		17.6			22.2			20.8			39.4	
Confl. Peds. (#/hr)							2					2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Adj. Flow (vph)	504	700	41	30	643	118	20	30	9	178	83	478
Shared Lane Traffic (%)												
Lane Group Flow (vph)	504	700	41	30	643	118	20	39	0	178	561	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		6.6			6.6			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0	2.0	2.0	10.0	2.0	2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6	2.0	2.0	0.6	2.0	2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

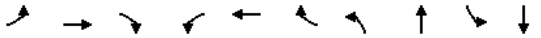
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Detector Phase	5	2	2	6	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		10.0	10.0	
Minimum Split (s)	9.5	27.8	27.8	27.8	27.8	27.8	32.1	32.1		32.1	32.1	
Total Split (s)	21.0	67.9	67.9	46.9	46.9	46.9	32.1	32.1		32.1	32.1	
Total Split (%)	21.0%	67.9%	67.9%	46.9%	46.9%	46.9%	32.1%	32.1%		32.1%	32.1%	
Maximum Green (s)	16.5	62.1	62.1	41.1	41.1	41.1	26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.7	3.7	3.7	3.7	3.7	3.3	3.3		3.3	3.3	
All-Red Time (s)	1.0	2.1	2.1	2.1	2.1	2.1	2.8	2.8		2.8	2.8	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Max	Max	Max	Max	Max	None	None		None	None	
Walk Time (s)		7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0	15.0	15.0	15.0	15.0	19.0	19.0		19.0	19.0	
Pedestrian Calls (#/hr)		0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	16.3	62.2	62.2	41.4	41.4	41.4	23.9	23.9		23.9	23.9	
Actuated g/C Ratio	0.17	0.63	0.63	0.42	0.42	0.42	0.24	0.24		0.24	0.24	
v/c Ratio	0.90	0.61	0.04	0.10	0.84	0.18	0.29	0.09		0.58	0.95	
Control Delay	62.1	14.1	3.2	19.3	37.7	7.7	42.4	23.7		41.0	46.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	62.1	14.1	3.2	19.3	37.7	7.7	42.4	23.7		41.0	46.1	
LOS	E	B	A	B	D	A	D	C		D	D	
Approach Delay		33.2			32.5			30.0			44.9	
Approach LOS		C			C			C			D	

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 98			
Natural Cycle: 90			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 36.0		Intersection LOS: D	
Intersection Capacity Utilization 96.6%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 5: Regalview Drive/Fruitland Road & Highway No. 8

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

02-16-2018



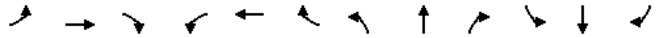
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	504	700	41	30	643	118	20	39	178	561
v/c Ratio	0.90	0.61	0.04	0.10	0.84	0.18	0.29	0.09	0.58	0.95
Control Delay	62.1	14.1	3.2	19.3	37.7	7.7	42.4	23.7	41.0	46.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.1	14.1	3.2	19.3	37.7	7.7	42.4	23.7	41.0	46.1
Queue Length 50th (m)	52.6	81.1	0.5	3.7	117.1	4.2	3.3	4.6	31.4	60.7
Queue Length 95th (m)	#82.8	118.1	4.4	10.0	#183.7	15.4	11.0	13.0	54.2	#130.3
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	564	1143	1003	309	767	663	75	477	333	617
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	0.89	0.61	0.04	0.10	0.84	0.18	0.27	0.08	0.53	0.91

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

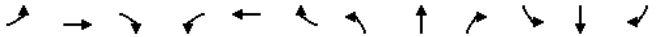
02-16-2018



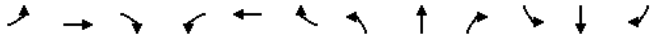
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Future Volume (vph)	464	644	38	28	592	109	18	28	8	164	76	440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	0.97	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	1.00	1.00	1.00	1.00	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.87	
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)	3351	1801	1561	1745	1818	1459	1614	1773		1631	1552	
Flt Permitted	0.95	1.00	1.00	0.40	1.00	1.00	0.17	1.00		0.73	1.00	
Satd. Flow (perm)	3351	1801	1561	733	1818	1459	284	1773		1256	1552	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	504	700	41	30	643	118	20	30	9	178	83	478
RTOR Reduction (vph)	0	0	12	0	0	48	0	7	0	0	212	0
Lane Group Flow (vph)	504	700	29	30	643	70	20	32	0	178	349	0
Confl. Peds. (#/hr)							2					2
Heavy Vehicles (%)	1%	2%	0%	0%	1%	7%	8%	0%	0%	7%	2%	1%
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases			2	6		6	8			4		
Actuated Green, G (s)	16.3	62.2	62.2	41.4	41.4	41.4	23.9	23.9		23.9	23.9	
Effective Green, g (s)	16.3	62.2	62.2	41.4	41.4	41.4	23.9	23.9		23.9	23.9	
Actuated g/C Ratio	0.17	0.63	0.63	0.42	0.42	0.42	0.24	0.24		0.24	0.24	
Clearance Time (s)	4.5	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	557	1143	990	309	768	616	69	432		306	378	
v/s Ratio Prot	c0.15	0.39			c0.35			0.02			c0.23	
v/s Ratio Perm			0.02	0.04		0.05	0.07			0.14		
v/c Ratio	0.90	0.61	0.03	0.10	0.84	0.11	0.29	0.07		0.58	0.92	
Uniform Delay, d1	40.1	10.7	6.7	17.0	25.3	17.2	30.1	28.5		32.6	36.2	
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	18.1	2.5	0.1	0.6	10.5	0.4	2.3	0.1		2.8	27.8	
Delay (s)	58.2	13.2	6.7	17.7	35.8	17.5	32.5	28.6		35.5	64.0	
Level of Service	E	B	A	B	D	B	C	C		D	E	
Approach Delay (s)		31.2			32.4			29.9			57.1	
Approach LOS		C			C			C			E	

Intersection Summary				
HCM 2000 Control Delay	38.3	HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio	0.88			
Actuated Cycle Length (s)	98.0	Sum of lost time (s)	16.4	
Intersection Capacity Utilization	96.6%	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 Configurations												
Traffic Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Future Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	35.0		0.0	25.0		0.0	15.0		0.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988						0.856	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1572	1782	0	1745	1782	0	1745	1837	0	1745	1572	0
Flt Permitted	0.221			0.167			0.695			0.757		
Satd. Flow (perm)	366	1782	0	307	1782	0	1276	1837	0	1390	1572	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10						92	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		380.0			377.6			196.0			436.5	
Travel Time (s)		22.8			22.7			14.1			31.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	71	795	3	1	668	58	3	1	0	76	4	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	798	0	1	726	0	3	1	0	76	96	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.3			3.3			3.3			3.3	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	2.0	10.0		2.0	10.0		2.0	10.0		2.0	10.0	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	2.0	0.6		2.0	0.6		2.0	0.6		2.0	0.6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		9.4			9.4			9.4			9.4	
Detector 2 Size(m)		0.6			0.6			0.6			0.6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	



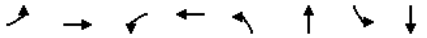
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	66.0	66.0		66.0	66.0		24.0	24.0		24.0	24.0	
Total Split (%)	73.3%	73.3%		73.3%	73.3%		26.7%	26.7%		26.7%	26.7%	
Maximum Green (s)	60.0	60.0		60.0	60.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	33.8	33.8		33.8	33.8		18.5	18.5		18.5	18.5	
Actuated g/C Ratio	0.52	0.52		0.52	0.52		0.29	0.29		0.29	0.29	
v/c Ratio	0.37	0.86		0.01	0.78		0.01	0.00		0.19	0.19	
Control Delay	14.4	22.9		6.0	17.9		22.3	23.0		23.2	7.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.4	22.9		6.0	17.9		22.3	23.0		23.2	7.6	
LOS	B	C		A	B		C	C		C	A	
Approach Delay		22.2			17.9			22.5			14.5	
Approach LOS		C			B			C			B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 64.6			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 19.7		Intersection LOS: B	
Intersection Capacity Utilization 74.6%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 6: Jones Road & Highway No. 8

Queues
6: Jones Road & Highway No. 8

02-16-2018

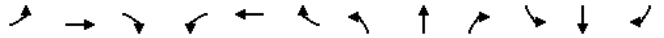


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	71	798	1	726	3	1	76	96
v/c Ratio	0.37	0.86	0.01	0.78	0.01	0.00	0.19	0.19
Control Delay	14.4	22.9	6.0	17.9	22.3	23.0	23.2	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	22.9	6.0	17.9	22.3	23.0	23.2	7.6
Queue Length 50th (m)	4.7	77.2	0.1	64.3	0.3	0.1	6.9	0.4
Queue Length 95th (m)	13.1	120.4	0.6	99.8	2.6	1.4	22.2	12.4
Internal Link Dist (m)		356.0		353.6		172.0		412.5
Turn Bay Length (m)	80.0		35.0		25.0		15.0	
Base Capacity (vph)	332	1620	279	1621	365	525	397	515
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	0.21	0.49	0.00	0.45	0.01	0.00	0.19	0.19

Intersection Summary

HCM Signalized Intersection Capacity Analysis
6: Jones Road & Highway No. 8

02-16-2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Future Volume (vph)	65	731	3	1	615	53	3	1	0	70	4	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	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	1.00		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1572	1782		1745	1782		1745	1837		1745	1573	
Flt Permitted	0.22	1.00		0.17	1.00		0.69	1.00		0.76	1.00	
Satd. Flow (perm)	366	1782		307	1782		1276	1837		1391	1573	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	795	3	1	668	58	3	1	0	76	4	92
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	66	0
Lane Group Flow (vph)	71	798	0	1	721	0	3	1	0	76	30	0
Heavy Vehicles (%)	11%	3%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.8	33.8		33.8	33.8		18.5	18.5		18.5	18.5	
Effective Green, g (s)	33.8	33.8		33.8	33.8		18.5	18.5		18.5	18.5	
Actuated g/C Ratio	0.53	0.53		0.53	0.53		0.29	0.29		0.29	0.29	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	192	936		161	936		367	528		400	452	
v/s Ratio Prot		c0.45			0.40			0.00			0.02	
v/s Ratio Perm	0.19			0.00			0.00			c0.05		
v/c Ratio	0.37	0.85		0.01	0.77		0.01	0.00		0.19	0.07	
Uniform Delay, d1	9.0	13.1		7.3	12.2		16.3	16.3		17.3	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	7.6		0.0	4.0		0.0	0.0		1.1	0.3	
Delay (s)	10.2	20.7		7.3	16.1		16.4	16.3		18.3	16.9	
Level of Service	B	C		A	B		B	B		B	B	
Approach Delay (s)		19.8			16.1			16.4			17.5	
Approach LOS		B			B			B			B	

Intersection Summary					
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.62				
Actuated Cycle Length (s)	64.3	Sum of lost time (s)		12.0	
Intersection Capacity Utilization	74.6%	ICU Level of Service		D	
Analysis Period (min)	15				
c Critical Lane Group					

Appendix T

Phase 2 Road Network with Intersection Improvements – 2031 Signal Justification Warrant Worksheets

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AF
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Sunnyhurst/Gordon Dean

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Barton Road						Sunnyhurst/Gordon Dean						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	8	526	72	31	708	17	231	0	64	7	0	8	
PM Peak Hour	11	853	236	65	587	1	137	0	48	7	0	11	
Average Hourly Volume	5	345	77	24	324	5	92	0	28	4	0	5	0

Warrant	AHV
1A - All	907
1B - Minor	128
2A - Major	779
2B - Cross	96

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	907
					% Fulfilled	126.0%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	128
					% Fulfilled	75.4%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	779
					% Fulfilled	108.2%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	96
					% Fulfilled	127.3%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AF
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Jones Road

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Barton Road						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	48	482	54	43	630	80	92	89	32	24	27	34	
PM Peak Hour	11	788	108	44	496	22	83	34	40	35	65	49	
Average Hourly Volume	15	318	41	22	282	26	44	31	18	15	23	21	0

Warrant	AHV
1A - All	853
1B - Minor	151
2A - Major	702
2B - Cross	89

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	853
					% Fulfilled	118.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	151
					% Fulfilled	88.8%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	702
					% Fulfilled	97.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	89
					% Fulfilled	119.0%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AF
Region/City/Township: City of Hamilton

Major Street: Fruitland Road
Minor Street: Sherwood Park/Collector B
North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Fruitland Road						Sherwood Park/Collector B						
	Northbound			Southbound			Eastbound			Westbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	15	461	99	73	248	9	26	4	28	290	4	229	
PM Peak Hour	30	399	297	236	554	39	28	1	29	185	1	138	
Average Hourly Volume	11	215	99	77	201	12	14	1	14	119	1	92	0

Warrant	AHV
1A - All	856
1B - Minor	241
2A - Major	615
2B - Cross	134

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	856
					% Fulfilled	118.9%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	241
					% Fulfilled	141.6%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	615
					% Fulfilled	85.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	134
					% Fulfilled	178.0%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AF
Region/City/Township: City of Hamilton

Major Street: Highway 8
Minor Street: Jones Road

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Highway 8						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	68	482	3	0	581	70	6	4	1	25	0	48	
PM Peak Hour	65	754	3	1	654	14	3	1	0	47	4	85	
Average Hourly Volume	33	309	2	0	309	21	2	1	0	18	1	33	0

Warrant	AHV
1A - All	730
1B - Minor	56
2A - Major	674
2B - Cross	22

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	730
					% Fulfilled	101.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	56
					% Fulfilled	32.9%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	674
					% Fulfilled	93.6%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	22
					% Fulfilled	28.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AJ
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Sunnyhurst/Gordon Dean

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Barton Road						Sunnyhurst/Gordon Dean						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	8	546	127	9	761	17	247	0	28	7	0	8	
PM Peak Hour	11	898	320	27	632	1	251	0	16	7	0	11	
Average Hourly Volume	5	361	112	9	348	5	125	0	11	4	0	5	0

Warrant	AHV
1A - All	983
1B - Minor	144
2A - Major	839
2B - Cross	128

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	983
					% Fulfilled	136.5%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	144
					% Fulfilled	84.6%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	839
					% Fulfilled	116.6%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	128
					% Fulfilled	170.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AJ
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Jones Road

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Barton Road						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	48	467	53	50	623	80	130	89	48	24	27	34	
PM Peak Hour	11	781	128	56	484	22	83	34	47	35	65	49	
Average Hourly Volume	15	312	45	27	277	26	53	31	24	15	23	21	0

Warrant	AHV
1A - All	867
1B - Minor	166
2A - Major	701
2B - Cross	99

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	867
					% Fulfilled	120.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	166
					% Fulfilled	97.8%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	701
					% Fulfilled	97.3%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	99
					% Fulfilled	131.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AJ
Region/City/Township: City of Hamilton

Major Street: Fruitland Road
Minor Street: Sherwood Park/Collector B
North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Fruitland Road						Sherwood Park/Collector B						
	Northbound			Southbound			Eastbound			Westbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	15	460			248	13	29		28				
PM Peak Hour	30	400			554	40	29		29				
Average Hourly Volume	11	215	0	0	201	13	15	0	14	0	0	0	0

Warrant	AHV
1A - All	469
1B - Minor	29
2A - Major	440
2B - Cross	15

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	469
					% Fulfilled	65.1%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	29
					% Fulfilled	16.9%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	440
					% Fulfilled	61.1%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	15
					% Fulfilled	19.3%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2AJ
Region/City/Township: City of Hamilton

Major Street: Highway 8
Minor Street: Jones Road
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Highway 8						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	132	439	3	0	565	86	6	4	1	69	0	267	
PM Peak Hour	279	731	3	1	615	53	3	1	0	70	4	205	
Average Hourly Volume	103	293	2	0	295	35	2	1	0	35	1	118	0

Warrant	AHV
1A - All	884
1B - Minor	158
2A - Major	727
2B - Cross	38

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	884
					% Fulfilled	122.8%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	158
					% Fulfilled	92.6%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	727
					% Fulfilled	100.9%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	38
					% Fulfilled	51.0%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2B
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Sunnyhurst/Gordon Dean
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Barton Road						Sunnyhurst/Gordon Dean						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	8	530	68	9	712	17	227	0	28	7	0	8	
PM Peak Hour	11	854	235	27	588	1	136	0	16	7	0	11	
Average Hourly Volume	5	346	76	9	325	5	91	0	11	4	0	5	0

Warrant	AHV
1A - All	875
1B - Minor	110
2A - Major	765
2B - Cross	94

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	875
					% Fulfilled	121.5%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	110
					% Fulfilled	64.7%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	765
					% Fulfilled	106.3%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	94
					% Fulfilled	125.7%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2B
Region/City/Township: City of Hamilton

Major Street: Barton Road
Minor Street: Jones Road

North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Barton Road						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	48	467	37	50	623	80	81	89	48	24	27	34	
PM Peak Hour	11	781	84	56	484	22	58	34	37	35	65	49	
Average Hourly Volume	15	312	30	27	277	26	35	31	21	15	23	21	0

Warrant	AHV
1A - All	831
1B - Minor	145
2A - Major	686
2B - Cross	80

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	831
					% Fulfilled	115.4%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	145
					% Fulfilled	85.4%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	686
					% Fulfilled	95.2%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	80
					% Fulfilled	107.0%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2B
Region/City/Township: City of Hamilton

Major Street: Fruitland Road
Minor Street: Sherwood Park/Collector B
North/South?: Y

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street						Minor Street						
	Fruitland Road						Sherwood Park/Collector B						
	Northbound			Southbound			Eastbound			Westbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	13	459	64	76	245	9	26	7	25	217	6	231	
PM Peak Hour	24	393	214	242	548	39	28	7	23	120	7	144	
Average Hourly Volume	9	213	70	80	198	12	14	4	12	84	3	94	0

Warrant	AHV
1A - All	792
1B - Minor	210
2A - Major	582
2B - Cross	101

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	792
					% Fulfilled	110.0%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	210
					% Fulfilled	123.7%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	582
					% Fulfilled	80.8%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	101
					% Fulfilled	135.0%

Signal Justification Calculation for Forecasted Volumes
(OTM Book 12 - Justification 7)

Horizon Year: 2031 (Total Traffic) Phase 2B
Region/City/Township: City of Hamilton

Major Street: Highway 8
Minor Street: Jones Road
North/South?: N

Number of Approach Lanes: 1
Tee Intersection? N
Flow Conditions: Restricted

PM Forecast Only? N

Warrant Results		
150% Satisfied	No	Justification for new intersections with forecast traffic
120% Satisfied	No	Justification for existing intersections with forecast traffic

	Major Street Highway 8						Minor Street Jones Road						
	Eastbound			Westbound			Northbound			Southbound			Peds Crossing
Time Period	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Main Road
AM Peak Hour	68	439	3	0	565	86	6	4	1	69	0	50	
PM Peak Hour	65	731	3	1	615	53	3	1	0	70	4	85	
Average Hourly Volume	33	293	2	0	295	35	2	1	0	35	1	34	0

Warrant	AHV
1A - All	731
1B - Minor	73
2A - Major	657
2B - Cross	38

Warrant 1 - Minimum Vehicular Volume

	Approach Lanes	1		2 or more		Average Hourly Volume
1A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	All Approaches	480	720	600	900	731
					% Fulfilled	101.5%

	Approach Lanes	1		2 or more		Average Hourly Volume
1B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Minor Street Approaches	120	170	120	170	73
					% Fulfilled	43.1%

Warrant 2 - Delay To Cross Traffic

	Approach Lanes	1		2 or more		Average Hourly Volume
2A	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Major Street Approaches	480	720	600	900	657
					% Fulfilled	91.3%

	Approach Lanes	1		2 or more		Average Hourly Volume
2B	Flow Conditions	Free	Restricted	Free	Restricted	
			X			
	Traffic Crossing Major Street	50	75	50	75	38
					% Fulfilled	51.0%

Appendix U

Phase 3 Road Network with Signal Optimization – 2031 Total Traffic Operations Reports

Queues
1: Fruitland Road & Barton Street

08-24-2017

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	310	461	49	686	304	228	529	66	216	257	317
v/c Ratio	0.90	0.32	0.23	0.77	0.58	0.54	0.93	0.13	0.94	0.52	0.56
Control Delay	52.4	21.4	37.3	46.3	16.7	24.8	64.6	2.8	74.7	40.1	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.4	21.4	37.3	46.3	16.7	24.8	64.6	2.8	74.7	40.1	15.7
Queue Length 50th (m)	50.0	37.1	9.4	83.1	18.6	33.4	123.6	0.0	34.1	52.8	19.2
Queue Length 95th (m)	#103.0	50.3	21.0	106.9	50.0	51.9	#187.8	5.1	#83.8	80.4	49.5
Internal Link Dist (m)		201.8		131.4			469.1			155.3	
Turn Bay Length (m)	80.0		35.0		40.0	35.0		25.0	50.0		25.0
Base Capacity (vph)	345	1437	216	895	526	446	595	535	229	504	574
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	0.90	0.32	0.23	0.77	0.58	0.51	0.89	0.12	0.94	0.51	0.55

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-24-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	358	66	45	631	280	210	487	61	199	236	292
Future Volume (vph)	285	358	66	45	631	280	210	487	61	199	236	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0	6.0	4.5	6.3	6.3	4.5	6.3	6.3
Lane Util. Factor	1.00	0.95		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		1.00	1.00	0.98	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
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1661	3173		1477	3144	1324	1585	1801	1426	1662	1733	1451
Flt Permitted	0.20	1.00		0.49	1.00	1.00	0.42	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	343	3173		757	3144	1324	701	1801	1426	235	1733	1451
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	310	389	72	49	686	304	228	529	66	216	257	317
RTOR Reduction (vph)	0	12	0	0	0	149	0	0	45	0	0	153
Lane Group Flow (vph)	310	449	0	49	686	155	228	529	21	216	257	164
Confl. Peds. (#/hr)	2		1	1		2	2		1	1		2
Heavy Vehicles (%)	5%	5%	18%	18%	11%	15%	10%	2%	8%	5%	6%	6%
Turn Type	pm+pt	NA		Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2			6		6	8		8	4		4
Actuated Green, G (s)	53.9	53.9		34.2	34.2	34.2	52.7	37.8	37.8	45.9	34.4	34.4
Effective Green, g (s)	53.9	53.9		34.2	34.2	34.2	52.7	37.8	37.8	45.9	34.4	34.4
Actuated g/C Ratio	0.45	0.45		0.29	0.29	0.29	0.44	0.31	0.31	0.38	0.29	0.29
Clearance Time (s)	3.0	6.0		6.0	6.0	6.0	4.5	6.3	6.3	4.5	6.3	6.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	337	1425		215	896	377	417	567	449	226	496	415
v/s Ratio Prot	c0.13	0.14			0.22		c0.07	c0.29		c0.09	0.15	
v/s Ratio Perm	c0.28			0.06		0.12	0.17		0.01	0.27		0.11
v/c Ratio	0.92	0.32		0.23	0.77	0.41	0.55	0.93	0.05	0.96	0.52	0.39
Uniform Delay, d1	25.0	21.2		32.8	39.2	34.7	22.7	39.9	28.6	29.7	35.9	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
Incremental Delay, d2	29.1	0.6		2.5	6.2	3.3	1.5	22.5	0.0	47.1	0.9	0.6
Delay (s)	54.1	21.8		35.3	45.4	38.0	24.2	62.4	28.6	76.8	36.8	35.0
Level of Service	D	C		D	D	D	C	E	C	E	D	D
Approach Delay (s)		34.8			42.8			49.1			47.0	
Approach LOS		C			D			D			D	

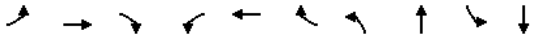
Intersection Summary

HCM 2000 Control Delay	43.5	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	0.95				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		19.8	
Intersection Capacity Utilization	94.0%	ICU Level of Service		F	
Analysis Period (min)	15				

c Critical Lane Group

Queues
5: Regalview Drive/Fruitland Road & Highway No. 8

08-24-2017



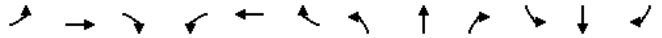
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	255	523	20	11	776	125	30	89	95	231
v/c Ratio	0.69	0.41	0.02	0.02	0.62	0.13	0.32	0.33	0.55	0.58
Control Delay	20.6	6.7	1.1	4.7	9.7	2.3	42.1	32.4	46.7	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	6.7	1.1	4.7	9.7	2.3	42.1	32.4	46.7	12.8
Queue Length 50th (m)	20.2	29.9	0.0	0.5	56.3	1.8	4.8	12.5	15.6	2.9
Queue Length 95th (m)	#79.8	60.4	1.4	2.4	114.6	8.1	13.3	26.1	31.3	23.3
Internal Link Dist (m)		269.2			322.3			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	371	1264	981	574	1252	965	189	530	346	579
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	0.69	0.41	0.02	0.02	0.62	0.13	0.16	0.17	0.27	0.40

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
5: Regalview Drive/Fruitland Road & Highway No. 8

08-24-2017



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	481	18	10	714	115	28	68	14	87	14	199
Future Volume (vph)	235	481	18	10	714	115	28	68	14	87	14	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Lane Util. Factor	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	1.00	1.00	1.00	0.98	1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	0.86	
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)	1677	1766	1358	1745	1749	1316	1581	1761		1586	1450	
Flt Permitted	0.29	1.00	1.00	0.44	1.00	1.00	0.38	1.00		0.70	1.00	
Satd. Flow (perm)	519	1766	1358	803	1749	1316	639	1761		1168	1450	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	523	20	11	776	125	30	74	15	95	15	216
RTOR Reduction (vph)	0	0	6	0	0	23	0	9	0	0	181	0
Lane Group Flow (vph)	255	523	14	11	776	102	30	80	0	95	50	0
Confl. Peds. (#/hr)	1					1	3					3
Heavy Vehicles (%)	4%	4%	15%	0%	5%	16%	10%	0%	10%	10%	11%	6%
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	62.7	62.7	62.7	62.7	62.7	62.7	13.0	13.0		13.0	13.0	
Effective Green, g (s)	62.7	62.7	62.7	62.7	62.7	62.7	13.0	13.0		13.0	13.0	
Actuated g/C Ratio	0.72	0.72	0.72	0.72	0.72	0.72	0.15	0.15		0.15	0.15	
Clearance Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.1	6.1		6.1	6.1	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	371	1264	971	574	1251	941	94	261		173	215	
v/s Ratio Prot		0.30			0.44			0.05			0.03	
v/s Ratio Perm	c0.49		0.01	0.01		0.08	0.05			c0.08		
v/c Ratio	0.69	0.41	0.01	0.02	0.62	0.11	0.32	0.31		0.55	0.23	
Uniform Delay, d1	7.0	5.0	3.6	3.6	6.4	3.8	33.3	33.3		34.6	32.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.0	1.0	0.0	0.1	2.3	0.2	2.0	0.7		3.5	0.6	
Delay (s)	16.9	6.0	3.6	3.6	8.7	4.1	35.3	34.0		38.1	33.5	
Level of Service	B	A	A	A	A	A	D	C		D	C	
Approach Delay (s)		9.5			8.0			34.3			34.8	
Approach LOS		A			A			C			C	

Intersection Summary					
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B		
HCM 2000 Volume to Capacity ratio	0.66				
Actuated Cycle Length (s)	87.6	Sum of lost time (s)	11.9		
Intersection Capacity Utilization	92.3%	ICU Level of Service	F		
Analysis Period (min)	15				

c Critical Lane Group

Queues
1: Fruitland Road & Barton Street

08-24-2017

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	361	1028	111	520	220	138	380	88	353	629	238
v/c Ratio	0.91	0.67	0.81	0.44	0.33	1.03	0.72	0.19	1.04	0.81	0.31
Control Delay	54.9	26.7	77.1	31.4	5.0	127.4	46.4	7.2	84.8	39.1	4.2
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	54.9	26.7	77.1	31.4	5.0	127.4	46.4	7.2	84.8	39.1	4.2
Queue Length 50th (m)	58.1	99.4	24.8	51.7	0.0	33.9	82.7	0.0	~59.5	130.2	1.6
Queue Length 95th (m)	#119.9	124.2	#60.1	68.1	17.0	#77.1	119.0	12.3	#126.7	181.6	16.4
Internal Link Dist (m)		201.8		131.4			469.1			155.3	
Turn Bay Length (m)	80.0		35.0			35.0			50.0		
Base Capacity (vph)	395	1537	137	1185	661	140	550	489	340	797	776
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	0.91	0.67	0.81	0.44	0.33	0.99	0.69	0.18	1.04	0.79	0.31

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.

HCM Signalized Intersection Capacity Analysis
1: Fruitland Road & Barton Street

08-24-2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	332	704	242	102	478	202	127	350	81	325	579	219
Future Volume (vph)	332	704	242	102	478	202	127	350	81	325	579	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0	6.0	6.3	6.3	6.3	3.0	6.3	6.3
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.98	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
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1694	3264		1661	3388	1482	1641	1801	1400	1601	1783	1456
Flt Permitted	0.35	1.00		0.22	1.00	1.00	0.27	1.00	1.00	0.26	1.00	1.00
Satd. Flow (perm)	619	3264		392	3388	1482	462	1801	1400	445	1783	1456
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	361	765	263	111	520	220	138	380	88	353	629	238
RTOR Reduction (vph)	0	28	0	0	0	143	0	0	62	0	0	128
Lane Group Flow (vph)	361	1000	0	111	520	77	138	380	26	353	629	110
Confl. Peds. (#/hr)	1		1	1		1	7		1	1		7
Heavy Vehicles (%)	3%	3%	0%	5%	3%	3%	6%	2%	10%	9%	3%	5%
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2			6			8		7	4	
Permitted Phases	2			6		6	8		8	4		4
Actuated Green, G (s)	55.5	55.5		42.0	42.0	42.0	35.2	35.2	35.2	52.2	52.2	52.2
Effective Green, g (s)	55.5	55.5		42.0	42.0	42.0	35.2	35.2	35.2	52.2	52.2	52.2
Actuated g/C Ratio	0.46	0.46		0.35	0.35	0.35	0.29	0.29	0.29	0.44	0.44	0.44
Clearance Time (s)	3.0	6.0		6.0	6.0	6.0	6.3	6.3	6.3	3.0	6.3	6.3
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	380	1509		137	1185	518	135	528	410	328	775	633
v/s Ratio Prot	c0.08	0.31			0.15			0.21		c0.13	0.35	
v/s Ratio Perm	c0.36			0.28		0.05	0.30		0.02	c0.34		0.08
v/c Ratio	0.95	0.66		0.81	0.44	0.15	1.02	0.72	0.06	1.08	0.81	0.17
Uniform Delay, d1	28.6	25.0		35.4	29.9	26.7	42.4	38.0	30.5	30.2	29.6	20.7
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	33.0	2.3		38.6	1.2	0.6	83.5	4.7	0.1	71.5	6.5	0.1
Delay (s)	61.6	27.3		74.0	31.1	27.3	125.9	42.7	30.6	101.7	36.1	20.9
Level of Service	E	C		E	C	C	F	D	C	F	D	C
Approach Delay (s)		36.2			35.7			59.9			52.1	
Approach LOS		D			D			E			D	

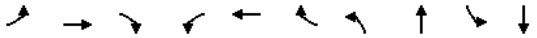
Intersection Summary					
HCM 2000 Control Delay	44.4	HCM 2000 Level of Service		D	
HCM 2000 Volume to Capacity ratio	1.06				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		18.3	
Intersection Capacity Utilization	107.4%	ICU Level of Service		G	
Analysis Period (min)	15				

c Critical Lane Group

Queues

5: Regalview Drive/Fruitland Road & Highway No. 8

08-24-2017



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	302	902	41	30	755	118	20	39	178	448
v/c Ratio	0.92	0.76	0.04	0.13	0.63	0.12	0.28	0.10	0.66	0.89
Control Delay	53.7	17.7	3.2	9.2	13.5	3.3	40.9	24.1	46.3	39.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.7	17.7	3.2	9.2	13.5	3.3	40.9	24.1	46.3	39.7
Queue Length 50th (m)	49.0	114.8	0.5	2.1	82.0	2.5	3.2	4.6	31.4	45.6
Queue Length 95th (m)	#116.5	190.6	4.4	6.9	132.8	9.5	10.6	13.0	54.2	#96.8
Internal Link Dist (m)		269.2			345.8			265.3		523.7
Turn Bay Length (m)	75.0		10.0	60.0		35.0	25.0		25.0	
Base Capacity (vph)	327	1188	1041	230	1199	989	92	496	347	586
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	0.92	0.76	0.04	0.13	0.63	0.12	0.22	0.08	0.51	0.76

Intersection Summary

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

Species	Current Common Name (NHIC 2020)	G_RANK	S_RANK	COSEWIC (2017)	MNR (SARO 2017)	Hamilton (2014)	CC	CW	Native Status
Cornus racemosa	Gray Dogwood	G5?	S5				2	-2	N
Cornus sericea	Red-osier Dogwood	G5	S5				2	-3	N
Crataegus compacta	Clustered Hawthorn	G5	S4			H	4	5	N
Crataegus macrosperma	Big-fruited Hawthorn	G5	S5				4	5	N
Crataegus pruinosa s.l.	Frosted Hawthorn	G5	S5				4	5	N
Crataegus sp	Hawthorn Species								
Crataegus submollis	Quebec Hawthorn	G5	S5				4	5	N
Cynoglossum officinale	Common Hound's-tongue	GNR	SNA				0	5	I
Dactylis glomerata	Orchard Grass	GNR	SNA				0	3	I
Daucus carota	Wild Carrot	GNR	SNA				0	5	I
Dipsacus fullonum	Fuller's Teasel	GNR	SNA				0	5	I
Echinochloa crus-galli	Large Barnyard Grass	GNR	SNA				0	-3	I
Echinocystis lobata	Wild Mock-cucumber	G5	S5				3	-2	N
Eleocharis obtusa	Blunt Spikerush	G5	S5				5	-5	N
Elymus repens	Creeping Wildrye	GNR	SNA				0	3	I
Epilobium ciliatum	Hairy Willowherb	G5	S5				3	3	N
Epilobium hirsutum	Hairy Willowherb	GNR	SNA				0	-4	I
Equisetum arvense	Field Horsetail	G5	S5				0	0	N
Erigeron annuus	Annual Fleabane	G5	S5				0	1	N
Erigeron philadelphicus	Philadelphia Fleabane	G5	S5				1	-3	N
Euphorbia esula	Leafy Spurge	GNR	SNA				0	5	I
Euthamia graminifolia	Grass-leaved Goldenrod	G5	S5				2	-2	N
Fallopia japonica	Japanese Knotweed	GNR	SNA				0	3	I
Festuca rubra	Red Fescue	G5	S5				0	1	N
Fragaria virginiana	Wild Strawberry	G5	S5				2	1	N
Fraxinus americana	White Ash	G5	S4				4	3	N
Fraxinus pennsylvanica	Green Ash	G5	S4				3	-3	N
Geranium maculatum	Spotted Geranium	G5	S5				6	3	N
Geranium robertianum	Herb-Robert	G5	S5				0	5	I
Geum sp	Avens Species								
Glechoma hederacea	Ground Ivy	GNR	SNA				0	3	I
Gleditsia triacanthos	Honey-locust	G5	S2				3	0	N
Hesperis matronalis	Dame's Rocket	G4G5	SNA				0	5	I
Hordeum jubatum ssp. jubatum	Foxtail Barley	G5T5	S5				0	-1	N
Hypericum perforatum	Common St. John's-wort	GNR	SNA				0	5	I
Impatiens capensis	Spotted Jewelweed	G5	S5				4	-3	N
Inula helenium	Elecampane	GNR	SNA				0	5	I
Juglans nigra	Black Walnut	G5	S4				5	3	N
Juncus dudleyi	Dudley's Rush	G5	S5				1	0	N
Juncus effusus	Soft Rush	G5	S5				4	-5	N
Juncus sp	Rush Species								
Juniperus virginiana	Eastern Red Cedar	G5	S5				4	3	N
Lactuca serriola	Prickly Lettuce	GNR	SNA				0	0	I
Lathyrus tuberosus	Tuberous Vetchling	GNR	SNA				0	5	I
Leonurus cardiaca	Common Motherwort	GNR	SNA				0	5	I
Leucanthemum vulgare	Oxeye Daisy	GNR	SNA				0	5	I

Species	Current Common Name (NHIC 2020)	G_RANK	S_RANK	COSEWIC (2017)	MNR (SARO 2017)	Hamilton (2014)	CC	CW	Native Status
Ligustrum vulgare	European Privet	GNR	SNA				0	1	I
Linaria vulgaris	Butter-and-eggs	GNR	SNA				0	5	I
Lonicera sp	Honeysuckle Species								
Lonicera tatarica	Tartarian Honeysuckle	GNR	SNA				0	3	I
Lotus corniculatus	Garden Bird's-foot Trefoil	GNR	SNA				0	1	I
Lysimachia nummularia	Creeping Jennie	GNR	SNA				0	-4	I
Lythrum salicaria	Purple Loosestrife	G5	SNA				0	-5	I
Maianthemum racemosum	False Solomon's-seal	G5	S5				4	3	N
Malus pumila	Common Apple	G5	SNA				0	5	I
Malus sp	Apple Species								
Medicago lupulina	Black Medic	GNR	SNA				0	1	I
Melilotus albus	White Sweet-clover	G5	SNA				0	3	I
Melilotus officinalis	Yellow Sweet-clover	GNR	SNA				0	3	I
Melilotus sp	Sweet Clover Species								
Mentha sp	Mint Species								
Mentha x piperita	(Mentha aquatica X Mentha spicata)	GNA	SNA				0	-5	I
Oenothera biennis	Common Evening Primrose	G5	S5				0	3	N
Oxalis sp	Wood Sorrel Species								
Panicum capillare	Common Panicgrass	G5	S5				0	0	N
Parthenocissus inserta	Thicket Creeper	G5	S5				3	3	N
Parthenocissus vitacea	Thicket Creeper	G5	S5				3	3	N
Persicaria hydropiper	Marshpepper Smartweed	GNR	SNA				4	-5	I
Persicaria lapathifolia	Pale Smartweed	G5	S5				2	-4	N
Persicaria maculosa	Spotted Lady's-thumb	G3G5	SNA				0	-3	N
Persicaria pensylvanica	Pennsylvania Smartweed	G5	S5				3	-4	N
Phalaris arundinacea	Reed Canary Grass	G5	S5				0	-4	N
Phleum pratense	Common Timothy	GNR	SNA				0	3	I
Phragmites australis ssp. australis	European Reed	G5T5	SNA						I
Picea abies	Norway Spruce	G5	SNA				0	5	I
Picea glauca	White Spruce	G5	S5				6	3	N
Picea pungens	Blue Spruce	G5	SNA						I
Picris hieracioides	Hawkweed Oxtongue	G5	SNA				0	5	I
Pilosella piloselloides ssp. praealta	King Devil Hawkweed	GNR	SNA						I
Pinus resinosa	Red Pine	G5	S5				8	3	N
Pinus strobus	Eastern White Pine	G5	S5				4	3	N
Pinus sylvestris	Scotch Pine	GNR	SNA				0	5	I
Plantago major	Common Plantain	G5	S5				0	-1	N
Poa pratensis	Kentucky Bluegrass	G5	S5				0	1	N
Poa pratensis ssp. agassizensis	Agassiz's Bluegrass	GNR	SU						
Poa pratensis ssp. pratensis	Kentucky Bluegrass	G5T5	S5				0	1	N
Polygonum sp	Smartweed Species								
Populus deltoides	Eastern Cottonwood	G5	S5				4	-1	N
Populus grandidentata	Large-tooth Aspen	G5	S5				5	3	N
Populus tremuloides	Trembling Aspen	G5	S5				2	0	N
Potentilla recta	Sulphur Cinquefoil	GNR	SNA				0	5	I
Potentilla simplex	Old-field Cinquefoil	G5	S5				3	4	N

Species	Current Common Name (NHIC 2020)	G_RANK	S_RANK	COSEWIC (2017)	MNR (SARO 2017)	Hamilton (2014)	CC	CW	Native Status
Prenanthes sp	Rattlesnake-root Species								
Prunella vulgaris	Self-heal	G5	S5						N
Prunus avium	Sweet Cherry	GNR	SNA				0	5	I
Prunus serotina	Black Cherry	G5	S5				3	3	N
Prunus sp	Cherry Species								
Prunus virginiana	Choke Cherry	G5	S5				2	1	N
Pyrus communis	Common Pear	G5	SNA				0	5	I
Quercus alba	White Oak	G5	S5				6	3	N
Quercus macrocarpa	Bur Oak	G5	S5				5	1	N
Quercus rubra	Northern Red Oak	G5	S5				6	3	N
Ranunculus acris	Tall Buttercup	G5	SNA				0	-2	I
Ranunculus bulbosus	Bulbous Buttercup	GNR	SNA				0	-3	I
Ranunculus repens	Creeping Buttercup	GNR	SNA				0	-1	I
Ranunculus sceleratus var. sceleratus	Cursed Buttercup	G5T5	SNA				2	-5	I
Ranunculus sp	Buttercup Species								
Rhamnus cathartica	Common Buckthorn	GNR	SNA				0	3	I
Rhus typhina	Staghorn Sumac	G5	S5				1	5	N
Ribes americanum	Wild Black Currant	G5	S5				4	-3	N
Rosa canina	Dog Rose	GNR	SNA				0	5	I
Rosa carolina ssp. carolina	Carolina Rose	GNR	S4				6	4	N
Rosa multiflora	Multiflora Rose	GNR	SNA				0	3	I
Rosa sp	Rose Species								
Rubus allegheniensis	Alleghany Blackberry	G5	S5				2	2	N
Rubus idaeus ssp. strigosus	Wild Red Raspberry	G5T5	S5				0	-2	N
Rubus occidentalis	Black Raspberry	G5	S5				2	5	N
Rumex acetosella	Sheep Sorrel	GNR	SNA				0	0	I
Rumex crispus	Curly Dock	GNR	SNA				0	-1	I
Salix alba	White Willow	G5	SNA				0	-3	I
Salix bebbiana	Bebb's Willow	G5	S5				4	-4	N
Salix eriocephala	Heart-leaved Willow	G5	S5				4	-3	N
Salix sp	Willow Species								
Sambucus canadensis	Common Elderberry	G5T5	S5				5	-2	N
Scirpus atrovirens	Dark-green Bulrush	G5?	S5				3	-5	N
Scirpus cyperinus	Cottongrass Bulrush	G5	S5				4	-5	N
Securigera varia	Common Crown-vetch	GNR	SNA				0	5	I
Solanum dulcamara	Climbing Nightshade	GNR	SNA				0	0	I
Solidago canadensis var. canadensis	Canada Goldenrod	G5T5	S5				1	3	N
Solidago juncea	Early Goldenrod	G5	S5				3	5	N
Solidago nemoralis	Gray-stemmed Goldenrod	G5	S5				2	5	N
Sonchus arvensis	Field Sow-thistle	GNR	SNA					1	I
Sonchus arvensis ssp. arvensis	Field Sow-thistle	GNRTNR	SNA				0	1	I
Sorbus aucuparia	European Mountain-ash	G5	SNA				0	5	I
Symphyotrichum cordifolium	Heart-leaved Aster	G5	S5				5	5	N
Symphyotrichum ericoides	White Heath Aster	G5	S5				4	4	N
Symphyotrichum lanceolatum ssp. lanceolatum	Panicled Aster	G5T5	S5				3	-3	N

Species	Current Common Name (NHIC 2020)	G_RANK	S_RANK	COSEWIC (2017)	MNR (SARO 2017)	Hamilton (2014)	CC	CW	Native Status
Symphyotrichum novae-angliae	New England Aster	G5	S5				2	-3	N
Symphyotrichum pilosum	White Heath Aster	G5	S5						N
Symphyotrichum puniceum	Swamp Aster	G5	S5				6	-5	N
Taraxacum officinale	Common Dandelion	G5	SNA				0	3	I
Taxus canadensis	Canadian Yew	G5	S4				7	3	N
Thuja occidentalis	Eastern White Cedar	G5	S5				4	-3	N
Toxicodendron radicans	Climbing Poison Ivy	G5	S5				5	-1	N
Toxicodendron radicans var. rydbergii	Western Poison Ivy	G5	S5				0	0	N
Trifolium pratense	Red Clover	GNR	SNA				0	2	I
Trifolium repens	White Clover	GNR	SNA				0	2	I
Trifolium sp	Clover Species								
Tussilago farfara	Colt's-foot	GNR	SNA				0	3	I
Typha angustifolia	Narrow-leaved Cattail	G5	SNA				3	-5	I
Typha latifolia	Broad-leaved Cattail	G5	S5				3	-5	N
Typha x glauca	(Typha angustifolia X Typha latifolia)	GNA	SNA				3	-5	I
Ulmus americana	American Elm	G5?	S5				3	-2	N
Ulmus rubra	Slippery Elm	G5	S5				6	0	N
Urtica dioica ssp. dioica	European Stinging Nettle	G5T5?	SNA				0	-1	I
Verbascum thapsus	Common Mullein	GNR	SNA				0	5	I
Verbena hastata	Blue Vervain	G5	S5				4	-4	N
Viburnum opulus ssp. opulus	Cranberry Viburnum	GNR	SNA				0	0	I
Vicia cracca	Tufted Vetch	GNR	SNA				0	5	I
Vicia sp	Vetch Species								
Vicia tetrasperma	Four-seeded Vetch	GNR	SNA				0	5	I
Vinca minor	Periwinkle	GNR	SNA				0	5	I
Viola sp	Violet Species								
		G5	S5				0	-2	N

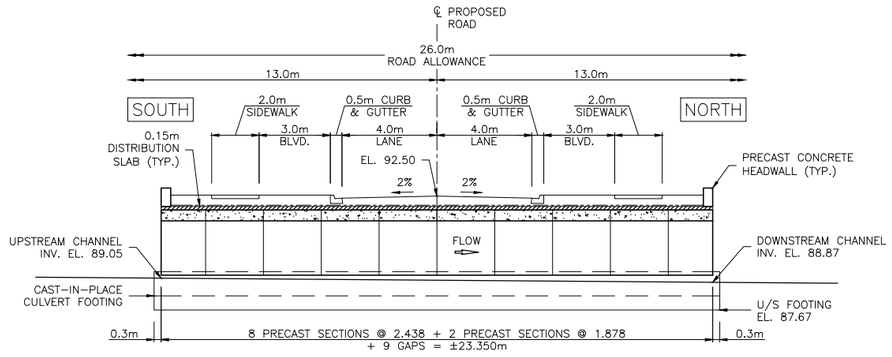
	On culvert crossing, facing downstream
	Upstream of existing culvert crossing, facing downstream.
	Upstream of existing culvert crossing, facing upstream.

		Facing east across Watercourse 5.0 crossing location
		Facing west across Watercourse 5.0 crossing location
		Potential fish barrier downstream of the Study Area, facing upstream. Photo 1 of 2 at this location.

	Potential fish barrier downstream of the Study Area, facing upstream. Photo 2 of 2 at this location.
	Potential fish barrier approximately 150 m downstream of crossing location. Photo 1 of 2 at this location.
	Potential fish barrier approximately 150 m downstream of crossing location. Photo 2 of 2 at this location.

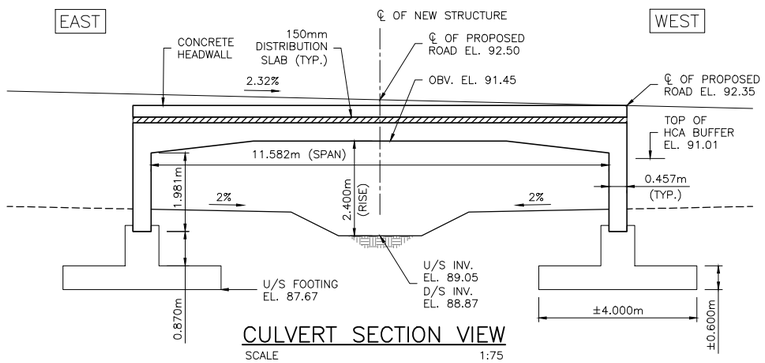
Appendix B

Culvert Drawing



ELEVATION

SCALE 1:125



CULVERT SECTION VIEW

SCALE 1:75

Path: P:\Work\TP115082 - Gordon Dean Avenue\06_DES-ENG\01_CAD\02_DWGS\03_STRUC\02_CONT\TP115082-S1.dwg

Plotted: 2020-04-23 Plotted By: khaled.kallas
Last Saved: 2020-04-14 Last Saved By: khaled.kallas

No	Date	Drawn	Appr'd	Revisions

Design	KK	Checked	
Drawn	PK	Checked	
Scale	AS SHOWN		
Date	APRIL 2020		

tw9[LaLb!w¸ bh¢¢h .9¦{95 Chw/hb{¢w¦/¢Lhb

Dhw5hb 59!b !±9b¦9 {/I95¦[9ч/ч a¦bL/Lt![/[!{{ 9b±Lwhb a9b¢![!{{9{{a9b¢ ót I!{9{ o ƨ nύ

EAST-WEST COLLECTOR ROAD
SPAN CULVERT AT WC 5

wood.

Contract No.

Consultant File No. TP115082

Drawing No. SHEET S1 OF S1

Ministry of Heritage, Sport, Tourism, and Culture Industries

Archaeology Program Unit
Programs and Services Branch
Heritage, Tourism and Culture Division
401 Bay Street, Suite 1700
Toronto ON M7A 0A7
Tel.: (519) 671-7742
Email: Shari.Prowse@ontario.ca

Ministère des Industries du patrimoine, du sport, du tourisme et de la culture

Unité des programme d'archéologie
Direction des programmes et des services
Division du patrimoine, du tourisme et de la culture
401, rue Bay, bureau 1700
Toronto ON M7A 0A7
Tél. : (519) 671-7742
Email: Shari.Prowse@ontario.ca

Ontario

Oct 19, 2020

Jason Seguin (P354)
Wood Environment &Infrastructure Solutions
302 - 325 James Hamilton ON L8P 3B7

RE: Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Original Report: Stage 1 Archaeological Assessment Gordon Dean Avenue Schedule “C” Municipal Class EA, Located on Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario ", Dated Sep 25, 2020, Filed with MHSTCI Toronto Office on Oct 2, 2020, MHSTCI Project Information Form Number P354-0054-2020, MHSTCI File Number 0012930

Dear Mr. Seguin:

This office has reviewed the above-mentioned report, which has been submitted to this ministry as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18.[1] This review has been carried out in order to determine whether the licensed professional consultant archaeologist has met the terms and conditions of their licence, that the licensee assessed the property and documented archaeological resources using a process that accords with the 2011 *Standards and Guidelines for Consultant Archaeologists* set by the ministry, and that the archaeological fieldwork and report recommendations are consistent with the conservation, protection and preservation of the cultural heritage of Ontario.

The report documents the Stage 1 archaeological assessment of the study area as depicted in Figure 8 ARO of the above titled report and recommends the following:

1) Approximately 0.13 ha (1%) of the study area is permanently low and wet and approximately 4.43 ha (23%) of the study area has been previously disturbed (Figure 8). The low and wet areas and the previously disturbed areas are evaluated as having low to no archaeological potential and do not require further archaeological assessment.

2) Approximately 6.39 ha (33%) of the study area is an actively cultivated agricultural field with archaeological potential (Figure 8). Therefore, it should be subject to Stage 2 property survey by means of pedestrian survey, as per Section 2.1.1 Standard 1 of the Standards and Guidelines for Consultant Archaeologists (2011). This technique involves walking across the entire field in parallel rows at 5 m intervals and surveying the ground surface for artifacts. The agricultural land should be prepared for the pedestrian survey by ploughing to the depth of previous ploughing. The fields must be allowed to weather through one heavy rainfall to improve surface visibility. At least 80% of the ploughed ground surface must

be visible after ploughing.

3) Approximately 8.3 ha (43%) of the study area is brush and tree covered lands, and manicured lawns that has archaeological potential but cannot be accessed by plough (Figure 8). As per Section 2.1.2 Standard 1c and Standard 1e, these portions of the study area should be subject to Stage 2 property survey by means of test pit survey. This technique involves hand excavating test pits at 5 m intervals. All test pits should be a minimum of 30 centimetres ("cm") in diameter and dug to a minimum of five cm into the subsoil. Soil fills should be screened through six millimetre ("mm") mesh screens in order to facilitate artifact recovery. Test pit profiles should be examined for cultural deposits prior to being backfilled. Test pitting should be conducted to within 1 m of all disturbances. All test pits should be backfilled to level grade, and any sod caps replaced and tamped down by foot.

4) Additionally, the Stage 1 archaeological assessment, through background research including communication with the Bereavement Authority of Ontario and the City of Hamilton and a review of a 1969 survey map, confirmed the western limits of Mountview Gardens Cemetery (opened c. 1976) were well-defined, dated to the 20th century, and that no burials were likely to be encountered outside the cemetery boundaries. As such, a Stage 3 cemetery assessment is not required for any portion of the Project's anticipated construction which impacts the areas of archaeological potential directly adjacent to Mountview Gardens Cemetery.

Based on the information contained in the report, the ministry is satisfied that the fieldwork and reporting for the archaeological assessment are consistent with the ministry's 2011 *Standards and Guidelines for Consultant Archaeologists* and the terms and conditions for archaeological licences. This report has been entered into the Ontario Public Register of Archaeological Reports. Please note that the ministry makes no representation or warranty as to the completeness, accuracy or quality of reports in the register.

Should you require any further information regarding this matter, please feel free to contact me.

Sincerely,

Shari Prowse
Archaeology Review Officer

cc. Archaeology Licensing Officer
Jack Restivo,Fruitland Winona Block 1 Development Group
Cynthia Graham, City of Hamilton

[1] *In no way will the ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.*

Original Report:
Stage 1 Archaeological Assessment

Gordon Dean Avenue Schedule òCó Municipal Class EA, Located on Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario
Project # TP115082

Archaeological Consulting License # P354 (Seguin)
PIF # P354-0054-2020 (Stage 1)
{Associated with PIF P1066-0025-2017 (Stage 1); P1066-0036-2017 (Stage 2); P141-0329-2018 (Stage 1); P013-259-2006 (Stage1-3); P141-0329-2018 (Stage 4)}

Prepared for:
Fruitland ð Winona Block 1 Development Group
4 Hughson Street South, Suite 1000, Hamilton, ON L8N 3Z1 25-Sep-20

Stage 1 Archaeological Assessment

Gordon Dean Avenue Schedule òCó Municipal Class EA, Located on Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario

Project # TP115082

Prepared for:

Fruitland ð Winona Block 1 Development Group
4 Hughson Street South, Suite 1000, Hamilton, ON L8N 3Z1

Prepared by:

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited
3450 Harvester Rd
Burlington, ON L7N 3W5
Canada
T: 519-681-2400

25-Sep-20

Copyright and non-disclosure notice

The contents and layout of this report are subject to copyright owned by Wood (© Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited). save to the extent that copyright has been legally assigned by us to another party or is used by Wood under license. To the extent that we own the copyright in this report, it may not be copied or used without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to you in confidence and must not be disclosed or copied to third parties without the prior written agreement of Wood. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests. Any third party who obtains access to this report by any means will, in any event, be subject to the Third Party Disclaimer set out below.

Third-party disclaimer

Any disclosure of this report to a third party is subject to this disclaimer. The report was prepared by Wood at the instruction of, and for use by, our client named on the front of the report. It does not in any way constitute advice to any third party who is able to access it by any means. Wood excludes to the fullest extent lawfully permitted all liability whatsoever for any loss or damage howsoever arising from reliance on the contents of this report. We do not however exclude our liability (if any) for personal injury or death resulting from our negligence, for fraud or any other matter in relation to which we cannot legally exclude liability.

Executive Summary

Wood Environment & Infrastructure (òWoodó) was retained by Fruitland ð Winona Block 1 Development Group (FWDG) (the òClientó) to conduct a Stage 1 archaeological assessment in support of the Gordon Dean Avenue - Schedule ôCô Municipal Class Environmental Assessment (MCEA Phases 3 & 4) (the Project). This archaeological assessment was triggered under the Environmental Assessment Act and as part of the Class EA Study. The project involves a proposed north-south road from Barton Street to Highway 8 and the east-west connection to Fruitland Road at Sherwood Park Road from the proposed north-south road (the Study Area). The proposed north-south road is referred to as Gordon Dean Avenue, and the proposed east-west road to Fruitland Road at Sherwood Park Road from the proposed Gordon Dean Avenue is referred to as Collector Road ôBô. The study area was historically described as part of Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario (Appendix A: Figures 1, 2 and 3). The study area is approximately 19.25 hectares (òháó) in size. The Class EA Study has identified a preferred design, as show in Figure 4 in Appendix A.

The Stage 1 archaeological assessment was carried out in accordance with the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries (òMHSTCIó) *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P354) held by Jason Seguin, Senior Archaeologist at Wood. The project information was acknowledged by the MHSTCI on 18 August 2020 with the issuance of PIF number P354-0054-2020 (Stage 1). Permission to enter the lands owned by FWDG within the study area for the purposes of the Stage 1 assessment was granted to Wood by the Client on 19 August 2020. This permission extended to all required archaeological fieldwork activities.

The Stage 1 property inspection was directed by Jason Seguin (P354) of Wood on 19 August 2020, with the assistance of Alejandra Cooney (R1188). The weather during the assessment was sunny and hot, approximately 24°C with partial cloud coverage. The weather did not impede the inspection in any way.

The Stage 1 background study indicated that the study area has general archaeological potential and warrants Stage 2 property assessment for the following reasons: 1) the presence of six previously registered archaeological sites within a 1 kilometer (òkmó) radius, four of which are within 240 metres (òmó) of the study area; 2) the presence of historical transportation routes directly adjacent to the study area; 3) the presence of historical features - a homestead illustrated within 100 m of the study area; 4) the presence of early Euro-Canadian settlement features illustrated in historical mapping within 300 m of the study area; such as, a school (located approximately 250 m to the west of the study area) and a mill (located approximately 300 m to the northwest of the study area; and 5) the presence of three watercourses (5.0, 5.2 and 6.0) located within 300 m of the study area. Watercourse 5.0 intersects the western portion of the study area.

The Stage 1 archaeological assessment determined that 4.43 ha (23%) of the study area is disturbed and does not require Stage 2 assessment, 0.13 ha (1%) of the study area does not require Stage 2 assessment because it is permanently low and wet, and 14.69 ha (76%) of the

study area retains archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 8).

Areas that retain archaeological potential include 6.39 ha (33% of the study area) of ploughed agricultural field and 8.3 ha (43% of the study area) of brush/tree covered lands, and manicured lawns where ploughing is not viable. The ploughed fields should be assessed using pedestrian survey at 5 m intervals and all non-ploughable portions of the study area should be assessed using test pit survey at 5 m intervals.

In light of the findings of the Stage 1 archaeological assessment of the study area, the following recommendations are made, subject to the conditions outlined below and in Section 5.0:

1) Approximately 0.13 ha (1%) of the study area is permanently low and wet and approximately 4.43 ha (23%) of the study area has been previously disturbed (Figure 8). The low and wet areas and the previously disturbed areas are evaluated as having low to no archaeological potential and do not require further archaeological assessment.

2) Approximately 6.39 ha (33%) of the study area is an actively cultivated agricultural field with archaeological potential (Figure 8). Therefore, it should be subject to Stage 2 property survey by means of pedestrian survey, as per Section 2.1.1 Standard 1 of the *Standards and Guidelines for Consultant Archaeologists* (2011). This technique involves walking across the entire field in parallel rows at 5 m intervals and surveying the ground surface for artifacts. The agricultural land should be prepared for the pedestrian survey by ploughing to the depth of previous ploughing. The fields must be allowed to weather through one heavy rainfall to improve surface visibility. At least 80% of the ploughed ground surface must be visible after ploughing.

3) Approximately 8.3 ha (43%) of the study area is brush and tree covered lands, and manicured lawns that has archaeological potential but cannot be accessed by plough (Figure 8). As per Section 2.1.2 Standard 1c and Standard 1e, these portions of the study area should be subject to Stage 2 property survey by means of test pit survey. This technique involves hand excavating test pits at 5 m intervals. All test pits should be a minimum of 30 centimetres (òcmó) in diameter and dug to a minimum of five cm into the subsoil. Soil fills should be screened through six millimetre (òmmó) mesh screens in order to facilitate artifact recovery. Test pit profiles should be examined for cultural deposits prior to being backfilled. Test pitting should be conducted to within 1 m of all disturbances. All test pits should be backfilled to level grade, and any sod caps replaced and tamped down by foot.

4) Additionally, the Stage 1 archaeological assessment, through background research including communication with the Bereavement Authority of Ontario and the City of Hamilton and a review of a 1969 survey map, confirmed the western limits of Mountview Gardens Cemetery (opened c. 1976) were well-defined, dated to the 20th century, and that no burials were likely to be encountered outside the cemetery boundaries. As such, a Stage 3 cemetery assessment is not required for any portion of

the Projectõs anticipated construction which impacts the areas of archaeological potential directly adjacent to Mountview Gardens Cemetery.

The above recommendations are subject to Ministry of Heritage, Sport, Tourism and Culture Industriesõ approval, and it is an offence to alter any portion of the study area without Ministry of Heritage, Sport, Tourism and Culture Industriesõ concurrence.

No grading or other construction activities that may result in the destruction or disturbance of the study area is permitted until notice of Ministry of Heritage, Sport, Tourism and Culture Industriesõ approval has been received.

TABLE OF CONTENTS

Section Page

1.0 PROJECT CONTEXT 1
1.1 Development Context 1
1.2 Scope of Work 1
2.0 STAGE 1 BACKGROUND STUDY 3
2.1 Archaeological Context 3
2.1.1 Registered Archaeological Sites 3
2.1.2 History of Archaeological Investigations 4
2.1.3 Environmental Context 6
2.2 Historical Context 7
2.2.1 A Cultural History for Southern and Eastern Ontario 7
2.2.2 Review of Historical Records 10
2.2.3 Historical Plaques 13
2.3 Recent Land Use History 13
2.4 City of Hamilton Archaeological Master Plan 14
2.5 Potential for Archaeological Resources 15
3.0 STAGE 1 PROPERTY ASSESSMENT 18
3.1 Methods 18
3.2 Results 18
3.3 Stage 1 Analysis and Conclusions 19
4.0 RECOMMENDATIONS 20
5.0 ADVICE ON COMPLIANCE WITH LEGISLATION 22
6.0 ASSESSOR QUALIFICATIONS 23
7.0 CLOSURE 24
8.0 BIBLIOGRAPHY 26

LIST OF TABLES

Table 1: Registered Archaeological Sites within a 1-km Radius 3
Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario..... 9
Table 3: Review of Historical Records.....12
Table 4: Review of Historical Photographs 13
Table 5: Inventory of Documentary Record.....19

LIST OF APPENDICES

APPENDIX A: FIGURES
- Figure 1 Location of the Study Area
- Figure 2 Aerial Photograph Showing the Location of the Study Area
- Figure 3 Topographic Map Showing the Location of the Study Area
- Figure 4 Development Plan
- Figure 5 Previous Archaeological Investigations within the Study Area and Within 50 m of the Study Area
- Figure 6 1859 Tremaineὸs Map of the County of Wentworth Showing the Location of the Study Area
- Figure 7 1877 Illustrated Historical Atlas Map of Wentworth County
- Figure 8 Stage 1 Results with Photograph Locations and Directions

APPENDIX B: AERIAL PHOTOGRPAHS
APPENDIX C: PHOTOGRAPHS
APPENDIX D: ASSESSOR QUALIFICATIONS
APPENDIX E: LIMITATIONS

SUPPLEMENTARY DOCUMENTATION

SECTION 1: CORRESPONDENCE WITH THE BEREAVEMENT AUTHORITY OF ONTARIO
SECTION 2: CORRESPONDENCE WITH THE CITY OF HAMILTON

Project Personnel

Project Director:	Jason Seguin, M.A. (P354)
Project Manager:	Cara Howell, B.A. (R180)
Field Director:	Jason Seguin, M.A.
Field Technician:	Alejandra Cooney, B.Sc. (R1188)
Report Preparation:	Chelsea Dickinson, B.A. (R1194) Alejandra Cooney, B.Sc.
Graphics:	Lindsay Ketchabaw, CAD
Report Reviewer:	Peter Popkin, Ph.D., CAHP, MClfA (P362) Barbara Slim, M.A. (P348)

1.0 Project Context

1.1 Development Context

Wood Environment & Infrastructure (ôWoodó) was retained by Fruitland ð Winona Block 1 Development Group (FWDG) (the ôClientó) to conduct a Stage 1 archaeological assessment in support of the Gordon Dean Avenue - Schedule ôCô Municipal Class Environmental Assessment (MCEA Phases 3 & 4) (the Project). This archaeological assessment was triggered under the Environmental Assessment Act and as part of the Class EA Study. The project involves a proposed north-south road from Barton Street to Highway 8 and the east-west connection to Fruitland Road at Sherwood Park Road from the proposed north-south road (the Study Area). The proposed north-south road is referred to as Gordon Dean Avenue, and the proposed east-west road to Fruitland Road at Sherwood Park Road from the proposed Gordon Dean Avenue is referred to as Collector Road ôBô. The study area was historically described as part of Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario (Appendix A: Figures 1, 2 and 3). The study area is approximately 19.25 hectares (ôhaó) in size. The Class EA Study has identified a preferred design, as shown in Figure 4 in Appendix A.

The Stage 1 archaeological assessment was carried out in accordance with the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries (ôMHSTCIó) *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P354) held by Jason Seguin, Senior Archaeologist at Wood. The project information was acknowledged by the MHSTCI on 18 August 2020 with the issuance of PIF number P354-0054-2020 (Stage 1). Permission to enter the lands owned by FWDG within the study area for the purposes of the Stage 1 assessment was granted to Wood by the Client on 19 August 2020. This permission extended to all required archaeological fieldwork activities.

This report presents the results of the Stage 1 background study and makes pertinent recommendations.

1.2 Scope of Work

This Stage 1 archaeological assessment was carried out in accordance with the work plan provided in Woodôs work agreement dated 07 August 2020.

A Stage 1 archaeological assessment is a systematic qualitative process executed in order to assess the archaeological potential of a study area based on its historical use and its potential for early Euro-Canadian (early settler) and pre-contact Indigenous occupation. The objectives of a Stage 1 background study are: 1) to provide information about the study areaôs geography, history, previous archaeological fieldwork and current land condition; 2) to evaluate in detail the study areaôs archaeological potential which will support recommendations for Stage 2 property assessment for all or parts of the study area if warranted; and, 3) to recommend appropriate strategies for Stage 2 property assessment if warranted.

The scope of work for the Stage 1 background study consisted of the following tasks:

- Contacting the MHSTCI to determine if recorded archaeological sites exist in the vicinity (1-kilometre [ôkmó] radius) of the study area, through a search of the *Ontario Archaeological Sites Database* maintained by that Ministry;

- Contacting the MHSTCI to determine if there are any known reports of previous archaeological field work within the study area or within a radius of 50 metres (ÒmÓ) around the study area, through a search of the *Ontario Public Register of Archaeological Reports* maintained by that Ministry;
- A desktop review of the study areaÕs physical setting to determine its potential for both pre-contact and post-contact period human occupation, including its topography, hydrology, soils, and proximity to important resources and historical transportation routes and settlements;
- A review of the potential for post-contact period human occupation as documented in historical atlases and other archival sources;
- A visual inspection of the study area to gather first-hand evidence of its physical setting, and to aid in delineating areas where archaeological potential may have been impacted or removed by recent land-use practices.
- Formulate appropriate field testing strategies for areas of general archaeological potential;
- Mapping, photography, and the production of other relevant graphics; and
- Preparing a Stage 1 report of findings with recommendations regarding the need for further archaeological work if deemed necessary.

In addition to the above scope of work, the Bereavement Authority of Ontario and City of Hamilton were contacted regarding the boundaries of the Mountview Gardens Cemetery (see Supplemental Documentation).

The Stage 1 background study was conducted in accordance with the *Standards and Guidelines for Consultant Archaeologists* set out by the MHSTCI (2011) pursuant to the Ontario Heritage Act, R.S.O. 1990, c. O.18.

2.0 Stage 1 Background Study

As part of the Stage 1 archaeological assessment, Wood queried the *Ontario Archaeological Sites Database,* maintained by the MHSTCI to determine if archaeological sites have been registered within 1 km of the study area (Section 2.1.1) (MHSTCI 2020a). The *Ontario Public Register of Archaeological Reports* was also queried to determine whether previous archaeological assessments have been carried out within the study area, or within a 50 m radius of the study area (Section 2.1.2) (MHSTCI 2020b). Secondly, the principal determinants of archaeological potential, namely proximity to water, topography, drainage, soils, and proximity to important resources and historical transportation routes and settlements, were examined to evaluate the study areaôs general archaeological potential (Sections 2.1, 2.1.3, 2.2, and 2.2.1). Thirdly, the specific potential for post-contact period archaeological resources was assessed through an examination of available historical maps and other archival sources (Section 2.2). And fourthly, a property inspection was conducted to confirm the desktop evaluation of archaeological potential and identify areas where recent land use has impacted or removed that potential.

2.1 Archaeological Context

2.1.1 Registered Archaeological Sites

Wood conducted the requisite Stage 1 background research. First, Wood queried the *Ontario Archaeological Sites Database* maintained by the MHSTCI to ascertain whether archaeological sites have been registered in close proximity (within 1 km) to the study area (MHSTCI 2020a).

In Ontario, information concerning archaeology sites is stored in the *Ontario Archaeological Sites Database* maintained by the MHSTCI. This database contains archaeological sites registered within the Borden system (Borden 1952). Under the Borden system, Canada has been divided into grid blocks based on longitude and latitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referred to by a four-letter designation and sites located within the block are numbered sequentially as they are found. The study area is located within the *AhGw* Borden block. On the basis of a search of the *Ontario Archaeological Sites Database* on 17 August 2020, there are six registered sites located within a 1 km radius of the study area; four of these sites are located within 250 m of the study area (Table 1).

Table 1: Registered Archaeological Sites within a 1 km Radius of the Study Area

Borden Number	Site Name	Cultural Affiliation	Site Type	Distance from Study Area	Development Review Status
AhGw-241	Philander Barnes	Euro-Canadian	Unknown	770 m	-
AhGw-242	Hanes I	Indigenous (Archaic)	-	235 m	No Further CHVI[1]
AhGw-243	Hanes II	Indigenous (Early Archaic)	Findspot	195 m	No Further CHVI
AhGw-244	Hanes III	Indigenous (Early Archaic)	Findspot, Hunting Loss	5 m	No Further CHVI

[1] CHVI- Cultural Heritage Value or Interest

Table 1: Registered Archaeological Sites within a 1 km Radius of the Study Area					
Borden Number	Site Name	Cultural Affiliation	Site Type	Distance from Study Area	Development Review Status
AhGw-536	-	Indigenous (Pre-Contact)	Unknown	530 m	No Further CHVI
AhGw-537	Sirtec-Rottaris Site	Indigenous (Late Archaic/ Early Woodland)	Camp/Campsite, Domestic	160 m	No Further CHVI

Archaeology Sites within 250 m of study area:

- Archaeological Site AhGw-242 is located 235 m to the north of the study area (MHSTCI 2020a). The site is spread over an area of 90 m north-south by 15 m east-west and extends west outside of the subject property towards Fruitland Road. Artifact densities were between 1-112 per 1 m unit. A total of over 2,500 chipped stone artifacts including one diagnostic artifact (one small side noted projectile point, likely Crawford Knoll or Innes) were recovered from the Hanes site as a result of the Stage 4 excavations (MHSTCI 2020a).

- Archaeological Site AhGw-243 is located 195 m to the north of the study area. The site was recorded following a Stage 2 test pit survey and subsequent Stage 3 investigation. The Stage 3 investigation yielded a single lithic artifact and it was concluded that the recovered artifact did not represent a significant archaeological resource and was no longer a planning concern. Thus, it was recommended that no further archaeological investigations be carried out on this site (MHSTCI 2020a).

- Archaeological Site AhGw-244 (Hanes III) is located 5 m to the west of the study area. The site was recorded following a Stage 1-2 investigation resulting in a positive test pit and subsequent Stage 3 investigation which yielded a single corner-notched Bifurcate Base projectile point fragment. It was concluded that the single artifact recovered from the Stage 3 investigation did not represent a significant archaeological resource and thus it was recommended that no further archaeological investigations be carried out on this site (MHSTCI 2020a).

- Archaeological Site AhGw-537 (Sirtec-Rottaris) is located 160 m to the east of the study area. The site was reported to Christopher Ellis by a citizens group as who wanted to artifacts recorded after they were discovered following ploughing for a garden. Personal communications by the landowners noted the presence of one biface and one Archaic Crawford Knoll-like point found on the site. In addition, the landowners noted the presence of other finds within the vicinity of the site including ceramics to the east (MHSTCI 2020a).

2.1.2 History of Archaeological Investigations

Wood completed a search for archaeological reports within 50 m of the study area within the *Ontario Register of Archaeological Reports* administered by the MHSTCI on 18 August 2020. Based

on this search (by address, lot and concession, and above-mentioned archaeological sites), six archaeological assessments have been conducted within the study area or within 50 m of the study area.

Appendix A: Figure 5 shows the location of these previous studies.

- *Stage 1 Archaeological Assessment 0 Jones Road Fruitland Winona Development Area Part of Lot 13, Concession 2 (Former Township of Saltfleet, County of Wentworth) City of Hamilton, Ontario* Prepared by Archaeological & Cultural Heritage Services (ASI), July 2017, PIF P1066-0025-2017.

In 2017, ASI conducted a Stage 1 archaeological assessment in advance of an application for the proposed redevelopment of 0 Jones Road within the Fruitland Winona Development Area, located within the current study area. ASI concluded that all areas that have not been extensively disturbed or exhibited low and wet conditions retain their archaeological potential. This recommendation was based on three previously identified registered archaeological sites located within 1 km of the study area. ASI recommended further archaeological assessment by means of a combination of hand-shovel test-pit survey and pedestrian survey (ASI 2017a).

- *Stage 2 Archaeological Assessment 0 Jones Road Fruitland Winona Development Area Part of Lot 13, Concession 2 Former Township of Saltfleet, County of Wentworth City of Hamilton, Ontario* Prepared by Archaeological & Cultural Heritage Services (ASI), December 2019, PIF P1066-0036-2017.

In 2017, ASI conducted a Stage 2 archaeological assessment in for the proposed redevelopment of 0 Jones Road within the Fruitland Winona Development Area, located within the current study area. The Stage 2 identified two non-diagnostic pre-contact artifacts (findspots P1 and P2) during the 5 m interval test pit survey. ASI concluded that no further archaeological assessment was required based on the fact that the artifacts recovered were non-diagnostic in nature (ASI 2019).

- *The Stage 1-3 Archaeological Assessment Of The Hanes Property, Part Of Lots 13 & 14, Concession 2, Geographic Township Of Saltfleet, City Of Hamilton (Stoney Creek)*, Prepared by Archaeological Assessment Limited, PIF P013-259-2006

A review of the Stage 2 Archaeological Assessment completed by ASI regarding the Jones Road Fruitland Winona Development Area identified that Archaeological Assessment Limited (2006) conducted a Stage 1-3 archaeological assessment within Lot 13 and 14 Concession 2. The Stage 2 survey identified three sites within the property including: 1) Hanes (AhGw-242), 2) Hanes II (AhGw-243), and 3) Hanes III (AhGw-244). The third site is located within 5 m of the current study area. ASI noted that following the Stage 3 investigations of the Hanes II and III sites no additional cultural materials and no further work was recommended. At the time of preparation of this report, a copy of this Stage 1-3 report was not received from MHSTCI.

- *The Stage 4 Excavation of the Hanes Site (AhGw-242), Hanes Property, Part of Lots 13 & 14, Concession 2, Geographic Township of Saltfleet, City of Hamilton (Stoney Creek).* Prepared by Archaeological Assessment Limited, PIF P013-314-2007

A review of the Stage 2 Archaeological Assessment completed by ASI regarding the Jones Road Fruitland Winona Development Area identified that Archaeological Assessment Limited (2006)

conducted a Stage 4 archaeological assessment of the Hanes Site which as noted by ASI yielded approximately 2,500 chipped stone artifacts, including small side notched projectile point dating to the Late Archaic period. ASI noted the potential for the site to extend to the west under Fruitland Road, beyond the area of their assessment. The area assessed in Lot 14 was considered fully mitigated and no further work was recommended. At the time of preparation of this report, a copy of this Stage 1-3 report was not received from MHSTCI

- *Stage 1 Archaeological Background Study and Property Inspection of Barton Street, from Fruitland Road to Fifty Road, and Fifty Road form QEW to HWY 8, Lots 1 and 2, Concession 2-15 Township of Saltfleet, City of Hamilton, Ontario.* Prepared by Amec Foster Wheeler, September 2017, PIF P141-0265-2016.

In 2017, Wood Environment & Infrastructure Solutions (formally Amec Foster Wheeler), conducted a Stage 1 archaeological assessment of a portion of Barton Street, from Fruitland Road to Fifty Road, in the City of Hamilton, Ontario. This assessment was triggered under a Municipal Class Environmental Assessment (Class EA) for road improvements and was conducted prior to development. Wood recommended the following: 1) before land alterations occur a Stage 2 archaeological assessment should be conducted in the areas of archaeological potential, which were 49% (20.32 ha) of the study area, by means of either pedestrian or hand-shovel test-pit survey; and; 2) the remainder of the study area, 51% (21.28 ha), does not require further archaeological assessment (Amec Foster Wheeler, 2017).

- *Stage 1 Archaeological Assessment Highway 8 Improvements (Fruitland Road to Fifty Road), Lot 2 to 15, Concession II, and Lots 13, 14 and 15, Concession III, in the historic township of Saltfleet, Wentworth County, City of Hamilton, Ontario.* Prepared by Wood, December 2019, PIF P141-0329-2018.

In 2019, Wood Environment & Infrastructure Solutions, conducted a Stage 1 archaeological assessment of a portion of Highway 8 from Fruitland Road to Fifty Road in the City of Hamilton, Ontario. This assessment was triggered under a Municipal Class Environmental Assessment (Class EA) for road improvements and was conducted prior to development. Wood recommended the following: 1) before land alterations occur a Stage 2 archaeological assessment should be conducted in the areas of archaeological potential, which were 14.4 % (2.6 ha) of the study area, by means of a hand-shovel test-pit survey; 2) should development related activities occur within 10 m of the ca. 1862 Fruitland Cemetery a Stage 3 Cemetery Investigation would be required; and; 3) the remainder of the study area, 83.8 % (15.05 ha), does not require further archaeological assessment (Wood, 2019).

2.1.3 Environmental Context

The study area is situated within the Iroquois Plain physiographic region of Ontario (Chapman and Putnam 1984:191-192). This physiographic region encompasses lowlands bordering Lake Ontario, from the Niagara River to the Trent River. The Iroquois Plain was inundated in the late Pleistocene by glacial Lake Iroquois (Chapman and Putnam 1984:190). Those sections of the region located in the vicinity of the Credit River consist of barrier beaches of varying sizes. The portion of the Iroquois Plain in which the study area lies is underlain by shale plains. The sandy

topsoil of the Iroquois Plain historically lent itself to the growing of apples, pears, bush fruits, strawberries and vegetables (Chapman and Putnam 1984:192).

The dominant surface soil type within the study area is Trafalgar silty clay loam (OMAFRA 2006). This soil is characterized as having imperfect drainage.

According to the òMinistry of Northern Development and Mines Quaternary Geologyó, map 2556, this immediate area includes Halton Till and Bedrock deposits (OMAFRA, 2006).

It is crucial to consider the proximity of water sources in any evaluation of archaeological potential because the availability of water is arguably the single most important determinant of human land use, past and present. The *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011) lists proximity to water as one of the prime indicators of potential for the presence of archaeological sites. Distance from potable water has been one of the most commonly used variables for predictive modeling of archaeological site location. Water, both potable and non-potable, also facilitated the transportation of people and goods and served to focus animal and plant resources. According to the 2011 *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011), lands within 300 m of an extant or formerly mapped river or creek have potential for the presence of early Indigenous and Euro-Canadian archaeological sites. There are three watercourses (5.0, 5.2 and 6.0) located within 300 m of the study area, one of which is transecting the northwest section of the study area and runs parallel to Fruitland Road. Lake Ontario is also located 1.7 km north of the study area.

2.2 Historical Context

2.2.1 A Cultural History for Southern and Eastern Ontario

The majority of interpretations of pre-contact Indigenous adaptations in Ontario derive from the analysis and interpretation of stone tools. Stone tools are made from specific types of rocks that fracture in ways that can be controlled, so that they are easily shaped into useful forms. These rocks include chert, chalcedony, quartzite, petrified wood, and volcanic glass, known as obsidian. Most stone tools found in southern Ontario are formed from types of chert that outcrop in local limestone formations, such as: Onondaga and Haldimand cherts, found near the north shore of Lake Erie; Kettle Point chert, which outcrops near Lake Huron; and Collingwood chert, which outcrops along the Niagara Escarpment near Georgian Bay.

Stone tools used as spear tips and arrowheads are the most commonly studied tool type. These are referred to as projectile points. As projectile point technology changed over time, styles and shapes of points changed also. Studying these changing point types has resulted in the development of a chronological framework for pre-contact times prior to 3,000 years ago, when First Nations groups began to make clay pottery. Later periods are defined both by point types and pottery characteristics. Radiocarbon dating of archaeological sites can only be done when organic materials are collected from those sites, so the dating of most sites is done by comparing the artifacts from dated sites to those from undated sites. The following is an overview of the pre-contact history of southern Ontario as understood by archaeologists.

The cultural history of southern Ontario began approximately 11,000 years ago when the glaciers had melted, and the land was re-exposed. The land was quickly settled by bands of hunters and

gatherers who are thought to have been large game hunters. These people used large spear points that are distinctively shaped with long central grooves, called òflutesó. Archaeologists have defined a number of point types that date to this time, including Gainey, Barnes, Crowfield, and Hi-Lo types. This period is referred to as the Paleo-Indian Period and it is thought to have lasted until approximately 9,000 years ago.

After 9,500 years ago, there was a long period when the climate was variable and the bare lands left by the glaciers were becoming re-forested, resulting in patchier, more diverse ecozones. During this time, which lasted until 3,000 years ago, people were adapting to diverse environmental settings. There appears to have been more reliance on local stone for making tools and more variable tool manufacturing technologies. The adoption of a spear-throwing board, known as an atlatl, was an important innovation, resulting in the ability to throw smaller darts with more force. Projectile points from this period, called the Archaic Period, are commonly side or corner-notched and are smaller than those of the preceding period. The Archaic adaptation is generally thought to have centred on localized resources, often forest resources, and groups of people are thought to have been less mobile, an adaptation that continued to develop until the arrival of Europeans.

In southern Ontario, the Archaic Period is divided into the Early, Middle and Late Archaic. Early point types include serrated Nettling and Bifurcate Base points. Middle types include Brewerton Corner Notched and Otter Creek, and Late types include Lamoka, Genesee, Crawford Knoll, and Innes. Most of these point types are named after archaeological sites where they were first identified.

The Archaic Period is followed by the Woodland Period. The major technological change in the Early Woodland Period is the introduction of pottery. During this time, people are thought to have developed more community organization and the manufacture of clay pottery is thought to indicate less residential mobility. Burial sites dating to this time often display evidence of ceremonial activities. Projectile points made at this time include much smaller types, probably used as arrow tips. Point types include Meadowood and Kramer and early ceramics were crudely-made vessels with conoidal (pointed) bases. The Early Woodland Period transitioned into the Middle Woodland Period approximately 2,400 years ago.

During the Middle Woodland Period in southern Ontario community and kin identity became more deeply entrenched, and more sedentary communities developed. Point types made at this time include Saugeen, Vanport, and Snyders. Ceramic vessels were conoidal in shape but were decorated with stamped designs in the soft clay. The Middle Woodland Period transitioned into the Late Woodland Period A.D. 500ð900 with the earliest direct evidence for agriculture.

The Late Woodland Period saw the development of recognizable Iroquoian and Algonkian cultures in southern Ontario, characterized by the intensification of agriculture and the increased utilization of corn. Greater sedentism led to increasing settlement populations and greater complexity of settlement organization. Sites dating to this time are often found on terraces overlooking the floodplains of large rivers. Iroquoian villages tended to be small, palisaded compounds with longhouses occupied by families. As the Late Woodland Period progressed, more intercommunity communication and integration became necessary to maintain the

sedentary agricultural way of life. Later Iroquoian villages were larger and more heavily palisaded, and longhouses were larger also.

When European explorers and missionaries arrived in southern Ontario in the early seventeenth century, they described the local Iroquoian social organization as being under the direction of elected chiefs. Tribal confederacies and allegiances resulted in intertribal warfare, which was only made worse by the European presence. Three Ontario Iroquoian confederacies, the Huron, Petun, and Neutral, were driven from their traditional territories before the middle of the seventeenth century.

Archaeologists tend to describe a period of transition from Late Woodland to post-contact contact times as òproto-historicó. The dating of this period is variable and may be different from site to site within a region as it describes a time when local Indigenous peoples were acquiring European trade goods indirectly through other Indigenous middlemen rather than directly from European traders. This period was generally very short and is often difficult to differentiate archaeologically from later post-contact times, when trade goods were widely available, but it usually is identified by evidence of an intact traditional cultural adaptation with occasional European items used in traditional ways.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario

Period	Complexes/Cultures, Some Diagnostic Artifacts
Early Paleo-Indian (9000ð8500 B.C.)	Small nomadic hunter-gatherer bands. Early Paleo-Indian (EPI) rarely found in eastern Ontario. Gainey, Barnes, Crowfield fluted points.
Late Paleo-Indian (8500ð7500 B.C.)	Small nomadic hunter-gatherer bands. Hi-Lo, Holcombe points, Lanceolate Bifaces.
Early Archaic (7500ð6000/4500 B.C.)	Small nomadic hunter-gatherer bands. Nettling, Stanley/Neville points.
Middle Archaic (6000/4500ð2500 B.C.)	Transition to territorial settlements. Seasonal round of subsistence introduced. Thebes (6000ð5000 B.C.), Otter Creek points (4500ð3000 B.C.). Brewerton Complex (3000ð2500 B.C.). Brewerton points. Laurentian Complex (6000ð2500 B.C.) (Eastern Ontario)
Late Archaic (2500ð1000 B.C.)	More numerous territorial hunter- gatherer bands, increasing use of exotic materials and artistic items for grave offerings, regional trade networks. Narrowpoint Complex (2500ð1850 B.C.). Lamoka points. Broadpoint Complex (1850ð1650 B.C.). Adder Orchard, Genesee points. Smallpoint Complex (1650ð1000 B.C.). Crawford Knoll, Innes points. Terminal Archaic (1100ð1000 B.C.) Glacial Kame Complex. Hind points.
Early Woodland (1000ð400 B.C.)	Pottery introduced. Meadowood Notched points, Meadowood Cache Blades, Kramer, Adena points. Meadowood Complex (1000ð400 B.C.). Middlesex Complex (650ð400 B.C.). Introduction of true cemeteries.
Middle Woodland (400 B.C.ðA.D. 500/900)	Saugeen, Snyders, Vanport, Port Maitland points. Point Peninsula Complex (Southcentral and eastern Ontario) Saugeen Complex (Southeast of Lake Huron and the Bruce Peninsula, London area, and possibly as far east as the Grand River) Couture Complex (Lake St. Clair and the western end of Lake Erie). Burial ceremonialism.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario	
Period	Complexes/Cultures, Some Diagnostic Artifacts
Transitional Woodland (A.D. 500ð900)	Agriculture introduced. Levanna, Jacks Reef points. Princess Point Complex (Eastern end of Lake Erie and the western end of Lake Ontario). Rivière au Vase Phase of the Younge / Western Basin Tradition (Lake St. Clair and western end of Lake Erie) Sandbanks Complex (Kingston area).
Late Woodland (A.D. 900ð1650)	Tribal differentiation. Transition to settled village life. Dewaele, Glen Meyer Tanged, Triangular Nanticoke, Notched Nanticoke, Triangular Daniels/Madison points. Ontario Iroquoian and St. Lawrence Iroquoian Traditions (Southcentral and eastern Ontario, respectively). Algonkian Western Basin Tradition (Lake St. Clair and the western end of Lake Erie).
Early Post-Contact (A.D. 1650ð1763)	Iroquoian, Algonkian migrations and resettlement. French exploration and colonization
Late Post-Contact (A.D. 1763ð1867)	Iroquoian, Algonkian migrations and resettlement. British and other European immigration increases.

In southern Ontario, significant post-contact archaeological sites are those that have an affiliation with an important historic event, figure, or family, but can also be anything dating to the original European settlement of a region. Often, these archaeological sites date to before A.D. 1830, but archaeologically significant Euro-Canadian sites can date into the twentieth century.

2.2.2 Review of Historical Records

During pre-contact and early contact times, the vicinity of the study area would have contained a mixture of deciduous trees, coniferous trees, and open areas. In the early nineteenth century, Euro-Canadian settlers arrived and began to clear the forests for agricultural purposes. In the nineteenth and early twentieth centuries, the study area and surrounding land were primarily used for agricultural purposes.

Historically, the study area was located in the Township of Saltfleet, County of Wentworth. Wentworth County was established following the abolition of the Old Upper Canadian District system in 1849 and was temporarily united with Brant and Halton Counties until 1854ð1855. In 1973ð1974, the county was dissolved and succeeded by the Regional Municipality of Hamilton-Wentworth. The City of Hamilton has remained the administrative seat since the original creation of the Gore District nearly two centuries ago (Stanton 1843:215; Armstrong 1985:170ð171; Jonasson 2006:191ð209). In 2001, the current boundaries of the City of Hamilton were created by incorporating the original city and a number of surrounding communities, such as Ancaster, Stoney Creek and Dundas.

Aside from Ancaster and Barton townships, Saltfleet was the earliest settled township in the county, around 1786 (Page & Smith 1875: XIII). ôBetween 1786 and 1790, Levi Lewis, John Pettit, Gershom Carpenter, Augustus Jones, John Biggar, John Wilson [and] Samuel Deathê settled in the locality west of the Fifty Mile Creekó (Page & Smith 1875: XIII).

Although there were few settlers in the vicinity, salt manufacturing began here around 1812. The bed of the creek, near the intersection was then Concession 2, contained two or three productive salt springs. Early in 1812 Allan McDougall erected a salt-works. It became so successful that a second salt-works was put up that same year by William Kent. During that time salt was not imported and the works supplied the whole region for approximately four years. The two manufacturers held a complete monopoly over the local salt trade and sold all they could produce at £10 a bushel or £50 a barrel. It was during this time that the Township was formed and took on the name of òSaltfleetó, derived from the words salt and fleet (Saxon fleot, a creek or flooding), signifying the salt creek on which the works were built (Page & Smith 1875: XII).Originally tow words, it soon came to be written as one word, and appeared as such in the early records of the Township.

There was good growth in this section of the County, largely since the only two avenues of communication in this part of the peninsula ran through Saltfleet. With the tide of United European Loyalists and European immigrants beginning around 1790, settlement advanced rapidly. At this time, the above-mentioned avenues of communication were two roads that appeared as little more than footpaths fenced in by forest trees. One ran in a zig-zag course near the foot of the mountain, while the other followed the curves of the lakeshore. Both ended at Burlington Heights. Lake Road, as it was named, was the principal thoroughfare for many years. However, as time progressed, òêwave action of [Lake] Ontario washed away the banks from the Beach to east of the òThirtyó, until they encroached upon the highway. Eventually, the line of Lake Road, in most places, was under water (Page & Smith 1875: XII).

In 1816 the first school was established in Saltfleet. It was a simple log cabin that was heated by a fire-place and contained a few board seats. It lacked any sort of school furniture, maps etc. The first teacher was an Irishman by the name of George Hughes, Hughesô salary was paid in grain or equivalent goods. Some of Hughesô pupils included: Judge OôReilly of Hamilton; Thomas, Robert and William Lottridge; and Betsy Brant (daughter of Joseph Brant, Head Chief of the Six Nations of the Grand River) (Page & Smith 1875: XIV).

Saltfleetôs first tax assessment roll was compiled in 1815. At that time there were 102 householders, with a total property value assessed at £10,151. Mr. Levi Lewis was then the highest assessed resident, with a property value of £735. In total, there were 33 log houses, 20 one-storey frame houses, a two-storey log house and a two-storey frame house. There were no stone or brick houses at that time and no evidence of merchant shops. The only non-residential buildings were those associated with two separate water-powered sawmills owned by John Springstead and Levenus Van Duzen on Stoney Creek.

The first municipal council was elected in 1850 and included John Williamson, David Williamson and Samuel Green. The population at this time was 2,614. The historic Township also included the villages of Elfrida, Mount Albion, Stoney Creek, Tapleytown, Tweedside and Winona.

Located approximately 3.9 km to the northeast of the study area is the former Village of Winona. Winona was part of the Township of Saltfleet until 1974 when it became part of the New Town of Stoney Creek. Stoney Creek became a city in 1985 until it was merged with the City of Hamilton by order of the Ontario government. The first settlers built a farming hamlet called òthe Fiftyó as it was close to the Fifty Creek and the waterfront. The centre of Winona shifted in the late 19th

century away from the waterfront to a central place around the railway and roads, tied together by what was then Station Road. Later on, the focus shifted in favour of Highway 8, the escarpment, and Winona Road. Of notable interest, John Wilson, the first speaker of the Legislative Assembly of Upper Canada, moved to Winona from New Jersey in the 1790s. Wilson became a Justice of the Peace for Gore District (present day Hamilton) in 1811. His son Hugh Wilson was born in Winona and fought in the 3rd Gore Regiment during the rebellion of 1837, after which going on to practice law.

In addition, ED (Ernest DôIsreali) Smith and Sons was a leader in the economy and society of Winona in the late 19th and early 20th centuries. Both a businessman and a politician, he founded the E.D. Smith food company in 1882 when he started making jam from left over fruit (Bailey 1992: 143).

Historical records and mapping were examined for evidence of early Euro-Canadian use of the study area. The study area was located on Lots 13 and 14, Concession II, in the Historic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario (Appendix A: Figures 6-7).

The following historical records were examined in an effort to determine the potential for archaeological evidence within the study area:

Table 3: Review of Historical Records

Figure No.	Year	Map Title	Historical Feature(s)
6	1859	*1859 Map of the County of Wentworth* (Surtees, 1859)	¢ The study area for Lot 13, concession II is listed under the ownership of Alexander Stewart. ¢ The study area for Lot 14, concession II is listed as a Brick and Tile Yard ¢ There are roadways running north-south, and east-west directly adjacent to the study area. ¢ A schoolhouse is located approximately 250 m to the west of the study area
7	1875	*Illustrated Historical Atlas of Wentworth County* (Page & Smith, 1875)	There appears to be no change to configuration from the 1859 historical map, with the exception of: ¢ There is one orchard and one building located within Lot 13 Concession II on the southwest edge of the study area. ¢ There is an orchard located on Lot 13, concession III within the study area ¢ A schoolhouse is located approximately 250 m to the west of the study area ¢ A church is located approximately 300 m to the southwest of the study area ¢ A mill is located approximately 300 m to the northwest of the study area No other features are illustrated within 300 m of the study area.

The 1871 historical census was reviewed to obtain additional information on this property. The 1871 historical census indicates that the owner of Lot 13, Concession II, Alexander Stewart was

born in 1844, he was 27 years old at the time of the census. Alexander a reformed Presbyterian, was identified as a farm labourer, born in Scotland; he is listed alongside his 26-year-old wife Elizabeth Stewart, their son Kenneth Steward, who was 2 months old at the time of the census.

Mountview Gardens Cemetery is located directly adjacent to the study area. Opened in 1976 (City of Hamilton 2005), Mountview Gardens Cemetery is currently listed as active according to the Bereavement Authority of Ontario, hereto referred to as the ȯBAOȯ (BAO, 2020). A directional signage boulder for the Mountview Gardens Cemetery is located north of Highway 8 and west of Jones Road, in close proximity to the ROW (City of Hamilton 2005).

The Fruitland Cemetery is located on Lot 15, Concession 2, at the corner of Fruitland Road and Highway 8 approximately 320 m to the east of the study area. The Crown patent for this lot was granted to John Bigger in 1798. In 1843, a Wesleyan Methodist Meeting Hall was established here and by 1853 a church was erected across the road from the current cemetery. It was established as a cemetery in 1862 and the first known burial was of Margaret McNeilly in that same year. It is a small cemetery containing approximately 200 monuments and is also known as *Wesley United Church Cemetery, Fruitland United Cemetery, and Fruitland United Church Cemetery*. Based on the distance from the study area, the Fruitland Cemetery is not considered an archaeological concern during the current development (City of Hamilton 2005).

2.2.3 Historical Plaques

The MHSTCIȭs *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011:18) stipulates that areas of early Euro-Canadian settlement, including places of early military pioneer settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches and early cemeteries, are considered to have archaeological potential. There may be commemorative markers of their history, such as local, provincial, or federal monuments or heritage parks. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the *Ontario Heritage Act* or a federal, provincial, or municipal historic landmark or site, and properties that local histories or informants have identified with possible archaeological sites, historical events, activities, or occupations are also considered to have archaeological potential.

There are no historical plaques located within a 1 km radius of the study area (Brown 2019).

2.3 Recent Land Use History

A review of aerial photographs obtained from 1960 and 1966 was completed for the study area to discern past and present land uses (Appendix B). Table 4 provides a summary of these findings.

Table 4: Review of Historical Photographs

Figure No.	Year	Features
B1	1960	The following features are observed: ¢ Highway 8, Fruitland Rd, and Barton St are illustrated. ¢ Lands surrounding the study area undeveloped agricultural land. ¢ Presence of large farming properties with orchards along Fruitland Rd and Highway 8. ¢ The orchard on Lot 14, Concession 2, just outside the study area is illustrated

Table 4: Review of Historical Photographs		
Figure No.	Year	Features
B2	1966	¢ The configuration does not appear to have changed much from the 1960 aerial photograph, except that: o There is an increase presence of agricultural fields in the area.
B3	2005	The following features are observed: ¢ The Queen Elizabeth Way (QEW) highway has been constructed, running East to West of the study area. ¢ On-ramps for Fruitland Rd have been constructed directly north of the study area. ¢ Jones Rd has been constructed directly East of the study area. ¢ Subdivisions have been developed on Fruitland Road and Highway 8 west and south of the study area. ¢ Commercial building and parking lot constructed north of the study area. ¢ Along Fruitland Rd on Lot 14, Concession 2 houses have been constructed and the orchard, which is directly west of the study area, has been removed. ¢ A commercial building and parking lot found on Lot 13 Concession 2 has been added to the study area.
Various (2003 to 2019 Online Google Earth Aerial Imagery)	2010 -2019	The configuration does not appear to have changed much from the 2005 aerial photograph.

Based on a review of the historical sources above, the study area has undergone development from 1960 onward. As indicated above, areas that have undergone significant disturbance during the construction of roads, parking lots and/or buildings may have impacted its archaeological potential.

2.4 City of Hamilton Archaeological Master Plan

The City of Hamilton has developed a preliminary draft of an Archaeology Management Plan (AMP) (City of Hamilton 2016). The AMPís goal is to ensure a comprehensive and consistent policy on archaeology by: 1) providing detailed policy for the management of archaeology in the City of Hamilton; 2) mapping all known archaeological sites within the City; 3) Mapping areas of archaeological potential; and, 4) identifying when and how archaeology will be carried out before soil is disturbed. Currently, Hamilton has over 1,300 known sites that are considered Provincial and National signiþcance. Pre-contact archaeology is found from 13,000 years ago to modern historic times, marking Indigenous presence since the glaciers retreated from Hamilton. In addition, Euro-Canadian archaeology appears with the initial colonization and settlement of Hamilton in the early 1700s through to modern times. As a result, the current study area falls within the City of Hamilton Archaeology Mater Plan parameters.

According to the City of Hamilton Archaeology Master Plan certain portions of the study area were identified as having archaeological potential (City of Hamilton 2016).

2.5 Potential for Archaeological Resources

Archaeological potential is defined as the likelihood of finding archaeological sites within a study area. For planning purposes, determining archaeological potential provides a preliminary indication that archaeological sites might be found within the study area, and consequently, that it may be necessary to allocate time and resources for archaeological survey and mitigation.

The framework for determining the presence of archaeological potential within a study area is drawn from provincial standards found in the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011, Sections 1.3.1 and 1.3.2). The following are features or characteristics that can indicate archaeological potential:

- previously identified archaeological sites;
- water sources (it is important to distinguish types of water and shoreline, and to distinguish natural from artificial water sources, as these features affect site locations and types to varying degrees):
    - primary water sources (e.g. lakes, rivers, streams, creeks);
    - secondary water sources (e.g. intermittent streams and creeks, springs, marshes, swamps);
    - features indicating past water sources (e.g. glacial lake shorelines indicated by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches); and,
    - accessible or inaccessible shoreline (e.g. high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh).
- elevated topography (e.g. eskers, drumlins, large knolls, plateaus);
- pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground;
- distinctive land formation that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings;
- resource areas, including:
    - food or medicinal plants (e.g. migratory routes, spawning areas, prairie);
    - scarce raw materials (e.g. quartz, copper, ochre or outcrops of chert); and,
    - early Euro-Canadian industry (e.g. fur trade, logging, prospecting, mining).
- areas of early Euro-Canadian settlement. These include places of early military or pioneer settlement (e.g. pioneer homesteads, isolated cabins, farmstead complexes), early wharf

or dock complexes, pioneer churches and cemeteries. There may be commemorative markers of their history, such as local provincial, or federal monuments or heritage parks;

- early transportation routes (e.g. trails, passes, roads, railways, portages); and,
- property listed on a municipal register or designated under the *Ontario Heritage Act* or that is a federal, provincial or municipal historic landmark or property that local histories or informants have identified with possible archaeological sites, historical events, activities or occupations.

Archaeological potential can be determined to not be present for either the entire study area or parts of it when the area under consideration has been subjected to extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. This is commonly referred to as ÒdisturbedÓ or ÒdisturbanceÓ and may include:

- quarrying;
- major landscaping involving grading below topsoil;
- building footprints;
- sewage and infrastructure development; and,
- activities such as agricultural cultivation, gardening, minor grading, and landscaping do not necessarily affect archaeological potential.

The study area consists largely of brush and tree covered lands in addition to agricultural fields. Additional buildings, roadways and compacted gravel roads can be found on the northern and southernmost portions of the study area. A tributary running north-south transects the western portion of the study area (Appendix C: Photograph 20).

Several factors can be used to assess the potential for recovery of Indigenous archaeological resources within a study area. Natural water sources are located within 300 m of the study area, including three unnamed tributaries, one of which transects the western portion of the study area while the other two 250 m and 120 m to the west and south respectively. Moreover, there is direct evidence that this general area has been intensively utilized by Indigenous people. Five Indigenous sites have been registered within a 1-km radius of the study area and four of these sites are located within 250 m of the study area.

Archaeological Site AhGw-244 (Hanes III) is located 5 m to the west of the study area. The site was recorded following a Stage 1-2 investigation resulting in a positive test pit and subsequent Stage 3 investigation which yielded a single corner-notched Bifurcate Base projectile point fragment. It was concluded that the single artifact recovered from the Stage 3 investigation did not represent a significant archaeological resource and thus it was recommended that no further archaeological investigations be carried out on this site (MHSTCI 2020).

As per the MHSTCIÕs *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011), any areas within 100 m of early transportation routes and 300 m of early Euro-Canadian settlement have archaeological potential. The study area is located directly adjacent to three unnamed historical roadways (now known as Fruitland Road, Barton Road and Highway No. 8) as illustrated in the 1859 and 1875 historical maps. The study area is located within 100 m of a homestead,

within 250 m of a school and within 300 m of a mill as depicted in the 1859 and 1875 historical maps (Appendix A: Figures 6-7). Moreover, there is direct evidence that this general area had been intensively utilized by Euro-Canadian people as evident from the one Euro-Canadian site registered within a 1 km radius of the study area.

The City of Hamilton Archaeology Master Plan identified that certain portions of the study area as having archaeological potential.

Given the above, background archival research supports the conclusion that portions of the study area exhibit general archaeological potential for the presence of both Indigenous and Euro-Canadian archaeological resources therefore, a Stage 2 archaeological assessment is required.

Areas that have been disturbed by modern activities, both extensive and intensive, have low potential for the recovery of archaeological resources. These areas include the following: buildings, building footprints, roadways, and a compacted gravel road.

Permanently wet areas, such as waterways, and areas of steeply sloping topography have low potential for the recovery of any archaeological resources. These areas include an unnamed tributary intersecting the study area that runs parallel to Fruitland Rd.

3.0 Stage 1 Property Assessment

3.1 Methods

A Stage 1 property inspection was conducted on 19 August 2020 with advance permission-to-enter obtained from the Client. The weather was sunny and hot with a maximum temperature of 24°C and did not impede the inspection in any way. As such, it is confirmed that the assessment met Section 1.2 Standard 2 of the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011) regarding weather and lighting.

The Stage 1 property assessment was directed by Jason Seguin (P354) of Wood with the assistance of Alejandra Cooney (R1188). The Wood field crew photo-documented the assessment (Appendix A: Figure 8; and Appendix C: Photographs 1 to 28).

The Stage 1 visual inspection confirmed general archaeological potential and determined the degree to which development and landscape alteration have affected that potential. It included a walk-through of the entire study area, which measures approximately 19.25 ha. The property inspection was thoroughly photo-documented. Field observations were recorded on aerial maps and field forms. All land conditions were recorded as shown in Appendix A: Figure 8 and Appendix C: Photographs 1 to 28. Landscaped sections/undeveloped sections of the study area were assumed to have retained archaeological potential.

3.2 Results

Based on the Stage 1 property inspection and background research, Wood determined that approximately 4.43 ha (23%) of the study area has been previously disturbed (Appendix A: Figure 8). These areas have had the integrity of the topsoil compromised by earth moving activities to the point where archaeological potential has been removed. These areas include the following: buildings, building footprints, roadways, sidewalks and a compacted gravel road (Appendix C: Photographs 2-12, 15-16 and 28).

Approximately 0.13 ha (1%) of the study area has low or no archaeological potential due to permanently low-lying and wet conditions (Appendix A: Figure 8). These areas include an unnamed tributary intersecting the study area that runs parallel to Fruitland Rd (Appendix C: Photograph 19).

The remainder of the study area, consisting of a actively cultivated agricultural field and brush and tree covered lands, and manicured lawns, has general archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 8; Appendix C: Photographs 1, 14, 17-18, 20-27).

Approximately 6.39 ha (33%) of the study area is actively cultivated agricultural field. Therefore, it should be subjected to Stage 2 property survey by means of pedestrian survey, as per Section 2.1.1 of the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011).

Approximately 8.3ha (43%) of the study area is a located within a brush and tree covered lands, and manicured lawns that has archaeological potential but cannot be ploughed prior to Stage 2 survey. These areas should be subject to Stage 2 property survey by means of test pit survey as per Section 2.1.2 of the of the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI 2011).

Documentary Record

Table 5 provides the inventory of documentary records accumulated as part of this assessment.

Table 5: Inventory of Documentary Record		
Study Area	Map and Photo(s)	Field Notes
Lots 13 and 14, Concession II, in the Historic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario	Copies of 2 historical maps, 28 Stage 1 photographs and 3 aerial photographs	Stage 1 photo logs, 3 field maps, and field notes.

Documentation related to the archaeological assessment of this project will be curated by Wood until such time that arrangements for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the project owner, the MHSTCI and any other legitimate interest groups.

3.3 Stage 1 Analysis and Conclusions

The Stage 1 background study indicated that the study area has general archaeological potential and warrants Stage 2 property assessment for the following reasons: 1) the presence of six previously registered archaeological sites within a 1 km radius, four of which are within 240 m of the study area; 2) the presence of historical transportation routes directly adjacent to the study area; 3) the presence of historical features - a homestead illustrated within 100 m of the study area; 4) the presence of early Euro-Canadian settlement features illustrated in historical mapping within 300 m of the study area; such as, a school (located approximately 250 m to the west of the study area) and a mill (located approximately 300 m to the northwest of the study area; and 5) the presence of three watercourses (5.0, 5.2 and 6.0) located within 300 m of the study area. Watercourse 5.0 intersects the western portion of the study area.

The Stage 1 archaeological assessment determined that 4.43 ha (23%) of the study area is disturbed and does not require Stage 2 assessment, 0.13 ha (1%) of the study area does not require Stage 2 assessment because it is permanently low and wet, and 14.69 ha (76%) of the study area retains archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 8).

Areas that retain archaeological potential include 6.39 ha (33% of the study area) of ploughed agricultural field and 8.3 ha (43% of the study area) of brush/tree covered lands, and manicured lawns where ploughing is not viable. The ploughed fields should be assessed using pedestrian survey at 5 m intervals and all non-ploughable portions of the study area should be assessed using test pit survey at 5 m intervals.

4.0 Recommendations

In light of the findings of the Stage 1 archaeological assessment of the study area, the following recommendations are made, subject to the conditions outlined below and in Section 5.0:

1) Approximately 0.13 ha (1%) of the study area is permanently low and wet and approximately 4.43 ha (23%) of the study area has been previously disturbed (Figure 8). The low and wet areas and the previously disturbed areas are evaluated as having low to no archaeological potential and do not require further archaeological assessment.

2) Approximately 6.39 ha (33%) of the study area is an actively cultivated agricultural field with archaeological potential (Figure 8). Therefore, it should be subjected to Stage 2 property survey by means of pedestrian survey, as per Section 2.1.1 Standard 1 of the *Standards and Guidelines for Consultant Archaeologists* (2011). This technique involves walking across the entire field in parallel rows at 5 m intervals and surveying the ground surface for artifacts. The agricultural land should be prepared for the pedestrian survey by ploughing to the depth of previous ploughing. The fields must be allowed to weather through one heavy rainfall to improve surface visibility. At least 80% of the ploughed ground surface must be visible after ploughing.

3) Approximately 8.3 ha (43%) of the study area is brush and tree covered lands, and manicured lawns that has archaeological potential but cannot be accessed by plough (Figure 8). As per Section 2.1.2 Standard 1c and Standard 1e, these portions of the study area should be subject to Stage 2 property survey by means of test pit survey. This technique involves hand excavating test pits at 5 m intervals. All test pits should be a minimum of 30 cm in diameter and dug to a minimum of five cm into the subsoil. Soil fills should be screened through six mm mesh screens in order to facilitate artifact recovery. Test pit profiles should be examined for cultural deposits prior to being backfilled. Test pitting should be conducted to within 1 m of all disturbances. All test pits should be backfilled to level grade, and any sod caps replaced and tamped down by foot.

4) Additionally, the Stage 1 archaeological assessment, through background research including communication with the Bereavement Authority of Ontario and the City of Hamilton and a review of a 1969 survey map, confirmed the western limits of Mountview Gardens Cemetery (opened c. 1976) were well-defined, dated to the 20th century, and that no burials were likely to be encountered outside the cemetery boundaries. As such, a Stage 3 cemetery assessment is not required for any portion of the Projectôs anticipated construction which impacts the areas of archaeological potential directly adjacent to Mountview Gardens Cemetery.

The above recommendations are subject to Ministry of Heritage, Sport, Tourism and Culture Industriesô approval, and it is an offence to alter any of portion of the study area without Ministry of Heritage, Sport, Tourism and Culture Industriesô concurrence.

No grading or other construction activities that may result in the destruction or disturbance of the study area is permitted until notice of Ministry of Heritage, Sport, Tourism and Culture Industriesὸ approval has been received.

5.0 Advice on Compliance with Legislation

a) This report is submitted to the Minister of Heritage, Sport, Tourism and Culture Industries as a condition of licensing in accordance with Part IV of the *Ontario Heritage Act, R.S.O. 1990, c O.18.* The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Heritage, Sport, Tourism and Culture Industries, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b) It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such a time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

c) Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

d) The *Funeral, Burial and Cremation Services Act,* 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the local police or coroner and the Registrar of Cemeteries at the Ministry of Government and Consumer Services.

e) Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

6.0 Assessor Qualifications

This report was prepared and reviewed by the undersigned, employees of Wood. Wood is one of North Americaὸs leading engineering firms, with more than 50 years of experience in the earth and environmental consulting industry. The qualifications of the assessors involved in the preparation of this report are provided in Appendix D.

7.0 Closure

This report was prepared for the exclusive use of Fruitland ð Winona Block 1 Development Group and is intended to provide a Stage 1 archaeological assessment of the study area. The project involves a proposed north-south road from Barton Street to Highway 8 and the east-west connection to Fruitland Road at Sherwood Park Road from the proposed north-south road (the Study Area). The proposed north-south road is referred to as Gordon Dean Avenue, and the proposed east-west road to Fruitland Road at Sherwood Park Road from the proposed Gordon Dean Avenue is referred to as Collector Road îBî. The Study Area is legally described as part of Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Wood will be required. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the Stage 1 background study and Stage 2 property inspection conducted by Wood. It is based solely a review of historical information, a property reconnaissance conducted on 19 August 2020 and data obtained by Wood as described in this report. Except as otherwise maybe specified, Wood disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Wood after the time during which Wood conducted the archaeological assessment. In evaluating the property, Wood has relied in good faith on information provided by other individuals noted in this report. Wood has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Wood accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Wood makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

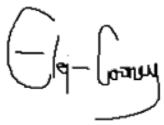
This report is also subject to the further Standard Limitations contained in Appendix E.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Respectfully Submitted,

Wood Environment & Infrastructure,
a Division of Wood Canada Limited

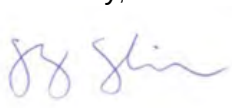
Prepared by,



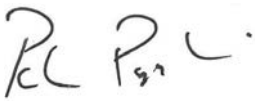
Alejandra Cooney, BSc. (R1188)
Field Archaeologist

Chelsea Dickinson (R1194)
Research Archaeologist

Reviewed by,



Barbara Slim, M.A. (P348)
Associate Archaeologist



Peter Popkin, Ph.D, CAHP, MClfA (P362)
Associate Archaeologist

8.0 Bibliography

Amec Foster Wheeler

2017 Stage 1 Archaeological Background Study and Property Inspection of Barton Street, from Fruitland Road to Fifty Road, and Fifty Road form QEW to HWY 8, Lots 1 and 2, Concession 2-15 Township of Saltfleet, City of Hamilton, Ontario. Prepared by Amec Foster Wheeler, September 2017, PIF P141-0265-2016.

Armstrong, Frederick H.

1985 Handbook of Upper Canadian Chronology. Toronto: Dundurn Press.

ASI

2017 Stage 1 Archaeological Assessment 0 Jones Road Fruitland Winona Development Area Part of Lot 13, Concession 2 (Former Township of Saltfleet, County of Wentworth) City of Hamilton, Ontario Prepared by Archaeological & Cultural Heritage Services (ASI), July 2017, PIF P1066-0025-2017.

2019 Stage 1 Archaeological Assessment Highway 8 Improvements (Fruitland Road to Fifty Road), Lot 2 to 15, Concession II, and Lots 13, 14 and 15, Concession III, in the historic township of Saltfleet, Wentworth Count, City of Hamilton, Ontario. Prepared by Wood, December 2019, PIF P141-0329-2018.

Bereavement Authority Ontario

2020 Bereavement Authority Ontario Register, Stoney Creek (Search Results). https://licensees.bereavementauthorityontario.ca/search-results?searchParams=~Stoney%20Creek~~~~0&Subject=PubBizByNamePro&Title=Public%20Register%20-%20Businesses. Last accessed 19 August 2020.

Brown, Alan

2019 Ontario's Historic Plagues. www.ontarioplaques.com Retrieved 18 August 2020

Bailey, Thomas Melville

1992 Dictionary of Hamilton Biography, Volume III, 1925-1939. W.L. Griffin LTD.

Borden, Charles E.

1952 A Uniform Site Designation Scheme for Canada. *Anthropology in British Columbia*, No. 3, 44-48.

City of Hamilton

2005 *Hamilton's Heritage Volume 6 Inventory of Cemeteries and Burial Grounds*. Planning and Economic Development Department, Development and Real Estate Division, Community Planning and Design Section. December 2005, Pp 114.

2016 *City of Hamilton Archaeology Management Plan*. Prepared by the Planning and Economic Development Department, Planning Division. Hamilton, Ontario. April 2016.

Chapman, L.J. and D. F. Putnam
1984 *The Physiography of Southern Ontario*. Second Edition. Ontario Geological Survey, Special Volume 2. Ontario Ministry of Natural Resources, Toronto University Press, Toronto.

Jonasson, Eric
2006 "The Districts and Countries of Southern Ontario, 1777–1979; Two Centuries of Evolution." Families 45.4 (2006) pp. 191–209.

McMaster University Library: Hisotrical Hamilton Portal
1960 *Aerial Photograph No. 159* https://library.mcmaster.ca/maps/aerialphotos/index.html. Accessed 18 August 2020.
1966 *Aerial Photograph No. 52* https://library.mcmaster.ca/maps/aerialphotos/index.html. Accessed 18 August 2020.

Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)
2011 *Standards and Guidelines for Consultant Archaeologists,* Ontario Ministry of Heritage, Sport, Tourism and Culture Industries, Toronto.
2020a Sites Within a One Kilometre Radius of the Study Area Provided from the *Ontario Archaeological Sites Database*, 18 August 2020.
2020b Archaeological Assessments Completed Within the Study Area or Within 50 Metres of the Study Area Provided from the *Ontario Public Register of Archaeological Reports*, 18 August 2020.

Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
2006 *GIS Layers for Soils and Physiography in the Province of Ontario.* http://sis.agr.gc.ca/cansis/publications/surveys/on/index.html. Retrieved 17 March 2020.

Library and Archives Canada
2020 *1861 Census of Canada*. http://www.bac-lac.gc.ca/eng/census/1861-canada-west/Pages/1861-canada-west.aspx, Retrieved 20 August 2020.
1871 Census of Canada. http://www.bac-lac.gc.ca/eng/census/1861-canada-west/Pages/1842-canada-west.aspx, Retrieved 20 August 2020.

Page and Smith
1875 *Illustrated Historical Atlas of Wentworth County*. Toronto: Page & Smith.
Stanton, Robert

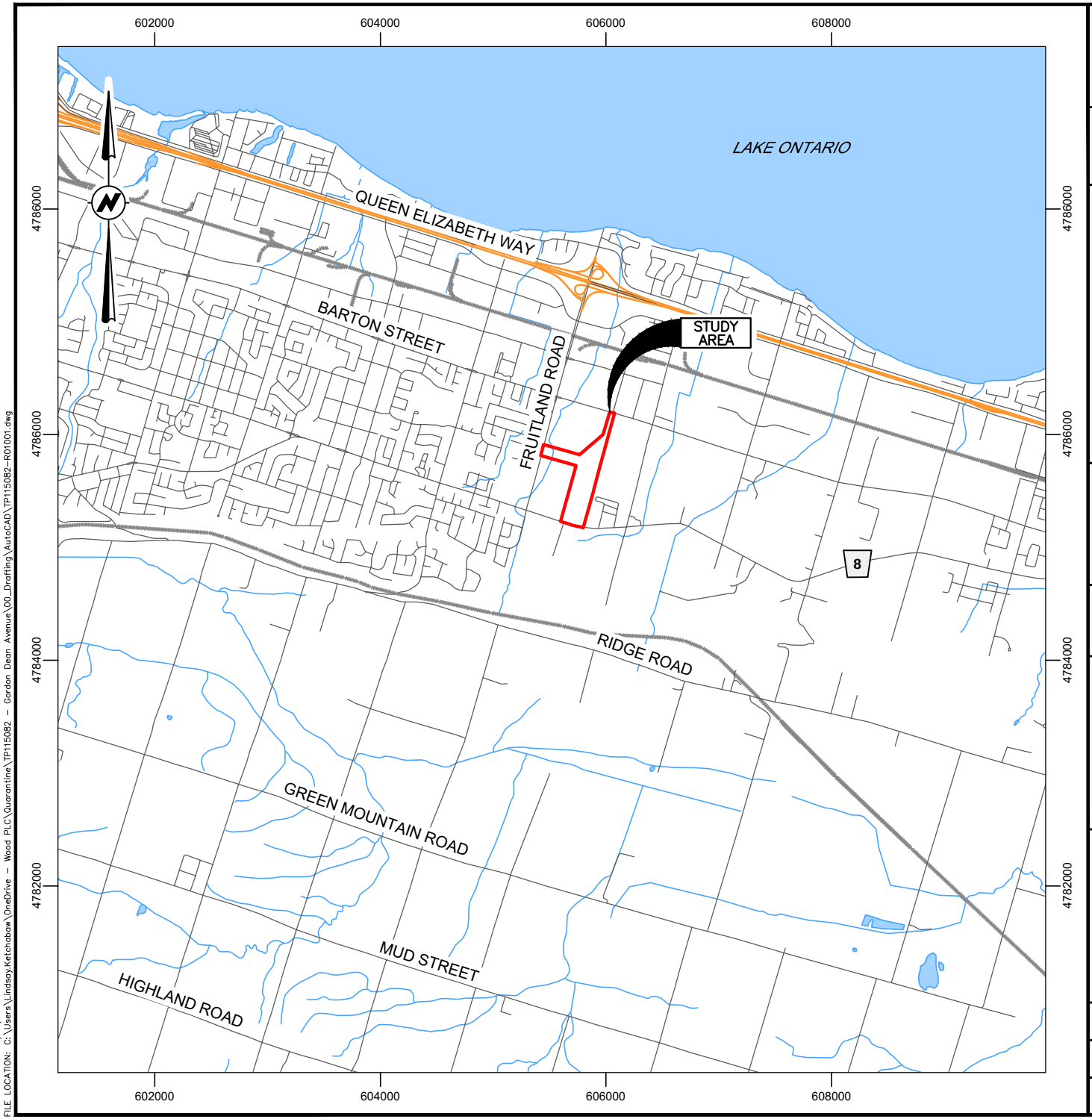
Stanton, Robert

1843 The Statues of Upper Canada, to the Time of the Union. Volume 1, Public Acts. Toronto; Robert Stanton (Queen's Printer).

Wood
2019 Stage 1 Archaeological Assessment Highway 8 Improvements (Fruitland Road to Fifty Road), Lot 2 to 15, Concession II, and Lots 13, 14 and 15, Concession III, in the historic township of Saltfleet, Wentworth Count, City of Hamilton, Ontario. Prepared by Wood, December 2019, PIF P141-0329-2018.

Appendix A

Figures



PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
LOCATION OF THE STUDY AREA

LEGEND:
STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
CANMAP STREETFILES V2008.4.

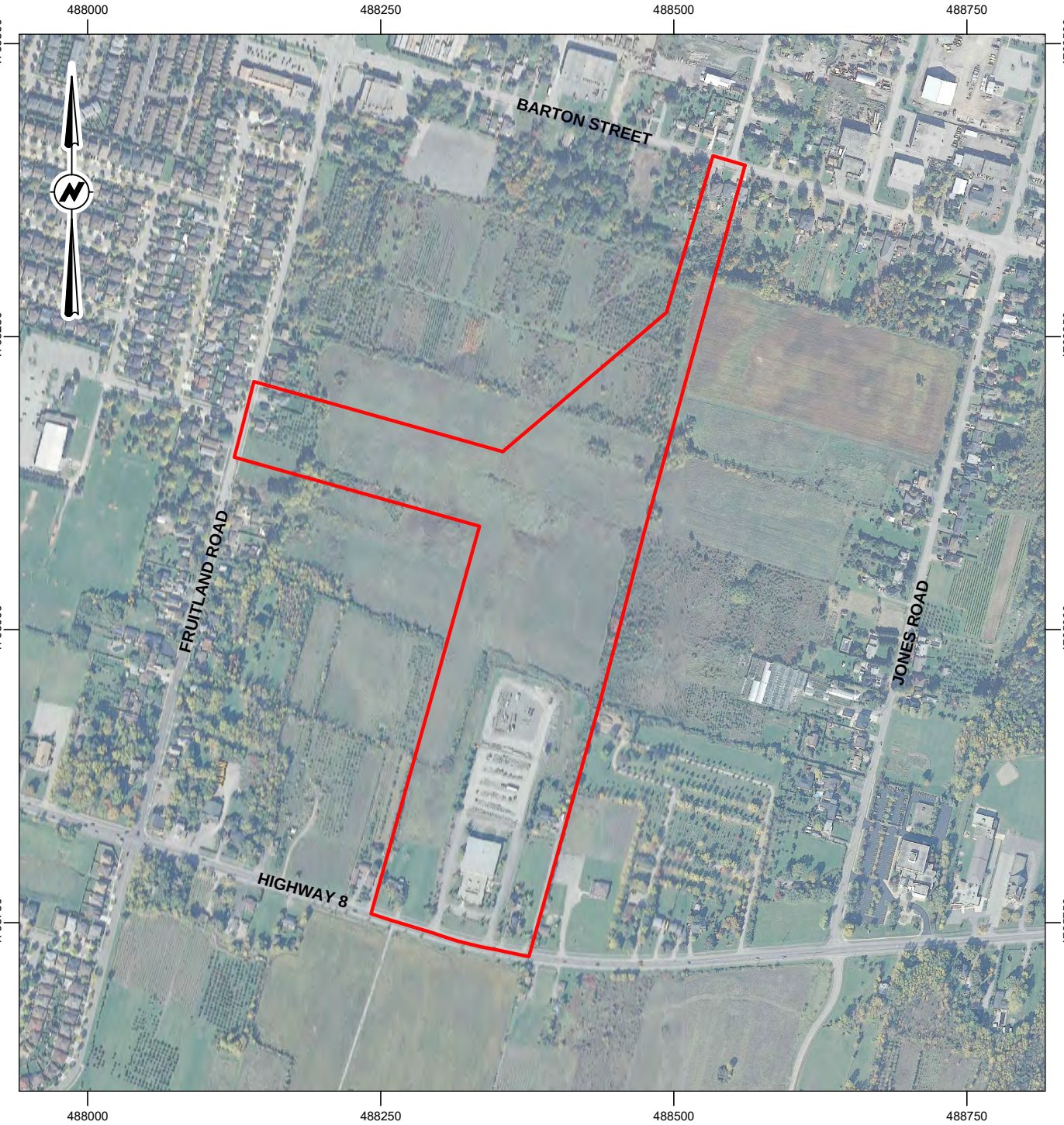
0 500 1,500 2,500m
SCALE 1:50,000

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10. 2020
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: TP115082
REV No: 0		FIGURE No: 1

DATE PLOTTED: 9/10/2020 1:40:44 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg



PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
AERIAL PHOTOGRAPH SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:

STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

0 100 200 300m
SCALE 1:7,500

CLIENT:

FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10. 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		2

DATE PLOTTED: 9/10/2020 1:41:24 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg

PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
TOPOGRAPHIC MAP SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:
STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
ONTARIO BASIC MAPPING (OBM).

0 500 1,500 2,500m
SCALE 1:50,000

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10. 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		3

DATE PLOTTED: 9/10/2020 1:42:08 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg

PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
DEVELOPMENT PLAN

LEGEND:

- STUDY AREA
- NOT IN SCOPE - ASSESSED AS PART OF SEPARATE DEVELOPMENT APPLICATION
- PREVIOUSLY ASSESSED FURTHER ASSESSMENT REQUIRED (AMEC FOSTER WHEELER 2017; PIF P141-0265-2016)
- PREVIOUSLY ASSESSED FURTHER ASSESSMENT REQUIRED (WOOD 2019; PIF P141-0329-2018)

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
PLAN PROVIDED BY CLIENT, AND 2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

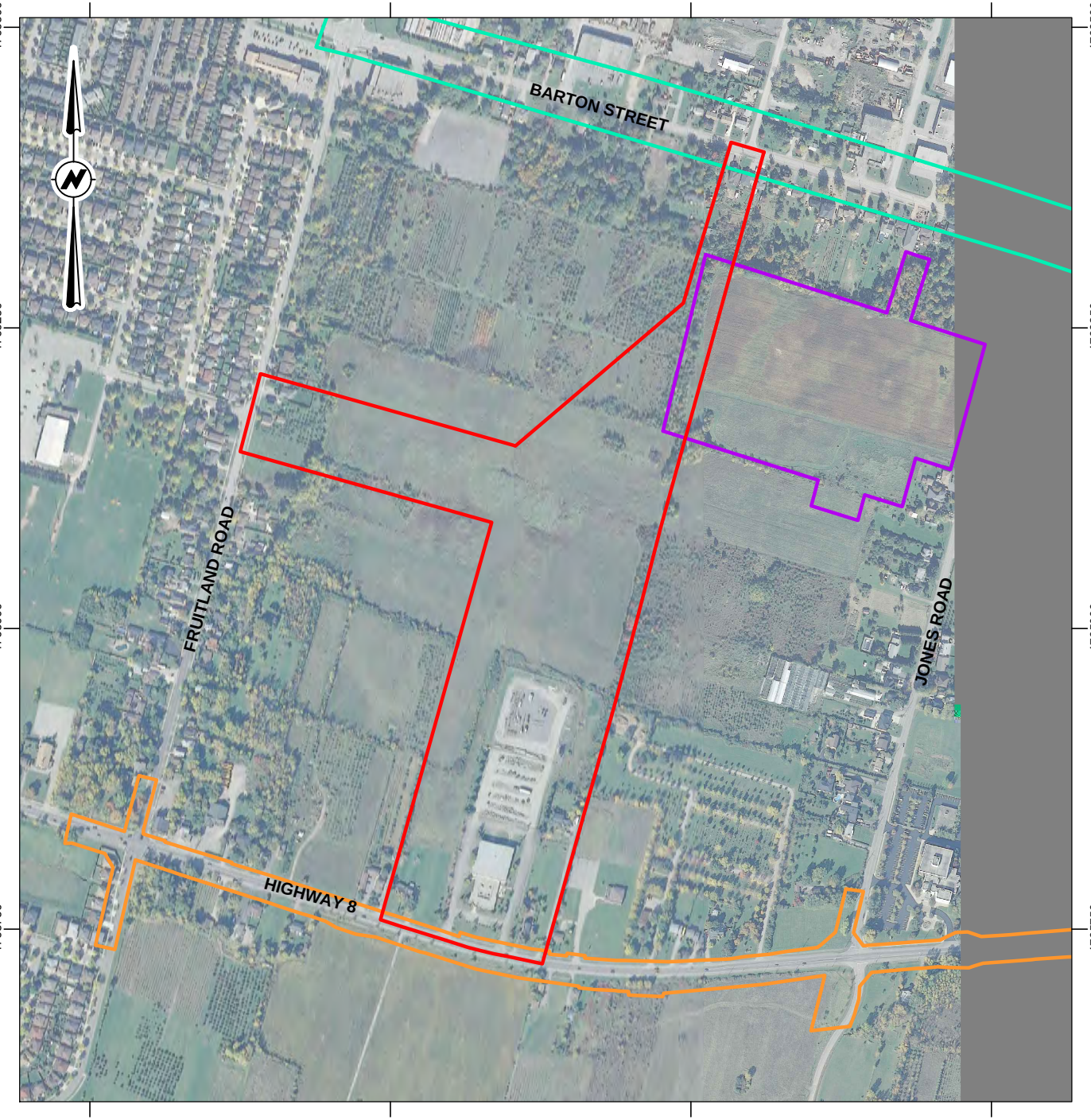
0 100 200 300m
SCALE 1:7,500

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10, 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		4

DATE PLOTTED: 9/10/2020 4:51:45 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg



PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS WITHIN THE STUDY AREA AND WITHIN 50 m OF THE STUDY AREA

LEGEND:

- STUDY AREA

NO FURTHER ASSESSMENT REQUIRED:

- STAGE 1&2 AA (ASI 2017; PIF P1066-0025-2017, P1066-0036-2017)

FURTHER ASSESSMENT REQUIRED:

- STAGE 1 AA (AMEC FOSTER WHEELER 2017; PIF P141-0265-2016)
- STAGE 1 AA (WOOD 2019; PIF P141-0329-2018)

NOTE:
A STAGE 1-3 ARCHAEOLOGICAL ASSESSMENT (P013-259-2006) AND A STAGE 4 ARCHAEOLOGICAL MITIGATION (P013-314-2007) HAVE TAKEN PLACE WITHIN PART OF LOTS 13 AND 14, CONCESSION 2, HOWEVER MAPPING OF THE STUDY AREAS WAS NOT AVAILABLE AT THE TIME OF THE PREPARATION OF THIS REPORT.

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

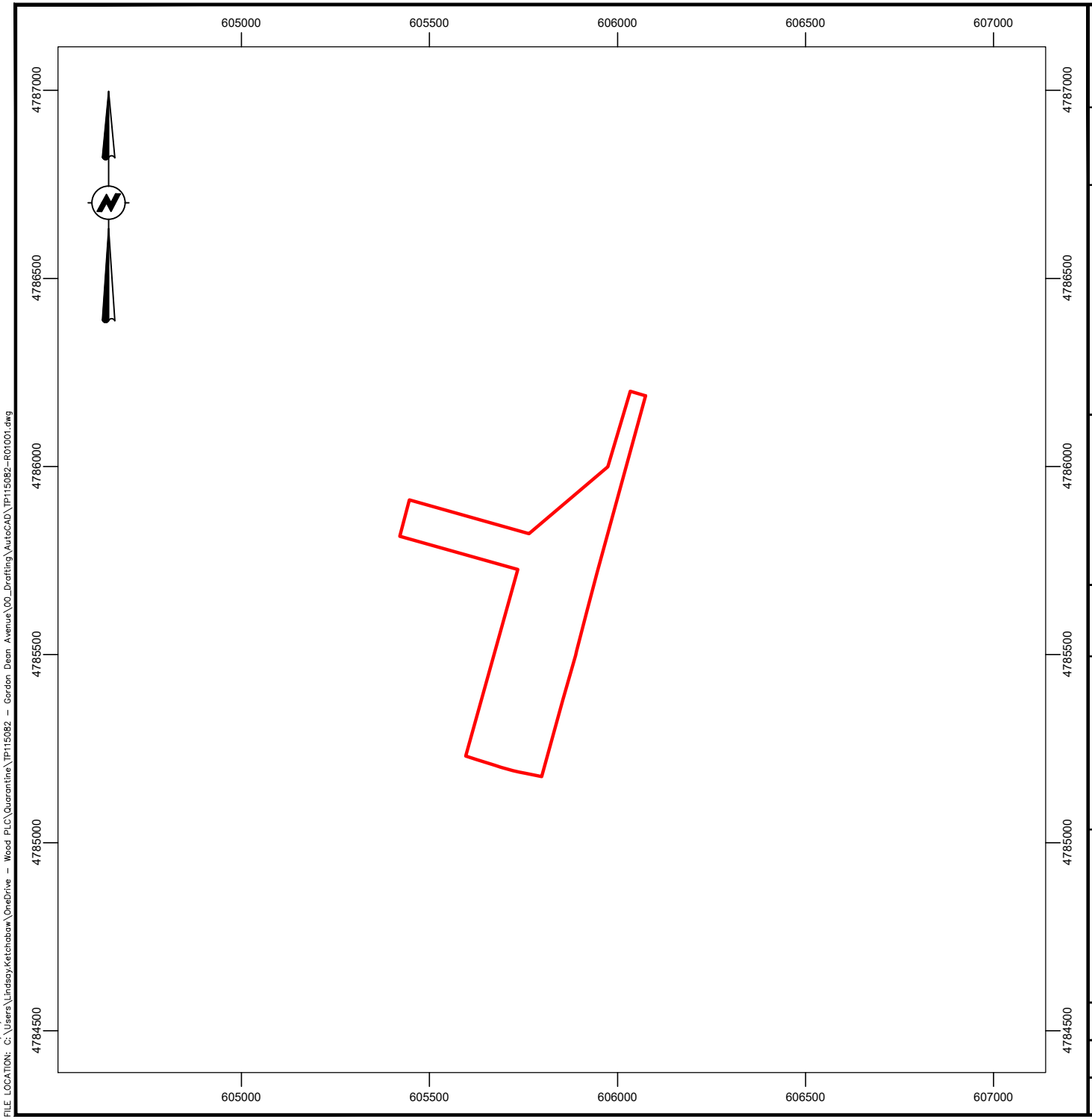
0 100 200 300m
SCALE 1:7,500

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10, 2020
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: TP115082
REV No: 0		FIGURE No: 5

DATE PLOTTED: 9/10/2020 1:54:10 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg



PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
1859 MAP OF THE COUNTY OF WENTWORTH SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:
STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

MAP SHOWN AT BEST AVAILABLE RESOLUTION.

ORIGINAL PAPER SIZE: 8½ x 11

REFERENCES:
SURTEES, 1859.

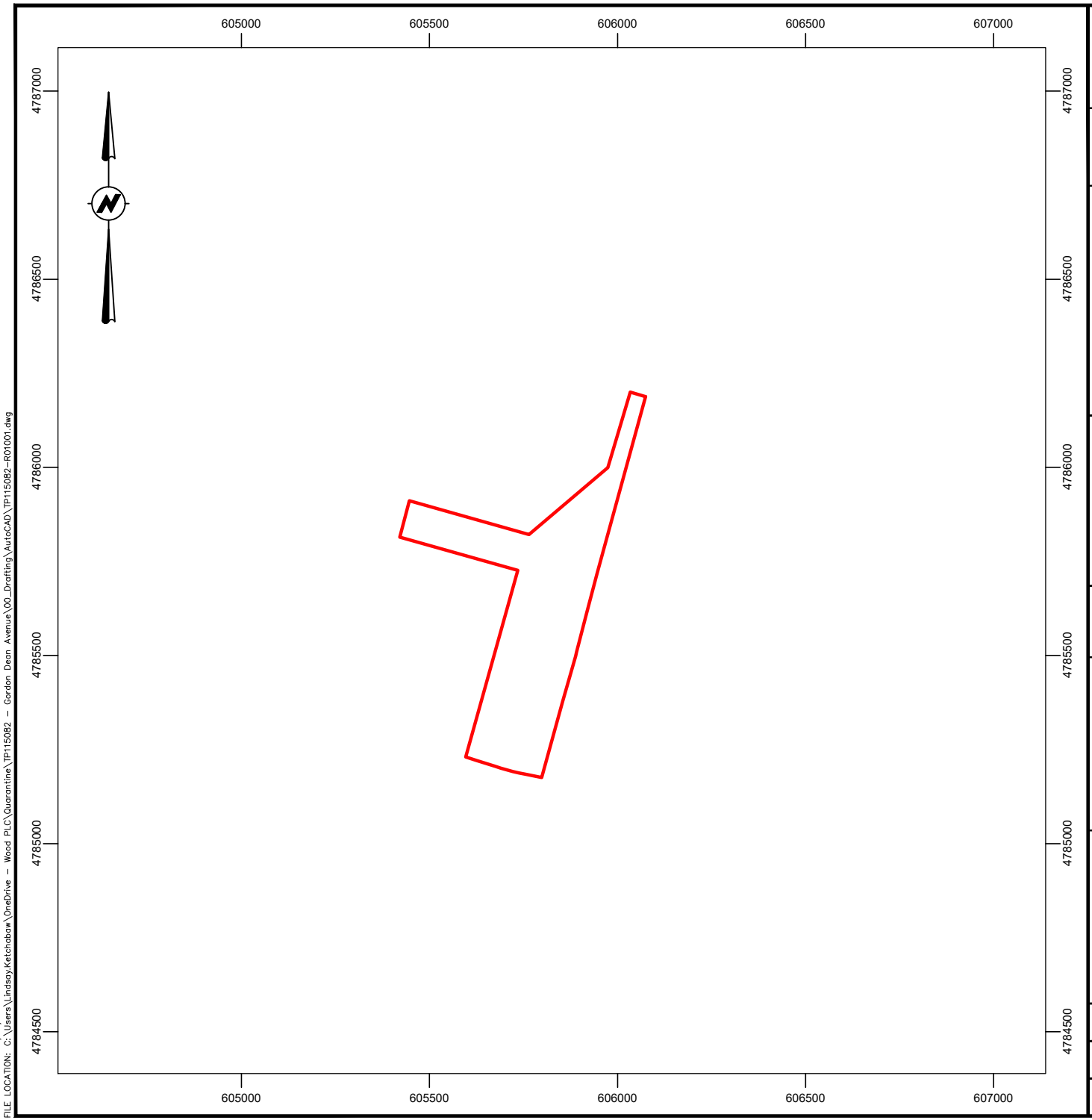
0 100 300 500m
SCALE 1:15,000

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10. 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		6

DATE PLOTTED: 9/10/2020 1:45:11 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg



PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
1875 ILLUSTRATED HISTORICAL ATLAS MAP OF WENTWORTH COUNTY

LEGEND:
STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

MAP SHOWN AT BEST AVAILABLE RESOLUTION.

ORIGINAL PAPER SIZE: 8½ x 11

REFERENCES:
PAGE & SMITH, 1875.

0 100 300 500m
SCALE 1:15,000

CLIENT:
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 10. 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		7

DATE PLOTTED: 9/10/2020 1:45:42 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg

PROJECT:
STAGE 1 AA GORDON DEAN AVENUE SCHEDULE "C" MUNICIPAL CLASS EA, LOCATED ON LOTS 13 AND 14, CONCESSION 2, GEOGRAPHIC TOWNSHIP OF SALTFLEET, WENTWORTH COUNTY, CITY OF HAMILTON, ONTARIO

TITLE:
STAGE 1 RESULTS WITH PHOTOGRAPH LOCATIONS AND DIRECTIONS

LEGEND:

- STUDY AREA

AREA OF ARCHAEOLOGICAL POTENTIAL:

- PLOUGHABLE LAND – TO BE PEDESTRIAN SURVEYED AT 5 m INTERVALS
- UNPLOUGHABLE LAND – TO BE TEST PIT SURVEYED AT 5 m INTERVALS

AREA OF NO OR LOW ARCHAEOLOGICAL POTENTIAL:

- DISTURBED: NO FURTHER ASSESSMENT REQUIRED
- LOW AND WET: NO FURTHER ASSESSMENT REQUIRED
- 2 PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND PLATE NUMBER

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

0 100 200 300m
SCALE 1:7,500

CLIENT:

FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.
Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY: LMK	CHK'D BY: CD	DATE: SEPT. 10, 2020
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: TP115082
REV No: 0		FIGURE No: 8

DATE PLOTTED: 9/10/2020 4:53:39 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R01001.dwg

Appendix B

Aerial Photographs

Aerial Photograph
Dated: 1960
Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario

Aerial Photograph
Dated: 1966
Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario

N

Study Area

Aerial Photograph
Dated: 2005
Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario

wood.

Appendix C

Photographs

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	1

Description
Study area facing northeast from southern portion of the study area.

PHOTOGRAPH	2

Description
Study area facing northeast along Highway 8, manicured lawn directly adjacent to gravel driveway.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	3

Description
Study area facing northeast along highway 8, paved driveway and building footprint.

PHOTOGRAPH	4

Description
Study area facing southeast along Highway 8, manicured law and paved sidewalk.

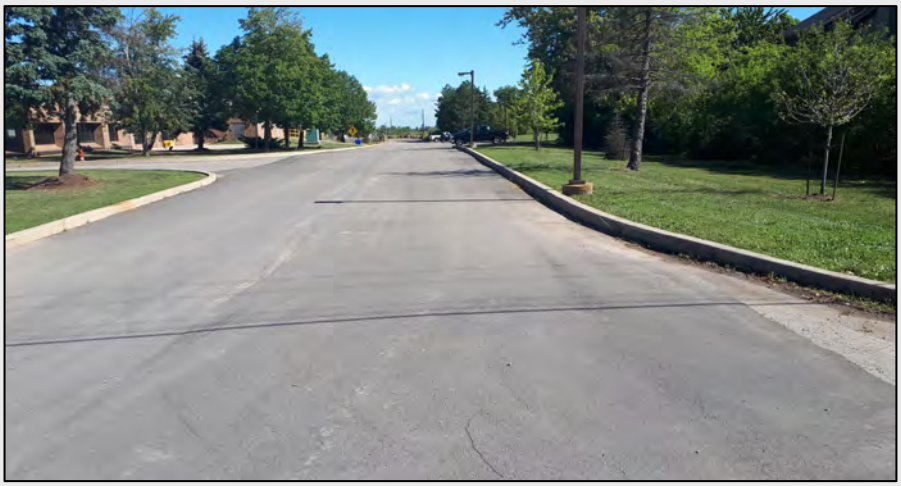
APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	5



Description
Study area facing northeast along highway 8, manicured lawn directly adjacent to paved sidewalk and building footprint.

PHOTOGRAPH	6

Description
Study area facing northeast along highway 8, manicured lawn directly adjacent to paved sidewalk and building footprint.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	7

Description
Study area facing northeast along highway 8 manicured lawn directly adjacent to paved sidewalk and building footprint.

PHOTOGRAPH	8

Description
Study area facing northeast along highway 8, manicured lawn directly adjacent to paved sidewalk and building footprint.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	9

Description
Study area facing southwest, paved driveway and building footprint.

PHOTOGRAPH	10

Description
Study area facing northeast, paved driveway and industrial area in the background.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	11

Description
Study area facing northwest, paved roadway and building/ construction footprint.

PHOTOGRAPH	12

Description
Study area facing northeast, gravel roadway and parking area.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	13

Description
Study area facing northeast.

PHOTOGRAPH	14

Description
Study area facing southwest.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	15

Description
Study area facing southwest along Fruitland Rd, paved driveway, sidewalk, and building footprint directly adjacent to a manicured lawn.

PHOTOGRAPH	16

Description
Study area facing south along Fruitland Rd, paved driveway, sidewalk, road, and building footprint directly adjacent to a manicured lawn.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	17

Description
Study area facing northeast along Fruitland Road.

PHOTOGRAPH	18

Description
Study area facing southeast along Fruitland Road.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	19

Description
Study area facing northeast, low and wet area with unnamed tributary within the bush line.

PHOTOGRAPH	20

Description
Study area facing northwest.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	21

Description
Study area facing southwest.

PHOTOGRAPH	22

Description
Study area facing southeast.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	23

Description
Study area facing northeast.

PHOTOGRAPH	24

Description
Study area facing southwest.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	25

Description
Study area facing northeast.

PHOTOGRAPH	26

Description
Study area facing northeast.

APPENDIX C - PHOTOGRAPHIC RECORD

PROJECT NO. TP115082

PROJECT Stage 1 Archaeological Assessment Gordon Dean Avenue

LOCATION City of Hamilton, Ontario

PHOTOGRAPH	27

Description
Study area facing southwest.

PHOTOGRAPH	28

Description
Study area facing southwest along Barton St, manicured law directly adjacent to paved sidewalk and buidling footprint.

Appendix D

Assessor Qualifications

Assessor Qualifications

Peter Popkin, Ph.D., CAHP, MCIfA, Associate Archaeologist – Dr. Popkin is an Associate Archaeologist at Wood. Peter has over 20 years of professional experience in both consulting and academic archaeology within Canada and internationally. In Ontario he has successfully undertaken consultant archaeology projects triggered by: the Planning Act (subdivisions, site plans, re-zoning, official plan amendments, consent), the Environmental Assessment Act (individual and Class EAs, provincial and federal EAs), the Environmental Protection Act (Renewable Energy Approvals O.Reg 359/09), as well as the Aggregates Resources Act (aggregate pit extensions), and has managed projects under the National Energy Board Act (now the Canadian Energy Regulator Act). Dr. Popkin has lectured in archaeology at York University, the University of Toronto and Wilfrid Laurier University in Ontario, as well as University College London, King's College London, and Birkbeck College, in the UK. Dr. Popkin holds a **Professional Archaeology Licence (P362)** from the MHSTCI, is a Professional Member of the Canadian Association of Heritage Professionals (CAHP) and is a full Member of the Chartered Institute for Archaeologists (MCIfA). Dr. Popkin received his Ph.D. from the Institute of Archaeology, University College London, London, UK (2009).

Barbara Slim, M.A., Associate Archaeologist, Ontario Archaeology Discipline Lead – Ms. Slim is a professionally licensed archaeologist with over 15 years of experience in the archaeology and environmental consulting industry. Ms. Slim has conducted all aspects of Stage 1 to 4 archaeological assessments for provincial agencies, municipalities, and land developers in support of infrastructure developments, financial real estate transactions, environmental remediation and private developments. As a founding member of the Wood Ontario archaeology team, Ms. Slim has performed every aspect of project execution, from client relations, project design to MHSTCI clearance. Through her project experience, Ms. Slim has gained an in-depth understanding of the Heritage Act and legislations & standards associated with cultural heritage management. Ms. Slim holds a Master's Degree in Anthropology from Trent University and an Honours Bachelor's Degree in Environmental Studies and Anthropology from Trent University. Ms. Slim currently holds a **Professional Archaeology Licence (P348)** issued by the Ministry of Heritage, Sport, Tourism and Culture Industries and is a member of the Ontario Association of Professional Archaeologists.

Cara Howell B.A., Senior Archaeologist - Ms. Howell holds a B.A. Degree in Anthropology and Classical Archaeology from McMaster University and has been working in the field of archaeological consulting since 1999. She holds an **Applied Research Licence (R180)** in archaeology from the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries and possesses a full range of archaeological skills. As a result of her specialized interest in the early post-contact period, she has become an authority on early Euro-Canadian artifacts and background research. As the archaeology Laboratory Director for Wood's Cultural Heritage Resources Group, she developed and implements a computerized cataloguing system for artifacts and other resources. Ms. Howell also serves as lead liaison with Indigenous communities.

Jason Seguin, M.A., Senior Archaeologist. - Mr. Seguin has worked as an archaeologist since 2004 and has conducted numerous Stage 1 to 4 archaeological assessments including background searches, field surveys, archaeological excavations, analysis of archaeological

resources, laboratory work and reporting. Mr. Seguin is involved in project management and supervision as well as being an archaeological laboratory director. Mr. Seguin has developed research and communication skills through producing and editing field reports, teaching university level students in both lecture and seminar environments, as well as preparing and presenting presentations at academic conferences. Mr. Seguin's education and work experience have provided him with an extensive knowledge base, consisting of theoretical and practical experience in cultural resource management in Canada and Central America, as well as curatorial, archival and museum management experience. Mr. Seguin holds a Master's Degree in Anthropology from Trent University, and a Post-Graduate Certificate in Museum Management and Curatorship from Sir Sandford Fleming College. Mr. Seguin currently holds a **Professional Archaeology Licence (Licence P354)** issued by the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries and is a member of the Association of Professional Archaeologists.

Chelsea Dickinson B.A., Research Archaeologist - Ms. Dickinson has been working in consulting archaeology since 2015. During this time, Ms. Dickinson has developed a variety of archaeological skills, from background research to Stage 4 excavations laboratory work, and artifact analysis. In Ontario Ms. Dickinson has worked on a variety of archaeological projects triggered by the Planning and Environmental Assessment Acts participating in a multitude of environmental assessments (EA) conducted for the development of wind and solar farms, hydro line corridors and municipal roadways. Ms. Dickinson has been the co-author on a multitude of archaeological reports specializing in historical background research spanning across Southern Ontario. Ms. Dickinson has had the privilege of working alongside a multitude of First Nation community members while conducting archaeological assessments in both Northern and Southern Ontario. Ms. Dickinson holds an honorary Degree in Near Eastern and Classical Archaeology from Wilfrid Laurier University, and a Post-Graduate Certificate in Geographical Information Systems from Fanshawe College. Ms. Dickinson holds an **Applied Research Licence (R1194)** from the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries.

Alejandra Cooney B.Sc., Field Archaeologist - Mrs. Cooney holds a BSc. Degree in Anthropology and Biology from Trent University and has been working in the field of archaeological consulting since 2013. She holds an **Applied Research License (R1188)** in archaeology from the Ontario Ministry of Heritage, Sport, Tourism, and Culture Industries and holds a range of archaeological skills. Throughout her archaeological career, Mrs. Cooney has developed her archaeological skills by conducting stage 1 to 4 archaeological assessments including background research, field surveys, and archaeological excavations, analysis of cultural material, laboratory work and reporting. In Ontario Ms. Cooney has worked on a variety of archaeological projects triggered by the Planning and Environmental Assessment Acts that allowed her to participate in a multitude of environmental assessments (EA) conducted for the development of environmental projects, hydro line corridors, municipal roadways and infrastructure development. These experiences have led her to travel all over the province of Ontario providing a range of archaeological assessments, which has given her the opportunity to be involved in projects that require the use of off-road vehicles, such as Argo/ ATV, and helicopters to gain access to remote locations. As a result, she has had the privilege of working alongside a multitude of First Nation community members while conducting archaeological assessments in both Northern and Southern Ontario.

Appendix E

Limitations

Limitations

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
   (a) The Standard Terms and Conditions which form a part of our Professional Services Contract;
   (b) The Scope of Services;
   (c) Time and Budgetary limitations as described in our Contract; and,
   (d) The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Study Area. Our conclusions cannot and are not extended to include those portions of the Study Area which were not reasonably available, in Wood Environment & Infrastructure's opinion, for direct observation.
4. The potential for archaeological resources, and any actual archaeological resources encountered, at the Study Area were assessed, within the limitations set out above, having due regard for applicable heritage regulations as of the date of the inspection.
5. Services including a background study and fieldwork were performed. Wood Environment & Infrastructure's work, including archival studies and fieldwork, were completed in a professional manner and in accordance with the Ministry of Heritage, Sport, Tourism and Culture Industries' guidelines. It is possible that unforeseen and undiscovered archaeological resources may be present at the Study Area.
6. The utilization of Wood Environment & Infrastructure's services during the implementation of any further archaeological work recommended will allow Wood Environment & Infrastructure to observe compliance with the conclusions and recommendations contained in the report. Wood Environment & Infrastructure's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
7. This report is for the sole use of the parties to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or in part, or any reliance thereon, or decisions made based on any information of conclusions in the report, is the sole responsibility of such third party. Wood Environment & Infrastructure accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
8. This report is not to be given over to any third-party other than a governmental entity, for any purpose whatsoever without the written permission of Wood Environment & Infrastructure, which shall not be unreasonably withheld.

Original Report:
Stage 1 Archaeological Assessment

Gordon Dean Avenue Schedule "C" Municipal Class EA, Located on Lots 13 and 14, Concession 2, Geographic Township of Saltfleet, Wentworth County, City of Hamilton, Ontario
Project # TP115082

Supplementary Documentation

Archaeological Consulting License # P354 (Seguin)
PIF # P354-0054-2020 (Stage 1)
{Associated with PIF P1066-0025-2017 (Stage 1); P1066-0036-2017 (Stage 2); P141-0329-2018 (Stage 1); P013-259-2006 (Stage1-3); P141-0329-2018 (Stage 4)}

Prepared for:

Fruitland – Winona Block 1 Development Group 25-Sep-20
4 Hughson Street South, Suite 1000Hamilton, ON L8N 3Z1

LIST OF SUPPLEMENTARY DOCUMENTATION

SECTION 1: CORRESPONDENCE WITH THE BEREAVEMENT AUTHORITY OF ONTARIO
SECTION 1: CORRESPONDENCE WITH THE CITY OF HAMILTON

Section 1

Correspondence with the Bereavement Authority of Ontario

Correspondence with the Bereavement Authority of Ontario

Email correspondence with the Bereavement Authority of Ontario (BAO) regarding the original burial grounds and property boundaries of Mountview Garden Cemetery (c. 1976) are provided on the following pages.

From:	Ray Porrill
To:	Dickinson, Chelsea; Michael D'Mello
Cc:	Howell, Cara; Seguin, Jason; Cooney, Leonoralejandra; "Prowse, Shari (MTCS)"
Subject:	RE: Information Request: Mountview Gardens Cemetery
Date:	Wednesday, September 2, 2020 9:22:17 AM
Attachments:	image014.png image015.png image016.png image017.png image018.png image019.png image001.png image006.png image007.png Mountview Cemetery - September 30, 1969 Survey.pdf

---

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Good morning, Chelsea.
I just happen to be in the office this morning and pulled the file. I found this survey from 1969. Will this be of assistance?

Best Regards,
Ray Porrill | Licensing Officer
Bereavement Authority of Ontario |100 Sheppard Av. East, Suite 505 |Toronto, Ontario, M2N 6N5
T: 647.483.2645 Ext. 211| F: 647-748-2645
www.thebao.ca |

This message may contain confidential and/or privileged information. If you are not the addressee or authorized to receive this for the addressee, you must not use, copy, disclose, or take any action based on this message or any information herein. If you have received this message in error, please advise the sender immediately by reply email and delete this message. Thank you for your cooperation.

From: Dickinson, Chelsea <chelsea.dickinson@woodplc.com>

Sent: September 2, 2020 9:01 AM
To: Michael D'Mello <michael.dmello@thebao.ca>
Cc: Carey Smith <carey.smith@thebao.ca>; Howell, Cara <cara.howell@woodplc.com>; Seguin, Jason <jason.seguin@woodplc.com>; Cooney, Leonoralejandra <l.cooney@woodplc.com>; Ray Porrill <ray.porrill@thebao.ca>; Gillian Glover <Gillian.Glover@thebao.ca>; 'Prowse, Shari (MTCS)' <Shari.Prowse@ontario.ca>
Subject: RE: Information Request: Mountview Gardens Cemetery

Good Morning Michael,

I just wanted to follow up regarding our information request concerning the Mountview Gardens Cemetery.

Any update you could provide would be greatly appreciated.

Thanks,
Chelsea

From: Michael D'Mello <michael.dmello@thebao.ca>
Sent: Tuesday, August 25, 2020 9:48 AM
To: Dickinson, Chelsea <chelsea.dickinson@woodplc.com>
Cc: Michael D'Mello <michael.dmello@thebao.ca>; Carey Smith <carey.smith@thebao.ca>; Howell, Cara <cara.howell@woodplc.com>; Seguin, Jason <jason.seguin@woodplc.com>; Cooney, Leonoralejandra <l.cooney@woodplc.com>; Ray Porrill <ray.porrill@thebao.ca>; Gillian Glover <Gillian.Glover@thebao.ca>; 'Prowse, Shari (MTCS)' <Shari.Prowse@ontario.ca>
Subject: FW: Information Request: Mountview Gardens Cemetery

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Chelsea:

This is to acknowledge receipt of your e-mail of August 24, 2020, cc'd below requesting information on the boundaries of the Mountview Gardens Cemetery – Licensed Site # CM-01347 under the organization # 3275808 - CITY OF HAMILTON.

The contact for the City of Hamilton is:
CITY OF HAMILTON
WARREN, JOANNE (2032633)
777 YORK BLVD, HAMILTON, ON L8R2A4
P: (905) 546-2424 ext. 2144, F: (905) 546-4751

We will attempt to review our cemetery site file and confirm the existence of maps/surveys etc. by

August 30, 2020.

However, we expect that you will contact the City of Hamilton, confirm the identify of the owner of the land on which the cemetery is situated and seek confirmation of the boundaries of the cemetery. **Note: Current fences or hedges are not necessarily the legal boundaries of a cemetery, so it is important to make every effort to confirm the legal boundaries of the cemetery as this impacts that actions, processes and consequences that will follow should human remains/burials be discovered in closed proximity to the cemetery boundaries.**

Should you not get a response from the Bereavement Authority of Ontario by August 30, 2020, please feel free to contact me again.

We appreciate your cooperation in this matter.

Thanks,

Mike

Michael F. D'Mello | Deputy Registrar
Bereavement Authority of Ontario
Address: 100 Sheppard Avenue East, Suite 505, Toronto, Ontario, M2N 6N5
Direct: 647-483-2648 | Cell: 416-728-5396 | Toll Free: 1-844-493-6356 | Fax: 647-748-2645
www.thebao.ca |

This message may contain confidential and/or privileged information. If you are not the addressee or authorized to receive this for the addressee, you must not use, copy, disclose, or take any action based on this message or any information herein. If you have received this message in error, please advise the sender immediately by reply email and delete this message. Thank you for your cooperation.

From: Crystal MacLaren <Crystal.MacLaren@thebao.ca>
Sent: August 25, 2020 9:11 AM
To: Michael D'Mello <michael.dmello@thebao.ca>
Subject: FW: Information Request: Mountview Gardens Cemetery

From: Dickinson, Chelsea <chelsea.dickinson@woodplc.com>
Sent: August 24, 2020 6:45 PM
To: BAO Info <info@thebao.ca>
Cc: Howell, Cara <cara.howell@woodplc.com>; Seguin, Jason <jason.seguin@woodplc.com>; Cooney, Leonoralejandra <l.cooney@woodplc.com>

Subject: Information Request: Mountview Gardens Cemetery

Good Evening,

I am currently working on a Stage 1 archaeological assessment in Hamilton, Ontario.

Mountview Gardens Cemetery (Lot 13, Con 2, Township of Saltfleet, Wentworth County) is located within our study area. I am writing to inquire if you had any information that would show the original burial grounds and property boundaries? I believe it dates back to 1976 and is approximately 12 acres of land.

I am aware that Covid-19 restrictions may affect your ability to access records, but any information you could provide would be greatly appreciated. I have attached a google map image for your reference.

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

Thanks,
Chelsea

Chelsea Dickinson, B.A.
Research Archaeologist
Environment and Infrastructure Solutions
Work: (226) 821-2497
chelsea.dickinson@woodplc.com
www.woodplc.com

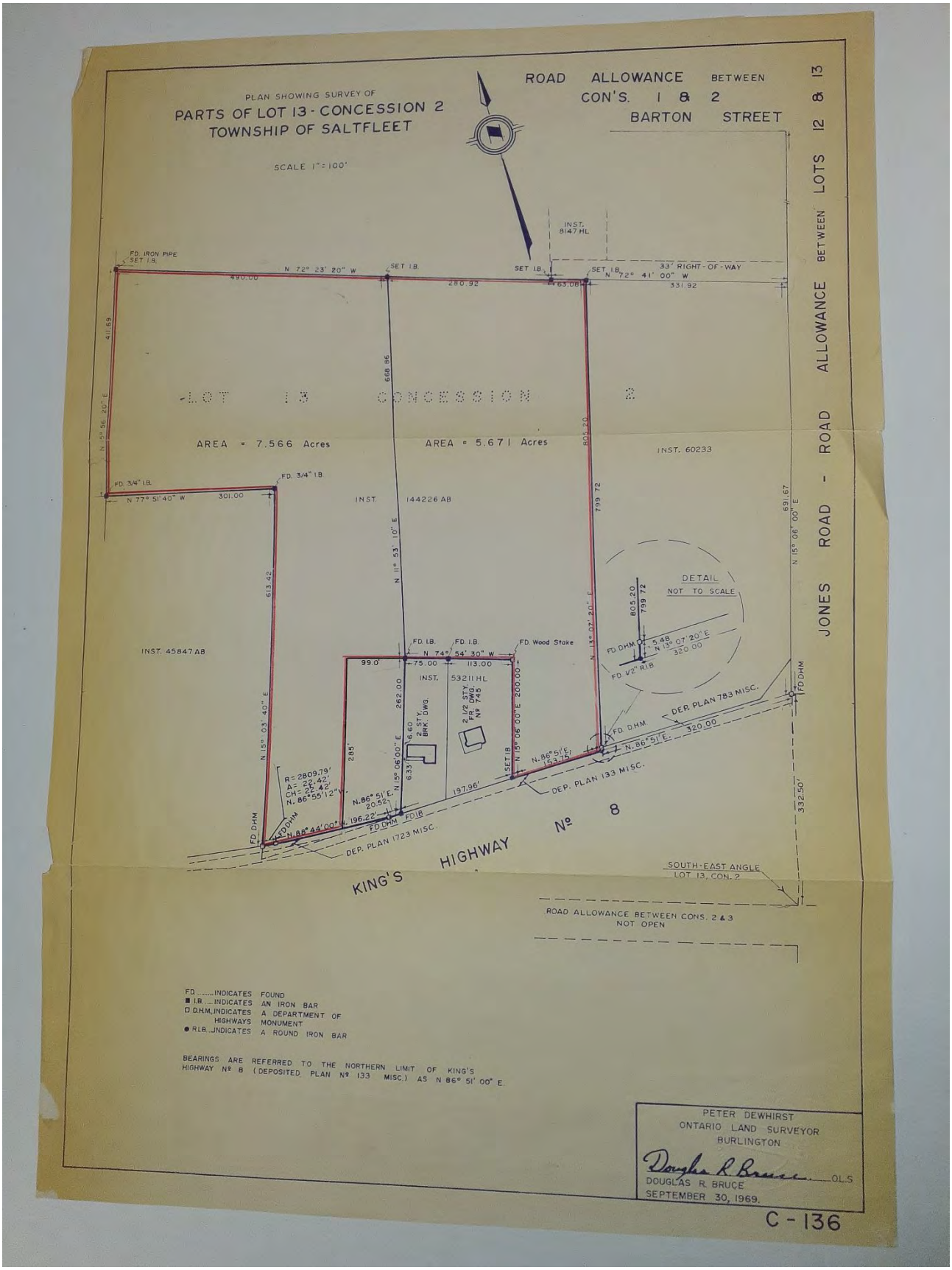
wood.

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include "Unsubscribe" in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice


PLAN SHOWING SURVEY OF
PARTS OF LOT 13 - CONCESSION 2
TOWNSHIP OF SALTFLEET
SCALE 1" = 100'
ROAD ALLOWANCE BETWEEN
CON'S. 1 & 2
BARTON STREET
JONES ROAD - ROAD ALLOWANCE BETWEEN LOTS 12 & 13
LOT 13 CONCESSION 2
AREA = 7.566 Acres
AREA = 5.671 Acres
INST. 60233
INST. 144226 AB
INST. 45847 AB
INST. 53211 HL
INST. 8147 HL
33' RIGHT-OF-WAY
DETAIL
NOT TO SCALE
KING'S HIGHWAY Nº 8
DEP. PLAN 783 MISC.
DEP. PLAN 133 MISC.
DEP. PLAN 1723 MISC.
SOUTH-EAST ANGLE
LOT 13, CON. 2
ROAD ALLOWANCE BETWEEN CONS. 2 & 3
NOT OPEN
FD. ..... INDICATES FOUND
■ I.B. ... INDICATES AN IRON BAR
□ D.H.M. INDICATES A DEPARTMENT OF HIGHWAYS MONUMENT
● R.I.B. ... INDICATES A ROUND IRON BAR
BEARINGS ARE REFERRED TO THE NORTHERN LIMIT OF KING'S HIGHWAY Nº 8 (DEPOSITED PLAN Nº 133 MISC.) AS N 86° 51' 00" E.
PETER DEWHIRST
ONTARIO LAND SURVEYOR
BURLINGTON
DOUGLAS R. BRUCE
SEPTEMBER 30, 1969.
C - 136

Section 2

Correspondence with the City of Hamilton

Correspondence with the City of Hamilton

Email correspondence with the City of Hamilton regarding the property owner and boundaries of Mountview Garden Cemetery (c. 1976) are provided on the following pages.

From:	Perrotta, John
To:	Dickinson, Chelsea
Cc:	Seguin, Jason; Popkin, Peter; Howell, Cara; Cooney, Leonoralejandra
Subject:	RE: Information Request: Mountview Gardens Cemetery
Date:	Monday, September 14, 2020 12:13:25 PM
Attachments:	image005.png image001.png Mountview Gardens Cemetery Boundary.pdf

CAUTION: External email. Please do not click on links/attachments unless you know the content is genuine and safe.

Hello Chelsea,

Thank you for your email.

Mountview Gardens Cemetery is owned by the City of Hamilton. I have attached a map that shows the Cemetery boundaries.

If you require any further information, please do not hesitate to contact me,

Thank you,

John Perrotta Superintendent,
Cemeteries Public Works
Environmental Services, City of Hamilton
(905) 546-2424 Ext.4402
Hamilton

The City of Hamilton encourages physical distancing and increased handwashing. Learn more about the City's response to COVID-19 www.hamilton.ca/coronavirus

From: Dickinson, Chelsea <chelsea.dickinson@woodplc.com>
Sent: Tuesday, September 1, 2020 5:11 PM
To: Cemeteries Generic <cemeteries@hamilton.ca>
Cc: Seguin, Jason <jason.seguin@woodplc.com>; Popkin, Peter <peter.popkin@woodplc.com>; Howell, Cara <cara.howell@woodplc.com>; Cooney, Leonoralejandra <l.cooney@woodplc.com> **Subject:** Information Request: Mountview Gardens Cemetery

Good Afternoon,

I am currently working on a Stage 1 archaeological assessment in Hamilton, Ontario and we have identified Mountview Gardens Cemetery (Lot 13, Con 2, Township of Saltfleet, Wentworth County) within our study area.

Following up on a request from the Bereavement Authority of Ontario I am looking to identify the owner of the land on which the cemetery is situated and seek confirmation of the boundaries of the cemetery.

Any information you could provide would be greatly appreciated.

Thanks,

Chelsea Dickinson, B.A.
Research Archaeologist
Environment and Infrastructure Solutions
Work: (226) 821-2497
chelsea.dickinson@woodplc.com
www.woodplc.com

This message is the property of John Wood Group PLC and/or its subsidiaries and/or affiliates and is intended only for the named recipient(s). Its contents (including any attachments) may be confidential, legally privileged or otherwise protected from disclosure by law. Unauthorized use, copying, distribution or disclosure of any of it may be unlawful and is strictly prohibited. We assume no responsibility to persons other than the intended named recipient(s) and do not accept liability for any errors or omissions which are a result of email transmission. If you have received this message in error, please notify us immediately by reply email to the sender and confirm that the original message and any attachments and copies have been destroyed and deleted from your system.

If you do not wish to receive future unsolicited commercial electronic messages from us, please forward this email to: unsubscribe@woodplc.com and include "Unsubscribe" in the subject line. If applicable, you will continue to receive invoices, project communications and similar factual, non-commercial electronic communications.

Please click http://www.woodplc.com/email-disclaimer for notices and company information in relation to emails originating in the UK, Italy or France.

As a recipient of an email from a John Wood Group Plc company, your contact information will be on our systems and we may hold other personal data about you such as identification information, CVs, financial information and information contained in correspondence. For more information on our privacy practices and your data protection rights, please see our privacy notice at https://www.woodplc.com/policies/privacy-notice

Mountview Gardens Cemetery

2020-09-14, 11:56:22 a.m.

1:4,514
0 0.03 0.06 0.11 mi
0 0.04 0.09 0.17 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, City of Hamilton

The City of Hamilton is not liable for any damages resulting from the use of, or reliance on, the information contained herein. This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes.

Memo

To:	Mir Taplur, Environmental Planner Jim Enos, Project Manager	**Date:**	September 25, 2020
From:	Heidy Schopf, Senior Cultural Heritage Specialist, Wood PLC Chelsea Dickinson, Research Archaeologist, Wood PLC		
cc:	Peter Popkin		
Ref:	**TP115082 Gordon Dean Avenue – Municipal Class EA - MHSTCI Checklist**		
Re:	**Gordon Dean Avenue and Collector Road 'B', Cultural Heritage Checklist and Identification of Properties 40 Years or Older**		

1.0 Introduction

Wood Environment & Infrastructure ("Wood") was retained by Fruitland - Winona Development Group (the "Client") to complete a cultural heritage memo in support of the Class Environmental Assessment (EA) for the proposed Gordon Dean Avenue and Collector Road 'B' project. The project involves a proposed north-south road from Barton Street to Highway 8 and the east-west connection to Fruitland Road at Sherwood Park Road from the proposed north-south road (the Study Area). The proposed north-south road is referred to as Gordon Dean Avenue, and the proposed east-west road to Fruitland Road at Sherwood Park Road from the proposed Gordon Dean Avenue is referred to as Collector Road 'B'. Historically, the Study Area is located on Lot 13 and 14, Concession 2, in the Geographic Township of Saltfleet, Wentworth County, now in the City of Hamilton, Ontario (Figure 1 and Figure 2).

Wood completed a draft Environmental Study Report (ESR) for this MCEA in 2020. The Ministry of Heritage, Culture, Tourism and Sport Industries (MHSTCI) reviewed the draft ESR in July 2020 and noted that the Study Area needs to be screened using the MHSTCI checklist. To consider cultural heritage for the Gordon Dean EA, the MHSTCI *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes: A Checklist for the Non-Specialist* (the Checklist) was completed to identify recognized heritage properties and potential heritage properties that may

be of cultural heritage value. Following completion of the Checklist, it was found that the Study Area contains buildings that are 40 years or older and is adjacent to a cemetery.

The approach and methodology used to complete the Checklist are provided in Section 2.0, the results of the Checklist are provided in Section 3.0, a discussion of the results is provided in Section 4.0, and recommendations are provided in Section 5.0. Figures are included in Appendix A, the completed MHSTCI Checklist is provided in Appendix B, and a figure showing the preferred alternative for the proposed Gordon Dean Avenue and Collector 'B' Road is provided in Appendix C.

2.0 Approach and Methodology

2.1 Legislative Requirements and Guidance Documents

The requirements to consider cultural heritage under the Environmental Assessment (EA) process are found in the *Provincial Policy Statement* (PPS) 2020 (Government of Ontario 2020) and the *Environmental Assessment Act* (1990).

The PPS provides policy direction on matters of provincial interest related to land use planning and development (Government of Ontario 2020:1). The PPS is applicable to the entire Province of Ontario. Under the PPS, the conservation of cultural heritage is identified as a matter of provincial interest. Section 2.6 of the PPS gives direction on the consideration of cultural heritage and archaeology (Government of Ontario 2020:31). Specifically, the following direction is given regarding built heritage resources, cultural heritage landscapes, and protected heritage properties:

> *2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved*
>
> *2.6.3 Planning authorities shall not permit development and site alteration on adjacent lands to protected heritage property except where the proposed development and site alteration has been evaluated and it has been demonstrated that the heritage attributes of the protected heritage property will be conserved.*
>
> (Government of Ontario 2020)

The *Environmental Assessment Act* R.S.O. 1990, c. E.18 (EA Act) sets out planning and decision-making process so that potential environmental effects are considered before a project begins (Government of Ontario 2019). The EA Act applies to provincial ministries and agencies, municipalities, and public bodies.

The *Ontario Heritage Act*, R.S.O. 1990, c. O.18, provides a framework for the protection of cultural heritage resources in the Province. It gives municipalities and the provincial government powers to protect heritage properties and archaeological sites. The MHSTCI is responsible for the administration of the *Ontario Heritage Act* and has developed checklists, information bulletins, standards and guidelines, and policies to support the conservation of Ontario's cultural heritage resources, including built heritage resources, cultural heritage landscapes, and archaeological sites.

The MHSTCI developed the Checklist to screen for known (or recognized) heritage properties and properties with potential cultural heritage value. The Checklist also includes other considerations to account for local or Indigenous knowledge that may suggest a property acts as a landmark, have special historical associations, or is part of a cultural heritage landscape. The Checklist represents a high-level screening for properties with cultural heritage value or interest (CHVI). Where properties with known or potential CHVI are identified as part of the Checklist, further work, such as a Cultural Heritage Assessment Report (CHAR), Cultural Heritage Evaluation Report (CHER), or Heritage Impact Assessment (HIA), may be recommended as appropriate.

2.2 Desktop Data Collection and Information Gathering

The Checklist was completed through a combination of desktop data collection and municipal and agency consultation conducted via telephone and email.

The desktop data collection was completed by following the instructions provided pages 4-8 of the Checklist. To identify known (or recognized) heritage properties, the following online sources were reviewed:

- Hamilton Cultural Heritage Resources (2020)
- Easements/Protections, (Ontario Heritage Trust 2020)
- Directory of Designated Heritage Railway Stations in Ontario (Parks Canada 2017)
- Designated Lighthouses (Parks Canada 2020)
- Directory of Federal Heritage Designations (Government of Canada 2020)
- World Heritage List (UNESCO 2020)

In addition, information requests were submitted to identify protected cultural heritage resources in the Study Area. The City of Hamilton, Ontario Heritage Trust, and the MHSTCI were contacted directly via email and/or telephone to determine the presence of listed, designated, or protected heritage properties within, and adjacent to, the Study Area.

To identify properties with potential cultural heritage value, the following online sources were reviewed:

- Plaques Database (Ontario Heritage Trust 2019)
- Bereavement Authority of Ontario: Home, City of Hamilton Cemeteries (2019)
- Canadian Heritage Rivers System (2017)

In addition, historical mapping from 1877, 1881, 1907, 1923, 1929, 1934, 1938 and aerial photographs from 1960 and 1966 were reviewed to identify the presence of properties containing buildings and structures 40 years or older. Historical maps were reviewed to complete the Checklist are contained in Appendix A. In addition, Google Earth imagery was reviewed to gain an understanding of recent change and development within the Study Area.

2.3 Field Review

A field review of the Study Area was completed by Chelsea Dickinson, Research Archaeologist at Wood, on Tuesday, August 25, 2020 to confirm the existing conditions of previously identified heritage properties, including both built heritage resources and cultural heritage landscapes. During the field review, the 40-year 'rule of thumb' was used to identify properties with the potential to have CHVI. The 40-year rule is generally accepted by federal and provincial agencies as a preliminary screening measure for CHVI. It should be noted, however, that the 40-year threshold is a guide only and does not imply that all properties of 40 years of age have CHVI. Nor does it exclude properties that are less than 40 years of age and exhibit CHVI. Following the fieldwork, the professional judgement of Wood's Research Archaeologist and Senior Cultural Heritage Specialist, Heidy Schopf at Wood was used to apply the 40-year rule and identify properties with potential CHVI.

3.0 Results

3.1 Background Review

A high level review of previously completed cultural heritage studies was completed in order to gain a thorough understanding of the history of the Study Area. Each report was reviewed, and the key points summarized in Section 3.1.1 and3.1.2.

3.1.1 Information Sheet: Fruitland Road Study Area (Community Planning and Design, Heritage and Urban Design 2011)

In 2011, the City of Hamilton's Community Planning and Design, Heritage and Urban Design group created a document titled *Information Sheet: Fruitland Road Study Area* (Information Sheet) to provide background information on the development history and cultural heritage resources, including archaeology, built heritage and cultural heritage landscapes within the Fruitland EA study area. The Fruitland Road EA assessed parts of the present Gordon Dean EA Study Area, including both sides of Fruitland Road from Barton Street to Highway 8. The information sheet

identified three (3) properties listed in the City of Hamilton Inventory of Buildings of Architectural and/or Historical Interest and twelve (12) buildings of potential cultural heritage value or interest. For the purpose of this memo the following four (4) properties identified on the information sheet are located within, or adjacent to, the Gordon Dean Study Area and were subject to field review:

- 708 Barton Street
- 693 Highway No. 8
- 725 Highway No. 8
- 735 Highway 8 - Mountview Gardens Cemetery

3.1.2 Cultural Heritage Assessment Report (Letourneau Heritage Consulting Inc. 2019)

In 2019, Letourneau Heritage Consulting Inc. was retained by Wood PLC, on behalf of the City of Hamilton (the proponent), to prepare a Cultural Heritage Assessment Report (CHAR) for the proposed Highway 8 Improvement (Fruitland Road to Fifty Road) 'Schedule C' MCEA (Phases 3 and 4) in Hamilton, Ontario. Letourneau's assessment determined that the Highway 8 Improvement Study Area contained four (4) properties designated under Part IV of the *Ontario Heritage Act,* two (2) properties listed on the City of Hamilton's Register of Heritage Properties, and 32 of interest on the City of Hamilton's Inventory. Of these, three (3) properties identified by Letourneau are located adjacent to the Gordon Dean Study Area and were subject to field review:

- 693 Highway No. 8
- 725 Highway No. 8
- 735 Highway 8 - Mountview Gardens Cemetery

3.2 Information Gathering

The City of Hamilton, Ontario Heritage Trust, and MHSTCI were contacted to gather information on known or potential heritage properties within, and adjacent to, the Study Area.

Karla Barboza, Acting Team Lead at the MHSTCI, reported that there are no properties designated under the *Ontario Heritage Act* within, or adjacent to, the Study Area.

Miranda Brunton, Cultural Heritage Planner at the City of Hamilton, advised Wood to review the publicly accessible Cultural Heritage mapping to confirm the presence of protected and potential heritage properties. Wood reviewed the mapping provided by Miranda Brunton and noted that the Study Area contains, or is adjacent to, the following properties: two (2) inventoried properties (693 Highway No. 8 and 725 Highway No. 8) and one (1) inventoried cemetery (735 Highway No. 8). All three properties are 'inventoried' by the City of Hamilton and have potential CHVI. In effect, these properties are flagged as having potential CHVI but are not listed on a municipal heritage register or designated under the *Ontario Heritage Act*.

Kevin DeMille, Natural Heritage Coordinator at the Ontario Heritage Trust, reported that the Study Area does not contain any conservation easements or Ontario Heritage Trust-owned properties. Mr. DeMille also confirmed that there are no properties listed on the Ontario Heritage Trust's register within the Study Area.

3.3 Field Review

The field review was completed by Chelsea Dickinson, Research Archaeologist at Wood, on Tuesday, August 25, 2020. The field review confirmed that the Study Area is comprised of mostly agricultural lands, with scattered residential properties. The Study Area is bounded by three (3) historically surveyed roads: Fruitland Road to the east, Barton Street to the north, and Highway No. 8 to the south.

Fruitland Road, east of the study area is two lanes wide and includes sidewalks (Plate 1-Plate 9). The road is bordered by modest residential properties that date between to the mid-20th century to present.

Barton Street, north of the study area is two lanes wide and includes sidewalks. This section of Barton Street has a relatively steep slope and is bordered mainly by modest residential properties that were constructed between the mid-20th century to present (Plate 10 to Plate 11). The property at 708 Barton Street identified within the *Information Sheet: Fruitland Road Study Area* (2011) has been demolished and therefore does not appear to retain potential cultural heritage value or interest (Plate 12 and Plate 13).

The remaining section of the Study Area consists of Highway No. 8. There are two (2) properties inventoried properties by the City of Hamilton that have potential cultural heritage value or interest: 693 Highway No. 8 and 725 Highway No. 8 (Plate 14 and Plate 15). Additional photos of properties located outside the study area and its adjacent lands including but limited to those flagged as having potential CHVI within the City of Hamilton Cultural Heritage mapping were documented in order to develop a better understanding of the historical associations and current land use of the study area (Plate 16 to Plate 20). Mountview Gardens Cemetery (735 Highway No. 8) is located along Highway No. 8 (Plate 21 to Plate 22). The cemetery is bounded by residential properties on the east, Highway No. 8 on the south, the Stoney Creek Community Church on the west, and an agricultural field/residential property on the north. The cemetery includes four buildings, numerous paths, mature trees, tree lines, ornamental plantings, and numerous grave plots with markers. There are brick entry gates are located at the western entrance to the cemetery from Highway No. 8.

In addition, Wood notes that the Information Sheet produced by the City of Hamilton in 2011 identified that the general area contains remnant fruit farms, orchards, open spaces, fields, and tree lines. The information sheet also noted that Fruitland Road, Barton Street, and Jones Road are historical roads associated with the original survey of the Township of Saltfleet. Wood reviewed the Study Area for these landscape elements and found that Fruitland Road and Barton Street have been recently updated and do not retain physical characteristics of a historical roadscape. In addition, no remnant fruit farms, orchards, open spaces, fields, or treelines with potential cultural heritage value or interest were identified within the Study Area. The Study Area does contain open fields, but no heritage features of potential significance were identified.

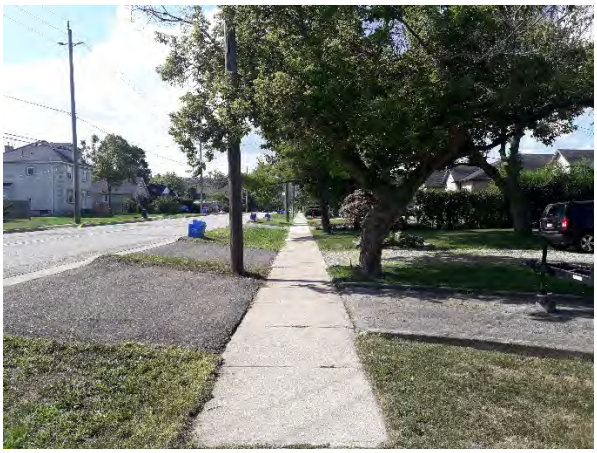


Plate 1: Southwest view of Fruitland Road

Plate 2: Northeast view of Fruitland Road

Plate 3: Southeast view of Study Area off Fruitland Road

Plate 4: Southwest view of Fruitland Road

Plate 13: 708 Barton Street (Inventoried Heritage Property; now demolished) facing southeast

Plate 14: 693 Highway No. 8 (Inventoried Heritage Property) within 50 m of Study Area

Plate 15: Stoney Creek Community Church (Inventoried Heritage Property) within 50 m buffer zone of Study Area found on Highway No. 8

Plate 16: 720 Barton Street, boarded up residence

Plate 17: 718 & 716 Barton Street, boarded up residences located adjacent to 708 Barton Street

Plate 18: 670 Barton Street (Inventoried Heritage Property); Located approximately 320 m to the southeast of the Study Area

Plate 19: 696 Barton Street East (Inventoried Heritage Property) located approximately 100 m to the southeast of the Study Area

Plate 20: Fruitland Motel found on Highway No. 8

Plate 21: Mountview Cemetery

Plate 22: Mountview Cemetery

3.4 Inventory of Built Heritage Resources and Cultural Heritage Landscapes

Following the completion of the information gathering requests and field review, an inventory of built heritage resources and cultural heritage landscapes within, and adjacent to, the Study Area was compiled. A summary of built heritage resources and cultural heritage landscapes is included in this inventory is provided in Table 1. The locations of identified heritage properties in relation to the Study Area are depicted in Figure 5.

Table 1: Inventory of Built Heritage Resources and Cultural Heritage Landscapes					
CHR No.	Type	Location	Heritage Recognition	Description of Property	Photograph
BHR 1	Residence	693 Highway No. 8	-Inventoried Property by the City of Hamilton -Previously identified in the Information Sheet: Fruitland Road Study Area (2011) & the CHAR by Letourneau Heritage Consulting Inc. (2019)	This property contains a one-and-a-half-storey residence with Ontario Gothic Revival style influences with additions to the original structure. The residence is clad in synthetic brick and wood cladding. The residence has a cross gable roof with pronounced, projecting eaves. The front façade (north elevation) is asymmetrically arranged with the front entrance offset to the right (east). The windows are sash one-over-one and appear to have wood trim. The front entrance is covered by a wood awning supported by brackets and the front door is made of wood. The front entrance also includes mature trees/tree lines. This residence appears on 1934 mapping but likely dates to the late 19th century or early 20th century based on architectural style and materials. As one of the few late 19th century/early 20th century residences in this section of Highway No. 8, it is likely that there are significant historical associations for this property. In addition, the property may be historically and visually linked to its surroundings and there are potential heritage attributes that may be found within the extant structure.	

BHR 2	Institutional (Stoney Creek Community Church)	725 Highway No. 8	-Inventoried Property by the City of Hamilton -Previously identified in the Information Sheet: Fruitland Road Study Area (2011) & the CHAR by Letourneau Heritage Consulting Inc. (2019)	This property contains a one-storey church (Stoney Creek Community Church) that dates to 1990 (City of Hamilton, 2020), and a one-storey residence, that is clad in brick. The church has a hip roof with abbreviated eaves. The front façade (north elevation) is asymmetrically arranged with the front entrance offset to the left (east). The windows are a mixture of a sash five-over-five window with wood trim and swept-head windows. The front entrance is covered by a brick awning. Letourneau Heritage Consulting Inc. (hereafter referred to as "LHC") notes the potential CHVI of this property lies with historical association of the church within the community. In addition, LHC noted that due to the fact that the extant church was constructed in 1990, that the listing may be associated with the earlier structure and the adjacent cemetery.	
CHL 1	Cemetery	735 Highway No. 8	-Identified during the field review	This property contains the Mountview Gardens Cemetery and is located adjacent to the Study Area. Opened in 1976 (Hamilton's Heritage Vol. 6, 2005), Mountview Gardens Cemetery is currently listed as active according to the Bereavement Authority of Ontario, hereto referred to as the "BAO" (BAO, 2020). A directional signage boulder for the Mountview Gardens Cemetery is located north of Highway 8 and west of Jones Road, in close proximity to the ROW. The cemetery is bounded by residential properties on the east, Highway No. 8 on the south, the Stoney Creek Community Church on the west, and an agricultural field/residential property on the	

				north. The cemetery includes four buildings, numerous paths, mature trees, tree lines, ornamental plantings, and numerous grave plots with markers. There are brick entry gates are located at the western entrance to the cemetery from Highway No. 8.	

3.5 MHSTCI Checklist Results

As part of the Gordon Dean EA, the MHSTCI Checklist was completed. The full Checklist is included in Appendix B and a summary of the Checklist is provided in Table 2.

Table 2: MHSCTI Checklist Results

Screening Questions	Yes	No
1. Is there a pre-approved screening checklist, methodology or process in place?		✓
Part A: Screening for known (or recognized) Cultural Heritage Value		
2. Has the property (or project area) been evaluated before and not found to be of cultural heritage value?		✓
Is the property (or project area):		
a. Identified, designated or otherwise protected under the Ontario Heritage Act as being of cultural heritage value?		✓
b. A National Historic Site (or part of)?		✓
c. Designated under the Heritage Railway Stations Protection Act?		✓
d. Designated under the Heritage Lighthouse Protection Act?		✓
e. Identified as a Federal Heritage Building by the Federal Heritage Buildings Review Office (FHBRO)?		✓
f. Located within a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?		✓
Part B: Screening for Potential Cultural Heritage Value		
Does the property (or project area) contain a parcel of land that:		
a. Is the subject of a municipal, provincial or federal commemorative or interpretive plaque?		✓
b. Has or is adjacent to a known burial site and/or cemetery?	✓	
c. Is in a Canadian Heritage River watershed?		✓
d. Contains buildings or structures that are 40 or more years old?	✓	
Part C: Other Considerations		
3. Is there local or Aboriginal knowledge or accessible documentation suggesting that the property (or project area):		
a. Is considered a landmark in the local community or contains any structures or sites that are important in defining the character of the area?		✓
b. Has a special association with a community, person, or historical event?		✓

Table 2: MHSCTI Checklist Results		
Screening Questions	**Yes**	**No**
c. Contains or is part of a cultural heritage landscape?	✓	

The completion of the Checklist determined that the Study Area is located directly adjacent to the Mountview Gardens Cemetery which was opened in 1976 (Hamilton's Heritage Vol. 6, 2005). Mountview Gardens Cemetery is currently listed as active according to the Bereavement Authority of Ontario, hereto referred to as the "BAO" (BAO, 2020). Per the Checklist, Mountview Gardens Cemetery is identified as having potential cultural heritage value.

The completion of the Checklist confirmed the presence of properties that contain buildings or structures 40 years or older. These include:

- 708 Barton Street (demolished)
- 693 Highway No. 8 (BHR1)
- 725 Highway No. 8 (BHR2)
- 735 Highway No. 8 - Mountview Gardens Cemetery (CHL1)

These properties are mapped in Figure 5.

Finally, the completion of the checklist determined the presence of 6 registered archaeological sites within 250 m of the study area, of which one (AhGw-536; Site Name Hanes III) is located 5 m to the west of the study area (MHSTCI 2020). Per the Checklist, Landscapes (which may include a combination of archaeological resources, built heritage resources and landscape elements) may be of cultural heritage value or interest to a community (MHSTCI 2016: 8).

4.0 Discussion

The MHSTCI Checklist determined the Study Area contains, and is adjacent to, properties with potential cultural heritage value due to the presence of buildings or structures 40 years or older (Figure 5). To determine whether these properties may be impacted by the proposed work, drawings of the preferred alternative for the proposed Gordon Dean Avenue and Collector 'B' Road were reviewed. The drawings are provided in Appendix C and demonstrate that no work is proposed within BHR 1 (693 Highway No. 8) or CHL 1 (735 Highway No. 8 - Mountview Gardens Cemetery). However, work is depicted within the property limits of BHR 2 (725 Highway No. 8) where the south section of proposed Gordon Dean Avenue is shown extending into the southwest corner of this property in close proximity to a one-storey residence.

The City of Hamilton Official Plan (2013) contains policies for the protection of non-designated or non-registered heritage properties in Section 3.4.2.7, which states:

> 3.4.2.7 The City shall ensure these non-designated and non-registered cultural heritage properties are identified, evaluated, and appropriately conserved through various legislated planning and assessment processes, including the *Planning Act*, R.S.O., 1990 c. P.13, the *Environmental Assessment Act* and the *Cemeteries Act*.

Further the MHSTCI Checklist recommends that a Cultural Heritage Evaluation Report (CHER) be completed to identify, evaluate, and protect cultural heritage resources impacted by a project. Given this, further cultural heritage work in the form of a Heritage Impact Assessment (HIA) that contains a cultural heritage evaluation of the property is warranted for BHR 2 (725 Highway No. 8). The goal of the HIA should be to determine if the property has CHVI when evaluated against the criteria of the *Ontario Heritage Act*. If the property is found to have CHVI, then an impact assessment should be completed.

In addition, there are six (6) registered archaeological sites within 250 m of the study area and one cemetery located adjacent to the study area (Mountview Gardens Cemetery). The recommendations contained in Wood's Stage 1 Archaeological Assessment for the Gordon Dean MCEA (2020) should be followed to address potential archaeological concerns related to this project.

5.0 Recommendations

Based on the completion of the MHSTCI Checklist and review of the proposed work, the following recommendations are made:

1) Avoidance of potential built heritage resources and cultural heritage landscapes is recommended from a cultural heritage perspective. The proposed work should be planned in a manner that avoids direct and indirect impact impacts to identified built heritage resources and cultural heritage landscapes. Further, the locations of BHR 1 (693 Highway No. 8), BHR 2 (725 Highway No. 8), and CHL 1 (735 Highway No. 8, Mountview Gardens Cemetery) should be indicated on construction mapping so that project personnel are aware of the presence of these potential built heritage resources and cultural heritage landscapes.
2) Work is planned within the southwest corner of BHR 2 (725 Highway No. 8) and in close proximity to a one-storey residence on the property. An HIA should be completed to

determine whether this property has CHVI under Ontario Regulation (O. Reg. 9/06) of the *Ontario Heritage Act*. If the property is found to have CHVI, then an impact assessment should be completed to evaluate the impacts of the proposed work and recommend appropriate mitigation measures.

3) The completion of the MHSTCI Checklist determined that there are six (6) registered archaeological sites within 250 m of the study area and one cemetery located adjacent to the study area (CHL 1, 735 Highway No. 8, Mountview Gardens Cemetery). The recommendations contained in Wood's Stage 1 Archaeological Assessment for the Gordon Dean MCEA (2020) should be followed to address potential archaeological concerns related to this project.

The above recommendations were prepared using drawings of the Gordon Dean Ave MCEA preferred alternative contained in Appendix C. Should the preferred alternative be updated or changed, then recommendations presented in this memo should be revisited to confirm impacts to potential cultural heritage resources.

We trust that the information presented in this memo meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Respectfully Submitted,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

Chelsea Dickinson, B.A.
Research Archaeologist
Environment and Infrastructure Solutions
Work: (226) 821-2497
chelsea.dickinson@woodplc.com
www.woodplc.com

Heidy Schopf, MES, CAHP
Senior Cultural Heritage Specialist
Environment and Infrastructure Solutions
Mobile: +1 (416) 518 0145
heidy.schopf@woodplc.com
www.woodplc.com

Peter Popkin, Ph.D., CAHP, MCIfA
Associate Archaeologist
Environment and Infrastructure Solutions
Mobile: +1 (905) 329-6456
peter.popkin@woodplc.com
www.woodplc.com

6.0 References

Amec Foster Wheeler

2017 *Built Heritage and Cultural Heritage Landscape Assessment, Barton Street Improvements, from Fruitland Road to Fifty Road, and Fifty Road from the QEW to Highway 8, Stoney Creek, City of Hamilton, Ontario*. Prepared for the City of Hamilton. March 2017

Bereavement Authority Ontario

2020 Bereavement Authority Ontario Register, Stoney Creek (Search Results). https://licensees.bereavementauthorityontario.ca/search-results?searchParams=~Stoney%20Creek~~~~0&Subject=PubBizByNamePro&Title=Public%20Register%20-%20Businesses Last accessed 19 August 2020.

Canadian Heritage Rivers System

2017 *The Rivers, Ontario*. Available online: http://chrs.ca/the-rivers-ontario/. Last accessed 19 August 2020.

City of Hamilton

2013 Chapter B – Communities. Available online: https://www.hamilton.ca/sites/default/files/media/browser/2015-01-15/urbanhamiltonofficialplan-volume1-chapterb-communities-dec2019.pdf. Last accessed September 8, 2020.

2020 *Heritage Property Mapping* Available online: https://www.hamilton.ca/city-planning/heritage-properties/heritage-resources. Last accessed 19 August 2020.

2020 *Cultural Heritage Resources Map* Available online: http://spatialsolutions.maps.arcgis.com/apps/webappviewer/index.html?id=ef361312714b4caa863016bba9e6e68f. Last accessed 19 August 2020.

Department of Militia and Defence

1907 *Topographic Map, Ontario, Grimsby Sheet No. 030M04*. Electronic document: http://geo2.scholarsportal.info/#r/details/_uri@=HTDP63360K030M04_1907TIFF&_add:true. Last accessed December 17, 2019. 19 August 2020.

1923 *Topographic Map, Ontario, Grimsby Sheet No. 030M04*. Electronic document: http://geo2.scholarsportal.info/#r/details/_uri@=HTDP63360K030M04_1923TIFF&_add:true. Last accessed December 17, 2019. 19 August 2020.

1929 *Topographic Map, Ontario, Grimsby Sheet No. 030M04*. Electronic document: http://geo1.scholarsportal.info/#r/details/_uri@=HTDP63360K030M04_1929TIFF&_add:true. Last accessed December 17, 2019. 19 August 2020.

1934 *Topographic Map, Ontario, Grimsby Sheet No. 030M04*. Electronic document: http://geo2.scholarsportal.info/#r/details/_uri@=HTDP63360K030M04_1934TIFF&_add:true. Last accessed December 17, 2019. 19 August 2020.

1938 *Topographic Map, Ontario, Grimsby Sheet No. 030M04*. Electronic document: http://geo2.scholarsportal.info/#r/details/_uri@=HTDP63360K030M04_1938TIFF&_add:true. Last accessed December 17, 2019. 19 August 2020.

Fruitland Road Information Sheet

2011 Fruitland Road Study Area (Municipal Class Environmental Assessment). Prepared by Community Planning and Design, Heritage and Urban Design 08 March 2011. Department of Militia and Defence

Government of Canada

2019 *Directory of Federal Heritage Designations*. Available online: https://www.pc.gc.ca/apps/dfhd/default_eng.aspx. Last accessed December 18, 2019.

Government of Ontario

1990 *Ontario Heritage Act, R.S.O. 1990, Chapter O.18*. Last amendment: July 1, 2019. Electronic document: https://www.ontario.ca/laws/statute/90o18. Last accessed October 30, 2019.

2006a *O. Reg. 9/06: Criteria for Determining Cultural Heritage Value or Interest*. Electronic document: https://www.ontario.ca/laws/regulation/060009. Last accessed October 30, 2019.

2006b *Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005*. Electronic document: file:///C:/Users/heidy.schopf.WOODPLC/Downloads/Heritage_Tool_Kit_Heritage_PPS_infoSheet%20(8).pdf. Last accessed October 30, 2019.

2020 *Provincial Policy Statement*. Electronic document: https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf. Last accessed September 9, 2020.

2017 *Ontario Heritage Toolkit*. Electronic document: http://www.mtc.gov.on.ca/en/heritage/heritage_toolkit.shtml. Last accessed October 30, 2019.

2019 *Preparing environmental assessments: How to prepare different types of environmental assessments in Ontario*. Electronic document: https://www.ontario.ca/page/preparing-environmental-assessments#section-1. Last accessed October 30, 2019.

Hamilton's Heritage Volume 6

2005 *Inventory of Cemeteries and Burial Grounds* Available online: https://spatialsolutions.hamilton.ca/images/CulturalHeritage/Inventories/HH_Vol6.pdf. Last accessed 19 August 2020.

Letourneau Heritage Consulting Inc.

2019 *Final Report: Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment Highway 8 Improvements (Fruitland Road to Fifty Road) Municipal Class*

Environmental Assessment, Stoney Creek, Hamilton, Ontario. Prepared for Wood PLC. November 2019.

Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI)

2020 Sites Within a One Kilometre Radius of the Study Area Provided from the Ontario Archaeological Sites Database, 18 August 2020.

Ontario Heritage Trust

2020 *Ontario Heritage Act Register, City of Hamilton, Fruitland (Search Results)*. Available online: https://www.heritagetrust.on.ca/en/oha/search-results?handle=pow-form&backlinkslug=advanced-search&fields%5Blimit%5D=200&fields%5Bproperty_name%5D=&fields%5Baddress%5D=Fruitland&fields%5Blocation%5D=&fields%5Bconstructed_from%5D=&fields%5Bconstructed_to%5D=&fields%5Bheritage_function_category%5D=-1&fields%5Bdocument_type_category%5D=-1. Last accessed 19 August 2020.

2020 *Ontario Heritage Act Register, City of Hamilton, Barton (Search Results)*. Available online: https://www.heritagetrust.on.ca/en/oha/search-results?handle=pow-form&backlinkslug=advanced-search&fields%5Blimit%5D=200&fields%5Bproperty_name%5D=&fields%5Baddress%5D=barton&fields%5Blocation%5D=16&fields%5Bconstructed_from%5D=&fields%5Bconstructed_to%5D=&fields%5Bheritage_function_category%5D=-1&fields%5Bdocument_type_category%5D=-1. Last accessed 19 August 2020.

2020 *Ontario Heritage Act Register, City of Hamilton, Highway 8 (Search Results)*. Available online: https://www.heritagetrust.on.ca/en/oha/search-results?handle=pow-form&backlinkslug=advanced-search&fields%5Blimit%5D=200&fields%5Bproperty_name%5D=&fields%5Baddress%5D=Highway+8&fields%5Blocation%5D=16&fields%5Bconstructed_from%5D=&fields%5Bconstructed_to%5D=&fields%5Bheritage_function_category%5D=-1&fields%5Bdocument_type_category%5D=-1. Last accessed 19 August 2020.

2019 *Plaque Database, City of Hamilton*. Available online: https://www.heritagetrust.on.ca/en/index.php/online-plaque-guide?handle=plaques-form&fields%5Bkeyword%5D=Fruitland&fields%5Btheme%5D=&fields%5Bgeoloc%5D=3766. Last accessed 19 August 2020.

Ontario Ministry of Natural Resources and Forestry

2020 *Ontario Flow Assessment Tool (OFAT)* Available online: https://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html?site=OFAT&viewer=OFAT&locale=en-US. Last accessed 19 August 2020.

Ontario Ministry of Heritage, Sport, Tourism and Culture Industries

2016 Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes Available online: http://www.mtc.gov.on.ca/en/heritage/tools.shtml. Last accessed 18 August 2020.

Page and Smith
1875 Illustrated Historical Atlas of Wentworth County. Toronto: Page & Smith.

Parks Canada
2017 *The Directory of Designated Heritage Railway Stations in Ontario*. Available online: https://www.pc.gc.ca/en/culture/clmhc-hsmbc/pat-her/gar-sta/on. Last accessed 19 August 2020.
2020 *National Historic Sites, Designated Lighthouses, Ontario*. Available online: https://www.pc.gc.ca/en/lhn-nhs/pp-hl/page01. Last accessed 19 August 2020.

2020 *National Historic Sites, Ontario*. Available online: https://www.pc.gc.ca/en/lhn-nhs/recherche-search. Last accessed 19 August 2020.
2020 *Directory of Federal Heritage Designations, City of Hamilton, Fruitland (Search Results)*. Available online: https://www.pc.gc.ca/apps/dfhd/results-resultats_eng.aspx?p=1&m=10&q=Fruitland&desCheck=NHS&desCheck=EVENT&desCheck=PERSON&desCheck=HRS&desCheck=FHBRO&desCheck=HL&c=Hamilton&ctl00%24Main%24PageSearch1%24ddlProvince=100058&dey=&ctl00%24Main%24PageSearch1%24ddlCustodian=. Last accessed 19 August 2020.

2020 *Ontario Heritage Act Register, City of Hamilton, Barton (Search Results)*. Available online: https://www.pc.gc.ca/apps/dfhd/results-resultats_eng.aspx?p=1&m=10&q=Barton&desCheck=NHS&desCheck=EVENT&desCheck=PERSON&desCheck=HRS&desCheck=FHBRO&desCheck=HL&c=Hamilton&ctl00%24Main%24PageSearch1%24ddlProvince=100058&dey=&ctl00%24Main%24PageSearch1%24ddlCustodian=. Last accessed 19 August 2020.

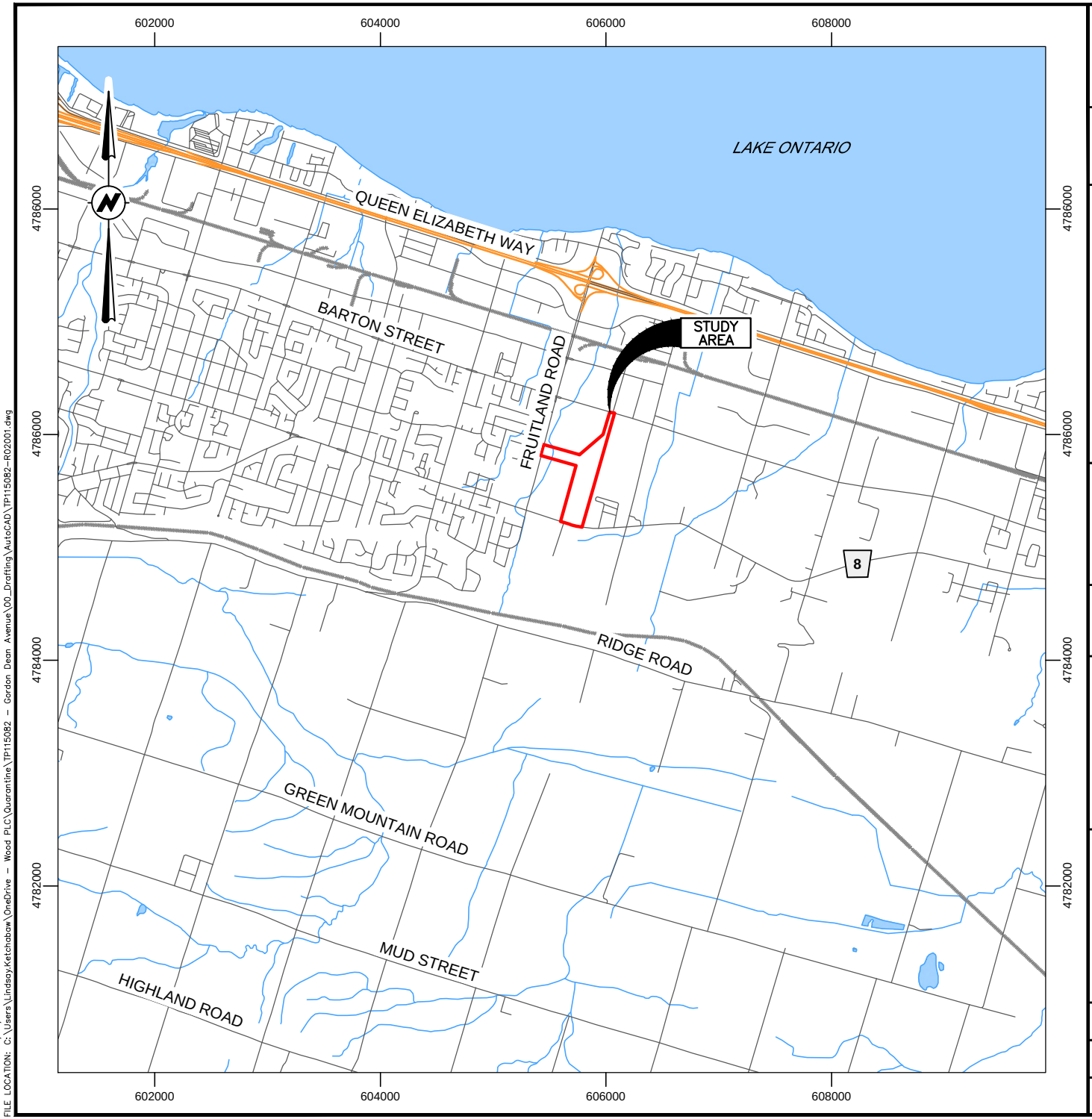
2020 *Ontario Heritage Act Register, City of Hamilton, Highway 8 (Search Results)*. Available online: https://www.pc.gc.ca/apps/dfhd/results-resultats_eng.aspx?p=1&m=10&q=Highway+8&desCheck=NHS&desCheck=EVENT&desCheck=PERSON&desCheck=HRS&desCheck=FHBRO&desCheck=HL&c=Hamilton&ctl00%24Main%24PageSearch1%24ddlProvince=100058&dey=&ctl00%24Main%24PageSearch1%24ddlCustodian=. Last accessed 19 August 2020.

Surtees, Robert
1859 *Map of the County of Wentworth, Canada West.* Hardy Gregory, Lithographer and Engraver, electronic document, Retrieved 20 August 2020. https://maps.library.utoronto.ca/hgis/countymaps/wentworth/

United Nations Educational, Scientific and Cultural Organization (UNESCO)
2019 *Canada, Properties inscribed on the World Heritage List*. Available online: https://whc.unesco.org/en/statesparties/ca. Last accessed 19 August 2020.

APPENDIX

Appendix A: Figures



PROJECT:

GORDON DEAN AVE, CLASS EA – MHSTCI CHECKLIST

TITLE:

LOCATION OF THE STUDY AREA

LEGEND:

STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:
CANMAP STREETFILES V2008.4.

0 500 1,500 2,500m

SCALE 1:50,000

CLIENT:

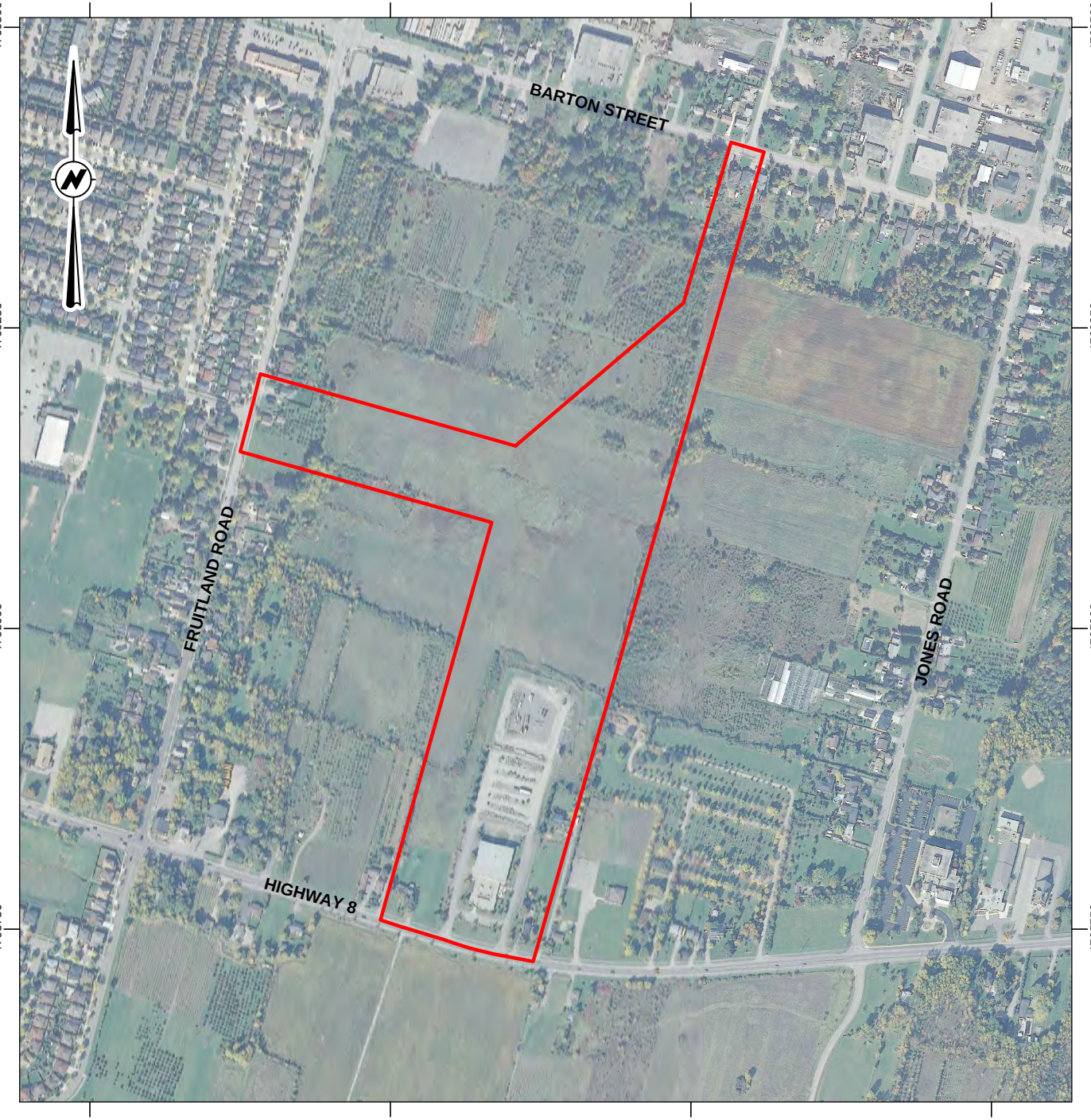
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.

Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	AUG. 31, 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		1

DATE PLOTTED: 8/31/2020 4:16:19 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive – Wood PLC\Quarantine\TP115082 – Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R02001.dwg



PROJECT:

GORDON DEAN AVE, CLASS EA – MHSTCI CHECKLIST

TITLE:

AERIAL PHOTOGRAPH SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:

STUDY AREA

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:

2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

0 100 200 300m

SCALE 1:7,500

CLIENT:

FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

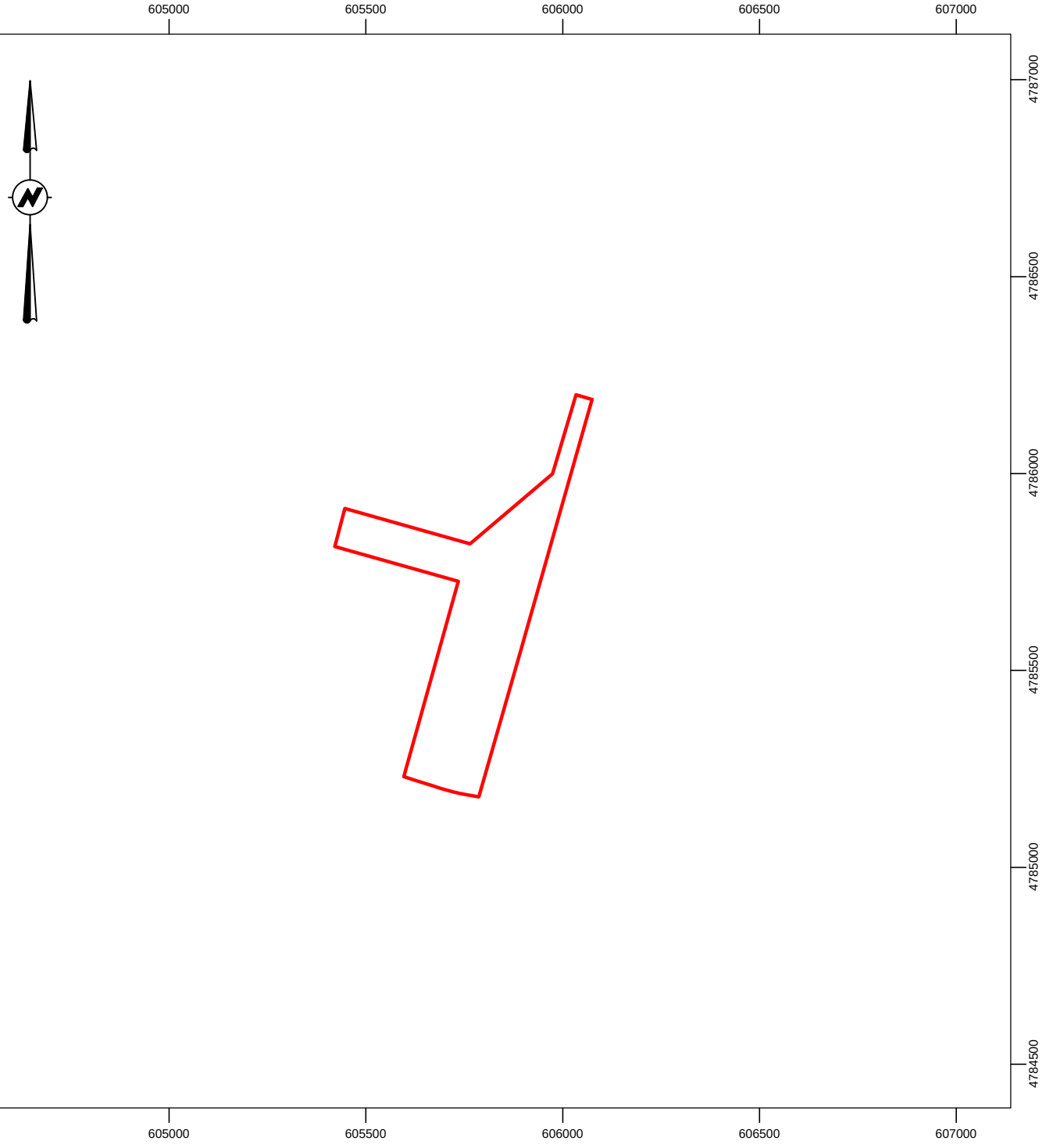
wood.

Wood Environment & Infrastructure Solutions

201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	AUG. 31, 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		2

DATE PLOTTED: 8/31/2020 4:16:47 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R02001.dwg



PROJECT:

GORDON DEAN AVE, CLASS EA – MHSTCI CHECKLIST

TITLE:

1859 MAP OF THE COUNTY OF WENTWORTH SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:

STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

MAP SHOWN AT BEST AVAILABLE RESOLUTION.

ORIGINAL PAPER SIZE: 8½ x 11

REFERENCES:
SURTEES, 1859.

0 100 300 500m

SCALE 1:15,000

CLIENT:

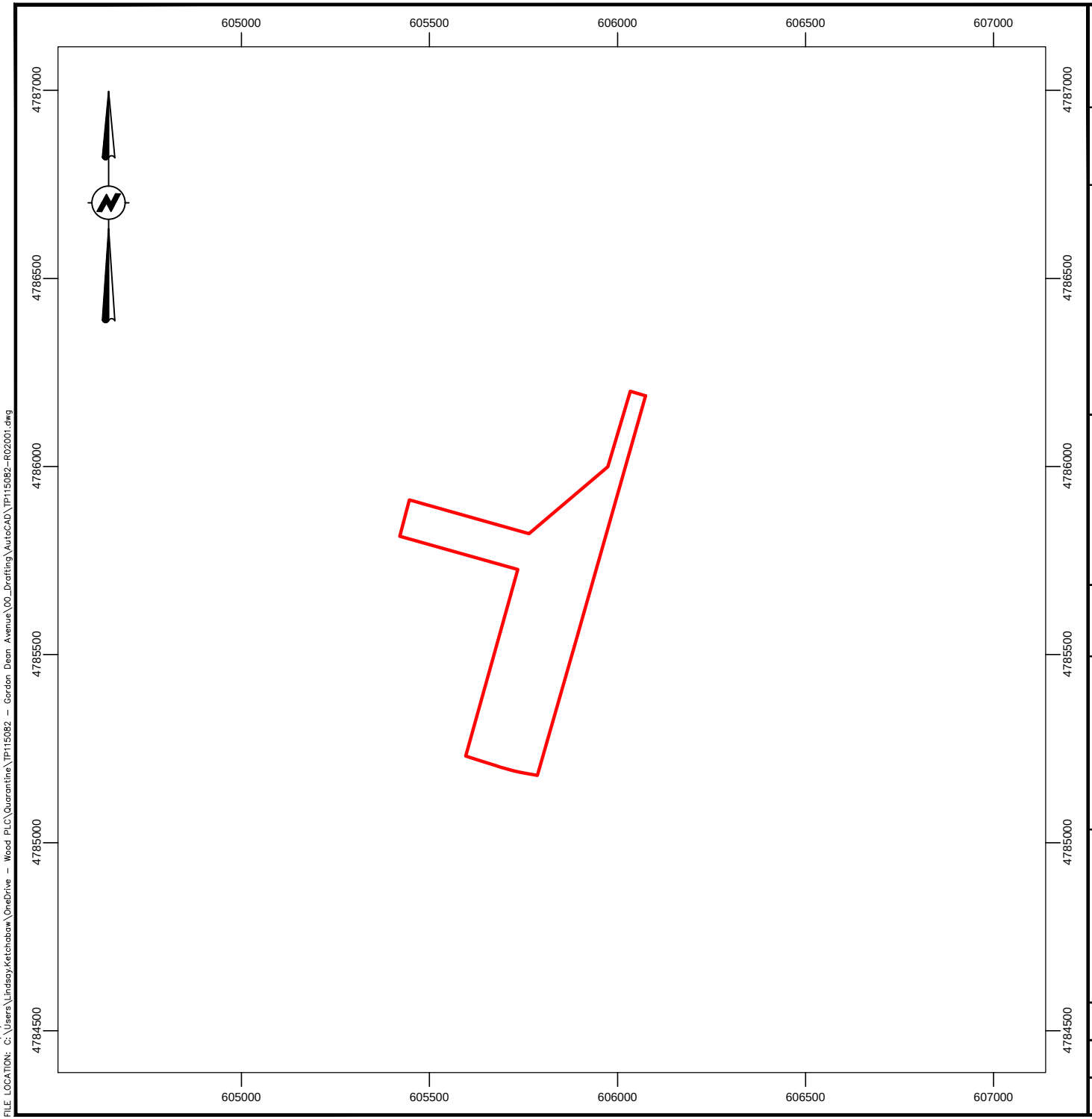
FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.

Wood Environment & Infrastructure Solutions
201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 4, 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		3

DATE PLOTTED: 9/4/2020 5:17:55 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R02001.dwg



PROJECT:

GORDON DEAN AVE, CLASS EA – MHSTCI CHECKLIST

TITLE:

1875 ILLUSTRATED HISTORICAL ATLAS MAP OF WENTWORTH COUNTY SHOWING THE LOCATION OF THE STUDY AREA

LEGEND:

STUDY AREA

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

MAP SHOWN AT BEST AVAILABLE RESOLUTION.

ORIGINAL PAPER SIZE: 8½ x 11

REFERENCES:

PAGE & SMITH, 1875.

0 100 300 500m

SCALE 1:15,000

CLIENT:

FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

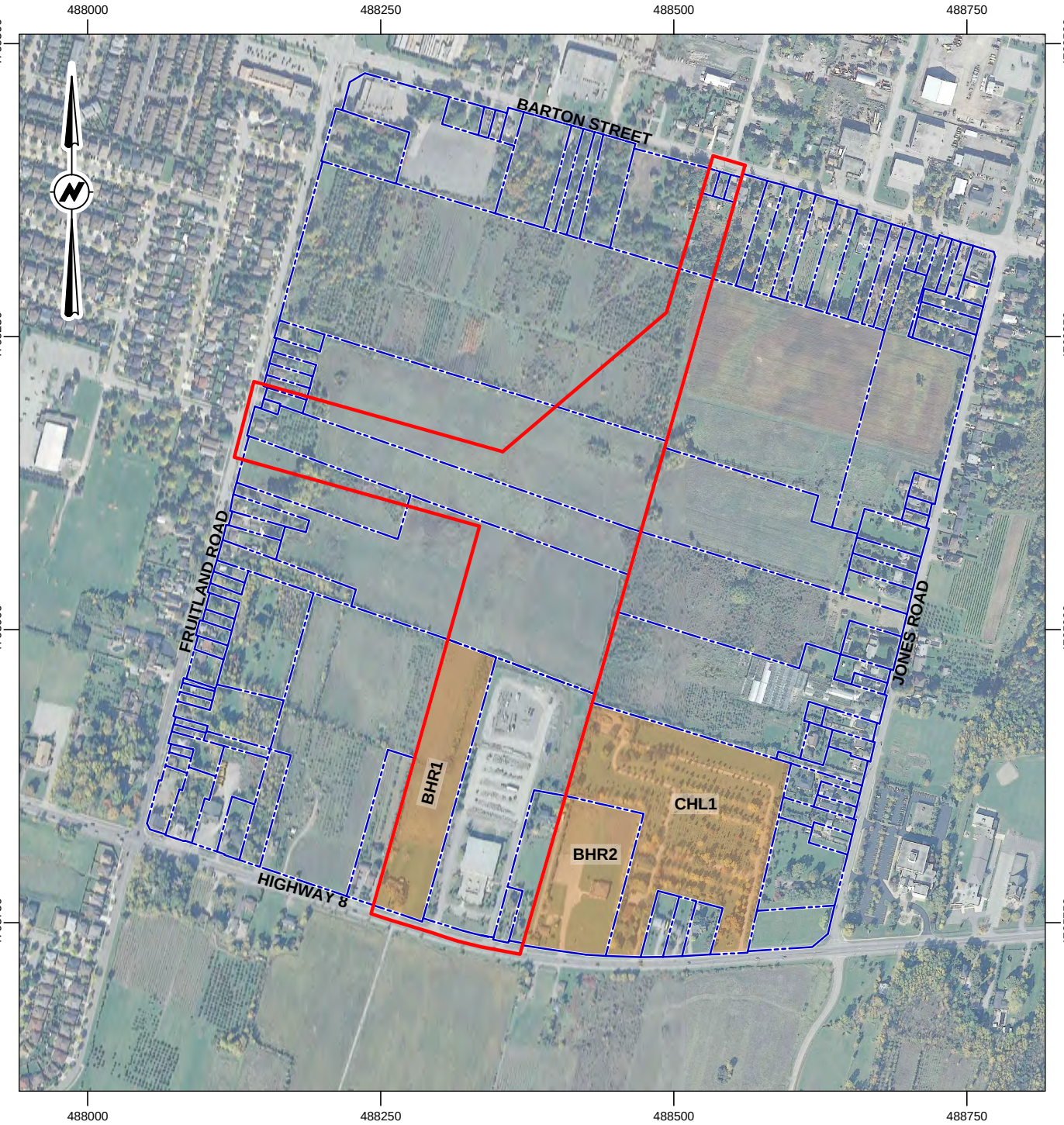
wood.

Wood Environment & Infrastructure Solutions

201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 4, 2020
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	TP115082
REV No:		FIGURE No:
0		4

DATE PLOTTED: 9/4/2020 5:18:58 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive - Wood PLC\Quarantine\TP115082 - Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R02001.dwg



PROJECT:

GORDON DEAN AVE, CLASS EA – MHSTCI CHECKLIST

TITLE:

INVENTORY OF BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE LANDSCAPES

LEGEND:

- STUDY AREA
- PROPERTY LINE
- BUILT HERITAGE RESOURCE AND/OR CULTURAL HERITAGE LANDSCAPE IDENTIFIED DURING FIELD REVIEW

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. TP115082.

ALL LOCATIONS ARE APPROXIMATE.

REFERENCES:

2008 AERIAL PHOTOGRAPH U.S. GEOLOGICAL SURVEY, AUGUST 31, 2020.

0 100 200 300m

SCALE 1:7,500

CLIENT:

FRUITLAND - WINONA BLOCK 1 DEVELOPMENT GROUP

wood.

Wood Environment & Infrastructure Solutions

201 KING STREET
LONDON, ONTARIO
N6A 1C3
519-681-2400

DWN BY:	CHK'D BY:	DATE:
LMK	CD	SEPT. 4, 2020
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: TP115082
REV No: 0		FIGURE No: 5

DATE PLOTTED: 9/17/2020 4:28:45 PM
FILE LOCATION: C:\Users\Lindsay.Ketchabaw\OneDrive – Wood PLC\Quarantine\TP115082 – Gordon Dean Avenue\00_Drafting\AutoCAD\TP115082-R02001.dwg

Appendix B: MHSTCI Checklist

Ministry of Tourism, Culture and Sport

Programs & Services Branch
401 Bay Street, Suite 1700
Toronto ON M7A 0A7

Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes

A Checklist for the Non-Specialist

The **purpose of the checklist** is to determine:

- if a property(ies) or project area:
    - is a recognized heritage property
    - may be of cultural heritage value
- it includes all areas that may be impacted by project activities, including – but not limited to:
    - the main project area
    - temporary storage
    - staging and working areas
    - temporary roads and detours

Processes covered under this checklist, such as:

- *Planning Act*
- *Environmental Assessment Act*
- *Aggregates Resources Act*
- *Ontario Heritage Act* – Standards and Guidelines for Conservation of Provincial Heritage Properties

Culties

 © Queen's Printer for Ontario, 2016

Appendix I
Evaluation of Alternatives Memo

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
160 Traders Boulevard East, Suite 110
Mississauga, Ontario L4Z 3K7
Canada
T: 905.568.2929
www.woodplc.com

Memo

To: Margaret Fazio, Project Manager (City of Hamilton) **Date:** June 8, 2020 (Updated November 9, 2020)

From: Wood Environment and Infrastructure Solutions

Ref: Project #TP115082

Re: **Gordon Dean Avenue Evaluation of Alternative Design Concepts – SCUBE Block 1**

1.0 Overview

The enclosed memo provides an overview of the second iteration to evaluate and assess a combination of four road options (and sub options) to address future growth within the Block 1 development area of the Stoney Creek Urban Boundary Expansion (SCUBE). The evaluation process represents a significant milestone of Phase 3 of the Municipal Class EA process which examines potential road design options based on a set of natural, social, technical and economic criteria. As a result of discussions that occurred with the City of Hamilton (City) and local landowners on May 27, 2019 and the corresponding comments received from the City on June 10, 2019, the evaluation criteria developed for this assessment were modified to reflect a more robust assessment of the community's natural heritage features, as well as changes to planned land uses within the study area.

The alignment options were generated from the initial two phases of the Class EA process in which the City of Hamilton recommended that through trucks utilize a new north-south road (i.e., Gordon Dean Avenue), east of existing Fruitland Road between Highway 8 and Barton Street, and that the existing section of Fruitland Road remain open. The development of the alternatives was based on the alignments approved by City Council through the Fruitland-Winona Secondary Plan in 2014. While reviewing the approved alignment options from the Fruitland-Winona Secondary Plan, additional roadway alternatives were developed based on land availability and other variables.

'Wood' is a trading name for John Wood Group PLC and its subsidiaries

2.0 Study Process

2.1. New Design Options

A summary of the design options that are proposed to connect Barton Street to Highway 8 (north to south) and Fruitland Road to Jones Road (west to east) include the following:

Gordon Dean Avenue Options	General Description
Option 1a – West of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities)	• North-south road (Gordon Dean Avenue) would run west of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities). • East-west road would run east from Fruitland Road with curved sections in the west.
Option 2a – Traverse Western Portions of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities). East-West Road runs parallel to Barton Street.	• North-south road (Gordon Dean Avenue) would traverse western and northern sections of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities). • East-west road would align with Sherwood Park Road at Fruitland Road.
Option 2b - Traverse Western and northern Portions of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) + Modified East-West Road	• North-south road (Gordon Dean Avenue) would traverse western and northern sections of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities). • East-west road would run slightly north of Option 2a from Fruitland Road.
Option 3a - Traverse Central and Eastern Portions of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities). East-West Road runs parallel to Barton Street.	• North-south road (Gordon Dean Avenue) would traverse central and eastern sections of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities), including the existing commercial building. • East-west road would align with Sherwood Park Road at Fruitland Road.

Gordon Dean Avenue Options	General Description
Option 3b - Traverse Central and Eastern Portions of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) + Modified East-West Road	• North-south road (Gordon Dean Avenue) would traverse central and eastern sections of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities), including the existing commercial building. • East-west road would run slightly north of Option 3a from Fruitland Road.
Option 4a – East of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities). East-West Road runs parallel to Barton Street.	• North-south road (Gordon Dean Avenue) would run mostly east of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities). • East-west road would align with Sherwood Park Road at Fruitland Road.
Option 4b – East of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) + Modified East-West Road.	• North-south road (Gordon Dean Avenue) would run mostly east of the City of Hamilton property for the Public Works Facilityproposed TOM facility and cemetery expansion (lands formerly owned by Alectra Utilities). • East-west road would run slightly north of Option 4a from Fruitland Road.

Figures 1 to 7 illustrate the alignment options and sub options.

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

PROPOSED GORDON DEAN

SHERWOOD PARK LANE

HIGHWAY 8

7+85.811
L = 171.749
R = 525.000

2+97.593
L = 122.143
R = 400.000

1+00.917
L = 64.906
R = 400.000

5+23.104
L = 57.107
R = 400.000

3+60.457
L = 131.096
R = 525.000

INTERSECTION ANGLE AT 80°

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
1 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP1

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

SHERWOOD PARK LANE

HIGHWAY 8

PROPOSED GORDON DEAN

INTERSECTION ANGLE AT 80°

R = 64.824
L = 179.973
R = 1000.000

R = 99.675
L = 180.738
R = 700.000

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
2 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP2A

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

SHERWOOD PARK LANE

HIGHWAY 8

PROPOSED GORDON DEAN

INTERSECTION ANGLE AT 80°

5+64.824
L = 179.973
R = 1000.000

2+24.928
L = 87.113
R = 1000.000

6+52.843
L = 35.136
R = 350.000

0+58.521
L = 41.492
R = 500.000

7+54.870
L = 36.581
R = 350.000

0+99.675
L = 180.738
R = 700.000

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
3 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP2B

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

PROPOSED GORDON DEAN

8+10.996
L = 96.889
R = 3000.000

INTERSECTION ANGLE AT 89°

4+48.864
L = 98.804
R = 600.000

2+34.697
L = 130.894
R = 600.000

SHERWOOD PARK LANE

HIGHWAY 8

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
4 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP3A

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

PROPOSED GORDON DEAN

SHERWOOD PARK LANE

HIGHWAY 8

INTERSECTION ANGLE AT 89°

2+07.136
L = 80.442
R = 1000.000

0+75.039
L = 41.492
R = 500.000

4+48.864
L = 98.804
R = 600.000

2+34.697
L = 130.894
R = 600.000

6+38.472
L = 37.471
R = 350.000

7+53.920
L = 36.581
R = 350.000

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
5 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP3B

FRUITLAND - WINONA BLOCK 1 EA

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.

6 OF 7

LEGEND

- PROPOSED ROW
- PROPERTY BOUNDARY
- STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP4A

FRUITLAND - WINONA BLOCK 1 EA

BARTON STREET

FRUITLAND ROAD

PROPOSED GORDON DEAN

SHERWOOD PARK LANE

HIGHWAY 8

INTERSECTION ANGLE AT 90°

1+80.831
L = 48.421
R = 500.000

6+17.466
L = 183.817
R = 5000.000

6+45.386
L = 49.550
R = 400.000

0+82.584
L = 40.658
R = 400.000

7+47.194
L = 47.630
R = 400.000

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

CONTRACT No.

DRAWING No.

FILE No.

SHEET No.
7 OF 7

LEGEND

PROPOSED ROW

PROPERTY BOUNDARY

STAGE 2 BLOCK SERVICING STRATEGY

wood.

FRUITLAND-WINONA BLOCK 1 EA

PROPOSED ALGINMENT OPTIONS

OP4B

3.0 Results of the Evaluation Process

The alignment options were evaluated based on several criteria grouped around six categories of impacts:

- Environmental;
- Socio-economic;
- Archaeology / Built Heritage;
- Governance;
- Sustainability; and
- Operations and Safety.

The evaluation criteria used for this analysis align with those previously developed by the City of Hamilton for similar exercises. Some of the criteria were modified so that they could be tailored to this specific study. Additional criteria were revised as a result of the discussions that occurred with the City staff and the local landowners on May 27, 2019 and in the corresponding comments received from the City on June 10, 2019.

The detailed evaluation is provided in **Appendix A**, followed by a summary of the evaluation results in **Appendix B**. A summary is provided below.

Category 1: Environmental Impacts

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Environmental							
Natural Heritage Systems (Core Areas, including Significant Woodlands, PSWs, unevaluated wetlands, Watercourse 5.0, Significant Wildlife Habitat, and Species at Risk)	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
NHS: Linkages, Restoration Areas,	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
and Vegetation Protection Zones							
Avian Species at Risk (SAR)	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Wetlands	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Non-Core Area Woodlands	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Hedgerows and Thickets	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Avian and Wildlife Resources	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Candidate Significant Wildlife Habitat (SWH)	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Watercourses	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Groundwater Impacts	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Hydraulics and Hydrology	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Stormwater Management and LID	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**

Summary: Several criteria comprise the "Environmental" category and focus on potential impacts to terrestrial and aquatic features, surface water, groundwater and stormwater. The results are based on the completion of several reports including the:

- Natural Heritage Assessment of Lands Bounded by Fruitland Road, Glover Road, Barton Street and Highway 8 (Dillon Consulting, 2010).
- Fruitland-Winona Block 1 Servicing Strategy: Fluvial Geomorphic and Meander Belt Width Assessment (Parish Aquatic Services, 2015).
- Hydrogeological Assessment, Block 1, Fruitland-Winona Block Servicing Strategy (Amec Foster Wheeler, 2015).
- Fruitland-Winona Block 1 Servicing Strategy Environmental Assessment & Natural Heritage System Plan (Dougan, September 2017).

- City of Hamilton Class EA to Address Route Options for Gordon Dean Avenue and the East-West Corridor, Fruitland-Winona Block 1 Lands Memorandum - Terrestrial and Watercourse/Aquatic Environments (Dougan, 2019)

The results indicate little differentiation amongst the seven roadway design options. Key findings include:

- The core areas within the natural heritage system will not be impacted.
- Direct impacts are anticipated to terrestrial habitat features. Mitigation and/or compensation are possible through enhancements to areas that will be protected within the Natural Heritage System, including Linkages, Vegetation Protection Zones (VPZ), and Restoration Areas (RA).
- Impacts to Barn Swallow, Bobolink and Eastern Meadowlark habitat (Avian Species at Risk) removal are anticipated to be low.
- Wetland loss for impacts less than 0.5 hectares can be compensated by creating new wetlands in linkage areas, Restoration Areas, and VPZs.
- Minimal impacts are anticipated to occur to the non-core area woodland within the Fresh-Moist Oak-Hardwood Deciduous Forest at the north end of the study area. The amount of this habitat directly impacted by the road alternatives varies from 0.11 to 0.12 ha.
- The amount of hedgerow lost for each of the road alternatives varies from 0.4 to 0.7 hectares; the amount of shrub thicket lost varies from 0.51 to 0.68 hectares.
- Candidate Significant Wildlife Habitat (SWH) that have a potential to occur in the study area include: Bat Maternity Colonies, Migratory Butterfly Stopover Area, Turtle Nesting Areas and Special Concern and Rare Wildlife Species (Monarch and Snapping Turtle).
- The road alternatives only cross one watercourse (5.0) in Block 1, and all of them do so at the same location and within the same proposed right-of-way widths.
- All road alternatives will similarly affect the site water balance by creating impervious surfaces, and the magnitude of the effect will be dependent upon the area of the impervious surfaces. This is expected to decrease evapotranspiration and infiltration of precipitation and increase surface runoff, thus resulting in some decrease of recharge to groundwater and potentially a localized lowering of the groundwater table. This can be mitigated by directing runoff from the impervious areas towards pervious areas.
- The road alternatives will not result in any anticipated changes to existing hydraulics or hydrology (no change in flood risk).
- Each of the alternatives will result in improved stormwater quality and quantity handling, including implementation of some LID techniques.

Category 2: Socio-economic Impacts

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Socio-economic							
Residential Impacts	**Poor**	**Poor**	**Poor**	**Excellent**	**Excellent**	**Poor**	**Poor**
Business Impacts	**Good**	**Poor**	**Poor**	**Poor**	**Poor**	**Good**	**Good**
Noise Level Impacts	**Neutral**	**Neutral**	**Neutral**	**Good**	**Good**	**Good**	**Good**
Access to Community Services	**Excellent**	**Poor**	**Poor**	**Poor**	**Poor**	**Excellent**	**Excellent**
Recreational Features Impacts	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**

Summary: The "Socio-economic Impacts" category primary revolves around potential impacts to residences and businesses as well as the effects of the road improvements on area noise, emergency services and community and recreational features.

The analysis suggests that the displacement of at least one residential property will be required for all alternatives with the exception of Options 3a and 3b. However, the latter two options will require the displacement of a portion of the former Alectra lands, which has recently been purchased by the City for future civic uses. The displacement of this portion of lands was previously accounted for within the Approved Fruitland-Winona Secondary Plan. Conversely, Options 1, 4a and 4b will require a significantly smaller amount of the former Alectra lands to accommodate the new road.

A breakdown of the residential lands required for each alignment option is provided below:

Parcel No.	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
693	1.22 ha	0.68 ha	0.68 ha	N/A	N/A	N/A	N/A
715	N/A	N/A	N/A	N/A	N/A	0.13 ha	0.13 ha
717	N/A	N/A	N/A	N/A	N/A	0.59 ha	0.59 ha
Total	1.22 ha	0.68 ha	0.68 ha	0.0 ha	0.0 ha	0.72 ha	0.72 ha

With regard to noise level impacts, Options 3a, 3b, 4a and 4b allow for a reduction of residential developments exposed to noise and vibration levels resulting from the diverted truck route traffic relative to other options.

Among the other characteristics representing the "Socio-economic Impacts" category, there is little differentiation amongst the seven options. Each new road alignment will:

- Improve access to the future community centre and recreational facility, identified in the Block 1 Plan.
- Mitigate higher noise levels resulting from future traffic operations and construction through noise walls or other measures.

Relative to the latter, additional analyses should be completed to fully assess the potential effects of noise associated with the preliminarily recommended option as well as the specific measures identified to minimize or avoid impacts, as needed.

Category 3: Archaeological / Built Heritage Impacts

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Archaeology / Built Heritage							
Cultural/Built Heritage Features/Landscapes Impacts	**Good**	**Good**	**Good**	**Good**	**Good**	**Neutral**	**Neutral**
Archaeological Impacts	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**

Summary: The results of this assessment are based on two previously completed reports:

- Stage 1 Archaeological Assessment, Watercourse 5 and 6 Environmental Assessment, Stoney Creek, City of Hamilton, Ontario (Jacques Whitford, 2007).
- History and Cultural Heritage Resources prepared for the Fruitland Road Study Area Municipal Class Environmental Assessment (City of Hamilton Community Planning and Design, Heritage and Urban Design, 2011).

The results indicate little differentiation amongst the seven roadway design options. Key findings include:

- Archaeological potential is found throughout entire study area, so a Stage 2 Archaeological Assessment would be required for the recommended option.
- No impacts to built heritage features are anticipated. Alignments 4a and 4b are abutting the west boundary of Mountview Cemetery; however, no impacts are anticipated at that location.

Category 4: Governance

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Governance							
Impacts to Non-Participating Lands	**Medium**	**Poor**	**Poor**	**Poor**	**Poor**	**Medium**	**Medium**

Conforms to Secondary Plan	**Good**	**Poor**	**Poor**	**Poor**	**Poor**	**Excellent**	**Excellent**
Ease of Implementation	**Medium**	**Poor**	**Poor**	**Poor**	**Poor**	**Medium**	**Medium**
Estimated Capital Costs	**Medium**	**Medium**	**Medium**	**Poor**	**Poor**	**Medium**	**Medium**

Summary: All roadway options will result in the displacement of some property; however, Options 2a, 2b, 3a and 3b will require a significant portion of the former Alectra lands, which are planned to be converted by the City for civic uses. This will significantly constrain the ability to site and construct the new road.

Road alignment Option 1a conforms to the Approved Fruitland-Winona Secondary Plan for the North-South corridor however, the west portion of the East-West corridor does not conform. Road alignment Options 4a and 4b conform to the Approved Fruitland-Winona Secondary Plan, both for the North-South corridor and the East-West corridor.

The results of this analysis also considered the potential high-level capital costs of constructing Gordon Dean Avenue and the east-west collector road, as well as the potential costs associated with acquiring residential land and additional property. As the analysis suggests, Options 1, 2a, 2b, 4a and 4b will accrue similar infrastructure and land acquisition costs. Options 3a and 3b will accrue higher costs as a result of the challenges and expenses associated with acquiring the former Alectra lands that are now owned by the City.

Category 5: Sustainability

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Sustainability							
Pedestrians- safety, walking environment, encourages walking	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Cycling Infrastructure	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Transit Supportive Development	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Incorporates innovative products / practices	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**

Summary: Several criteria comprise the "Sustainability" category, primarily focusing on how the proposed infrastructure will promote alternative modes of transportation and integrate them into the right-of-way. There is no differentiation amongst the seven options as each road design would accommodate sidewalks, a multi-use path and transit amenities (i.e., shelters). As a result, all seven design options would reflect the vision embodied in Hamilton's *Complete Streets Policy* (November 2013).

Category 6: Operations and Safety

Evaluation Results:

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Operations and Safety							
Truck Operations (two lanes)	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**	**Neutral**
Truck Operations (four lanes)	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Drivers - capacity, speed, intersection operations	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Sight Distance Checks	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**
Overall Safety	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**	**Good**

Summary: From a traffic safety perspective, each of the seven design options are projected to operate at acceptable levels of service. Additionally, all of the alignments will exceed the City's design standards for arterial roads.

4.0 Recommendations

Based on the results of the evaluation process, Wood recommends that Options 4b will be the preferred alignment for the Block 1 development area of the SCUBE for the following reasons:

- It addresses the problem and opportunity statement identified in Fruitland Class EA (January 2011) i.e., it includes a new north-south road east of Fruitland Road from Barton Street to Highway 8 (Gordon Dean Avenue) to relocate the truck route from Fruitland Road;
- Impacts to the natural environment can be mitigated;
- Conforms to the Fruitland-Winona Secondary Plan, both in north-south and east-west corridor alignments;
- Avoids the need to displace existing businesses and planned civic uses on the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities), implementation is readily feasible, and is cost-effective given the shortest distance of roadway;
- Limits private property requirements to the acquisition of two residential lots along Highway 8;
- Reduces the noise level impacts to planned residential development relative to other alternatives;

- Promotes sustainability by accommodating pedestrian and cycling infrastructure as well as improvements that will enhance transit services; and

- Designed to exceed the City of Hamilton's design standards while performing at acceptable LOS. Based on City of Hamilton's input, the intersection of Gordon Dean Avenue and Collector Road 'B' has been designed at a 90° angle. The preferred road option will operate in an acceptable and safe manner relative to guidelines and road user expectations.

Appendix A

Detailed Evaluation

June 8, 2020 (Updated November 9, 2020)

Table 1: Detailed Evaluation of Alignment Alternatives for Gordon Dean Avenue Between Highway 8 and Barton Street

Category and Criteria		Indicators		Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Environment Impacts	**NHS: Core Areas, including Significant Woodlands, PSWs, unevaluated wetlands, Watercourse 5.0, Significant Wildlife Habitat, and Species at Risk)**	Poor	Direct impacts likely to significant Natural Heritage System resources	**Neutral:** • The Block 1 area is subject to an approved Secondary Plan where urban development will occur. This development will create secondary impacts related to noise, light, changes to surface water runoff, presence of domestic pets, and introduction of residential, commercial and institutional uses that will dominate activities in the Secondary Plan area outside of the protected Natural Heritage System.						
		Neutral	Direct impacts likely to terrestrial habitat features; mitigation and/or compensation likely							
		Excellent	No direct impacts to terrestrial habitat features anticipated							
	NHS: Linkages, Restoration Areas, and Vegetation Protection Zones	Poor	Direct impacts likely to significant Natural Heritage System resources	**Neutral:** • Direct impacts likely to terrestrial habitat features. Mitigation and/or compensation possible through enhancements to areas that will be protected within the Natural Heritage System, including Linkages, Vegetation Protection Zones (VPZ), and Restoration Areas (RA).						
		Neutral	Direct impacts likely to terrestrial habitat features; mitigation and/or compensation likely							
		Excellent	No direct impacts to terrestrial habitat features anticipated							
	Avian Species at Risk (SAR)	Poor	Greater than 30 hectares of Bobolink and Eastern Meadowlark habitat loss; Significant impact to Barn Swallow habitat	**Neutral:** • Barn Swallow: habitat removal and activities within Category 3 habitat per MNRF General Habitat Description (GHD). This is foraging habitat from five (5) to 200 metres from active nests. No nests were found within or adjacent to the locations of the seven road alternatives. Barn Swallows were seen foraging over many areas within the Block 1 lands, so it is likely there are nests within 200 metres. • Bobolink and Eastern Meadowlark: Low impacts – less than four (4) hectares of suitable habitat being removed; as both species are area sensitive, four hectares is the minimum amount of compensation lands per the Endangered Species Act (ESA). Any amount removed for the road corridors that is less than this amount will be 'rounded up' to four hectares from a compensation perspective.						
		Neutral	4 to 30 hectares of Bobolink and Eastern Meadowlark habitat loss; Medium impact to Barn Swallow habitat							
		Excellent	Less than 4 hectares of Bobolink and Eastern Meadowlark habitat loss; Low impact to Barn Swallow habitat							
	Wetlands	Poor	Significant impacts to wetlands in Core Areas	**Neutral:** • Medium impacts pertain to wetlands of less than 0.5 hectares. Wetland loss could be compensated by creating new wetlands in linkage areas, Restoration Areas, VPZs, etc.						
		Neutral	Impacts to wetlands but not within the Core Areas							
		Excellent	No impacts to wetlands							
	Non-Core Area Woodlands	Poor	Direct impacts to non-core area woodlands, however there are few mitigation and/or compensation opportunities	**Neutral:** • The only area that is impacted by the road alternatives is a small area within the Fresh-Moist Oak-Hardwood Deciduous Forest (FODM9-6) at the north end of the study area. This was not included in the recommended NHS due to its small size and isolated location. The amount of this habitat directly impacted by the road alternatives varies from 0.11 to 0.12 ha.						
		Neutral	Direct impacts to non-core area woodlands, however mitigation and/or compensation possible							
		Excellent	No impacts to non-core area woodlands							
Environment Impacts (cont'd)	**Hedgerows and Thickets**	Poor	Direct impacts to hedgerows and thickets, however there are few mitigation and/or compensation opportunities	**Neutral:** • The amount of hedgerow lost for each of the seven road alternatives varies from 0.4 to 0.7 hectares; the amount of shrub thicket lost for each of the seven road alternatives only varies from 0.51 to 0.68 hectares. With regard to mitigation, thickets can be created in future linkages, RAs, and VPZs.						
		Neutral	Direct impacts to hedgerows and thickets, however mitigation and/or compensation possible							
		Excellent	No impacts to hedgerows and thickets							
	Avian and Wildlife Resources	Poor	Direct impacts to avian and wildlife resources, however there are few mitigation and/or compensation opportunities	**Neutral:** • The categorization of impacts to avian and wildlife resources follows that of "Terrestrial Habitat Features". • The Block 1 area is subject to an approved Secondary Plan where urban development will occur. This development will create secondary impacts related to noise, light, changes to surface water runoff, presence of domestic pets, and introduction of residential, commercial and institutional uses that will dominate activities in the Secondary Plan area outside of the protected Natural Heritage System.						
		Neutral	Direct impacts to avian and wildlife resources, however mitigation and / or compensation possible							

June 8, 2020 (Updated November 9, 2020)

Table 1: Detailed Evaluation of Alignment Alternatives for Gordon Dean Avenue Between Highway 8 and Barton Street

Category and Criteria		Indicators		Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Environment Impacts (cont'd)		Excellent	No impacts to avian and wildlife resources							
	Candidate Significant Wildlife Habitat (SWH)	Poor	Permanent removal of SWH and/or few or no mitigation opportunities	**Neutral:** • Candidate SWH that have a potential to occur in the study area include: Bat Maternity Colonies, Migratory Butterfly Stopover Area, Turtle Nesting Areas and Special Concern and Rare Wildlife Species (Monarch and Snapping Turtle).						
		Neutral	Minimal impacts to SWH; readily replicated, mitigation opportunities within final NHS							
		Excellent	No impacts to SWH							
	Watercourses	Neutral	Moved, altered, reconfigured, enhanced watercourses; eliminated, few mitigation opportunities	**Neutral:** • The seven road alignment alternatives only cross one watercourse (5.0) in Block 1, and all of them do so at the same location and with the same proposed width of rights-of-way.						
		Excellent	Remaining watercourses; not crossed and/or no impacts							
	Groundwater Impacts	Poor	Net decrease in ground water quality and/or quantity	**Neutral:** • The creation of roads on the property will affect the site water balance by creating impervious surfaces and the magnitude of the effect will be dependent upon the area of the impervious surfaces. This is expected to decrease evapotranspiration, decrease infiltration of precipitation and increase surface runoff, thus resulting in some decrease of recharge to groundwater and potentially a localized lowering of the groundwater table. This can be mitigated to some extent by directing runoff from the impervious areas towards pervious areas. As the alternative proposed road alignments are very similar in extent and location, no significant difference in effects on groundwater between the alternative road locations are expected. Overall, the effect is quite minimal - 1.2 cm of reduced infiltration over the area due to the reduced area available for infiltration as a result of the new road.							
		Neutral	No change in ground water quality or quantity							
		Good	Net increase in ground water quality or quantity							
		Excellent	Net increase in ground water quality and quantity							
	Hydraulics & Hydrology	Poor	Negatively impacts existing hydraulics / hydrology. Likely to result in increased flood risks	**Neutral:** • No anticipated change to existing hydraulics or hydrology (no change in flood risk).						
		Neutral	No anticipated change to existing hydraulics or hydrology (no change in flood risk)							
		Good	Design will mitigate flood risks associated with significant storm events							
		Excellent	Design will result in elimination of flood risks associated with the 100-year storm event							
	Stormwater Management and LID	Poor	Negative impacts to existing stormwater management facilities	**Good:** • Improved stormwater quality and quantity handling, including implementation of some LID techniques.						
		Neutral	No net change in stormwater quality or quantity							
		Good	Improved stormwater quality and quantity handling, including implementation of some LID techniques							
		Excellent	Space, groundwater table and geotechnical conditions allow for implementation of advanced LID techniques							
Socio-Economic Impacts	**Residential Impacts**	Poor	Residents displaced and/or large area of residential property required	**Poor:** • One residence potentially displaced at the southwest corner.			**Excellent:** • No residence displaced.		**Poor:** • Two residences will be displaced.	
		Neutral	No residents displaced but large area of residential property required							
		Good	No residents displaced but some area of residential property required							
		Excellent	No residents displaced and no residential property required							
	Business Impacts	Poor	Businesses displaced and/or large area of commercial property required	**Good:** • No business displacement but western edge of the City of Hamilton property for the Public	**Poor:** • Displacing significant portion of lands north of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) and existing business structure, which has commercial value.				**Good:** • No businesses displaced, but a portion of commercial property will be required, located at the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) (northeast portion). This impact was accounted for in the approved Secondary	
		Neutral	No businesses displaced but large area of commercial property required							
		Good	No businesses displaced but small area of commercial property required							

Table 1: Detailed Evaluation of Alignment Alternatives for Gordon Dean Avenue Between Highway 8 and Barton Street

Category and Criteria		Indicators		Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Socio-Economic Impacts (cont'd)		Excellent	No businesses displaced, and no commercial property required	Works Facility (lands formerly owned by Alectra Utilities) may be required.					Plan.	
	Noise Level Impacts	Poor	Increased noise level impact to several residents/businesses	**Neutral:** • Higher noise levels will result from future traffic operations and construction; to be mitigated by noise walls or other measures. • The noise study will be completed during detailed design.			**Good:** • Anticipated noise level impact to planned residential development is reduced relative to other options. • The noise study will be completed during detailed design.			
		Neutral	Modest increase in noise levels to be mitigated.							
		Good	Noise level impact reduced							
		Excellent	Noise level impact significantly reduced							
	Access to Community Services	Poor	Potential impact to access community services	**Excellent:** • Direct access to potential community features located on the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities).	**Poor:** • Displacing significant portion of lands north of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) will remove some potential community features.				**Excellent:** • Direct access to potential community features located on the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities).	
		Excellent	Would provide access to future community services							
	Recreational Features Impacts	Poor	Required removal of recreational feature(s)	**Good:** • Improved access to the future community centre and recreational facility, identified in the Block 1 Plan.						
		Neutral	No removal but reduced access to existing recreational feature(s)							
		Good	Improved access to existing recreational feature(s)							
		Excellent	Creation of features and improved access to existing recreational feature(s)							
Archaeological / Built Heritage Impacts	**Cultural / Built Heritage Features / Landscapes Impacts**	Poor	Significant impacts to cultural or landscape features	**Good:** • No impacts to built heritage features.					**Neutral:** • Alignment immediately abutting Mountview cemetery.	
		Neutral	Minor impacts to cultural or landscape features							
		Good	No impact to cultural or landscape features							
		Excellent	Infrastructure provides additional space for, or highlights, cultural features or landscapes							
	Arch. Impacts	Poor	Significant disturbance to an archaeological site(s) and / or a large area of land deemed to have archaeological potential	**Neutral:** • Archaeological potential found throughout entire study area. Stage 2 Assessment is required.						
		Neutral	Disturbance to land deemed to have some archaeological potential							
		Good	No disturbance to archaeological sites or land with archaeological potential							
		Excellent	Mitigation practices put in place to protect archaeological resource / avoid ground disturbance							
Go	**Impacts to Non-Participating Lands**	Poor	Significant impacts; acquisitions required	**Medium:** • 1.26 hectares impacted						
		Medium	Modest impacts; acquisitions required							

Table 1: Detailed Evaluation of Alignment Alternatives for Gordon Dean Avenue Between Highway 8 and Barton Street

Category and Criteria		Indicators		Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Governance (cont'd)		Excellent	No impacts; no acquisition required	(2 parcels). • Potential acquisition of one residential property west of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities).	**Poor:** • 1.26 hectares impacted (2 parcels). • Potential acquisition of one residential property west of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities). • Partial acquisition of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities), which was recently purchased by the City for specific civic use purposes (impact at the north-west corner of former Alectra land).		**Poor:** • 1.26 hectares impacted (1 parcels). • Requires acquisition of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities), which was recently purchased by the City for specific civic use purposes.		**Medium:** • 1.22 hectares impacted (3 parcels). • Acquisition of a sliver of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) (northeast portions). • Acquisition of 2 residential properties.	
	Conforms to Secondary Plan	Poor	Does not conform to Secondary Plan	**Good:** • Conforms to Secondary Plan for north-south alignment only	**Poor:** • Does not conform to Secondary Plan.				**Excellent:** • Conforms to Secondary Plan.	
		Good	Partially conforms to Secondary Plan							
		Excellent	Conformance to Secondary Plan							
	Ease of Implementation	Poor	Significant challenges, which cannot be mitigated	**Medium:** • One residential property required, which may result in land aquisition.	**Poor:** • As a result of the City of Hamilton's recent purchase of the the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities) for civic purposes and in recognition of its intent to maintain the land for those uses, the ability to construct this alternative is unlikely.				**Medium:** • A minimum of two residential properties required, which may result in land acquisition.	
		Medium	Significant challenges, but can be mitigated							
		Good	Poses few challenges to implementation, but can be mitigated							
		Excellent	Poses no challenges to implementation							
	Estimated Capital Costs	Poor	High Cost	**Medium:** • Infrastructure costs: $4.6 - $5.0 million; plus, the potential cost associated with acquiring one residential property.	**Medium:** • Infrastructure costs: $4.5 - $4.9 million; plus, the potential cost associated with acquiring one residential property and partial acquisition of the the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities).		**Poor:** • Infrastructure costs: $5.3 - $5.7 million; plus, the potential cost associated with acquiring the former Alectra lands.		**Medium** • Infrastructure costs: $4.6 - $5.0 million; plus, the potential cost associated with acquiring two residential property and acquisition of a sliver of the City of Hamilton property for the Public Works Facility (lands formerly owned by Alectra Utilities).	
		Medium	Medium Cost							
		Good	Low Cost							
Sustainability	**Pedestrians- Safety, walking environment, encourages walking**	Poor	No pedestrian facilities provided	**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 24.5 m.	**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 22.9 m.	**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 23 m.	**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 22.9 m.		**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 23.2 m.	**Good:** • Will comprise a multi-use path on the east side and a wide sidewalk located on the west side. • The average pedestrian crossing distance is 22.9 m.
		Neutral	Sufficient sidewalk widths with adequate distance between roadway and sidewalk							
		Good	Sufficient sidewalk widths with large distance between roadway and sidewalk							
		Excellent	Wide sidewalk widths with large distance between roadway and sidewalk							
	Cycling Infrastructure	Poor	No cycling facilities	**Good:** • New road will comprise of a multi-use path on the east side of the road.						
		Neutral	On-street cycle lanes							
		Good	Separated on street cycle lanes (added buffer) or multi-use path added to boulevard							
		Excellent	Cycle Track provided							
	Transit Supportive Development	Poor	Decrease in ridership potential	**Good:** • Gordon Dean will accommodate Hamilton HSR service for local residents and community facilities. • Road rights-of-way will accommodate future Hamilton LRT.						
		Neutral	No anticipated change in ridership potential							
		Good	Provides for improved transit services							
		Excellent	Transit only lanes, significant increase in ridership potential							

June 8, 2020 (Updated November 9, 2020)

Table 1: Detailed Evaluation of Alignment Alternatives for Gordon Dean Avenue Between Highway 8 and Barton Street

Category and Criteria		Indicators		Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
	Incorporates innovative products / practices	Poor	Uses out of date products / practices	**Good:** • In light of the City of Hamilton Council's declaration of Climate Change Emergency, the use of LED street lights and innovative active transportation facility materials (i.e. permeable pavements) would be considered for all alignment alternatives. Exact practices / products to be determined during detailed design. No difference between alternatives.						
		Neutral	Uses standard products / practices							
		Good	Incorporates one innovative product or practice							
		Excellent	Incorporates two or more innovative products or practices							
Operations and Safety	**Truck Operations (2 lanes)**	Poor	No curb	**Neutral:** • The largest curb radius needed to accommodate truck traffic is 30 m at the northwest quadrant of the Gordon Dean and Hwy 8 intersection.			**Neutral:** • The largest curb radius needed to accommodate truck traffic is 30 m at the northeast quadrant of the Gordon Dean and Barton intersection.	**Neutral:** • The largest curb radius needed to accommodate truck traffic is 30 m at the northwest quadrant of the Gordon Dean and Hwy 8 intersection.		**Neutral:** • The largest curb radius needed to accommodate truck traffic is 30 m at the northeast quadrant of the Gordon Dean and Barton intersection.
		Neutral	Curb radii 10+m larger than standard							
		Good	Curb radii 5-10m larger than standard							
		Excellent	Standard curb radii							
	Truck Operations (4 lanes)	Poor	No curb	**Good:** • The curb radius follows the City of Hamilton standards, but LCVs turn into the second lane.						
		Neutral	Curb radii larger than standard							
		Good	Standard curb radii, trucks take two lanes to turn							
		Excellent	Standard curb radii, truck turns into designated lane							
	Drivers - Capacity, speed, intersection operations	Poor	Significant delay	**Good:** • The traffic analysis was conducted for the 2021 future total conditions with all study area intersections being unsignalized. Additional analysis was carried out assuming all three study intersections are signalized to provide controlled crossing for pedestrians along Gordon Dean Avenue. It is important to note that the intersection operations analysis for all proposed alternatives will be the same as Synchro software analyzes traffic operations generally based on lane configurations as opposed lane alignments. • The analysis results for unsignalized intersections conditions indicate that all movements are expected to operate with residual capacity and acceptable level of service (LOS) 'D' or better except for the following movements: o Northbound left movement at the intersection of Barton Street and Sunnyhurst Avenue (LOS F); and o Southbound left movement at the intersection of Gordon Dean Avenue and Highway 8 (LOS F). • The analysis results for signalized intersections, however, indicate that all movements are expected to operate with residual capacity and acceptable LOS 'D' or better during both AM and PM peak hours.						
		Neutral	Some delay							
		Good	Acceptable delay, sufficient capacity							
		Excellent	Significant reduction in congestion							
	Sight Distance Checks	Poor	Major obstruction	**Good:** • Some trees obstructing the right turn view on Barton St.						
		Neutral	Minor obstruction that cannot be easily removed							
		Good	Minor obstruction that can be easily removed							
		Excellent	No obstruction							
	Overall Safety	Poor	Severe residual safety risks	**Good:** • Safety for the provided options has been assessed by considering the geometric constraints, road function and traffic arrangement of each option. The options share the same general arrangement consistent with recommendations from traffic analysis. All geometric elements of the alignment have been provided to exceed the City of Hamilton and TAC design guidelines minimum standards for the relevant road class and design speed outlined in the design criteria. Combing the geometric and operational considerations a number of checks including sight distance and turn path templates where undertaken and found that no option provided displays any inherent safety issue that can be identified at this stage of design. With these considerations it is expected that all options will operate in an acceptable and safe manner relative to guidelines and road user expectations.						
		Neutral	Meets minimum requirements with some residual risk							
		Good	Low risk							
		Excellent	No risk							

Appendix B

Summary of Evaluation

Updated November 9, 2020

Summary of Gordon Dean Avenue Evaluation of Alternatives – Grouped by Category

Category and Criteria	Route 1a	Route 2a	Route 2b	Route 3a	Route 3b	Route 4a	Route 4b
Environmental							
NHS: Core Areas, including Significant Woodlands, PSWs, unevaluated wetlands, Watercourse 5.0, Significant Wildlife Habitat, and Species at Risk)	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
NHS: Linkages, Restoration Areas, and Vegetation Protection Zones	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Avian Species at Risk (SAR)	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Wetlands	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Non-Core Area Woodlands	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Hedgerows and Thickets	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Avian and Wildlife Resources	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Candidate Significant Wildlife Habitat (SWH)	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Watercourses	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Groundwater Impacts	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Hydraulics & Hydrology	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Stormwater Management and LID	Good	Good	Good	Good	Good	Good	Good
Socio-economic							
Residential Impacts	Poor	Poor	Poor	Excellent	Excellent	Poor	Poor
Business Impacts	Good	Poor	Poor	Poor	Poor	Good	Good
Noise Level Impacts	Neutral	Neutral	Neutral	Good	Good	Good	Good
Access to Community Services	Excellent	Poor	Poor	Poor	Poor	Excellent	Excellent
Recreational Features Impacts	Good	Good	Good	Good	Good	Good	Good
Archaeology / Built Heritage							
Cultural/Built Heritage Features/Landscapes Impacts	Good	Good	Good	Good	Good	Neutral	Neutral
Archaeological Impacts	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Governance							
Impacts to Non-Participating Lands	Medium	Poor	Poor	Poor	Poor	Medium	Medium
Conforms to Secondary Plan	Good	Poor	Poor	Poor	Poor	Excellent	Excellent
Ease of Implementation	Medium	Poor	Poor	Poor	Poor	Medium	Medium
Estimated Capital Costs	Medium	Medium	Medium	Poor	Poor	Medium	Medium
Sustainability							
Pedestrians- Safety, walking environment, encourages walking	Good	Good	Good	Good	Good	Good	Good
Cycling Infrastructure	Good	Good	Good	Good	Good	Good	Good
Transit Supportive Development	Good	Good	Good	Good	Good	Good	Good
Incorporates innovative products / practices	Good	Good	Good	Good	Good	Good	Good
Operations and Safety							
Truck Operations (2 lanes)	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Truck Operations (4 lanes)	Good	Good	Good	Good	Good	Good	Good
Drivers - Capacity, speed, intersection operations	Good	Good	Good	Good	Good	Good	Good
Sight Distance Checks	Good	Good	Good	Good	Good	Good	Good
Overall Safety	Good	Good	Good	Good	Good	Good	Good

Appendix J
Preliminary Design Plans

GORDON DEAN AVENUE

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

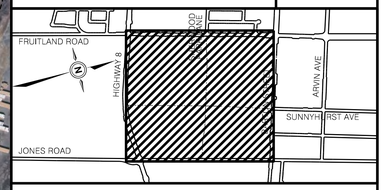
CONTRACT No.

DRAWING No.

FILE No.

SHEET No.

1 OF 9



LEGEND

EXISTING PROPERTY LINE ------

0 50m 100m

HORIZONTAL 1:2500

wood.

GORDON DEAN MCEA

Gordon Dean Ave.
Schedule 'C' MCEA (Ph. 3 & 4)
Ultimate Condition

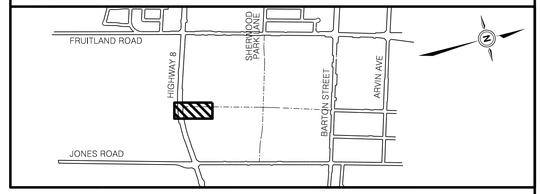
14-H-00 (1)

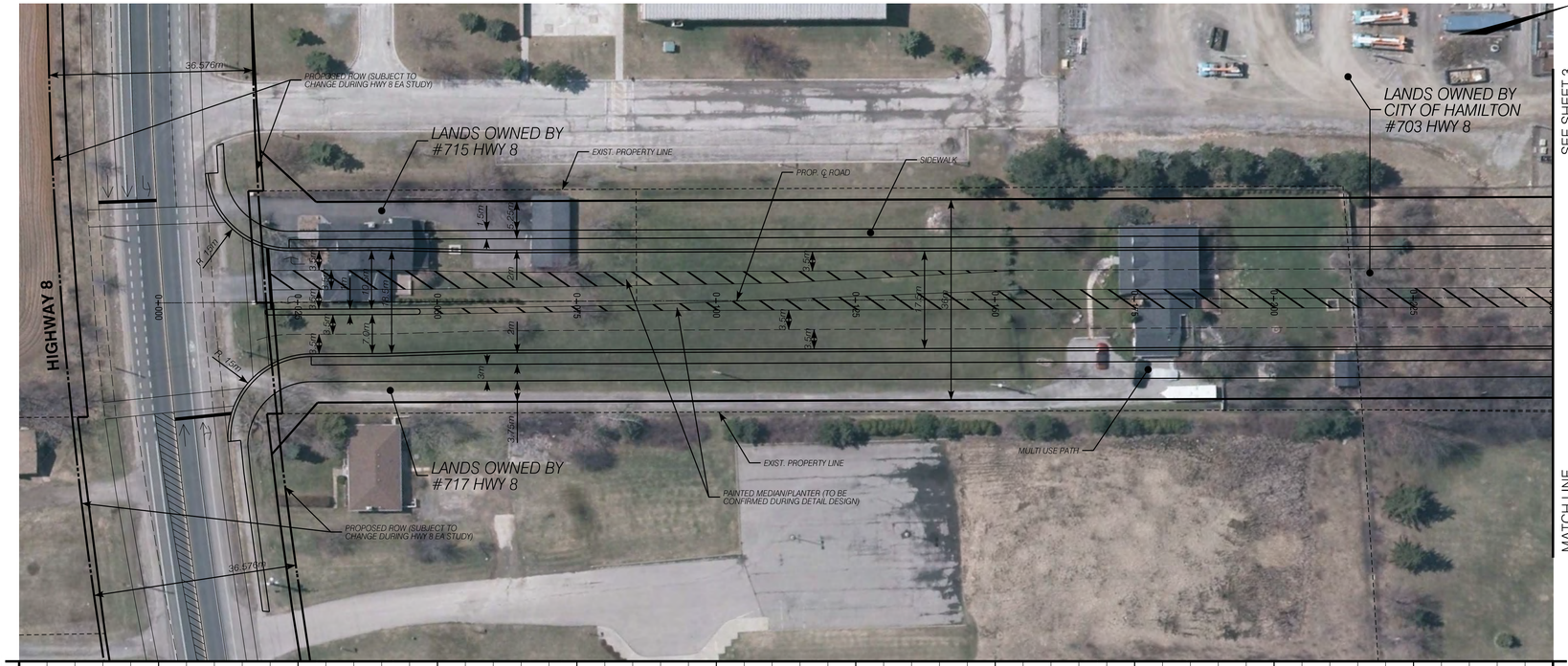
GORDON DEAN AVENUE

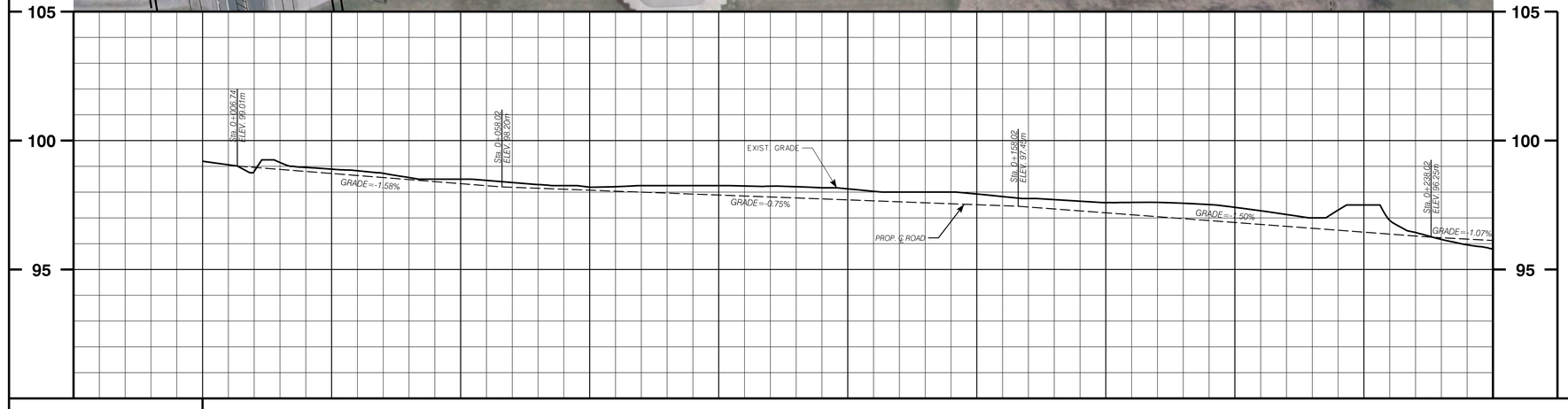
GORDON DEAN AVENUE

FILE No.	CONTRACT No. DRAWING No.	SHEET No. 2 OF 9

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED







PROPOSED SANITARY SEWER		*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER		*PROPOSED STORM SEWER*
EXIST. ℄ OF ROAD PROFILE ELEV. *PROP. ℄ OF ROAD PROFILE ELEV.*	99.00 97.80 98.81 97.77 98.53 98.00 98.25 97.78 97.97 97.62 97.69 97.85 97.41 97.95 97.13 97.76 96.85 97.91 96.57 97.83 96.29	EXIST. ℄ OF ROAD PROFILE ELEV. *PROP. ℄ OF ROAD PROFILE ELEV.*
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	0+000 0+025 0+050 0+075 0+100 0+125 0+150 0+175 0+200 0+225 0+250	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY: DATE: May 12, 2020

REFERENCE MATERIAL:

Geodetic Bench Mark Elevation=
Borehole Report -

SCALES

HORIZONTAL 1:500 (0 5m 10m 20m)

VERTICAL 1:100 (0 1m 2m 4m)

Project Manager (Design)

Manager of Design

FRUITLAND - WINONA DEVELOPMENT GROUP

GORDON DEAN AVENUE
Gordon Dean Ave.
Schedule 'C' MCEA (Ph. 3 & 4)
Ultimate Condition
Sta. 0+000 to Sta. 0+250

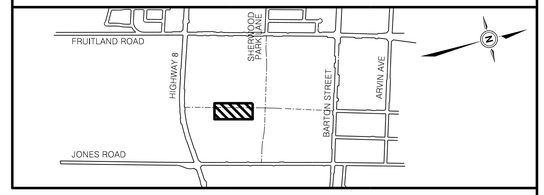
14-H-00 (1)

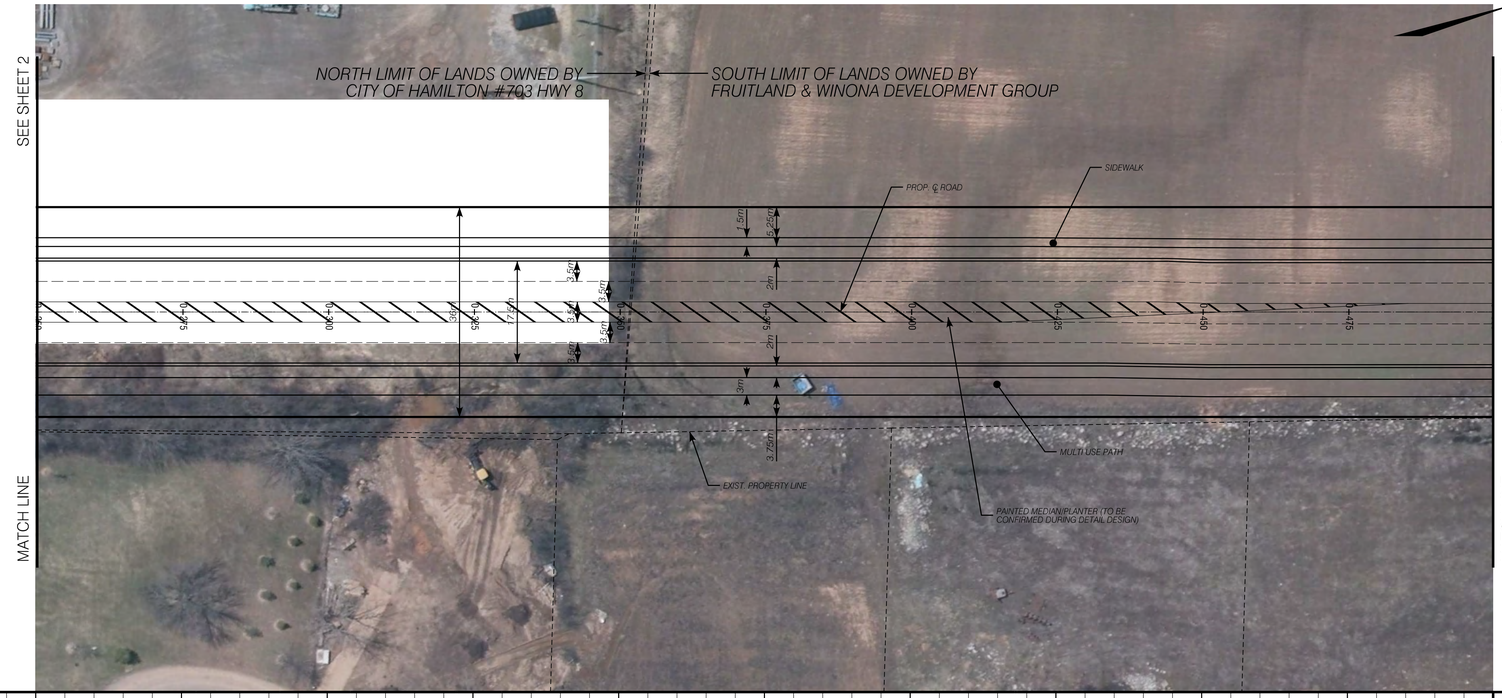
GORDON DEAN AVENUE

GORDON DEAN AVENUE

FILE No.	CONTRACT No. DRAWING No.	SHEET No. 3 OF 9

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED



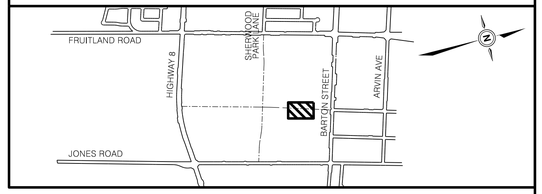

SEE SHEET 2
SEE SHEET 4
MATCH LINE
MATCH LINE
NORTH LIMIT OF LANDS OWNED BY CITY OF HAMILTON #703 HWY 8
SOUTH LIMIT OF LANDS OWNED BY FRUITLAND & WINONA DEVELOPMENT GROUP
PROP. ℄ ROAD
SIDEWALK
MULTI USE PATH
EXIST. PROPERTY LINE
PAINTED MEDIAN/PLANTER (TO BE CONFIRMED DURING DETAIL DESIGN)
1.5m
2.25m
2m
2m
3m
3.75m
3.5%
3.5%
3.5%

GORDON DEAN AVENUE

GORDON DEAN AVENUE

FILE No.	CONTRACT No. DRAWING No.	SHEET No. 5 OF 9

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED



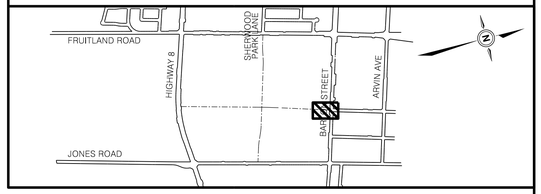
SEE SHEET 4
SEE SHEET 6
MATCH LINE
MATCH LINE
EXIST. PROPERTY LINE (TYP.)
SIDEWALK
PROP. ℄ ROAD
MULTI USE PATH
PAINTED MEDIAN/PLANTER (TO BE CONFIRMED DURING DETAIL DESIGN)
5.250
1.5m
2m
3.5m
3.5m
3.5

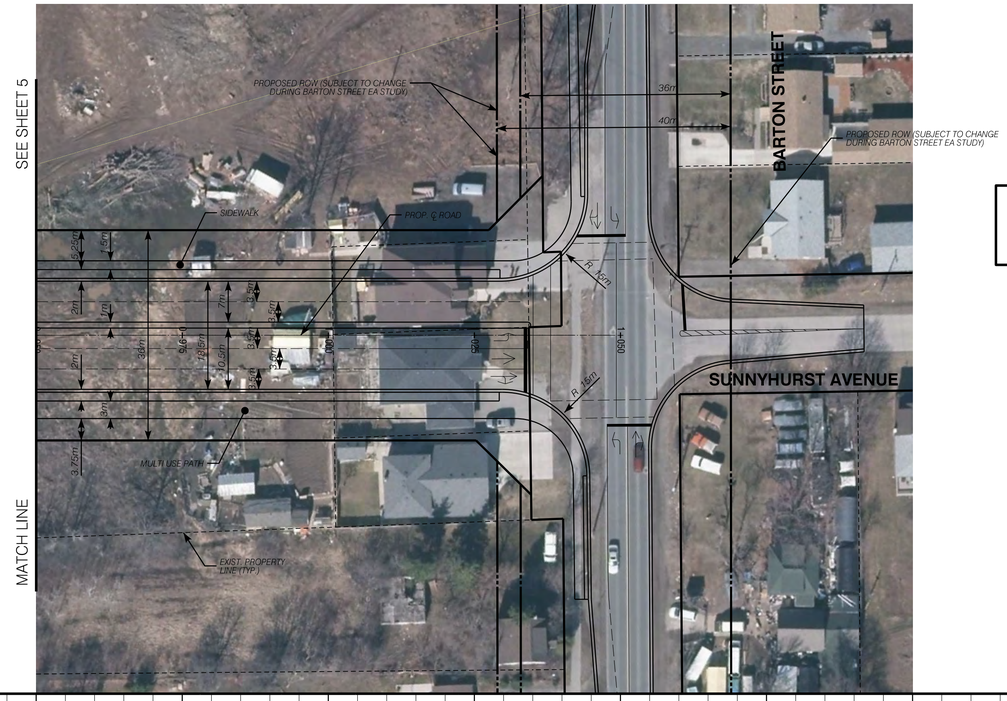
GORDON DEAN AVENUE

GORDON DEAN AVENUE

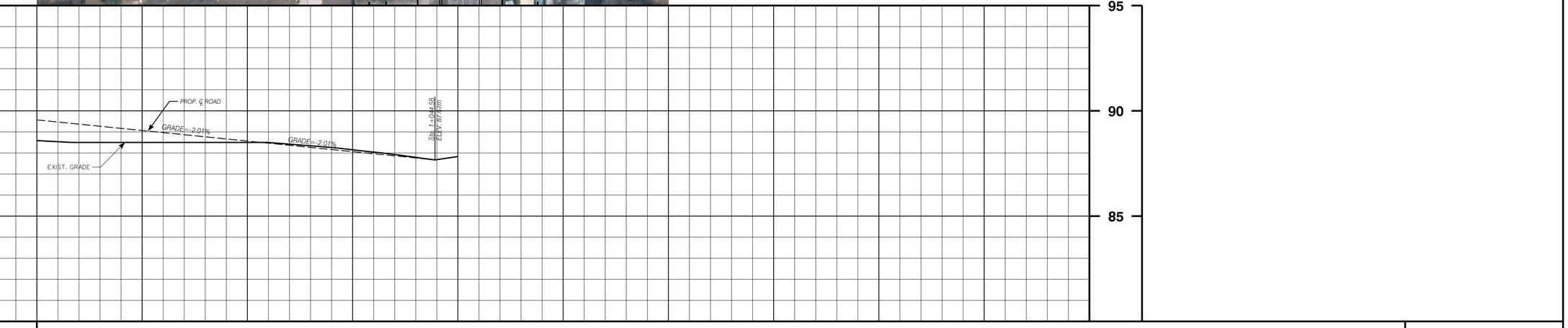
FILE No.	CONTRACT No. DRAWING No.	SHEET No. 6 OF 9

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED





NOTE
BARTON ST. INTERSECTION IS CURRENTLY UNDERGOING ENVIROMENTAL ASSESMENT PROCESS. CURRENT LAYOUT SHOWN IS NOT FINAL.



PROPOSED SANITARY SEWER												*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER												*PROPOSED STORM SEWER*
EXIST. ℄ OF ROAD PROFILE ELEV. *PROP. ℄ OF ROAD PROFILE ELEV.*	89.57	88.46	89.07	88.19	88.57	87.89	88.06	87.66				EXIST. ℄ OF ROAD PROFILE ELEV. *PROP. ℄ OF ROAD PROFILE ELEV.*
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	0+950		0+975	1+000		1+025		1+050		1+075		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY:
DATE: May 12, 2020
REFERENCE MATERIAL:
Geodetic Bench Mark
Borehole Report -
Elevation=

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

Project Manager (Design)

Manager of Design

FRUITLAND - WINONA DEVELOPMENT GROUP

GORDON DEAN AVENUE
Gordon Dean Ave.
Schedule 'C' MCEA (Ph. 3 & 4)
Ultimate Condition
Sta. 0+950 to Sta. 1+050

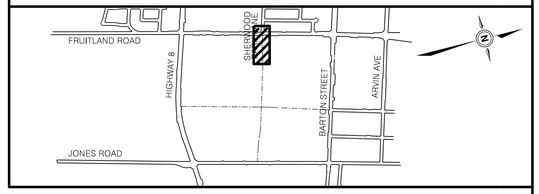
14-H-00 (1)

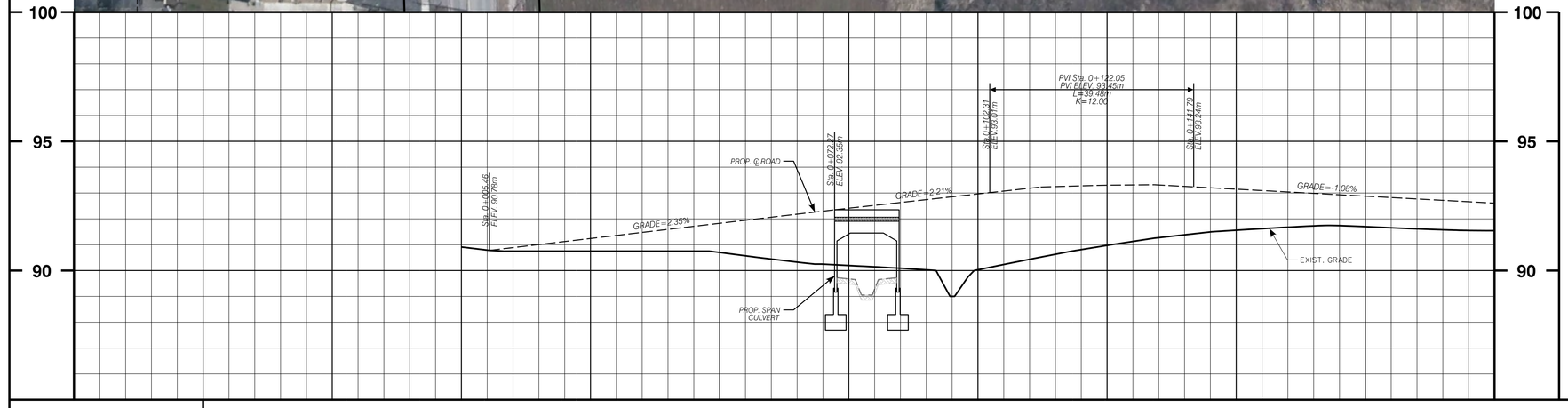
COLLECTOR ROAD 'B'

COLLECTOR ROAD 'B'

FILE No.	CONTRACT No. DRAWING No.	SHEET No. 7 OF 9

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED





PROPOSED SANITARY SEWER																				*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER																				*PROPOSED STORM SEWER*
EXIST. ℄ OF ROAD PROFILE ELEV. *PROP. ℄ OF ROAD PROFILE ELEV.*		90.75	90.17 91.24		90.01 91.83		90.92 92.41		91.53 92.96		91.66 93.42		91.47 93.15		91.45 92.88		91.50 92.61			EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE		0+000		0+025		0+050		0+075		0+100		0+125		0+150		0+175		0+200		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY: | DATE: May 12, 2020

REFERENCE MATERIAL:

Geodetic Bench Mark — Elevation=

Borehole Report -

SCALES

0 5m 10m 20m
HORIZONTAL 1:500

0 1m 2m 4m
VERTICAL 1:100

Project Manager (Design) _____

Manager of Design _____

FRUITLAND - WINONA DEVELOPMENT GROUP

COLLECTOR ROAD 'B'
Gordon Dean Ave.
Schedule 'C' MCEA (Ph. 3 & 4)
Ultimate Condition
Sta. 0+000 to Sta. 0+200

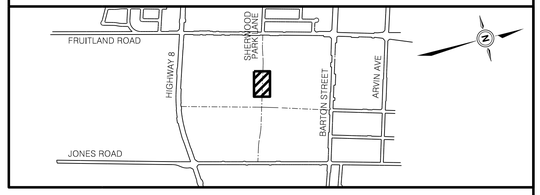
14-H-00 (1)

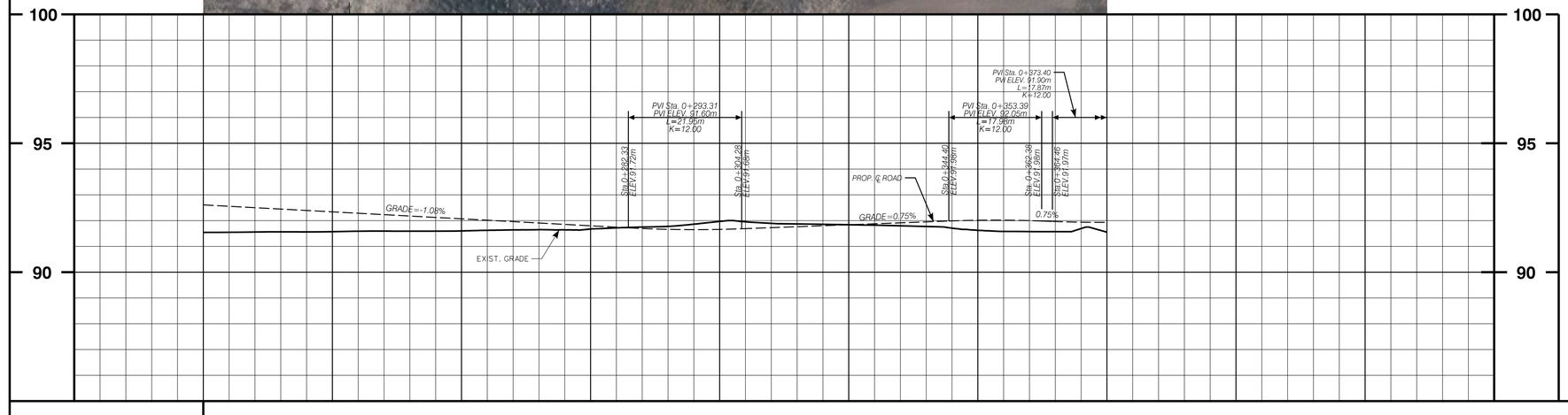
COLLECTOR ROAD 'B'

COLLECTOR ROAD 'B'

FILE No.	CONTRACT No. DRAWING No.	SHEET No. 8 OF 9

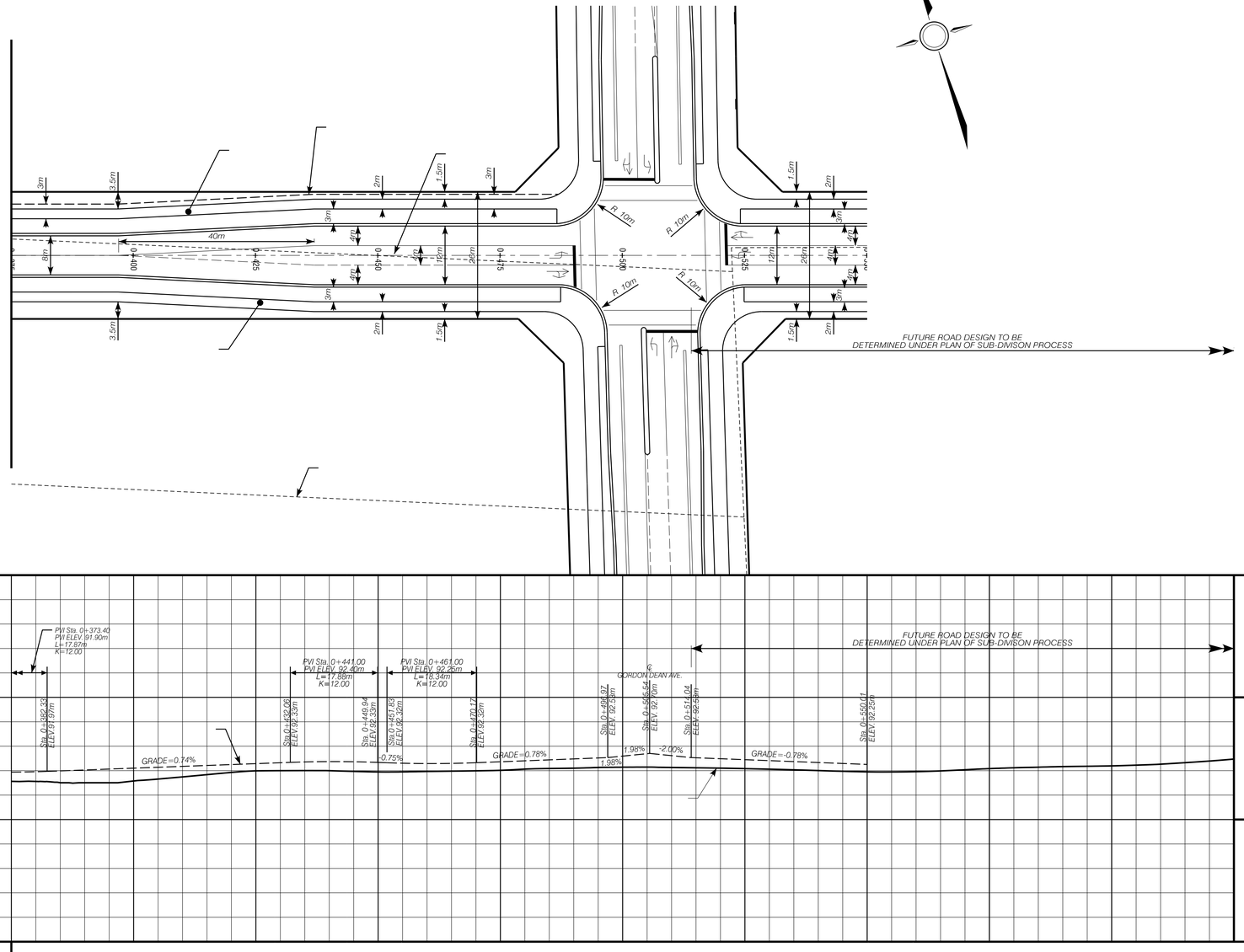
DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED





| | | |

SHEET No.



L	91.91	91.75	92.10	91.89	92.28	91.96	92.33	91.87	92.36	91.74	92.59	91.84	92.44	92.05	92.25		
	0+375		0+400		0+425		0+450		0+475		0+500		0+525		0+550		

N	REVISIONS	INITIAL	DATE

REFERENCE MATERIAL:

SCALES

14-H-00 (1)