RM of Corman Park #344

Discretionary Use Permit Application

Saskatoon Misbah School

SW-16-36-04 Parcel H

Submitted To:
RM of Corman Park #344

Submitted By:
PCL Construction Management Inc.

On Behalf Of:
Saskatoon Misbah School

CONSTRUCTION LEADERS

SHARING YOUR VISION. BUILIDNG SUCCESS.

October 20, 2015

RM of Corman Park #344
111 Pinehouse Drive
Saskatoon, SK S7K 5W1

RE: Discretionary Use Permit Application
Saskatoon Misbah School Development
SW-16-36-04 Parcel H
Our File: 2830026

We are pleased to provide the attached Discretionary Use Permit Application Form on behalf of our client the Saskatoon Misbah School. Included with the application are the following attachments:

- Presentation from the Saskatoon Misbah School
- Preliminary site plan including approximate building locations
- Preliminary building floor plans
- Photo's of the proposed site
- Satellite views of the proposed site
- Drainage Analysis and Site Servicing Report (Associated Engineering)
- Traffic Impact Assessment (MMM Group)
- City of Saskatoon review of the TIA
- Ministry of Highways TIA Review

Please note that the comments provided from the Ministy of Highways in regards to the TIA review can and will be addressed during the design development stage as well as the Roadside Development Permit Application.

Should you require any further information or have any questions regarding the attached, please do not hesitate to contact the undersigned at 306-657-1480.

Sincere Regards,

PCL CONSTRUCTION MANAGEMENT INC.

David Watt
Project Manager

cc: Ben Wagemakers, Manager, Special Projects - PCL Saskatoon
Ashraf El-Bakri - Saskatoon Misbah School

PCL CONSTRUCTION MANAGEMENT INC.
3120 Faithfull Avenue, Saskatoon, SK S7K 8H3
Telephone: (306) 931-3322 ♦ Fax: (306) 242-4876 ♦ Website: www.pcl.com

RM OF
CORMAN PARK
#344

Application Form

1) Applicant: PCL Construction Management Inc. c/o Saskatoon Misbah School

Address: 3120 Faithfull Avenue
Saskatoon, SK
S7K 8H3

Phone: 306-657-1480 Cell: 306-229-0819 Fax: 306-242-4876

Email: dlwatt@pcl.com

NOTE:If the applicant is not the registered owner of the subject property, the owner of the property must also sign the application form or provide a letter of consent for the application to be processed.

2) **Legal description of land proposed for development**

All/Part of the SW ¼, Section 16, Township 36, Range 04

LSD(s) _____ Lot(s) _____ Block(s) _____

Registered Plan No. 95S38867

Certificate of Title No. 95S38867A

3) **Existing use of land intended for development:**

The land is currently not used for any particular purpose. The land consists of prairie grass, small trees and a small amount of water from runoff.

4) **Proposed use of land and buildings:**

The proposed use consists of a K-12 school and a community center. The surrounding site will be utilized as parking, playground and as required for site and building services.

5) **Surrounding land uses**:

Are any of the following within 1.6 km (1 mile)?

	Yes/No	If Yes, Please State Distance
a) Residential Site	Yes	East, North, South (.75 km)
b) Recreation or Conservation Site	No	
c) Industrial or Commercial Site	Yes	West, South (.2 km)
d) Sewage Lagoon or Land Fill	No	
e) Urban Municipality	No	
f) Stream or Large Body of Water	No	
g) Other	No	

6) **Declaration by Applicant**

I, David Watt of PCL Construction Management Inc.

in the Province of Saskatchewan, solemnly declare that all of the above statements within this application are true, and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of "The Canada Evidence Act".

I further agree to indemnify and hold harmless the Municipality from and against any claims, demands, liabilities, costs or damages related to the development undertaken pursuant to this application.

DATE: Oct 20, 2015 SIGNATURE: _____

DATE: Oct 20, 2015 LANDOWNER SIGNATURE: _____
(if required)

Saskatoon Misbah school (SMS)

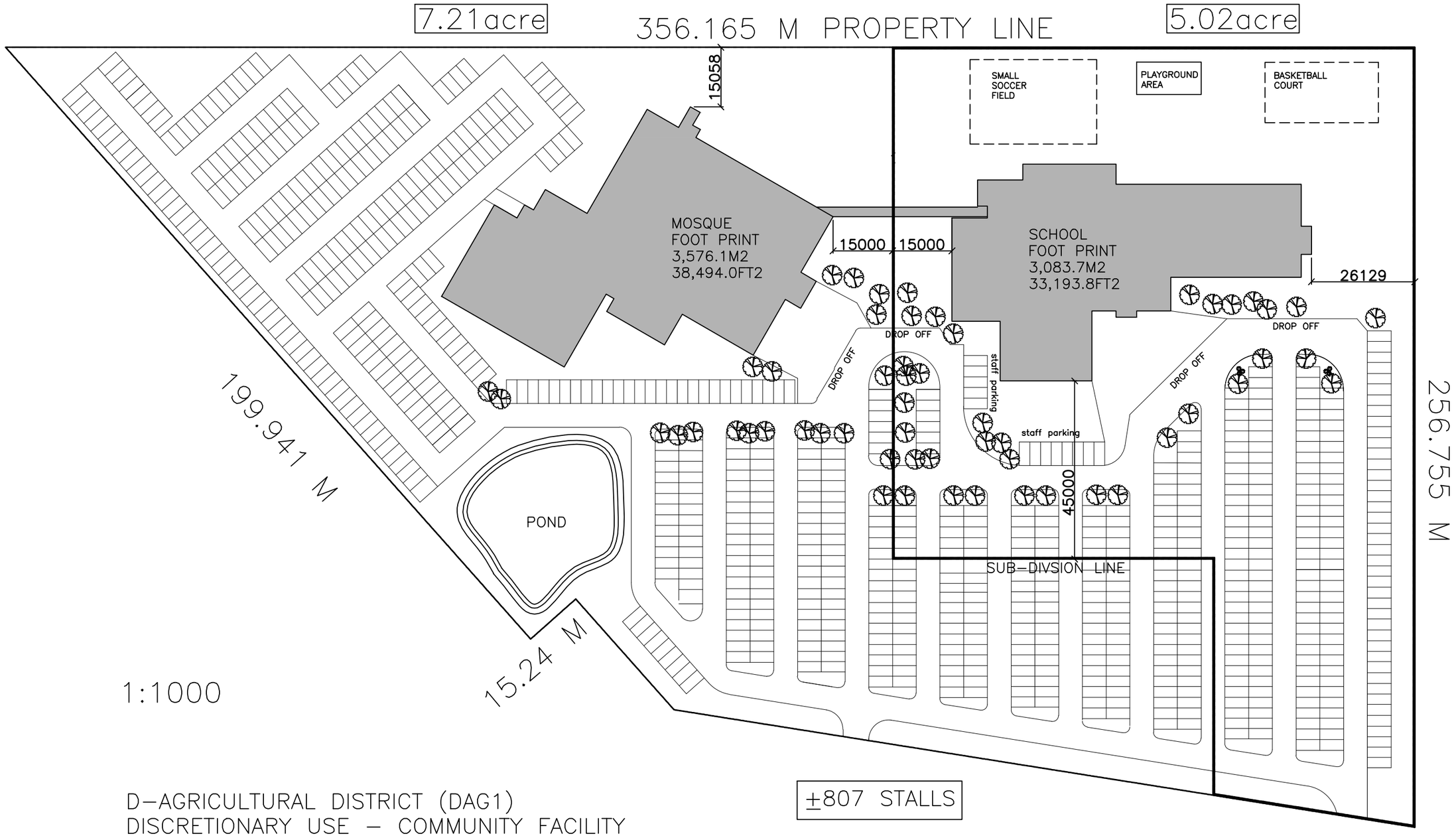
New School Project

School Background and History

- Established in 2000.
- SMS was started with less than 20 students and now serves over 200 students with 120 on the waiting list. The school currently enrolls students from pre-school to grade 9.
- The school mission is to achieve excellence in education of the curriculum while incorporating the Islamic and Arabic languages into it.
- The school is an associate school to the Saskatoon Public School Board (SPSD). In Saskatoon, currently the SMS and Saskatoon Christian School are the only associate school within the division.
- SMS has a tremendous relationship with SPSD and others schools.
- SMS focuses its relationship within the community and participates in many events to this regard.

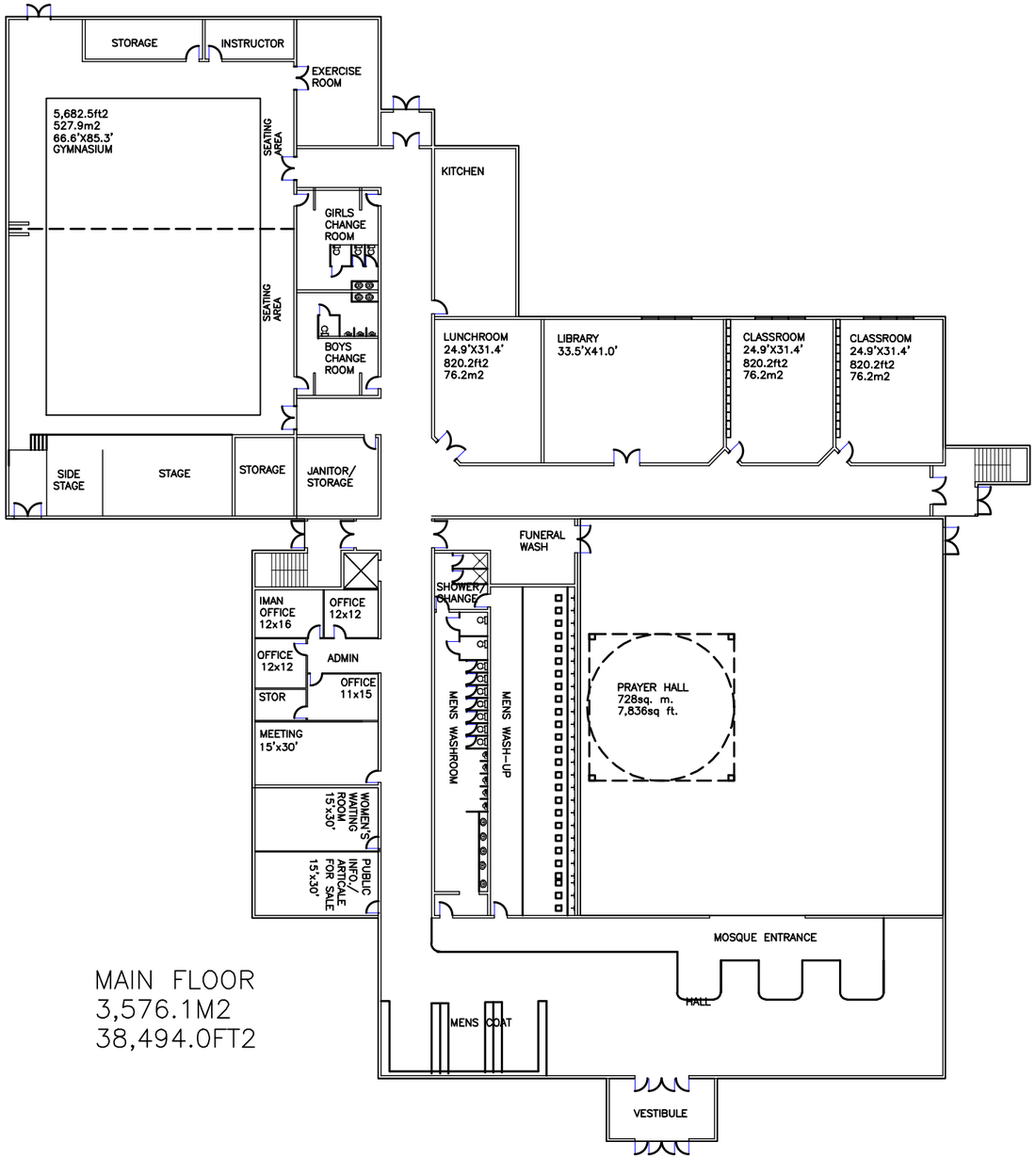
New School Project, why?

- Growth and demand for education in an Islamic environment
- Waiting list is currently over 100 students and growing
- Better facilities to meet our staff and students needs
- Accommodate our children from Gr. 9 through Gr. 12
- As part of a wider plan for a community center, SMS acquired a 15 acre parcel of land and developed a site plan and initial design to accommodate approximately 400 students
- SMS will fund its project from internal and external resources.

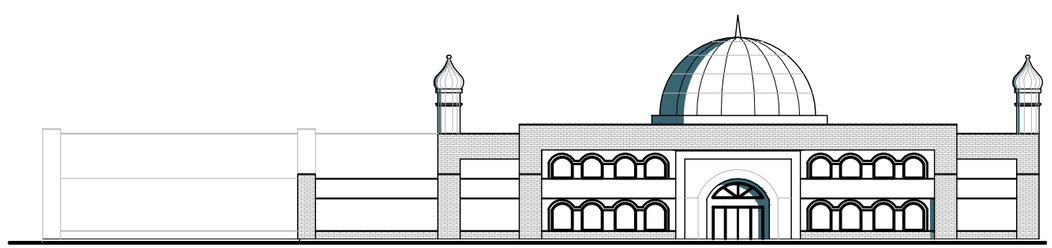


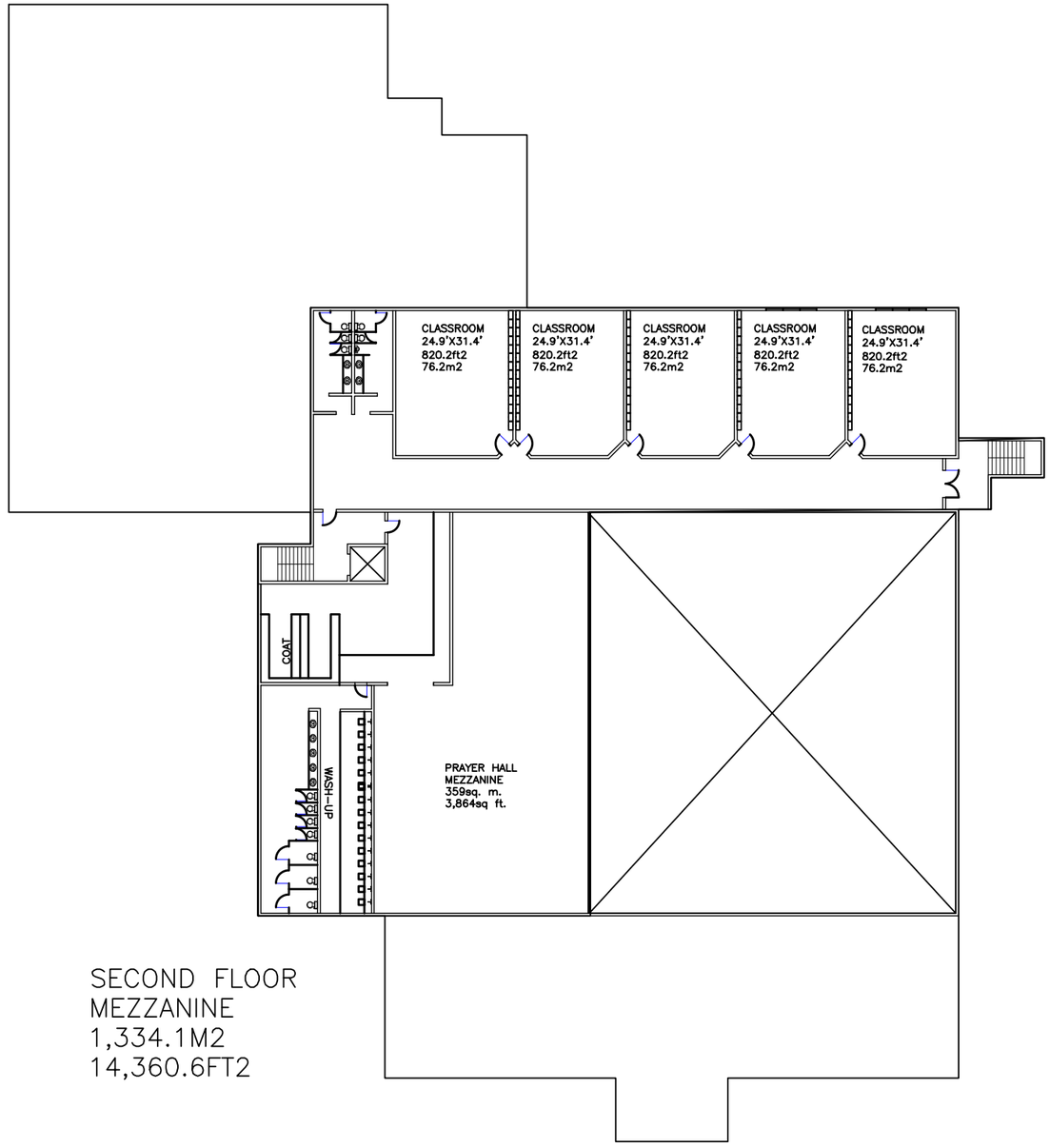
D-AGRICULTURAL DISTRICT (DAG1)
DISCRETIONARY USE - COMMUNITY FACILITY

SITE AREA = APPROX 59,907M2
MIN. SITE AREA = 2.47 ACRE
FRONT YARD SETBACK 45M
SIDE YARD SET BACK 15M
REAR YARD SETBACK 15M



MAIN FLOOR
3,576.1M2
38,494.0FT2

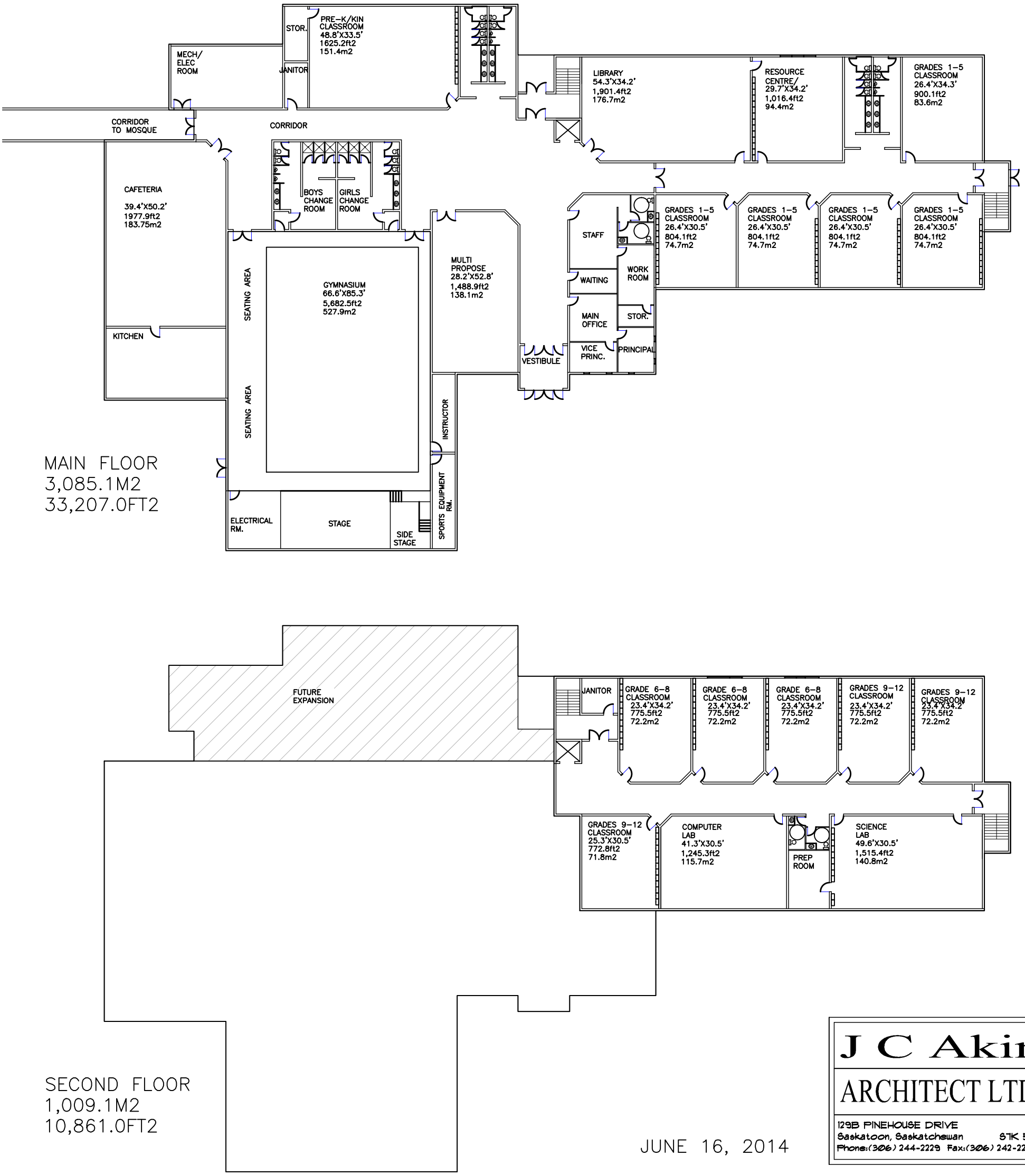




SECOND FLOOR
MEZZANINE
1,334.1M2
14,360.6FT2

JUNE 16, 2014

J C Akin
ARCHITECT LTD.
129B PINEHOUSE DRIVE
Saskatoon, Saskatchewan S7K 5W1
Phone:(306) 244-2229 Fax:(306) 242-2210



MAIN FLOOR
3,085.1M2
33,207.0FT2

SECOND FLOOR
1,009.1M2
10,861.0FT2

JUNE 16, 2014

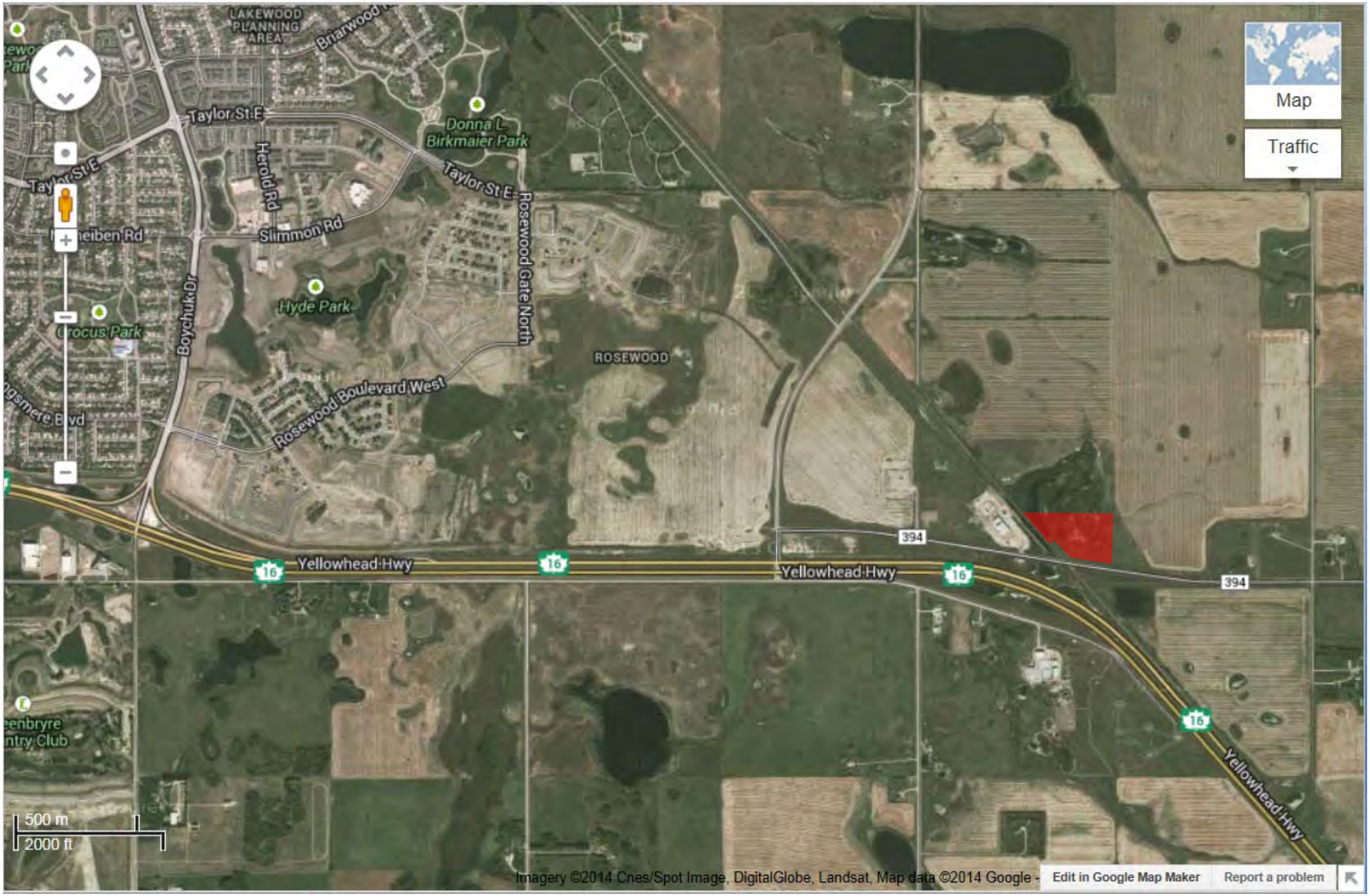
J C Akin
ARCHITECT LTD.
129B PINEHOUSE DRIVE
Saskatoon, Saskatchewan S7K 5W1
Phone:(306) 244-2229 Fax:(306) 242-2270

View from East side of property looking West

View from West side of property looking East

View from Southside of property looking North

View from West side of property looking North


LAKEWOOD PLANNING AREA
Briarwood
Taylor St E
Donna L. Birkmaier Park
Herold Rd
Slimmon Rd
Rosewood Gate North
Hyde Park
Crocus Park
Boychuk Dr
ROSEWOOD
Rosewood Boulevard West
Yellowhead Hwy
16
394
500 m
2000 ft
Map
Traffic
Imagery ©2014 Cnes/Spot Image, DigitalGlobe, Landsat, Map data ©2014 Google -
Edit in Google Map Maker
Report a problem


Map
Traffic
394
394
394
16
16
16
Yellowhead Hwy
Yellowhead Hwy
100 m
500 ft
Edit in Google Map Maker
Report a problem

Associated Engineering (Sask.) Ltd.
1 - 2225 Northridge Drive
Saskatoon, SK, Canada, S7L 6X6

TEL: 306.653.4969
FAX: 306.242.4904
www.ae.ca

September 9, 2015
File: 20154600.00.A.01.00

David Watt, GSI
Project Manager
PCL Construction Management Inc.
3120 Faithfull Avenue
Saskatoon, SK S7K 8H3

Re: PCL CONSTRUCTION MANAGEMENT INC.
SASKATOON MISBAH SCHOOL DEVELOPMENT
LETTER REPORT

Dear David:

1 INTRODUCTION

Associated Engineering (AE) has been engaged by PCL Construction Management (PCL) on behalf of the Saskatoon Misbah School (the School) to provide conceptual servicing options and recommendations for ISC Surface Parcel 131812691 located south east of Saskatoon. The following report is intended to support the Discretionary Use Application PCL is conducting on behalf of its client as it relates to water, wastewater, and stormwater servicing.

2 BACKGROUND

The parcel is located on a portion of the SW quarter Section of 16-36-04-W3M along Patience Lake Road (Provincial Highway No. 394) and is adjacent to the Canadian Pacific Railway (CPR) tracks. The land was purchased in 1988 by the Islamic Association of Saskatchewan with an initial area of 5.96 hectares (14.7 acres); however, a portion of land (1.01 hectares) along the southern edge of the property was expropriated in 1999 by the Saskatchewan Ministry of Highways & Infrastructure (MHI) in order to realign Highway No. 16 and Patience Lake Road. Figure 2-1 illustrates the subject property.

Figure 2-1
Site Location

3 WATER DISTRIBUTION

The following section outlines servicing options for the conceptual water distribution design intent. Final water distribution options will be determined during preliminary and detailed design.

3.1 ANALYSIS

Based on analysis of billing information provided by the Islamic Association of Saskatchewan for June 2013 through May 2015, the water use demands were determined for the current mosque and school. Table 3-1 outlines the current annual volume, peak day volume, and peak flow based on averaging the available time period data.

Table 3-1
Current Water Use Demands

Current Mosque/School	
Annual Volumes (m^3/year)	1420
Peak Day Volumes (m^3/day)	9.20
Peak Flow (L/s)	0.11

Future water use demands were determined based on water usage invoices indicating a maximum annual volume of 1944 m^3 in 2013. Projections were made using this value. Table 3-2 outlines the recommended future water use demands based on the anticipated increase in the population of the school and mosque.

Table 3-2
Recommended Future Water Use Demands

Future Mosque/School	
Annual Volumes (m^3/year)	3000
Peak Day Volumes (m^3/day)	13.0
Peak Flow (L/s)	0.15

3.2 SERVICING OPTIONS

A water supply source exists via the Forestry Farm Aquifer. Comprised of glacial sediments, primarily till, silt, sand and gravel, the Forestry Farm Aquifer is an unconfined aquifer. Based on a 2008 Beckie Hydrogeologists Ltd. report for the R.M. of Blucher Industrial Servicing Study, the estimated maximum pumping capacity of a Forestry Farm Aquifer well could be in the order of 0.50 m^3 per minute (0.008 L/s).

Potable water is potentially available from a number of regional water utilities in the area, SaskWater, and from the Forestry Farm Aquifer via a water well. Sourced from the City of Saskatoon, a connection to a regional water utility or SaskWater would provide for safe and reliable drinking water.

Based on the anticipated peak flow requirement of 0.15 L/s, it is not anticipated that the Forestry Farm Aquifer would provide sufficient flow to support the needs of the development. Accordingly, a regional water utility or SaskWater connection represent the only viable options for potable water service.

A Request for Service application regarding potable water service was submitted to SaskWater on May 20th, 2015. A copy of this application is included in Appendix A. Following that, on July 15, 2015 SaskWater requested additional information regarding the development to write a letter requesting Special Consideration for Service to the City of Saskatoon.

SaskWater, on behalf of the development contacted the regional water utilities in the area to see if any of them had allocation and a willingness to take on a new customer. Lost River Water responded in kind. Attached as Appendix B is confirmation from Lost River Water that they have the required allocation to supply the development; they are able and willing to take on this proposed development as a client; and they have identified a likely connection point.

4 WASTEWATER SERVICING

The following section outlines servicing options for the conceptual wastewater servicing design intent. Final wastewater servicing options will be determined during preliminary and detailed design.

4.1 ANALYSIS

Best practices suggest that wastewater flows are typically in the neighbourhood of 85% of potable water. As such, the estimated wastewater flow for the proposed full development is 0.13 L/s. As the school is to be built first with the mosque likely following in 5 to 10 years into the future, we have estimated the flow for the school exclusively at 0.07 L/s.

4.2 SERVICING OPTIONS

Options presented are based on initial information collected and are meant to provide background on conceptual servicing options. Options available for wastewater servicing include:

- lagoon
- sewer mounds
- jet type disposal system
- chamber systems
- absorption field systems
- septic tanks
- vendor packaged solution.

Lagoon

Requiring a minimum lot size of 4 hectares, a lagoon is a large gently sloped basin that can be designed to contain and treat sewage before discharging effluent. Based on *EPB503: Sewage Works Design Standard,* lagoons are required to be located a minimum of 300 metres from isolated human inhabitation, and 550 metres from built-up areas.

Based on EPB503, the development site is in close proximity to built-up areas and moreover does not provide the minimum land requirement for a lagoon. Therefore, a lagoon is not considered an acceptable on-site Wastewater Treatment System (OWTS) for the proposed development.

Sewer Mounds

A Type I sewer mound is a wastewater treatment system consisting of a series of perforated laterals on a rock bed above the natural soil surface. These perforated laterals receive wastewater effluent from a septic tank through a distribution box. The effluent is transmitted into the rock bed and natural soils for final treatment and disposal. A Type I mound is to be installed on a parcel having an area greater than 0.11 acres.

A Type II sewer mound is beneficial in large rural subdivisions where other sewage disposal systems are not possible. This mound is a wastewater treatment system that is raised above the natural soil surface in a specific graded, clean sand media. Sewage effluent is pumped from the septic tank to the distribution laterals under pressure. Effluent in the laterals is spread over the gravel and sand and allowed to percolate through this layer removing the organic load in the effluent.

A Type I or II sewer mound is not considered a feasible option for this site due to low water usage and periods of inactivity that may influence the mound's resistance to freezing. Additional maintenance may be required to protect the mounds from freezing during winter months.

Jet Type Disposal Systems

According to the Saskatchewan Ministry of the Environment (MOE), jet type disposal systems require a minimum lot size of 4 hectares. In areas of high residential development, this type of system is not recommended as it usually results in complaints with respect to odour and other aesthetic considerations. Therefore, jet disposal systems are not considered feasible for the proposed development.

Chamber Systems and Absorption Field Systems

Sanitary effluent collected in an adequately constructed septic tank can be transmitted into the soil using a chamber system. The base of each chamber system will require a separation distance of at least 1.5 metres from the high water groundwater table below the 0.9 metres deep absorption field trench.

Furthermore, due to the below grade nature of the absorption field, it may become covered by parking pads or other uses that would damage the systems integrity and performance. As a result, the site selection of the specific location of a chamber system will be contingent on groundwater conditions and soil topography and is not considered a feasible solution for this development due to the large parking requirements.

Septic Tanks

Septic tanks should be located where they cannot cause contamination of any well, spring or other source of water supply. Underground contamination may travel in any direction and for considerable distances. It is necessary to rely on horizontal as well as vertical distances for protection.

Capacity is one of the most important considerations in septic tank design. Tanks should not be less than 2300 litres. Most recent information suggests that for flows between 2000 litres and 6000 litres per day the capacity of the working compartment of the septic tank should be equal to at least 1.5 days of sewage flow.

A septic tank may be a suitable option depending on the depth of the ground water table and ground water flows. While a septic tank may be a suitable option, consideration needs to be given towards significant annualized septic hauling fees as part determining the most cost effective, long term solution for the development.

Vendor Packaged Solution

A package sewage treatment plant is a unit which complies with the National Sanitation Foundation *International Standard for Wastewater Technology*, NSF-40 Standard, Residential Wastewater Treatment Systems, Class 1 or other standard(s) recognized by the local health region. The vendor packaged solution treats the wastewater to an acceptable level for the effluent to be released into the natural environment.

The advantage of a vendor packaged solution is the potential for increased effluent quality prior to discharge to a soil absorption field thereby allowing for a smaller absorption field. Ongoing maintenance of these systems requires work being completed by qualified professionals in order to maintain the effluent quality. The potential exists to release the effluent to the proposed dry pond stormwater management area.

Conversations with the Environmental Project Officer and the Water Security Agency (WSA) Manager of Engineering and Approvals have confirmed that the Saskatoon Health Region will act as the local authority on this project due to an expected design flow of effluent less than 18 cubic metres per 24 hour period. Sewage works for the development would also be subject to *The Plumbing and Drainage Regulations* and *The Private Sewage Works Regulations*.

A vendor packaged solution requires a smaller footprint, has the potential to produce highly treated effluent, and presents a decreased impact on the environment.

An application for private sewage works would be made through the Saskatoon Health Region.

Potential vendors and systems include:

- Nelson Environmental Inc. (SAGR)
- Pinnacle Environmental Technologies Inc. (MicroFAST)
- Sapphire (Advanced Biological Treatment Process)
- Corix (Membrane Bioreactor)

Vendor brochures for the noted systems/technologies are included in Appendix C.

5 STORMWATER MANAGEMENT

The following section outlines stormwater management options and design intent. Final stormwater management options will be determined during preliminary and detailed design.

5.1 ANALYSIS

The site topography is relatively flat-lying to gently undulating. The general soil profile is expected to consist of organic topsoil overlying clay, followed by an extensive deposit of glacial till based on previous geotechnical reports in the surrounding area. Drainage through infiltration process is reduced due to this soil profile. As a result, surface water storage has begun to overwhelm the northern half of the site during the current wet cycles.

An application to Construct and Operate Drainage Works accompanied by a drainage analysis of the site was submitted to the WSA on March 20th, 2015. The application proposed that the site be built-up by approximately 1.0 metres to protect the buildings and facilities from potential flooding. A portion of the existing lands that currently flood would remain intact; and would be graded to maximize storage.

Additionally, it was recommended that a 600 millimeter diameter culvert be installed across the Canadian Pacific Railway (CPR) tracks and Patience Lake Road. The location of the culvert is illustrated in Figure 4-1. This culvert would be installed at an approximate elevation of 514.8 metres (to be confirmed during detailed design) and would discharge into the highway ditch. This culvert elevation will be set to allow ponding to still occur while allowing excessive flows to pass through the site along its natural path. Additionally, backflow prevention is also a consideration in the protection of the site.

Figure 4-1
Location of Proposed Culvert

The Drainage Analysis memo and the response from the WSA are included in Appendix D. The proposed on/off site drainage management will not require approval from the WSA while the land levelling and landscaping for the development of building sites is exempted from approval under *The Drainage Control Regulations.* Furthermore, the WSA stated that the intention to develop on-site storage demonstrates due diligence in maintaining pre and post development flows and that the stormwater management plan as presented would be considered a restoration of the natural drainage path and does not require approval from the WSA.

AE has been in conversation with both MHI and CPR regarding the stormwater management recommendations outlined in the Drainage Analysis memo.

AE met on site with a representative from CPR, Terry Gallant, on May 25th, 2015. During this visit it was determined that CPR could construct the culvert as required. Attached in Appendix E is an email from Terry to Joe Van Humbeck outlining their acceptance of the proposed culvert.

Andrew Nichollas from MHI was able to provide immediate feedback. Andrew indicated that if the proposed culvert is installed under the CPR tracks, the culvert will need to be installed perpendicular to Highway No. 16 and its right of way. Should CPR have a similar stipulation, MHI may be willing to accommodate this requirement. Andrew passed on AE's request to the MHI drainage engineers on May 13th, 2015 as this drainage issue impacts an area greater than just the proposed development site. On July 27th, 2015 MHI responded to the drainage request saying they do not agree that additional infrastructure is required.

On August 6th, 2015 a meeting was held with MHI (Matthew Gabruch and Jordan Parisien), WSA (Ron Crush), AE, and PCL staff to discuss the drainage matter and establish an acceptable solution. MHI identified that based on their record information a culvert may exist under the CPR tracks just north of Patience Lake Road. During AE's drainage analysis, confirmation of such a culvert could not be established during multiple visits to the site or in consultation with CPR, the RM, and the City. A joint site visit was conducted August 6th in an attempt to find said culvert; however, it could not be located. If a culvert currently exists as MHI suggests, no additional culverts should be required; however, the natural drainage route needs to be maintained across the highway to ensure excessive flows follow their natural path from the northeast to the southwest. The WSA is reviewing the local area drainage and will provide a third-party recommended solution regarding the need for a culvert and the potential impediment of the natural drainage route by Highway No. 16.

6 RECOMMENDATIONS

Based on the analysis conducted and outlined in this report, AE recommends that:

- water servicing be provided by Lost River Water
- wastewater treatment be provided by a vendor packaged solution. Due to the staged nature of the proposed development, a septic tank is a viable option for the school alone. In the future, when the mosque will be constructed, further evaluation of the vendor packaged solutions will be required as well as the evaluation of other means of servicing (i.e.: extending City services, a potential regional system, etc.).
- stormwater be managed through lot grading, pond construction, and potentially culvert installation.

7 CLOSURE

This letter report was prepared exclusively for the purposes and project outlined in the report. The report is based on information provided to, or obtained by Associated Engineering as indicated in the document and figures, and applies solely to site conditions existing at the time of reporting. This deliverable represents a reasonable review of available information within an agreed upon scope, schedule, and budget. Further review and updating of the document may be required as local site conditions and regulatory and planning frameworks change over time.

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

Yours truly,

Ryan Karsgaard, P.Eng.
Project Manager

RK/np

Reviewed by,

Darrell Rinas, P. Eng.

PROFESSIONAL ENGINEER
R.T. KARSGAARD
MEMBER 14927
15 09 09
YR. MN. DAY
SASKATCHEWAN

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF SASKATCHEWAN
CERTIFICATE OF AUTHORIZATION
ASSOCIATED ENGINEERING (SASK.) LTD.
NUMBER
C116
Permission to Consult Held By:

Discipline	Sask. Reg. No.	Signature
Munic.	12894	

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature:
Date: 2015 09 09

Appendix A – SaskWater Request for Service Application

SaskWater

Request for Service Form

CUSTOMER INFORMATION

Name: Saskatoon Misbah School Address: 222 Copland Cres

City/ Town/ Village: Saskatoon Postal Code: S7H 2Z5

Phone Number: ( ) 306-384-9499 Fax: ( )

Cell Number: ( ) 306-270-3308 E-Mail: ashrafbakri1@hotmail.com

SERVICE REQUEST INFORMATION

Request: Potable Water: ✓ Wastewater Treatment: ____

Non-Potable Water: ____ Wastewater Disposal: ____

Water Supply used for (drinking water, process water, etc): DRINKING WATER (SCHOOL / MOSQUE)

Please choose a sector that best describes Client's operations (please circle one):

Single User/ Association/ R.M./ Urban/ Ag. Production/ Ag. Processing/ Commercial-Retail/ Industrial- Manufacturing/ (Institutional)/ Mining/ Oil-Gas/ Recreation-Tourism / Domestic Sewage Hauler

Legal Land Location (of site): PARCEL NUMBER 131812691 → SW-16-36-04-3 RM: CORMAN PARK

Existing Water Supply: Ground: N/A Surface: ____ Combination: ____ Existing Storage? ____

Est. End Use Service Connections: 1 Est. Total Population Served: 1215 (DURING PEAK PERIODS)

Requested In-Service Date: _____ *(please be as specific as possible)*

WATER (Potable / Non-Potable)

Annual Volumes: 3000 m^3/ year Peak Day Volumes: 13.0 m^3/ day Peak Flow: 0.15 L/s

WASTEWATER

Annual Volumes: _____ m^3/ year BOD5: _____ mg/l *(Attach Wastewater Composition Report if Municipality)*

Notes:

Submission of this Request for Service is not chargeable. SaskWater will provide estimated charges that may be required to complete your Request and will proceed only with your authorization.

Ashraf EL Bakri
PRINT (Client Name)

(Client Signature)

President
(Title)

May 7th 2015
(Date)

Internal Use Only: Project Start Date: _____ (Date SaskWater receives all pertinent information)

Appendix B – Lost River Water Confirmation

Ryan Karsgaard

From: ROB RISLING <robert.r@shaw.ca>
Sent: Tuesday, August 18, 2015 6:25 AM
To: Ryan Karsgaard
Subject: Re: Saskatoon Misbah School Development

Hello Ryan,

I am the operations manager for Lost River Water, (306) 222-6035 and the best contact person. Phoning me works best.

1. Lost River Water has the allocation to accommodate the needs of the Misbah Development as per the attached SaskWater Request for Service form.

2. Our Utility is able and willing to take the Development on as a user.

3. The connection point to our Utility will be in the north west corner of the intersection of highway 394 (Patience Lake Highway) and range road 3041.

The above information should satisfy the Discretionary Use Application for the RM of Corman Park.

If you need further information don't hesitate to call.

Kind Regards,

Robert Risling

From: "Ryan Karsgaard" <karsgaardr@ae.ca>
To: "robert r" <robert.r@shaw.ca>
Cc: "Darrell Rinas" <rinasd@ae.ca>
Sent: Monday, August 17, 2015 10:36:01 AM
Subject: Saskatoon Misbah School Development

Hi Rob,

I am coordinating the utility services for the Saskatoon Misbah School Development. Thank you for considering the Development for servicing! Per your discussion with Darrell last week, please confirm the following:

1. That your Utility has the allocation to accommodate the needs of the Misbah Development as per the attached SaskWater Request for Service form.
2. That your Utility is able and willing to take the Development on as a user.
3. The likely connection point to your Utility.

The above information is necessary to inform the Discretionary Use Application that is going into the RM as soon as possible.

Thanks in advance for your time!

Regards,
Ryan

Ryan Karsgaard, P.Eng.
Project Manager, Infrastructure
Associated Engineering (Sask.) Ltd.
1 - 2225 Northridge Drive, Saskatoon, SK S7L 6X6
Tel: 306.653.4969

Appendix C – Wastewater Vendor Brochures

MBR Packaged Plants for Wastewater Treatment

Proteus Waters provides packaged wastewater plants based on membrane bioreactor (MBR) technology. Our MBR packaged plants employ PURON® single header, submerged, ultrafiltration membranes. These packaged plants are fully integrated wastewater treatment systems that incorporate all biological processes and ultrafiltration membranes into a compact tank network, enabling simple, cost-effective setup, maintenance, and operation. The MBR system outperforms conventional treatment alternatives, offering reduced operating costs, smaller plant footprints, more reliable performance, and high quality effluent that meets or exceeds the world's most stringent discharge and reuse standards. Our wastewater treatment solutions feature scalable treatment capacity that can be increased as demand grows.

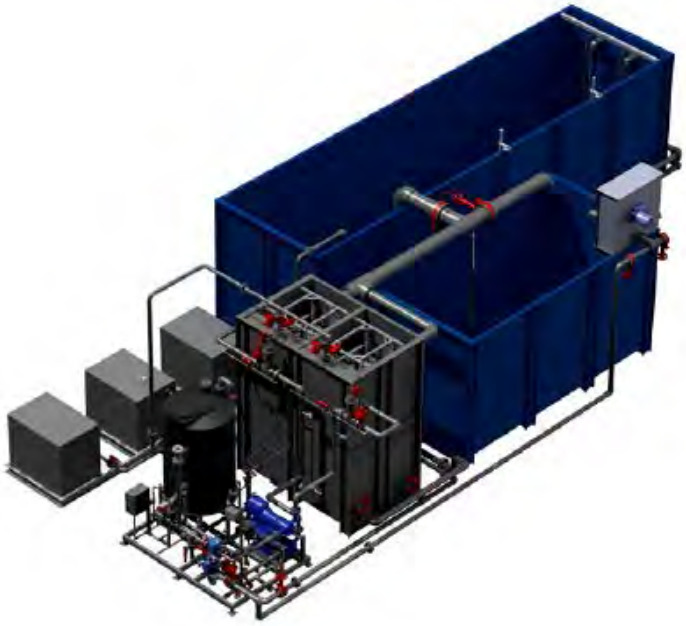


Figure 1. MBR Packaged Plant

Process Description

MBR systems combine biological wastewater treatment and high-efficient solids/liquid separation. Mechanically pre-screened wastewater is treated biologically and separated from the activated sludge by ultrafiltration membranes, which act as a physical barrier to suspended solids and bacteria, producing high quality effluent. Thus, no additional treatment clarification or filtration stages are needed to meet local discharge standards. By eliminating the need for sludge settling, the MBR process can operate at mixed liquor suspended solids (MLSS) concentrations in the range of 8 to 12 grams/liter, three to four times greater than conventional systems, resulting in designs that are significantly more compact. Figure 1 shows the general arrangement of an MBR packaged plant with a daily capacity of 360 m^3 of sewage.

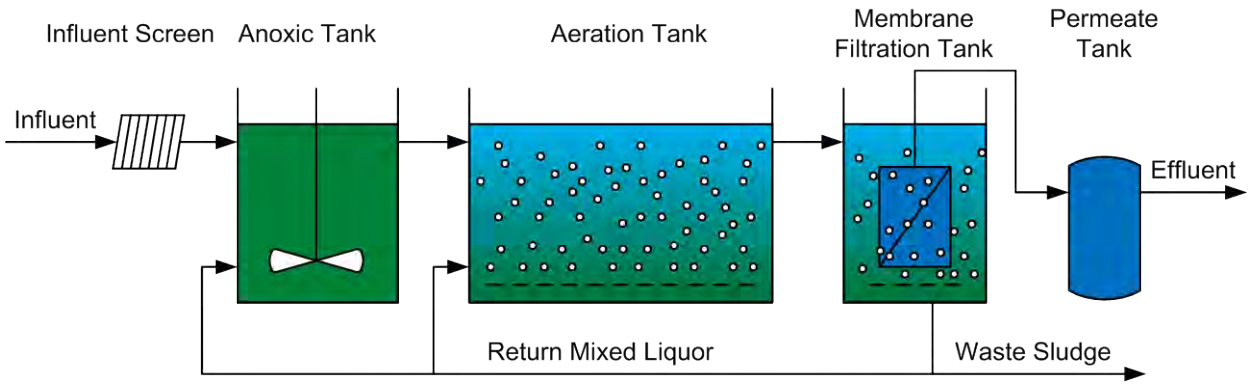


Figure 2. MBR Process Schematic Diagram

A schematic diagram of the MBR process is shown in Figure 2. The first step of the treatment process is the mechanical screening of the incoming wastewater. The wastewater enters a screen that is equipped with a 2-3 mm perforated plate. The solid particles and screenings are retained and continuously removed from the screen unit for disposal. The screened wastewater flows into the anoxic tank. Within the anoxic tank a submersible mixer blends the screened wastewater with the mixed liquor returning from the membrane filtration tanks at predetermined rates to achieve the desired level of denitrification. In the absence of dissolved oxygen nitrate is converted into nitrogen gas in the anoxic tank.

The wastewater flows from the anoxic tank to the aeration tank. Oxygen is supplied using air blowers and the diffused aeration system. A dissolved oxygen (DO) sensor monitors the selected range to help maintain nitrification and removal of organic material. In this oxygen rich environment, organic material and ammonia nitrogen are biologically oxidized into carbon dioxide (CO_2), nitrate (NO_3^-), and water. A pH sensor is provided in the aeration tank for continuous monitoring of the pH condition.

From the aerobic tank mixed liquor is pumped into the membrane filtration tank for liquid/solid separation. The membrane modules are fully submerged in the mixed liquor inside the membrane tank, for direct outside to inside filtration. The membrane filtration system is equipped with rotary lobe pumps that create suction inside the hollow fibers and draw water through the fiber wall to the permeate collection tank. Permeate generated from the membrane filtration process is transferred to a permeate collection tank. The effluent will be suitable for reuse applications, such as landscape irrigation.

Process Operation and Maintenance

Fewer processes, combined with programmable logic controller (PLC) of the principal system components, makes plant operation less labor intensive and much more straightforward. Plant operators are only required to perform regular preventive maintenance on the membrane system, pumps, blowers, and associated mechanical equipment to ensure efficient biological processes and optimum membrane operation.

The PLC automatically controls the filtration and cleaning operations while a human machine interface (HMI) continuously monitors system performance. The PLC is Ethernet capable and interacts with other plant PLCs including pretreatment and sludge dewatering. The main process variables being monitored are liquid levels, pH, DO, and turbidity.

An air scoured cleaning system is used to reject solids away from the membrane surface. Also, rotary lobe pumps periodically reverse the flow at predetermined frequencies and durations to backflush the membrane fibers. Pneumatic valves as well as pressure and flow measurement instruments provide continuous monitoring and control of the system operation. When cleaning is required to restore the desired flux, a train of modules is isolated from normal operations and sodium hypochlorite and citric acid are sequentially injected into the membrane modules for in situ chemical cleaning.

Membrane Information

The membrane modules are made up of hollow fibers with a nominal pore size of 0.05 µm. The free floating tips of the hollow fibers in the single header design of the PURON® module (Figure 3) reduce breakage by placing less mechanical stress on the fibers than in modules that use double header design. A single header design also results in minimal fouling and reduced power consumption. Technical specifications of the PURON module used in the proposed MBR system are presented in Table 1.

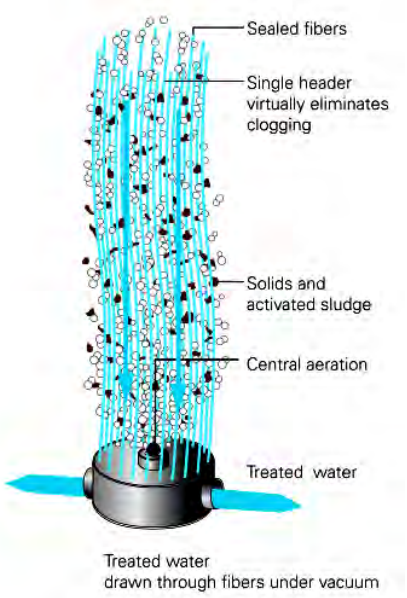


Figure 3. Single Header Hollow Fiber Membrane

PURON submerged membrane modules meet California Title 22 water recycling criteria, one of the strictest regulations in North America for effluent reuse. According to California regulations for Title 22 filtered wastewater, turbidity for membrane-filtered wastewater should not exceed 0.2 NTU for more than 5 percent of the time within a 24-hour period and should not exceed 0.5 NTU at any time.

Table 1. Membrane Module Information for a 360 m^3/d packaged plant

Parameter	Value
Fine Screen Size	≤ 2.0 mm punched hole type
MLSS Concentration in Membrane Tanks	≤ 12 grams/liter
Number of Membrane Filtration Trains (or Sections)	2
Membrane Module Designation	PURON® PSH300
Membrane Area per Module	300 m^2
Number of Membrane Modules Installed per Train	1
Total Installed Membrane Area	600 m^2

Effluent Quality

PURON® membrane bioreactors have been used in municipal and industrial applications. In municipal projects, it has been used at small and large scales applications around the world. Typical treatment results from municipal wastewater treatment applications are presented in Table 2.

Table 2. Typical Treated Water Results

Parameter	Raw Sewage	Effluent
Carbonaceous Biochemical Oxygen Demand, $CBOD_5$ (mg/L)	≤250	≤5
Total Suspended Solids, TSS (mg/L)	≤200	≤5
Total Nitrogen, TN (mg/L)	≤50	≤10
Total Phosphorous, TP (mg/L)	≤10	≤1
Turbidity (NTU)	-	<2

Membrane Bioreactor Wastewater Treatment Plants

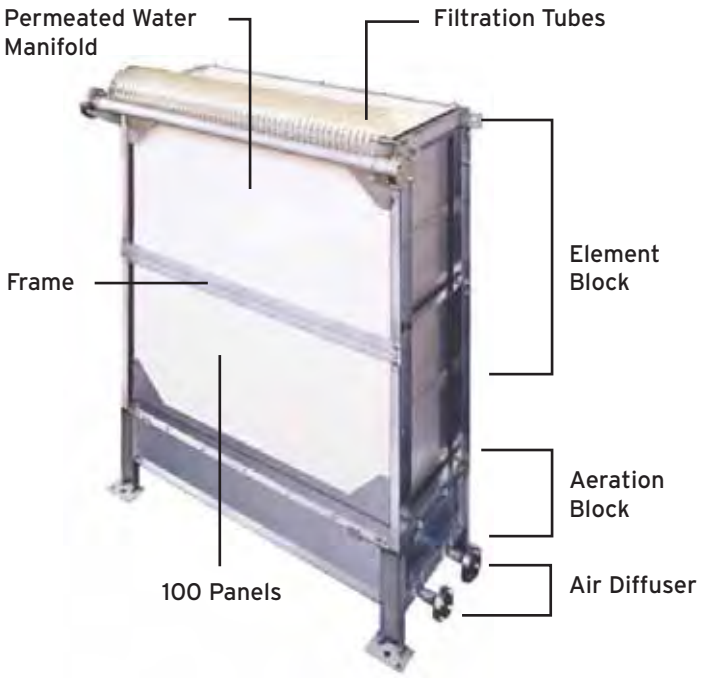
COMIX®

Membrane Bioreactor Wastewater Treatment Plants

CORIX Water Systems offers packaged membrane bioreactor (MBR) wastewater treatment plants based on submerged membrane modules.

Designed to treat domestic, commercial and industrial sewage for the removal of biochemical oxygen demand, total suspended solids, total nitrogen, ammonia and phosphorous, the CORIX MBR plant achieves very high re-use quality water and can handle a wide variation in loading and flow rates. Automation and flexible operating parameters deliver a cost-effective, trouble-free treatment process.

FLAT PANEL MEMBRANE



PLANT FEATURES

Advanced membrane technology

The membranes feature submerged flat sheet modules made of polyvinylidene fluoride for the functional layer, with a polyester non-woven fabric as the support layer. These materials provide superior physical strength and chemical stability for extended membrane life. Additional features include:

Uniform 0.08 micron pore size

- Reliably achieves clean effluent quality and disinfection by forming a physical barrier that blocks suspended solids and bacteria
- Provides disinfection by high rejection of coliform bacteria
- Protects sensitive aquatic environments by blocking suspended solids and reducing phosphorous precipitates to very low levels
- Improves membrane life and minimizes membrane fouling

Flat sheet configuration

- Improves reliability, as solids cannot get tangled in panels (as with hollow fiber membrane systems)
- Enables effective cleaning of membranes through coarse bubbles and periodic relaxations of the permeate flow. No complicated backpulse system is required. This maintains high permeability, decreases fouling and reduces chemical cleaning requirements. The simplified cleaning process (as compared to hollow fiber systems) also reduces equipment maintenance costs

Large panel design with larger surface area and tight panel spacing

- Reduces equipment footprint to build more compact plants or to retrofit existing tanks
- Reliable high MLSS operation (up to 16,000 mg/L) permits very small tank volumes for smallest possible plant footprint and eliminates the need for a sludge holding tank

Quality tank construction

CORIX constructs its tanks out of highly corrosion-resistant marine grade 5086 aluminum alloy. This construction eliminates the need for corrosion-protection coatings and prevents premature failures, which can occur with poor coating application or coating failures. Sacrificial anodes are used to further increase protection against corrosion. All fasteners in contact with the aluminum are 316 stainless steel to minimize galvanic corrosion. Stainless steel tanks are also available for critical applications. Our skid-mounted equipment systems can also be supplied for installation into site-constructed concrete tanks or retrofitted into existing tankage. In these circumstances, CORIX can provide tank dimensions and other civil criteria.

Electrical systems and control panels

CORIX designs, builds, programs and commissions fully integrated automated control and electrical systems. Our systems feature:

- Integrated UL and CSA approved MCC's and control panels
- Fully automatic operation with advanced instruments and controls
- Remote monitoring, control and SCADA options
- Industrial quality PLC's with simple plug-in, pre-programmed modules

Chemical systems

We offer a full range of chemical mixing and dosing systems, including solution tanks, mixers, dosing pumps and safety equipment.

HOW THE MBR TECHNOLOGY WORKS

1. Raw screened sewage is pumped at a controlled rate from an equalization tank into the treatment train(s), which typically include aerobic and membrane compartments. Due to the long sludge age of the biomass, ammonia is almost completely nitrified minimizing potential aquatic toxicity concerns. Redundant equipment is provided to meet applicable regulations.

2. For advanced nutrient removal, an anoxic zone is added to the treatment train if total nitrogen reduction is required. To control phosphorous, a chemical precipitant system is also added. CORIX's MBR system will achieve <0.1 mg/L phosphorous levels due to the efficient removal of solids compared to conventional systems. Biological phosphorous removal to reduce chemical consumption is offered for larger systems (>1,000 m^3/d). This involves the installation of an anaerobic tank to facilitate biological phosphorous uptake.

3. In the aeration tanks, aerobic micro-organisms feed on the soluble organics to reduce the biological oxygen demand of wastewater. Typically, dissolved oxygen control and other advanced instrumentation such as oxidation-reduction potential and pH sensors are utilized to reduce power consumption and improve treatment performance.

4. Finally, treated water is either drawn under low pressure through the membranes using permeate pumps or forced through by hydraulic head. Where required, ultraviolet (UV) disinfection is provided. The MBR greatly reduces coliform bacteria and produces clear effluent, resulting in smaller UV reactors and less UV power consumption.

ADVANTAGES OF CORIX MBR PLANTS

Corrosion-resistant

Our plants are fabricated with marine-grade aluminum alloy with sacrificial anodes or 304 stainless steel. This provides superior resistance to chemicals and corrosion, resulting in longer life. Unlike mild steel tanks, recoating is not required.

Uncomplicated membrane maintenance

Due to the efficient scouring action of the membrane, chemical cleaning is required less frequently and fewer chemicals are used, minimizing handling and operating costs. Complicated backwash cycles are not required, improving system reliability, reducing complexity and minimizing operator labor.

Unique membrane technology

Due to advanced manufacturing processes and flat panel configuration, the membranes have superior physical strength, operate with reduced membrane flux pressure, are less vulnerable to fouling and are highly resistant to clogging. They also deliver stable, clear treated effluent with minimal operator input.

Complete process

As a single source of responsibility, CORIX delivers the complete system from the influent pump station to the sludge dewatering.

Cost-effective

Our modular MBR plants feature an uncomplicated and easily maintained design for economical, trouble-free and long-term operation.

Compact footprint

The membrane's larger panel size, tight panel spacing, high MLSS operation and elimination of clarifiers provide a compact footprint for ease of installation and flexibility in retrofitting existing tanks.

Environmentally friendly

Our plants produce clear effluent with reduced nutrient loads, protecting our environment and aquatic habitat.

ABOUT CORIX WATER SYSTEMS

CORIX Water Systems specializes in providing innovative packaged and modular water and wastewater infrastructure solutions for municipal and industrial applications. With more than 500 plants delivered around the world, we offer unmatched expertise and a reputation for providing reliable, high quality water and wastewater solutions.

DELIVERING THE CORIX ADVANTAGE

CORIX is a fully integrated provider of utility infrastructure products, services and systems for water, wastewater and sustainable energy. Our "one-stop shop" approach allows us to deliver comprehensive, flexible and innovative solutions to our customers' most complex utility infrastructure challenges.

Contact CORIX today to discuss your project needs.
info.watersystems@corix.com

Decentralized MBR Wastewater Treatment

Scalable, Cost-Effective Solutions for Development Projects & WWTP Retrofits

newterra™

smart technology. sustainable solutions.™

Modular Systems That Grow As Your Developments Grow

newterra is leading the way with decentralized wastewater solutions that help you reduce project costs with a sustainable treatment approach. Our modular membrane bioreactor (MBR) systems are scalable – allowing treatment infrastructure to be added in stages as capacity requirements grow.

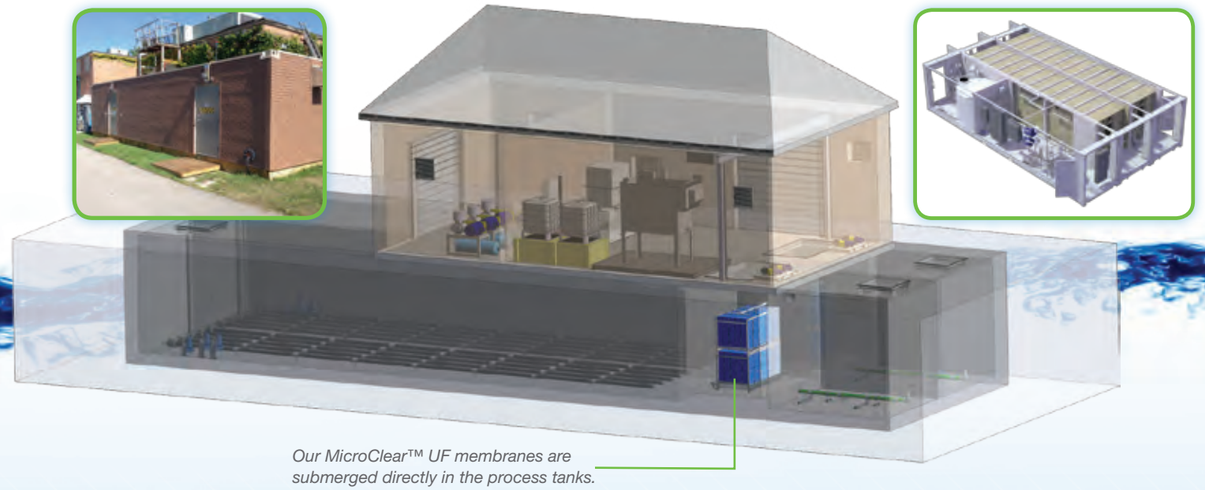
The Right Solution for a Wide Range of Projects

newterra's innovative wastewater treatment systems are ideally suited to many types of projects, including:

- Greenfield & Retrofit Projects
- Existing Infrastructure Tie-ins
- New Residential Developments
- Hotels, Resorts & Restaurants
- Campgrounds & Trailer Parks
- Mobile Home Communities
- Off-Grid & Remote Municipal Plants
- New Commercial Developments
- Service Area Expansions
- LEED® Certified & Green Buildings
- Schools & Hospitals
- Golf Courses
- Sports & Recreational Facilities
- Highway Rest Areas

Self-Contained and Enclosed Systems

newterra MBR wastewater systems are modular, and can be configured as fully self-contained units that blend in with surrounding buildings, or integrated into new or existing treatment structures. They are built in our MET-certified manufacturing facility and have UL electrical certification.



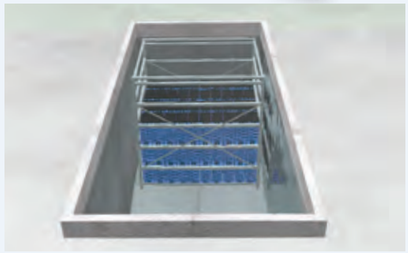
Our MicroClear™ UF membranes are submerged directly in the process tanks.

Add Infrastructure with Each Phase of a Project

Our modular, scalable treatment technology allows you to phase in wastewater infrastructure in parallel with the treatment demands of your development. **newterra** MBR systems can handle high loads, and are very resilient to flow and loading fluctuations. They are also extremely space efficient – reducing land requirements and providing more options of where the plant can be located. **newterra** offers you the option of renting or leasing to minimize your initial capital expenditures.

Cost-Effective for New Facilities & Retrofits

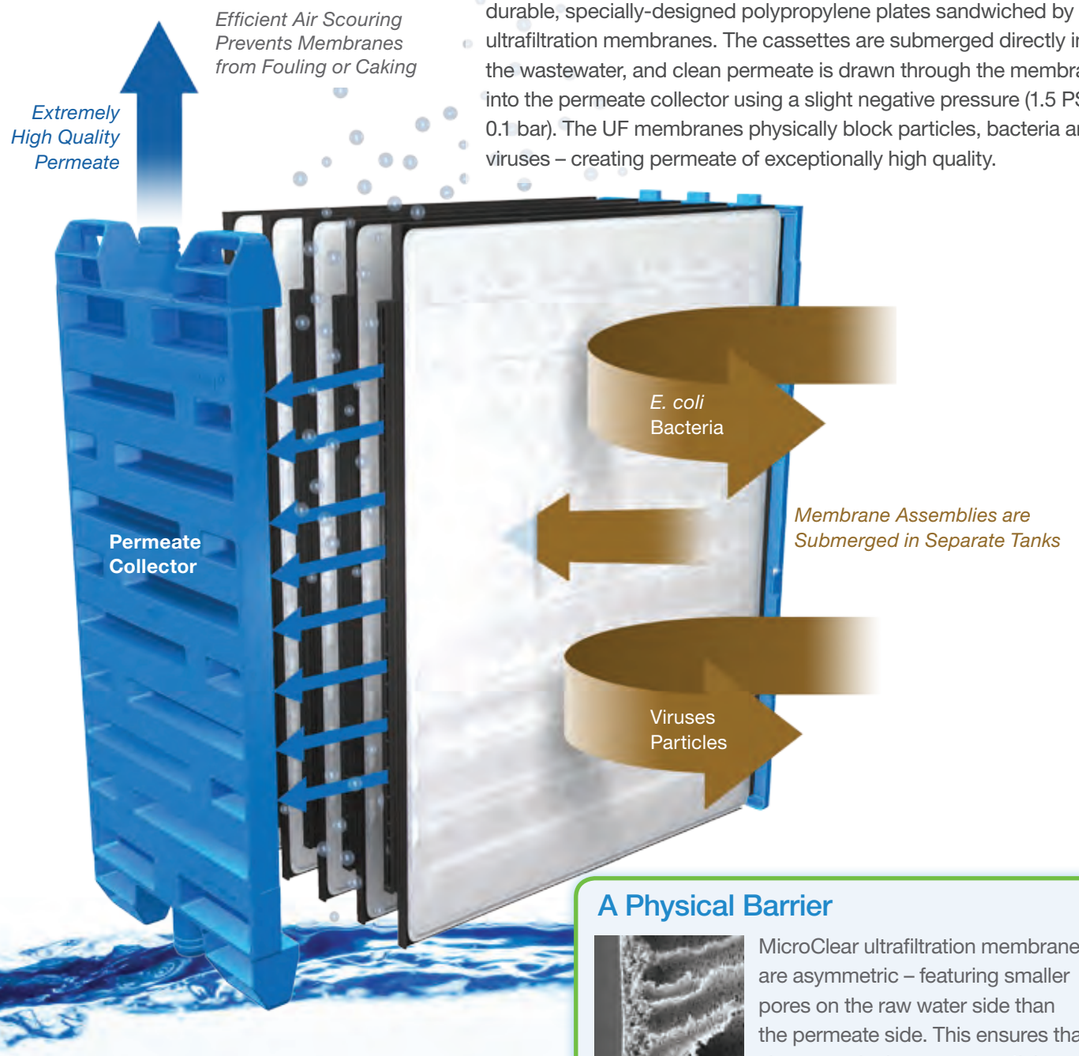
At **newterra**, we offer both custom-designed and pre-engineered, packaged MBR treatment systems for new facilities. Our technology is also very well suited to retrofitting conventional BNR and ENR plants to comply with higher regulatory standards or exand capacity. **newterra** MBR modules can be easily incorporated into existing clarification tanks – more than **tripling plant capacity** within the current footprint and eliminating the need for costly infrastructure expansion.



newterra MicroClear™ UF Membranes: The Core of our MBRs

Innovative Design. Outstanding Performance.

newterra's patented MicroClear cassettes consist of a series of durable, specially-designed polypropylene plates sandwiched by ultrafiltration membranes. The cassettes are submerged directly into the wastewater, and clean permeate is drawn through the membranes into the permeate collector using a slight negative pressure (1.5 PSI; 0.1 bar). The UF membranes physically block particles, bacteria and viruses – creating permeate of exceptionally high quality.



A Physical Barrier

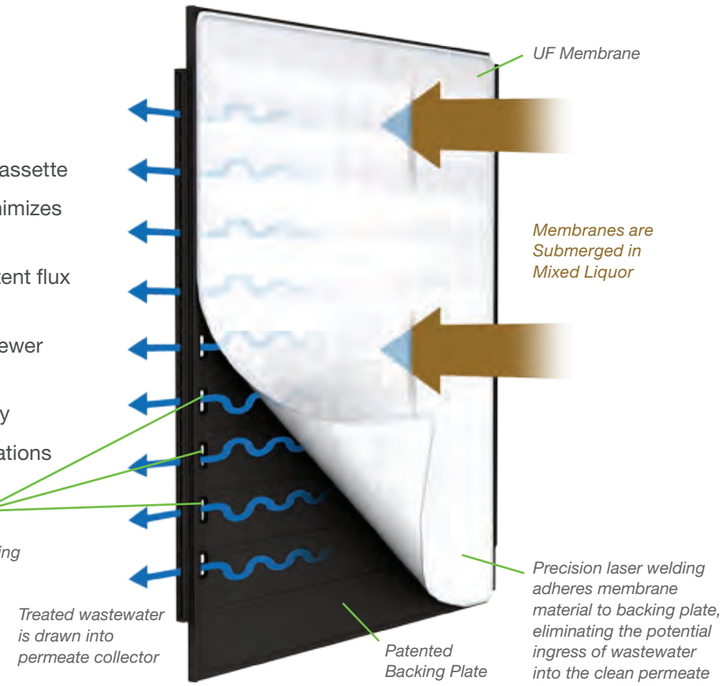
MicroClear ultrafiltration membranes are asymmetric – featuring smaller pores on the raw water side than the permeate side. This ensures that viruses and microscope particles are retained, while minimizing pressure loss inside the membrane.

Patented UF Membranes with Exceptional Packing Density

- Extremely compact design
- Total membrane surface area: 8 m^2 per cassette
- Efficient membrane aeration process minimizes power consumption
- Robust membranes can maintain consistent flux rates for long periods between cleanings
- Consistent long-term performance with fewer membranes & reduced operating costs
- Built in our ISO 9001:2008 certified facility
- Proven worldwide in thousands of installations

Multiple permeate extraction points ensure even distribution of pressure over the entire membrane surface – maximizing efficiency and minimizing fouling

ISO 9001:2008 certified



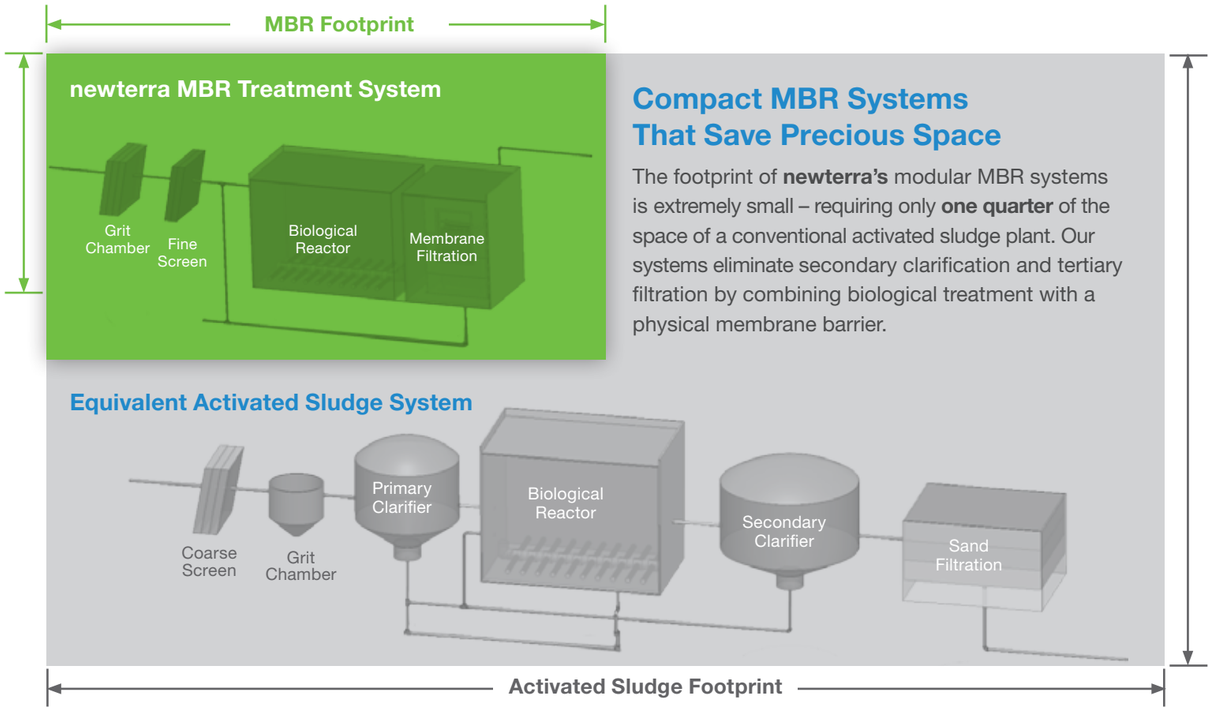
Excellent Permeate Quality That Meets Global Standards

newterra MBR treatment systems provide high quality permeate that meets or exceeds global regulatory standards for reuse applications or direct discharge – even in environmentally sensitive areas.

- WHO Health Guidelines for the Use of Wastewater in Agriculture & Aquaculture
- EU Bathing Water Directive (2006/7/EC)
- UN International Maritime Organization bacteriological limits
- California Title 22 – 4 Code of Regulations

Parameter	Permeate
Biological Oxygen Demand	<2.0 mg/L
Total Suspended Solids	<1.0 mg/L
Ammonia-N	<0.5 mg/L
Total Phosphorus	<0.05 mg/L
Total Nitrogen	<3.0 mg/L
Turbidity	<0.5 NTU

Compact, Operator-Friendly & Sustainable Treatment Solutions



Compact MBR Systems That Save Precious Space

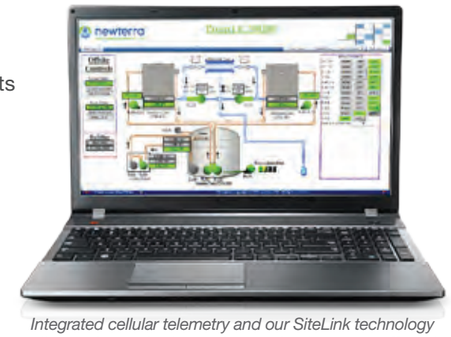
The footprint of **newterra's** modular MBR systems is extremely small – requiring only **one quarter** of the space of a conventional activated sludge plant. Our systems eliminate secondary clarification and tertiary filtration by combining biological treatment with a physical membrane barrier.

Designed & Built for Minimal Maintenance

newterra MBR systems are field proven in some of the most extreme conditions on the planet. Feedback from operators has been a key ingredient in the development and refinement of our low maintenance solutions:

- Intuitive, user-friendly controls and instrumentation
- Built-in telemetry & remote montoring reduce plant visits by operator
- Air scouring & periodic membrane relaxation minimize CIP requirements
- No backflushing or recovery cleaning required
- Built-in redundancy to eliminate downtime
- Proven in a wide range of regions, climates and altitudes

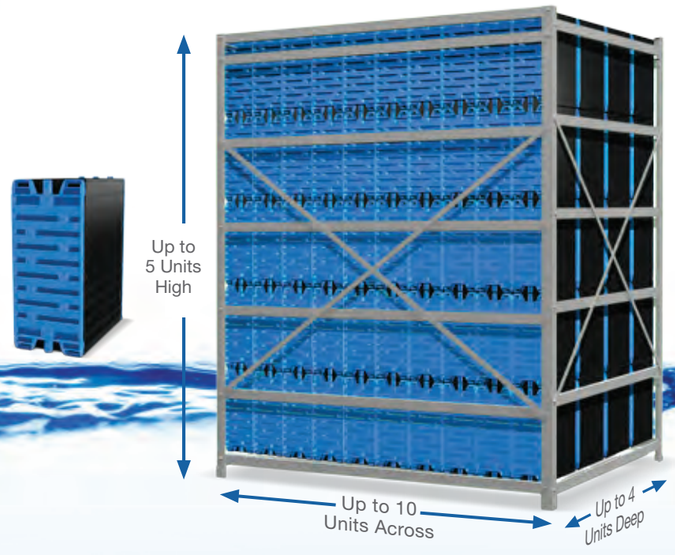
Ambient Temperatures	High Altitudes
-40˚F to +104˚F	13,125 ft.
-40˚C to +40˚C	4,000 m



Integrated cellular telemetry and our SiteLink technology allow 24/7 monitoring and operation by your staff, and proactive troubleshooting by our technical team

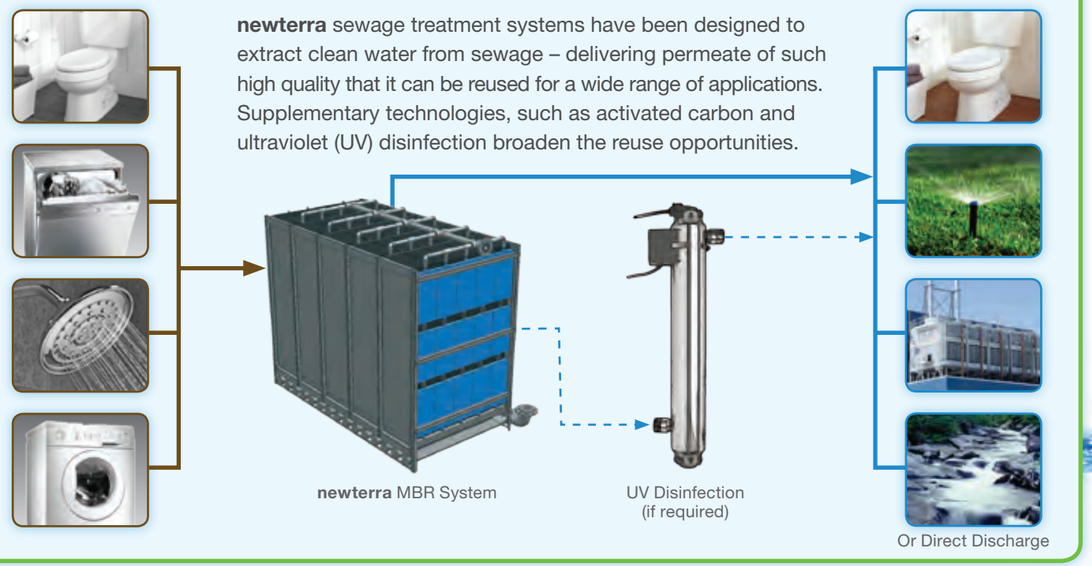
Scalability Starts from Within

newterra systems deliver maximum treatment capacity in a minimum of space. MicroClear UF cassettes are the building blocks of our scalable MBR treatment systems. They allow a wide range of configurations to suit your flow requirements, system footprint, and existing tanks and equipment for plant retrofits. The patented cassettes are framed in modules that are submerged directly in the mixed liquor.



Sewage Treatment That Offers A Wide Range of Reuse Applications

newterra sewage treatment systems have been designed to extract clean water from sewage – delivering permeate of such high quality that it can be reused for a wide range of applications. Supplementary technologies, such as activated carbon and ultraviolet (UV) disinfection broaden the reuse opportunities.



About newterra

A Global Water Technology Leader

newterra is recognized as a leader in the development of sustainable treatment solutions for water, sewage, wastewater and groundwater remediation for industrial, municipal, land development, commercial & residential markets. Our heritage of innovation in providing clean water solutions dates all the way back to 1863. Over that time, **newterra** has grown to over 250 people and we've installed thousands of treatment systems – some of which operate in the most extreme conditions on the planet.

Full Control from Start to Finish

At **newterra**, we take full control of virtually every aspect of the treatment systems we build – from process design and engineering to manufacturing, installation, operation and ongoing parts & service support. That also includes manufacturing our own MicroClear™ UF membranes and EPRO™ Reverse Osmosis (RO) systems in **newterra** owned facilities. This award-winning approach ensures **newterra** treatment systems meet our high standards for quality and on-time delivery.

250+ Employees

40+ Professional Engineers

10,000+ Installations Worldwide

CANADA'S BEST MANAGED COMPANIES Platinum member

100

NEW-2061-0314

newterra™

smart technology. sustainable solutions.™

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www.newterra.com

Brockville • Toronto • Burlington • Calgary • Trooper • Macon • Venice • Lakeland • Sacramento • Santiago • Langgöns

FAST®

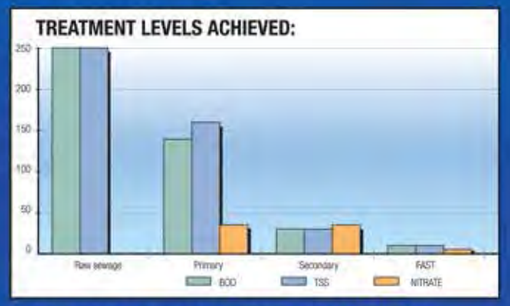
SEWAGE WASTEWATER TREATMENT SYSTEMS

TO PROTECT PUBLIC HEALTH AND THE ENVIRONMENT WE ALL SHARE

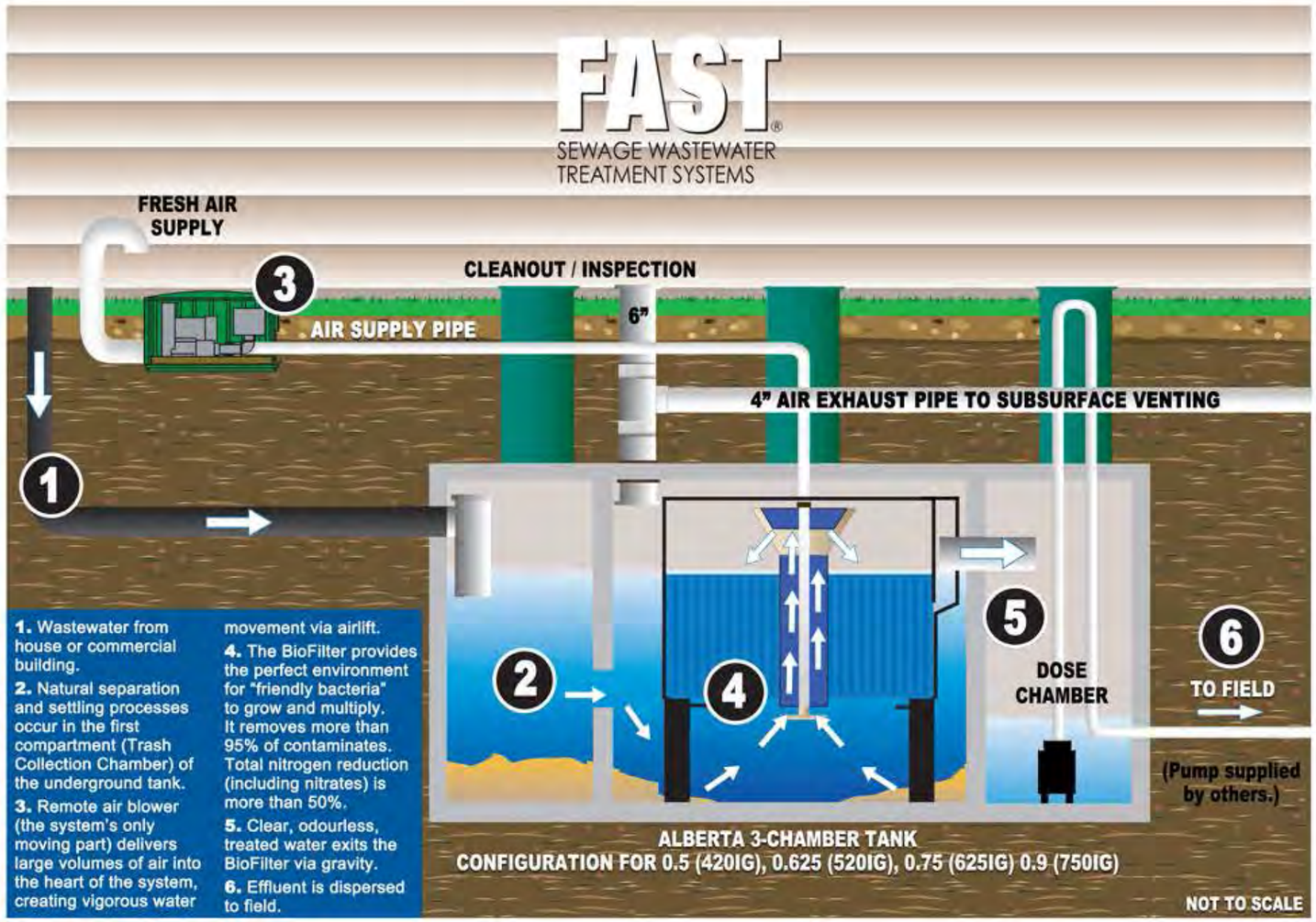
PINNACLE ENVIRONMENTAL TECHNOLOGIES INC.

EFFLUENT QUALITY

In domestic sewage wastewater, the two (2) main characteristics often mentioned are Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS), and are expressed as being 250 mg/l respectively. The graph shows the treatment levels of BOD and TSS from a septic tank, a secondary treatment device, or a **FAST®** sewage wastewater treatment plant. The **FAST®** has the capabilities of achieving a tertiary treatment level of BOD – less then 10/mg/l, TSS – less than 10 mg/l, total Nitrogen – 50% reduction with Nitrate – less than 5 mg/l.



- **SECONDARY AND TERTIARY LEVELS**
- **TOTAL NITROGEN REDUCTION 50%**



INSTALLATION

The **FAST®** system may be installed for residential and commercial facilities, including schools and public buildings. The **FAST®** is delivered to the site completely factory pre-assembled into the tank. The installer connects building drain, air blower and discharge pipe to the system.
The system is simple, quiet and efficient.

MAINTENANCE

There is no part in the **FAST®** system to be removed, replaced or cleaned. Typically, the liquids and sewage solids in suspension will need to be removed once every 3 to 5 years. The patented Micro**FAST®** media is self-cleaning and does not require maintenance.

APPROVALS

- STANDARDS COUNCIL OF CANADA
- NSF STANDARD 40, CLASS 1
- ONTARIO BUILDING CODE
- MANITOBA, SASKATCHEWAN
- ALBERTA, BC, YUKON
- NEWFOUNDLAND, NOVA SCOTIA
- LEED® RATED

MICRO**FAST**

Advanced treatment systems for homes, sub-divisions, small communities, parks, mobile home parks and campgrounds.

Systems are available for restaurants, pubs, lounges, golf and country clubs, service stations, commercial operations and permanent or mobile work camps.

info@peti.ca

The FAST® system is available from any one of Pinnacle's dealers throughout Canada

www.peti.ca

FAST®
SEWAGE WASTEWATER TREATMENT SYSTEMS

PINNACLE ENVIRONMENTAL TECHNOLOGIES INC.
22867 Fraser Highway, Langley, BC V3A 9J5, Canada

Locations: Cambridge, Ontario
Winnipeg, Manitoba
Edmonton, Alberta
Calgary, Alberta

Toll Free: 866-514-7555
Website: www.peti.ca

MODEL NO.	DAILY SEWAGE FLOW RATES	
	Imp. Gal.	Litres
MicroFAST® 0.375*	312	1,420
MicroFAST® 0.5	420	1,910
MicroFAST® 0.625	520	2,363
MicroFAST® 0.75	625	2,881
MicroFAST® 0.9	750	3,410
MicroFAST® 1.0*	833	3,787
MicroFAST® 1.5	1,250	5,683
MicroFAST® 3.0	2,500	11,365
MicroFAST® 4.5	3,750	17,048
MicroFAST® 9.0	7,500	34,095

* Not available in Ontario

WARRANTY

Materials and workmanship warranty for residential systems is 2 years on the air blower and 10 years on the BioFilter. Materials and workmanship warranty for systems larger than the MicroFAST® model 1.5 is 1 year for the air blower and 10 years on the BioFilter. Manufacturers' warranty for other products are covered by their respective warranties. Refer to full warranty statement available upon request.

Environmental Green Solutions

In addition to the treatment capacity of the MicroFAST® the BioFilter is manufactured from recycled plastic that is corrosion resistant and should never need replacement.

Contact: Michael Harkin, Prairies Manager
Phone: 403-921-2223 or 780-964-8755
Email: michael.harkin@pinnacleenvironmental.com

Appendix D – Drainage Analysis & WSA Response

Water Security Agency

Application for Approval to Construct and Operate Drainage Works under *The Water Security Agency Act*

WSA File: _____

PLEASE READ THE INSTRUCTIONS (RG-108D) BEFORE COMPLETING THIS APPLICATION.

PLEASE PRINT BELOW:

1. Name of Applicant(s): THE ISLAMIC ASSOCIATION OF SASKATCHEWAN c/o JAMIL (surname) OMAER (first name and initials)

   Mailing Address: 222 COPLAND CRESCENT, SASKATOON, SK

   Postal Code: S7H 2Z5

   E-mail Address: _____

   Telephone No.: (306) 665-6424 Cellular No.: ( )_____

2. Brief description of what the works will consist of: CULVERT INSTALLATION. SEE ATTACHED MEMO.

3. Works will be constructed on ☒ or exist on ☐ and affect the following lands or areas:

Land Description	Registered Owner	Applicant's Interest in Said Land
RAILWAY PARCEL #'S 131812613 & 131935583	CANADIAN PACIFIC RAILWAY COMPANY	
HIGHWAY R.O.W.	NON-TITLED	

Note: The Water Security Agency (WSA) will be registering notices on lands where the works are located and certificates on land affected by the works. WSA must recover charges applied by the Information Services Corporation (ISC) for registering the notices/certificates on the land and titles.

4. Drainage

(a) Approximate length of works ABOUT 30 m

(b) Approximate size of area drained SEE ATTACHED MEMO (hectares/acres)

(c) Description of outlet where works will discharge HIGHWAY 16 DITCH

5. Fees payable in support of this Application *(Refer to the schedule in Item 5 of the Instructions)*

(a) Application Fee – Approval to Construct and Operate Works $ 100.00

(b) ISC (Land Titles) – Registration Charges $ 50.00

Total Fees Payable $ 150.00

NOTE: All fees are to be made payable to the Water Security Agency.

I/We certify that the information contained in this application is complete and accurate.

I/We acknowledge and accept that this application will be subject to a registration fee payable to the Water Security Agency for the cost to register notices and/or certificates with ISC.

I/We acknowledge any information submitted in support of this application will be subject to disclosure under the Freedom of Information and Protection of Privacy Legislation. If supporting information contains a confidentiality provision, the Applicant must provide a letter from the author of the information acknowledging the information is being provided to WSA and authorizing it to be made public.

Dated at ~~March 24/2015~~ Saskatoon, Saskatchewan, this 24th day of March 20 15.

Omaer Jamil
Print Name of Applicant

Applicant's Signature

Print Name of Applicant

Applicant's Signature

Print Name of Applicant

Applicant's Signature

Water Security Agency Use Only

Approved as the application filed with the Water Security Agency dated

, 20

Publication of Notice is Required / Waived

for Water Security Agency

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Date: March 20, 2015 **File:** A.01

To: Water Security Agency

From: Ryan Karsgaard, P. Eng.

Project: Saskatoon Misbah School Development

Subject: Drainage Analysis

MEMO

1 INTRODUCTION

Associated Engineering (Sask.) Ltd. (AE) has been engaged by PCL Construction Management (PCL) on behalf of the Saskatoon Misbah School (the School) to review and provide drainage solutions for ISC Surface Parcel 131812691 located south east of Saskatoon. In order to move forward with the development of this land, work will need to be done to provide storage to accommodate existing runoff volumes, and protect against future significant storm events. Development of this land will likely require filling low areas of the site to accommodate the building and facilities as well as detention to accommodate post development runoff.

2 BACKGROUND

The parcel is located on a portion of the SW Quarter Section of 16-36-04-W3M along Patience Lake Road (Provincial Highway No. 394) and is adjacent to the Canadian Pacific Railway (CPR) tracks. The land was purchased in 1988 by the Islamic Association of Saskatchewan with an initial area of 5.96 hectares (14.7 acres); however, a portion of land (1.01 hectares) along the southern edge of the property was expropriated in 1999 by the Saskatchewan Ministry of Highways & Infrastructure (MHI) in order to realign Highway No. 16 and Patience Lake Road. Figure 2-1 below illustrates the subject property.

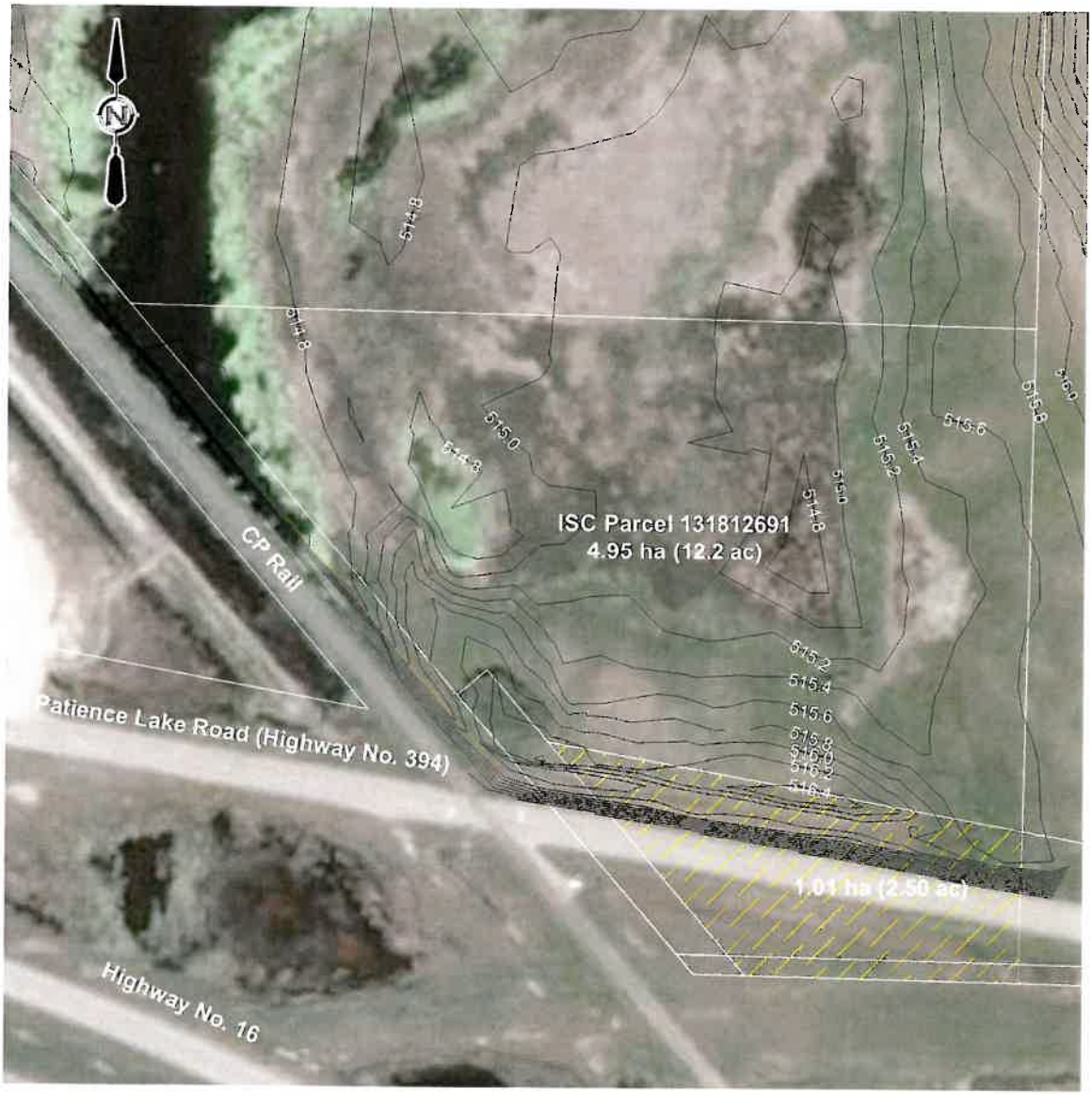


Figure 2-1
Subject Property

Aerial imagery dating back to 1944 shows minimal water storage in the area prior to the original highway construction and subsequently after the realignment of the Highway. At this time, it cannot be confirmed as to whether or not a culvert previously crossed Patience Lake Road or the CPR tracks. Surface water storage has begun to overwhelm the northern half of the site during the current wet cycle and drastically reduce the developable area. Figure 2-2 depicts the annual precipitation from 1909 to 2009 while aerial imagery of the property is illustrated in Figures 2-3 through 2-17 show the property through the years.

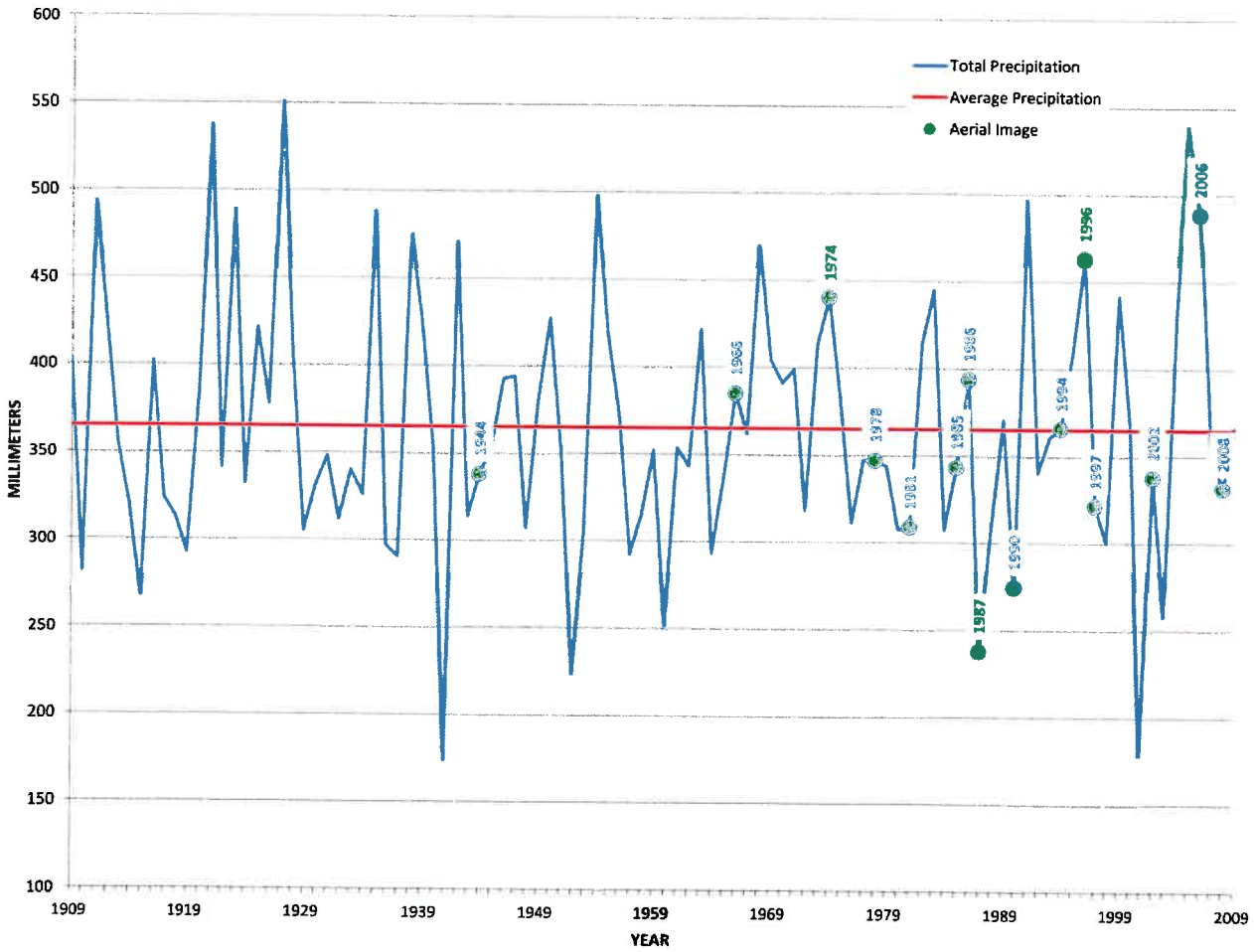


Figure 2-2
Annual Precipitation

Figure 2-3
1944 Aerial Image

Figure 2-4
1966 Aerial Image

Figure 2-5
1974 Aerial Image

Figure 2-6
1978 Aerial Image

Figure 2-7
1981 Aerial Image

Figure 2-8
1985 Aerial Image

Figure 2-9
1986 Aerial Image

Figure 2-10
1987 Aerial Image

Figure 2-11
1990 Aerial Image

Figure 2-12
1994 Aerial Image

Figure 2-13
1996 Aerial Image

Figure 2-14
1997 Aerial Image

Figure 2-15
2002 Aerial Image

Figure 2-16
2006 Aerial Image

Figure 2-17
2008 Aerial Image

3 ANALYSIS

Elevation banding was created using AutoCAD Civil 3D and 3.0 meter contours acquired through ISC (refer to FIGURE No. 1 appended to the back of this memo). This was used in conjunction with the historical aerial imagery to evaluate the natural topography of the surrounding area and determine the past and present extents of surface water ponding. The banding illustrates the natural drainage route which generally runs from the northeast to the southwest. This path is currently being impeded by not only the CPR tracks, but also Patience Lake Road and Highway No. 16. This elevation data and imagery shows that over the past 70 years the ponding of water has begun to encroach farther onto ISC Parcel 131812691 to the point where only a fraction of the land is currently developable.

The immediate watershed was delineated using Manifold System 8.0 software and the contours. The railway and road were used as boundary conditions as there are no identified flow paths through either element. Unfortunately, the 3.0 meter contours were not detailed enough to show the drainage separation between the parcel in question and the slough to the north. This larger catchment area was manually delineated into the approximate sub-catchment which is also noted on FIGURE No. 1. The sub-catchment has an estimated contributing area of 253 hectares. Using the modified Rationale method for a 1 in 100 year return period storm event, the sub-catchment would generate a runoff volume of approximately 60,000 cubic metres. During dry years, water levels appear hardly noticeable. During wet years, water levels pool to an elevation range of roughly 514.8 to 515.0 metres.

On site storage requirements were calculated using the Rationale method and the 1 in 100 year return period storm event resulting in the post-development storage volume requirement of approximately 2,250 cubic metres.

4 CONCLUSIONS & RECOMMENDATIONS

It is proposed that the site be built-up by approximately 1.0 metre to protect the buildings and facilities from potential flooding. A portion of the existing lands that currently flood would remain intact; however, they would be graded to maximize storage.

It is further proposed that a 600 mm diameter culvert, 30 metres in length, be installed across the CPR tracks and Patience Lake Road. This culvert would be installed at an approximate elevation of 514.8 meters (to be confirmed during detailed design) and would discharge into the highway ditch. This would allow excessive flows to pass through the site along its natural path. The existing ditches would be re-graded to steer said excess runoff towards the culvert. Figure 4-1 depicts the approximate location of the proposed culvert.

Lastly, it is proposed that a 2,250 cubic meter dry storage pond be constructed on site to accommodate the post-development runoff.

Figure 4-1
Proposed Culvert Locations

5 CLOSURE

This memo was prepared exclusively for the purposes and project outlined in the memo. The memo is based on information provided to, or obtained by Associated Engineering as indicated in the document and figures, and applies solely to site conditions existing at the time of reporting. This deliverable represents a reasonable review of available information within an agreed upon scope, schedule, and budget. Further review and updating of the document may be required as local site conditions and regulatory and planning frameworks change over time.

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

Respectfully submitted,
Associated Engineering (Sask.) Ltd.

Prepared by:

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MEMBER 14927
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Ryan Karsgaard, P.Eng.
Project Manager

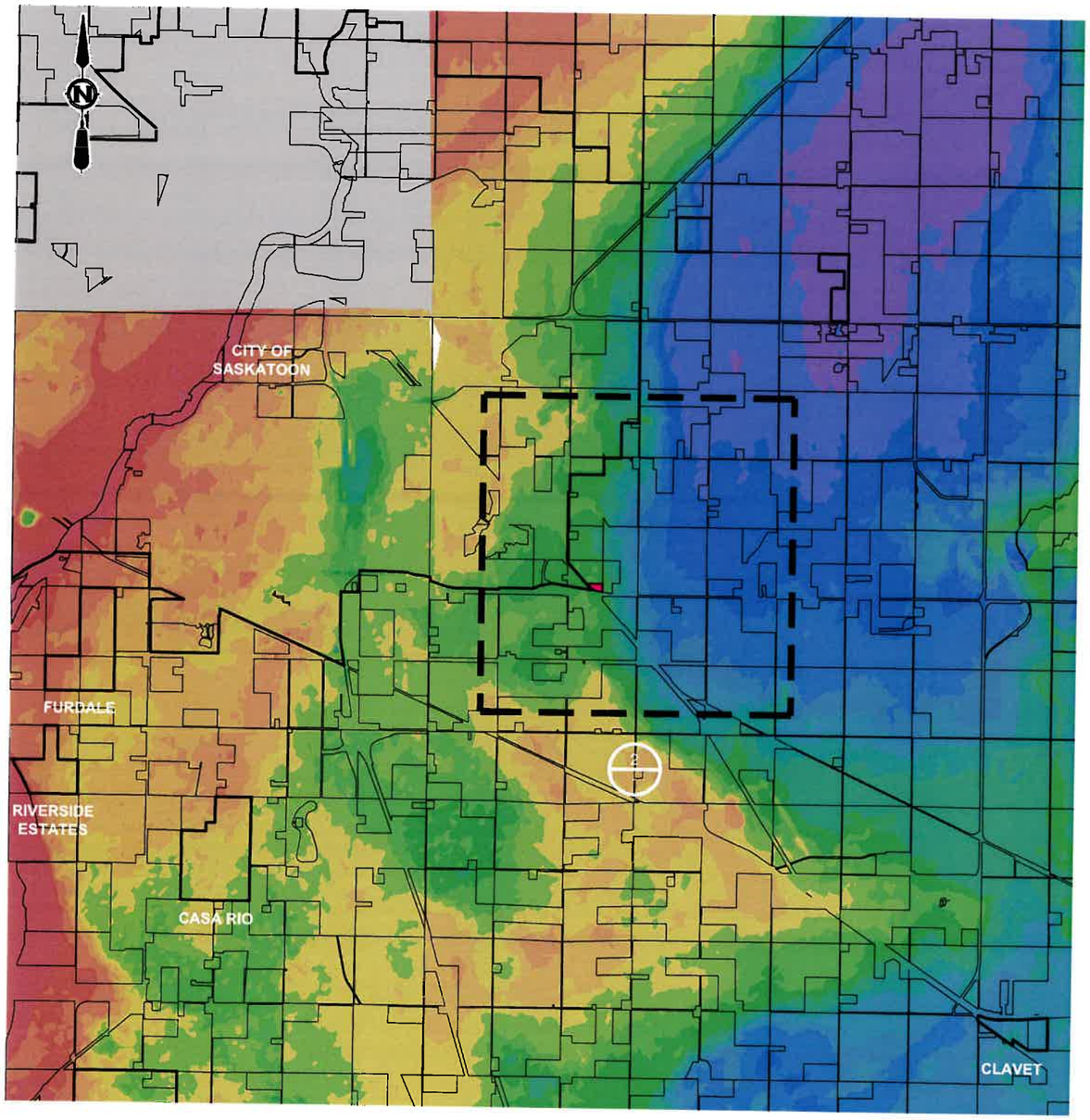
Reviewed by:

Darrell Rinas, P.Eng.

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF SASKATCHEWAN
CERTIFICATE OF AUTHORIZATION
ASSOCIATED ENGINEERING (SASK.) LTD.
NUMBER
C116
Permission to Consult Held By:

Discipline	Sask. Reg. No.	Signature
Municipal	12894	

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature:
Date: 2015.03.23



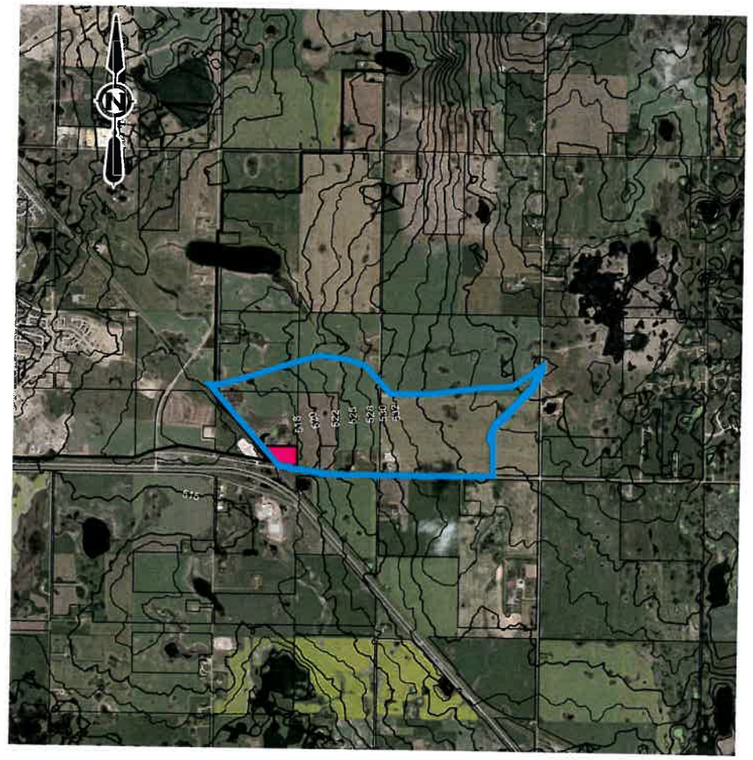
1 PLAN NTS

LEGEND
DEVELOPMENT SITE
DATA NOT ACQUIRED
WATERSHED DELINEATION

ELEVATION RANGE LEGEND			
#		MIN.	MAX.
1		468.0 m	483.0 m
2		483.0 m	495.0 m
3		495.0 m	501.0 m
4		501.0 m	504.0 m
5		504.0 m	507.0 m
6		507.0 m	510.0 m

ELEVATION RANGE LEGEND			
#		MIN.	MAX.
7		510.0 m	513.0 m
8		513.0 m	516.0 m
9		516.0 m	519.0 m
10		519.0 m	519.1 m
11		519.1 m	522.0 m
12		522.0 m	525.0 m

ELEVATION RANGE LEGEND			
#		MIN.	MAX.
13		525.0 m	528.0 m
14		528.0 m	531.0 m
15		531.0 m	537.0 m
16		537.0 m	546.0 m
17		546.0 m	564.0 m
18		564.0 m	612.0 m



2 PLAN NTS

P:\20154600\00_sken_misbah_sd\Working_Dwgs\100_Civil\4600-00-701.dwg
DATE: 2015-03-13, Reid Slyamko

Associated Engineering

AE PROJECT No.	20154600-00
SCALE	AS SHOWN
APPROVED	R. KARSGAARD
DATE	2015MAR11
REV	A
DESCRIPTION	ISSUED FOR MEMO

FIGURE No. 1

THE ISLAMIC ASSOCIATION OF SASKATCHEWAN
SASKATOON MISBAH SCHOOL

CIVIL
REGIONAL TOPOGRAPHY
DRAINAGE ANALYSIS

Water Security Agency

April 15, 2015

Mr. Ryan Karsgaard, P.Eng.
Associated Engineering (Sask.) Ltd.
1 – 2225 Northridge Drive
SASKATOON SK S7L 6X6

306.446.7457

E5/Islamic Association

Dear Mr. Karsgaard:

Re: Application to Construct and Operate Drainage Works – Saskatoon Misbah School

The Water Security Agency (WSA) received the above application on March 27, 2015 and subsequently I spoke with you April 15, 2015 regarding the proposal.

I reviewed the proposal and assessed it for any regulatory requirements under *The Water Security Agency Act*. Site development and proposed on/off site drainage management will not require an Approval from the WSA. Land levelling and landscaping for the development of building sites is exempted from approval under *The Drainage Control Regulations*.

The intention to develop on site in storage demonstrates due diligence in maintaining pre and post development flows. The provision for off site management (all culverts) actually appears to be an oversight when this infrastructure was constructed. It would be considered a restoration of natural drainage and would not require an Approval from the WSA.

A cooperative approach to its restoration may expedite its installation.

If there are any questions please call me at 306.446.7457.

Sincerely,

Ron S. Crush, A.Sc.T.
Supervisor, Regional Services
Integrated Water Services Division

RSC/ch
Enclosure (Cheque #002329)

Appendix E – Correspondence

From: Terry Gallant <Terry_Gallant@cpr.ca>
Sent: Monday, May 25, 2015 10:37 AM
To: Joe Van Humbeck; Ryan Karsgaard
Cc: Terry Gallant
Subject: land just east of Saskatoon, SK along Patience Lake Road and the CP tracks

Joe
I had a meeting with Ryan Karsgaard who is representing Saskatoon Misbah school and basically they want C.P.Rail to install a Culvert at the crossing to alleviate any potential for water backing up to where the school will be built I suggested we could Bore a 600 mm steel pipe through the crossing on an angle which would take any trapped water across the HI way into the city natural drainage channel this would have to be funded by a third party as C.P.Rail would have little to gain by pursuing this project

Terry Gallant/ Manager of Bridge Maintenance/ 801 Gray ave Saskatoon SK S7N 2K6 /ph# 1-306-230-8606

MMM GROUP

Prepared for: PCL Construction Inc.

MISBAH SITE DEVELOPMENT TIA

5414211 | September 2015

MMM GROUP

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REVISION LOG

Revision #	Revised By	Date	Issue / Revision Description
-	N. Hyder	September 2015	Draft Final Report

MMM GROUP LIMITED SIGNATURES

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Association of Professional Engineers & Geoscientists of Saskatchewan

CERTIFICATE OF AUTHORIZATION

MMM Group Limited
Number C0860

Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
TRANSPORTATION	9064	

EXECUTIVE SUMMARY

The Saskatoon Misbah School retained PCL Construction Management Inc. to develop 12.2 acres of land to build a private school and a mosque in the Rural Municipality of Corman Park No. 344, Saskatchewan at the southeast boundary of Saskatoon along the Patience Lake Road.

MMM Group Ltd. (MMM) has been retained by PCL Construction Management Inc. (PCL) to complete a Traffic Impact Assessment (TIA) report to identify and assess the potential impacts from the proposed development on the surrounding road network.

The TIA was completed using the following methodology:

- Identify the proposed future road network within the study area considering full build-out condition of the Rosewood neighbourhood in order to determine anticipated operation at key intersections without the Misbah site development. The following intersections were included:
    - Zimmerman Road and Highway 16 (existing)
    - Zimmerman Road and Rosewood Boulevard East (proposed)
    - Zimmerman Road and Connector Road (proposed)
    - Connector Road and Patience Lake Road (proposed)
    - Connector Road and Taylor Street (proposed)
    - Taylor Street and Boychuk Drive (existing)
- Examine the Misbah site development area with respect to land use and anticipated site-generated traffic
- Distribute anticipated site-generated vehicle trips on the study intersections (trips generated by proposed development were added to future background traffic considering full build-out condition of Rosewood)
- Conduct capacity analysis to assess the study intersections. The examination of background and site development volume scenarios are used to identify potential incremental traffic impacts resulting from the Misbah development

Forecast Background Conditions without Misbah Site Development

Analysis of future background traffic volumes was used to determine the level of service of the study intersections without Misbah site development trips. The signal timings, intersection lane configurations and background traffic volumes for this analysis were taken from the Rosewood Concept Plan Traffic Impact Study Report.

The analysis shows that all study intersections will operate at an acceptable level of service during the weekday morning peak hour. During this period the intersections will operate at overall LOS B or better with all individual movements operating at LOS D or better. The volume to capacity (v/c) ratios of all individual movements at these intersections will be within an acceptable threshold.

During the weekday afternoon peak hour, all intersections will operate at overall LOS C or better, however, the following individual movements will have v/c ratios greater than the threshold value of 0.85:

- Eastbound left-turn at Highway 16 and Zimmerman Road intersection will have a v/c ratio of 0.87, however, it will operate at LOS D.
- Southbound through movement at Zimmerman Road and Rosewood Boulevard East intersection will have a v/c ratio of 0.94 and will operate at LOS D
- Westbound through and southbound left-turn movements at Boychuk Drive and Taylor Street intersection will have a v/c ratio of 0.93 and 0.96, respectively and both will operate at LOS D.

Since all the above movements will operate at LOS D, the delays for these movements are considered acceptable.

Proposed Misbah Site Development

The Misbah site development area is approximately 12.2 acres of land which is designated for community facilities including a private school and a community mosque.

The morning and afternoon peak hour trip generation rates for private school (kindergarten to grade 12) and mosque land use were derived from the ITE Trip Generation Manual, 9th Edition.

As the Mosque typically generates significantly higher trips on Fridays than the rest of the week, the Friday afternoon peak hour was analyzed as the worst case scenario. For background traffic volumes, the afternoon peak hour was used from Rosewood Concept Plan Traffic Impact Study.

The following tables summarize the projected two-way vehicle trips anticipated to be generated by the Private School during the weekday morning and afternoon peak hours and the Mosque during Friday afternoon prayer services:

Private School (K-12) Peak Hour Trips

Land Use Type	ITE Code	Unit	AM Peak Hour				PM Peak Hour			
			Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total
Private School	536	400 Students	0.81	200 (61%)	125 (39%)	325	0.17	30 (43%)	40 (57%)	70

Mosque Peak Hour Trips

Land Use Type	ITE Code	Unit	Friday Peak Hour Generator (12:15 – 1:15 pm)			
			Rate	In (%)	Out (%)	Total
Mosque	562	20.9 1000 sq.ft GFA	18.37	370 (96%)	15 (4%)	385

Forecast Conditions with Misbah Site Development

Total future traffic volumes including the misbah development trips were examined to determine the potential incremental impact of the development trips on the study intersections.

The analysis shows that all study intersections will operate at an acceptable level of service during the weekday morning peak hour. During this period all intersections will operate at overall LOS C or better with all individual movements operating at LOS D or better. The volume to capacity ratios of all individual movements at these intersections will be within an acceptable threshold.

During the weekday afternoon peak hour all intersections will operate at overall LOS C or better. However, in addition to four individual movements which were previously identified to operate with high v/c ratios without the Misbah site development trips, two additional movements will have v/c ratios, slightly above the threshold value of 0.85:

- v/c ratio of northbound left-turn at Zimmerman Road and Rosewood Boulevard East intersection will increase from 0.85 to 0.90, however, level of service of this movement will remain LOS D
- v/c ratio of northbound through movement at Boychuk Drive and Taylor Street intersection will slightly increase from 0.83 to 0.89, however, level of service of this movement will remain LOS D

Since all the above movements will operate at LOS D, the delays for these movements are considered acceptable.

Access along Patience Lake Road

The preliminary site plan for the Misbah development identifies two access points along Patience Lake Road located approximately 120 m apart. The west access is also identified approximately 70 m west of the CPR mainline crossing. Due to the proximity to the railway, a reconfiguration of the site to place emphasis on an access located at the east property line to serve as the main access point and the utilization of the west access as a right-in/right-out access will simplify operations and provide sufficient room for a flared left-turn treatment (Ministry of Highways and Infrastructure standard plan).

The anticipated traffic volumes entering the site via an eastbound left-turn movement would warrant a channelized left-turn lane treatment. Based on 95th percentile queue generated from the SimTraffic, a minimum storage length of approximately 30 m is required to accommodate the eastbound left-turn queue, which can be provided via the flared treatment.

Conclusion and Recommendations

The results of Misbah Site Development TIA identify that the project trips will have a very minimal impact on the study intersections. With the addition of Misbah site development trips on top of the background trips, the v/c ratio of only one movement will slightly increase at two intersections during the afternoon peak hour. However, level of service of these individual movements will remain at LOS D and the overall intersection will continue to operate at LOS C.

.

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1.0 INTRODUCTION

1.1 Study Purpose and Background

The Saskatoon Misbah School retained PCL Construction Management Inc. to develop 12.2 acres of land to build a private school and a mosque in the R.M. of Corman Park No. 344, Saskatchewan at the southeast boundary of Saskatoon along the Patience Lake Road.

As part of development, PCL retained MMM Group to complete a Traffic Impact Assessment (TIA) report to identify and assess the potential impacts from the proposed development on the surrounding road network.

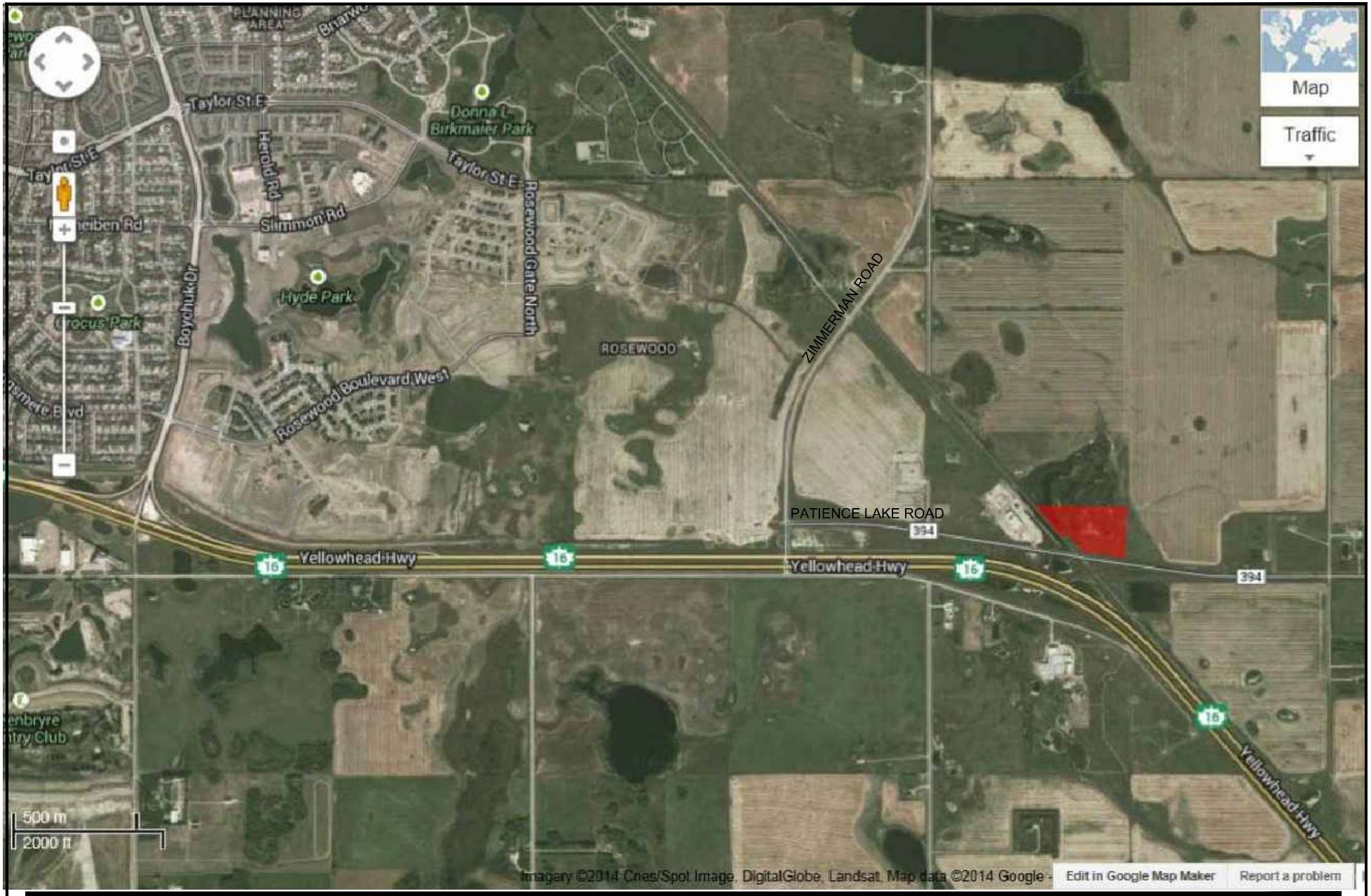
1.2 Project Location

Figure 1-1 shows the location of the Mishab Site Development. The plan area is approximately 12.2 acres of land located in the Rural Municipality of Corman Park No. 344 at the southeast boundary of Saskatoon immediately north of the Patience Lake Road.

1.3 Study Methodology

The Traffic Impact Assessment was completed using the following methodology:

- Identify the proposed future road network within the study area considering full build-out condition of the Rosewood neighbourhood in order to determine anticipated operation at key intersections without the Misbah site development. These intersections were included:
    - Zimmerman Road and Highway 16 (existing)
    - Zimmerman Road and Rosewood Boulevard East (proposed)
    - Zimmerman Road and Connector Road (proposed)
    - Connector Road and Patience Lake Road (proposed)
    - Connector Road and Taylor Street (proposed)
    - Taylor Street and Boychuk Drive (existing)
- Examine the Misbah site development area with respect to land use and anticipated site-generated traffic
- Distribute anticipated site-generated vehicle trips on the study intersections (trips generated by proposed development were added to future background traffic considering full build-out condition of Rosewood)
- Conduct capacity analysis to assess the study intersections. The examination of background and site development volume scenarios are used to identify potential incremental traffic impacts resulting from the Misbah development



MMM Ref. 5414211-000

September 2015

Saskatoon Misbah School
Misbah Site Development

Figure 1-1
Location Map

MMM GROUP

DATE: 2015-09-14 - 3:42pm (Link)
PATH: T:\Resource\52-61 - Transportation Planning\01 Projects\5414211-000 Saskatoon Misbah School Traffic Impact Study\Misbah School TIA-V3.dwg
LAYOUT: 1-1-LOC

2.0 BACKGROUND CONDITIONS

2.1 Study Horizon Year

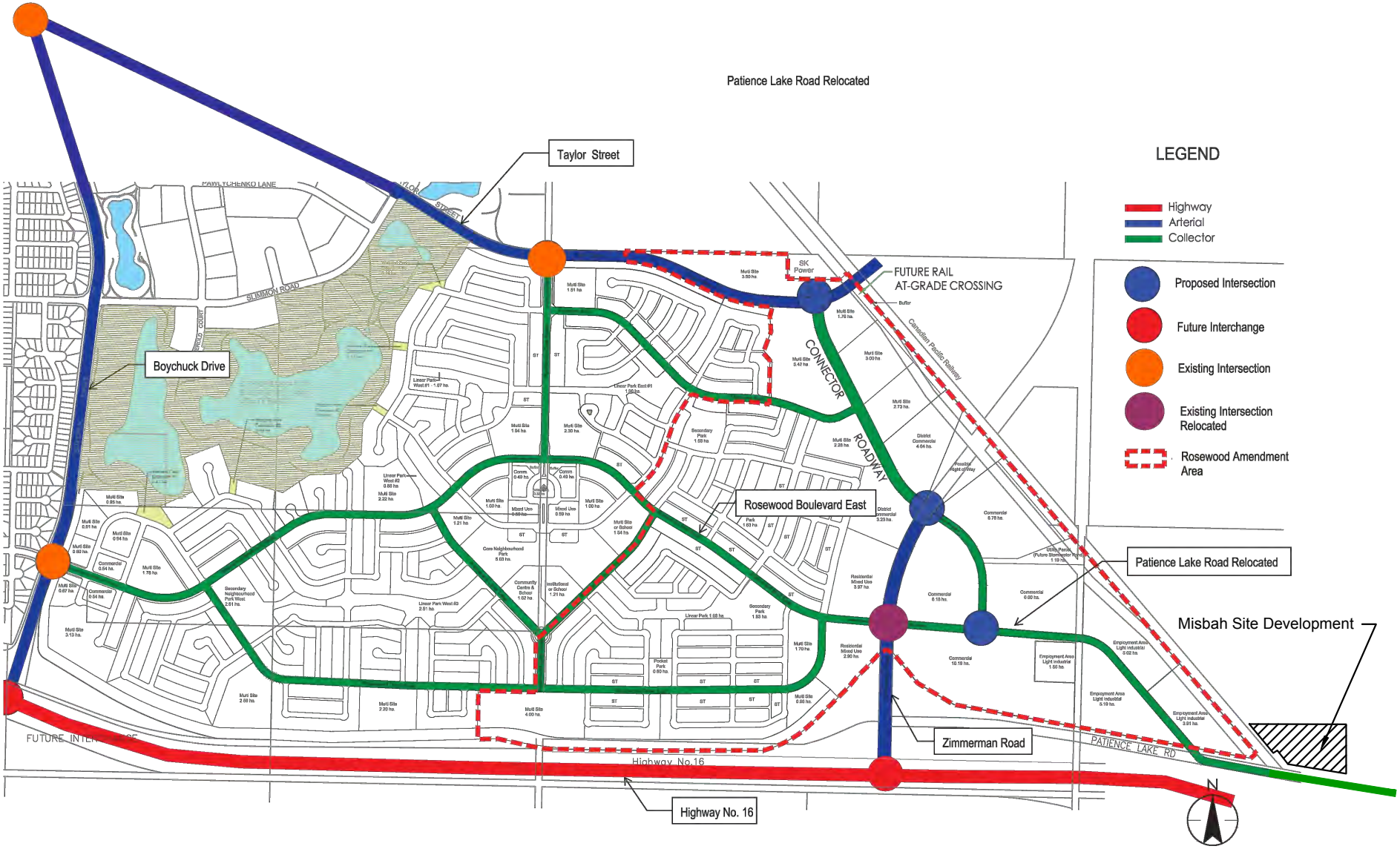
A long-term study horizon, consisting of the full build-out condition of the Rosewood neighbourhood, was selected for assessment purpose.

2.2 Future Road Network

The major access to the proposed Misbah Site Development is provided through Patience Lake Road east of Zimmerman Road. Patience Lake Road will be realigned further north to match with the Rosewood Boulevard East alignment. The existing and proposed study intersections are shown in **Figure 2-1**.

2.3 Future Background Traffic Volume

The future background traffic volumes at the study intersections for the long-term horizon were taken from the Rosewood Neighbourhood Concept Plan Traffic Impact Study Report, April 2014. The turning movement volumes for full build-out condition are illustrated in **Figure 2-2**.



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Saskatoon Misbah School
Misbah Site Development

Figure 2-1
Existing and Proposed Study Intersections

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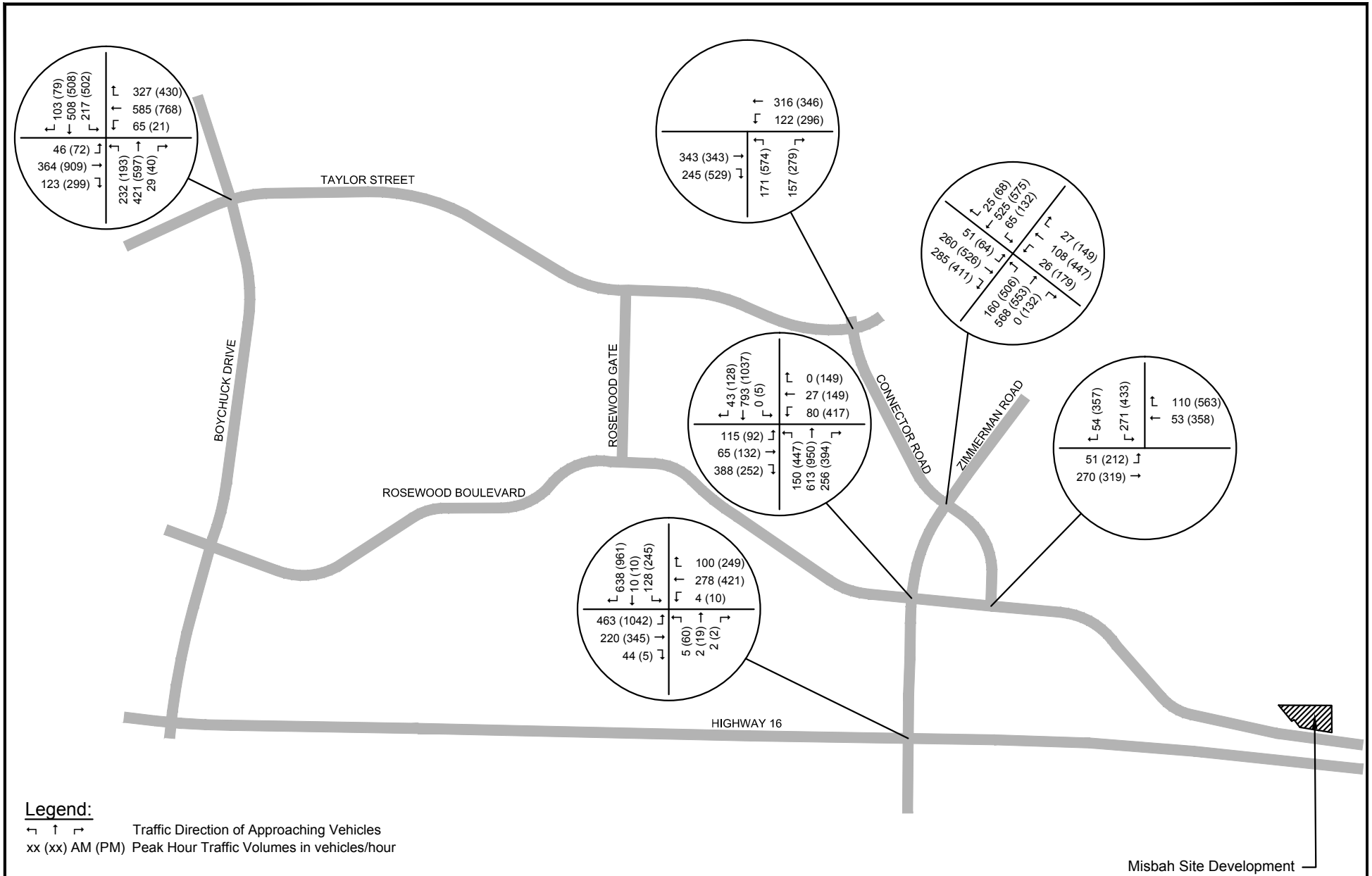

Legend:

↰ ↑ ↱ Traffic Direction of Approaching Vehicles

xx (xx) AM (PM) Peak Hour Traffic Volumes in vehicles/hour

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Saskatoon Misbah School
Misbah Site Development

Figure 2-2
Total Background Traffic Volumes without Development

3.0 PROPOSED DEVELOPMENT

The proposed Misbah site development is approximately 12.2 acres of land which is designated for community facilities comprising of a private school and a community mosque. The proposed land use plan is illustrated in **Figure 3-1**.

3.1 Trip Generation Assumptions

The morning and evening peak hour trip generation rates for private school (kindergarten to grade 12) and mosque land use were derived from the ITE Trip Generation Manual, 9th Edition. The school trips were calculated using number of student criteria while gross floor area was used to estimate mosque trips.

The weekday peak hours for the Mosque are between 6:00 AM to 7:00 AM and between 7:30 PM to 8:30 PM. Friday trip generations are typically higher than other weekdays. Friday peak hours are between 12:15 PM to 1:15 PM. As the weekday peak hours do not coincide with the peak hours of the adjacent street and have lower trip rates, the Friday peak hour was analyzed as the worst case scenario. For background traffic volumes, the afternoon peak was used from the Rosewood Concept Plan Traffic Impact Study.

The Mosque building also contains a Sunday school, gymnasium, funeral services and a waiting area mainly for Sunday school and funeral services. However, trips from these uses were not considered as they will not coincide with Mosque peak hour trips. Sunday school is opened on Sundays only, gymnasium is used during weekends or after peak hours and funeral services are occasionally utilized.

The preliminary plans and elevations of the school and mosque are attached as **Appendix-1**.

3.2 Trip Generation Volume

Table 3.1 summarizes the projected two-way vehicle trips anticipated to be generated by Private School during the weekday morning and afternoon peak hours and **Table 3.2** summarizes trips generated by Mosque during Friday afternoon prayer services.

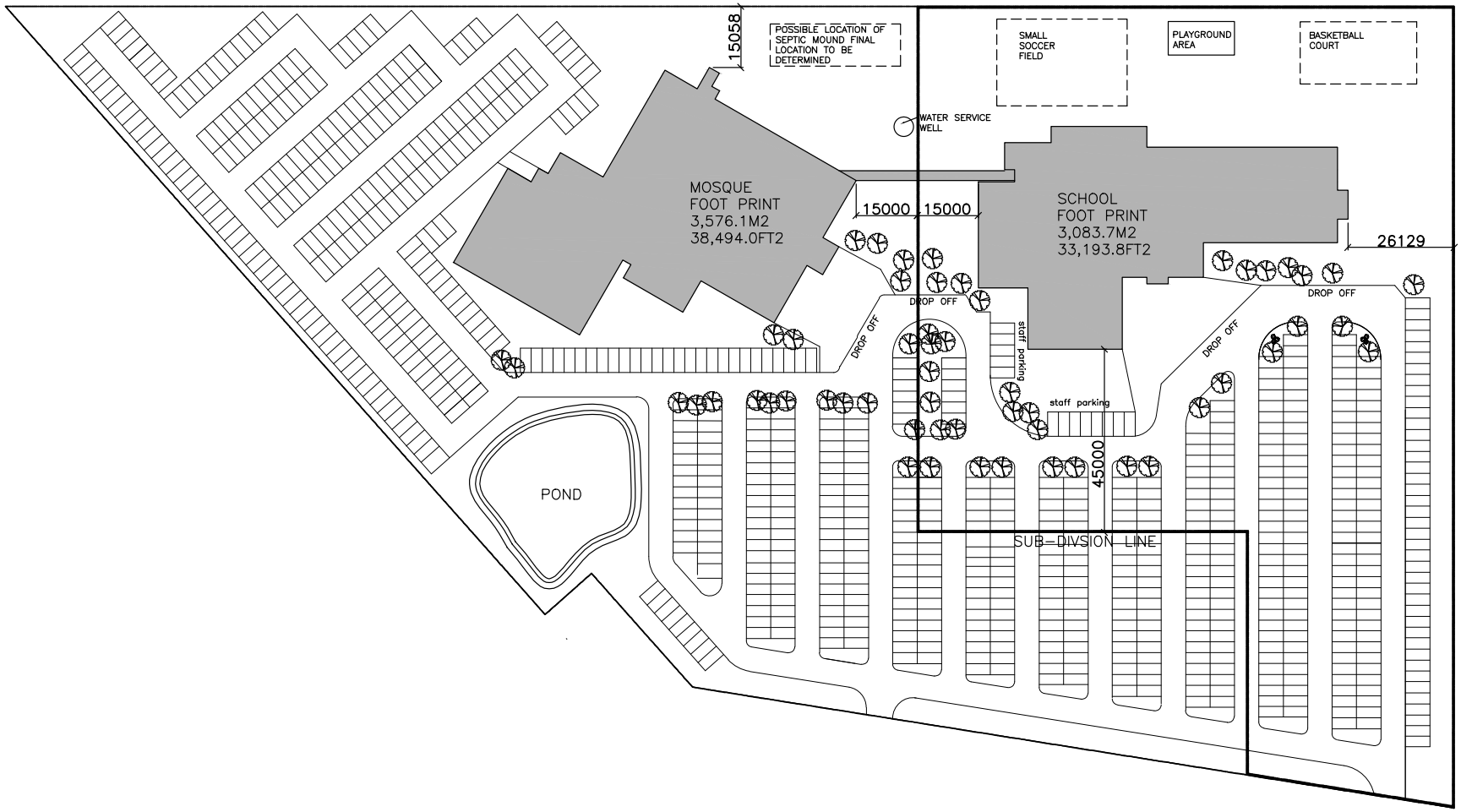
Table 3.1
Private School (K-12) Peak Hour Volumes

Land Use Type	ITE Code	Unit	AM Peak Hour				PM Peak Hour			
			Rate	In (%)	Out (%)	Total	Rate	In (%)	Out (%)	Total
Private School	536	400 Students	0.81	200 (61%)	125 (39%)	325	0.17	30 (43%)	40 (57%)	70

Table 3.2
Mosque Peak Hour Volumes

Land Use Type	ITE Code	Unit	Friday Peak Hour Generator (12:15 – 1:15 pm)			
			Rate	In (%)	Out (%)	Total
Mosque	562	20.9 1000 sq.ft GFA	18.37	370 (96%)	15 (4%)	385

As presented in above table, the proposed Misbah Site Development will generate approximately 325 vehicle trips in the morning peak hour; 200 vehicles will enter the development and 125 vehicles will exit from the development. In the afternoon peak hour, a total of 455 (385+70) vehicle trips will be generated by the proposed development; 400 vehicle trips will enter the development and about 55 vehicles are expected to exit the development.



MMM Ref. 5414211-000

September 2015

MMM GROUP

Saskatoon Misbah School
Misbah Site Development

Figure 3-1
Proposed Land Use Plan

DATE: 2015-09-14 - 3:42pm (Link)
PATH: T:\Resource\52-61 - Transportation Planning\01 Projects\5414211-000 Saskatoon Misbah School Traffic Impact Study\Misbah School TIA-V3.dwg
LAYOUT: 3-1-LU

3.3 Trip Distribution

The direction from which traffic will approach and depart the project site can vary depending on several factors, such as;

- Size of the development
- Type of development
- Surrounding land uses and population
- Condition of the surrounding roads network

For traffic distribution, a manual gravity model was used based on the Rosewood Conceptual Plan Traffic Impact Study Report. Traffic distribution is illustrated **in Figure 3-2**.

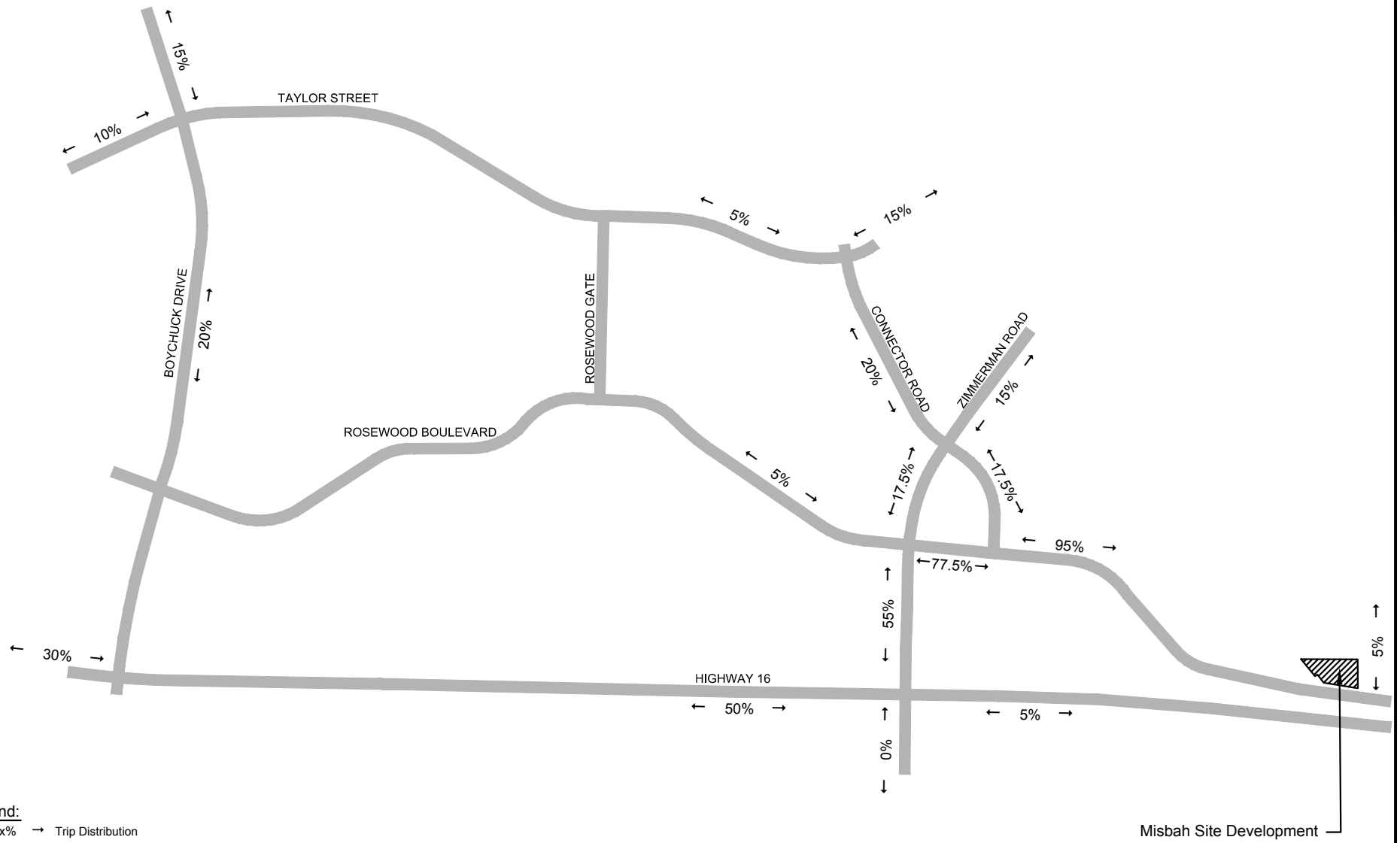
3.4 Trip Assignment

Site-generated trips were assigned to the proposed surrounding road network based on the Rosewood Conceptual Plan Traffic Impact Study Report. Trip assignment results at the study intersections for the site-generated trips are included in **Figure 3-3**.

3.5 Future Year Traffic Volumes

Total traffic volumes were compiled based on adding the site-generated trips to the full build-out volumes from the Rosewood Conceptual Plan Traffic Impact Study Report.

The Rosewood full build-out traffic volumes without the proposed development were presented in previous section 2.3 (Figure 2-2). The total future traffic volumes at study intersections with the development trips are shown in **Figures 3-4**.



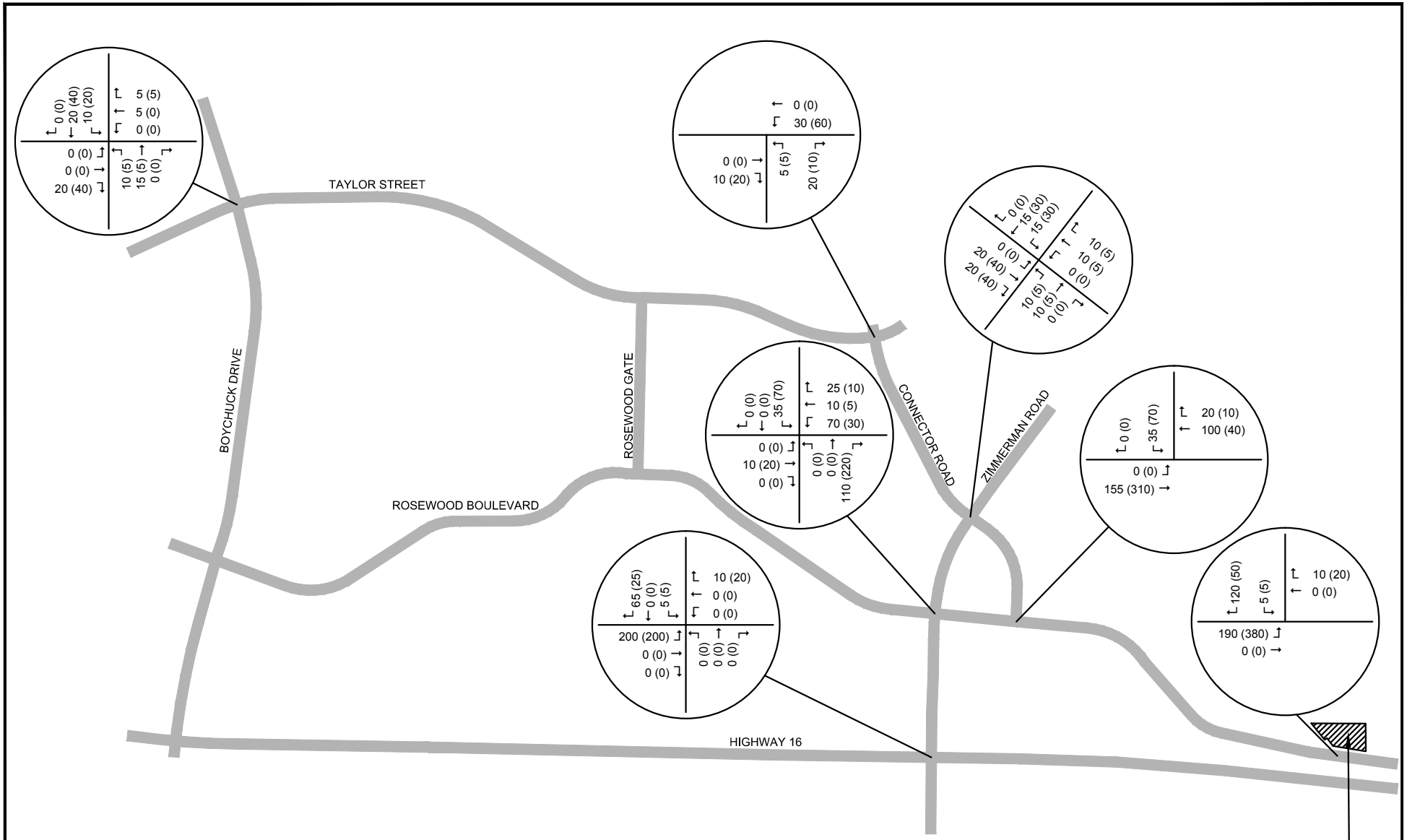
Legend:
← xx% → Trip Distribution

MMM Ref. 5414211-000
September 2015

MMM GROUP

Saskatoon Misbah School
Misbah Site Development

Figure 3-2
Site Generated Trip Distribution



Legend:

↰ ↑ ↱ Traffic Direction of Approaching Vehicles

xx (xx) AM (PM) Peak Hour Traffic Volumes in vehicles/hour (rounded to the nearest five vehicles)

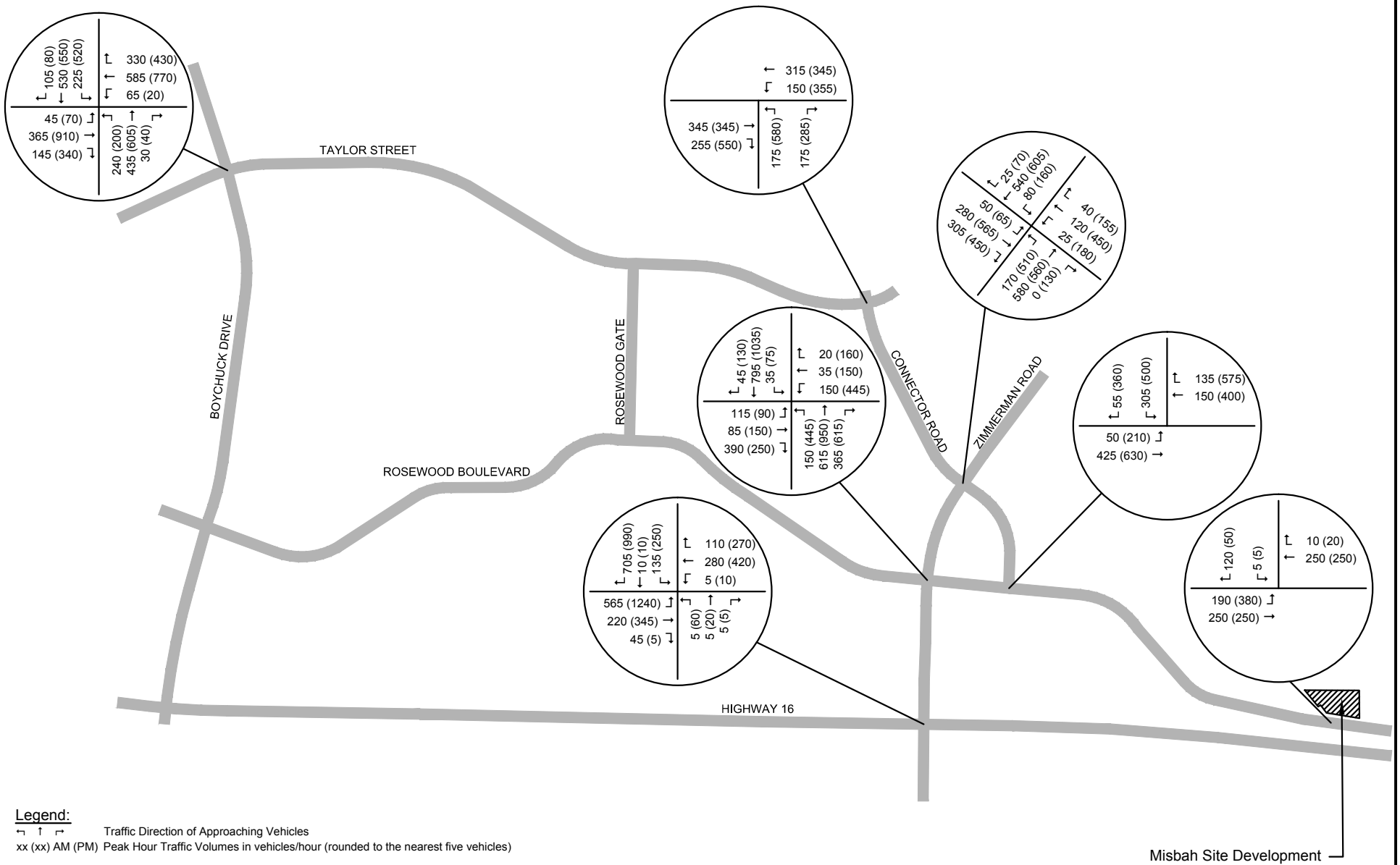
MMM Ref. 5414211-000

September 2015

MMM GROUP

Saskatoon Misbah School
Misbah Site Development

Figure 3-3
Site Generated Trip Assignment



Legend:

↰ ↑ ↱ Traffic Direction of Approaching Vehicles

xx (xx) AM (PM) Peak Hour Traffic Volumes in vehicles/hour (rounded to the nearest five vehicles)

MMM Ref. 5414211-000

September 2015

MMM GROUP

Saskatoon Misbah School
Misbah Site Development

Figure 3-4
Total Future Traffic Volumes with Development Trips

4.0 FUTURE TRAFFIC CONDITION

Intersection capacity analysis was conducted for the full build-out condition of Rosewood with and without the Misbah site development trips for each of the six (6) signalized intersections within the study area utilizing SYNCHRO 7 software. The objective of the assessments was to ensure that all study area intersections will work with an acceptable level of service.

In addition to the study area intersections, the access to the proposed site from Patience Lake Road was also examined to determine the appropriate number of access points that should be provided and optimal access locations along this roadway.

4.1 Background Conditions without Misbah Site Development

This analysis considered the future background traffic volumes without the development trips to determine the level of service of the study intersections without project trips. The signal timings, intersection lane configurations and background traffic volumes for this analysis were taken from the Rosewood Concept Plan Traffic Impact Study Report.

The results of intersection evaluation during morning peak hour are shown in **Table 4.1** and the results of intersection analysis during afternoon peak hour are presented in **Table 4.2**.

The summary of Synchro analysis is included in **Appendix-2**.

Table 4.1
AM - Level of Service for Full Build-out Condition without Project

Highway 16 and Zimmerman Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.68	0.15	0.06	-	0.54	0.30	-	0.01	0.00	0.25	0.01	0.44
LOS	C	B	A	-	C	A	-	B	A	C	C	A
Approach LOS	C			C			B			A		

Zimmerman Road and Rosewood Blvd East												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.31	0.29	0.27	0.28	0.13	-	0.55	0.29	0.18	-	0.52	0.06
LOS	C	C	A	C	C	-	D	B	A	-	B	A
Approach LOS	A			C			B			B		

Zimmerman Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.16	0.42	0.56	0.11	0.24	0.08	0.51	0.37	-	0.32	0.57	0.05
LOS	C	C	A	C	C	A	D	B	-	C	C	A
Approach LOS	B			C			B			C		

Patience Lake Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: A	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.17	0.29	-	-	0.08	0.08	-	-	-	0.35	-	0.04
LOS	B	B	-	-	B	A	-	-	-	B	-	A
Approach LOS	B			A						A		

Connector Road and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: A	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	-	0.38	0.42	0.49	0.35	-	0.12	-	0.21	-	-	-
LOS	-	B	A	B	B	-	A	-	A	-	-	-
Approach LOS	A			B			A					

Boychuk Drive and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.32	0.40	0.25	0.27	0.65	0.51	0.55	0.39	0.05	0.49	0.49	0.28
LOS	C	B	A	B	C	A	B	B	A	B	B	A
Approach LOS	B			B			B			B		

Table 4.2
PM - Level of Service for Full Build-out Condition without Project

Highway 16 and Zimmerman Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	**0.87**	0.17	0.01	-	0.80	0.54	-	0.36	0.01	0.76	0.02	0.66
LOS	D	A	A	-	D	A	-	D	A	D	D	A
Approach LOS	C			D			D			B		

Zimmerman Road and Rosewood Blvd East												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.29	0.60	0.17	0.79	0.46	0.40	0.85	0.53	0.27	0.03	**0.94**	0.09
LOS	C	D	A	D	D	B	D	C	A	C	D	A
Approach LOS	B			D			C			C		

Zimmerman Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.23	0.82	0.71	0.61	0.64	0.33	0.81	0.45	0.21	0.48	0.66	0.13
LOS	D	D	B	D	D	A	D	B	A	C	D	A
Approach LOS	C			D			C			C		

Patience Lake Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.52	0.21	-	-	0.39	0.39	-	-	-	0.73	-	0.25
LOS	B	A	-	-	B	A	-	-	-	C	-	A
Approach LOS	B			A						B		

Connector Road and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	-	0.52	0.74	0.75	0.25	-	0.41	-	0.35	-	-	-
LOS	-	C	A	C	B	-	B	-	A	-	-	-
Approach LOS	B			B			B					

Boychuk Drive and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.45	0.82	0.43	0.28	**0.93**	0.62	0.55	0.83	0.08	**0.96**	0.41	0.19
LOS	C	C	A	D	D	A	B	D	A	D	C	A
Approach LOS	C			D			D			D		

The above analysis identifies that all study intersections will operate at an acceptable level of service during the weekday morning peak hour. During this period the overall intersections will operate at LOS B or better with all individual movements operating at LOS D or better. The volume to capacity (v/c) ratios of all individual movements at these intersections will be within an acceptable threshold.

During the weekday afternoon peak hour all intersections will operate at overall LOS C or better, however, following individual movements will have v/c ratios above the threshold value of 0.85:

- Eastbound left-turn at Highway 16 and Zimmerman Road intersection will have a v/c ratio of 0.87, however, it will operate at LOS D
- Southbound through movement at Zimmerman Road and Rosewood Boulevard East intersection will have a v/c ratio of 0.94 and will operate at LOS D
- Westbound through and southbound left-turn movements at Boychuk Drive and Taylor Street intersection will have a v/c ratio of 0.93 and 0.96 respectively and both will operate at LOS D

Since all the above movements will operate at LOS D, the delays for these movements are considered acceptable.

4.2 Forecast Conditions with Misbah Site Development Trips

The total future traffic volumes including the development trips were evaluated to determine the potential incremental impact of the Misbah site development on the study intersections. Initially, the signal timings and lane configurations were taken from the Rosewood Concept Plan Traffic Impact Study Report. However, some adjustments were made in signal timings to maximize operations at the study intersections.

The results of intersection evaluation during morning peak hours are shown in **Table 4.3** and the results of intersection analysis during evening peak hours are presented in **Table 4.4**.

The summary of Synchro analysis is included in **Appendix-3**.

Table 4.3
AM - Level of Service for Full Build-out Condition with Project Trips

Highway 16 and Zimmerman Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.76	0.14	0.06	-	0.54	0.33	-	0.01	0.00	0.27	0.02	0.48
LOS	C	A	A	-	C	A	-	B	A	C	C	A
Approach LOS	C			C			B			A		

Zimmerman Road and Rosewood Blvd East												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.30	0.36	0.27	0.28	0.13	-	0.55	0.30	0.25	0.12	0.53	0.06
LOS	C	C	A	C	C	-	D	B	A	B	B	A
Approach LOS	A			C			B			B		

Zimmerman Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.16	0.45	0.58	0.11	0.26	0.11	0.55	0.38	-	0.40	0.59	0.05
LOS	C	C	A	C	C	A	D	B	-	C	C	A
Approach LOS	B			C			B			C		

Patience Lake Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: A	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.16	0.42	-	-	0.19	0.09	-	-	-	0.43	-	0.04
LOS	A	B	-	-	B	A	-	-	-	B	-	A
Approach LOS	B			A						B		

Connector Road and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: A	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	-	0.35	0.41	0.56	0.32	-	0.12	-	0.23	-	-	-
LOS	-	B	A	B	B	-	A	-	A	-	-	-
Approach LOS	A			B			A					

Boychuk Drive and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.32	0.40	0.28	0.27	0.65	0.52	0.59	0.40	0.05	0.51	0.51	0.28
LOS	C	B	A	B	C	A	B	B	A	B	B	A
Approach LOS	B			B			B			B		

Table 4.4
PM - Level of Service for Full Build-out Condition with Project Trips

Highway 16 and Zimmerman Road **												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	**0.98**	0.17	0.00	-	0.82	0.57	-	0.37	0.01	0.83	0.02	0.68
LOS	D	A	A	-	D	A	-	D	A	D	C	A
Approach LOS	D			D			D			B		

Zimmerman Road and Rosewood Blvd East **												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.27	0.65	0.17	0.83	0.49	0.42	**0.90**	0.54	0.42	0.46	**0.95**	0.09
LOS	C	D	A	D	D	B	D	C	A	C	D	A
Approach LOS	C			D			C			C		

Zimmerman Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.23	0.85	0.77	0.61	0.64	0.34	0.81	0.46	0.21	0.61	0.72	0.14
LOS	D	D	B	D	D	A	D	B	A	C	D	A
Approach LOS	D			D			C			D		

Patience Lake Road and Connector Road												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.55	0.41	-	-	0.43	0.39	-	-	-	0.84	-	0.25
LOS	B	B	-	-	B	A	-	-	-	C	-	A
Approach LOS	B			A						B		

Connector Road and Taylor Street **												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: B	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	-	0.44	0.72	0.74	0.22	-	0.53	-	0.42	-	-	-
LOS	-	C	A	C	A	-	B	-	A	-	-	-
Approach LOS	B			B			B					

Boychuk Drive and Taylor Street												
Overall	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
LOS: C	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
v/c Ratio	0.45	0.81	0.47	0.28	**0.93**	0.62	0.59	**0.89**	0.09	**0.97**	0.45	0.19
LOS	C	C	A	D	D	A	C	D	A	D	C	A
Approach LOS	C			D			D			D		

** Signal timings modified
Red denotes failing movements for background conditions without project
Blue denotes additional failing movements with project trips

The above analysis identifies that all study intersections will operate at an acceptable level of service during the weekday morning peak hour. During this period the intersections will operate at overall LOS C or better with all individual movements operating at LOS D or better. The volume to capacity ratios of all individual movements at these intersections will be within an acceptable threshold.

During the weekday afternoon peak hour all intersections will operate at overall LOS C or better, however, in addition to four individual movements which were previously operating with higher v/c ratios without the Misbah site-generated trips, two additional movements will have v/c ratios above the threshold value of 0.85,:

- v/c ratio of northbound left-turn at Zimmerman Road and Rosewood Boulevard East intersection will increase from 0.85 to 0.90, however, level of service of this movement will remain D
- v/c ratio of northbound through movement at Boychuk Drive and Taylor Street intersection will slightly increase from 0.83 to 0.89, however, level of service of this movement will remain D

Since all the above movements will operate at LOS D, the delays for these movements are considered acceptable.

4.3 Site Access along Patience Lake Road

The preliminary site plan for the Misbah development identifies two access points along Patience Lake Road located approximately 120 m apart. The west access is also identified approximately 70 m west of the CPR mainline crossing. This proximity to the railway will be an issue in terms of constructing turning lanes that meet the Ministry of Highways and Infrastructure (MHI) standard.

The anticipated traffic volumes entering the site via an eastbound left-turn movement during the afternoon peak hour is 380 vehicles per hour. This volume would warrant a channelized left-turn lane treatment as either one site access or two accesses based on the identified background traffic volumes from the Rosewood Concept Plan Traffic Impact Study and information provided by MHI for daily traffic volumes.

The 95th percentile queue length as predicted by SimTraffic was used to determine turning bay length of the eastbound left-turn movement. For a conservative assessment, the long-term through traffic on Patience Lake Road was assumed to be 250 vehicles per hour for each of the westbound and eastbound through movements at the access road intersection during the weekday morning and afternoon peak periods. The 95th percentile queue lengths for eastbound left-turn movement are presented in **Table 4.5** and SimTraffic Queuing Report is included in **Appendix-4**:

Table 4.5
95th Percentile Queue Length

Intersection	Queue Length for Eastbound Left-turn Movement*	
	AM	PM
Access Road and Patience Lake Road	20	30

* Rounded up to nearest 10

Based on SimTraffic queuing report, a minimum storage length of approximately 30 m is required to accommodate the eastbound left-turn queue, which can be provided via the flared treatment (approximately 110 m storage). The flared treatment will allow eastbound vehicles to progress through the intersection while left-turning vehicles wait for acceptable gaps in westbound traffic. A reconfiguration of the site to place emphasis on an access located at the east property line to serve as the main access point and the utilization of the west access as a right-in/right-out access will simplify operations and provide sufficient room for a flared left-turn treatment.

The realignment and widening of Patience Lake Road near Zimmerman Road, as part of additional commercial and industrial development adjacent to the roadway, will increase the capacity of that specific link. The function and posted speed will also change as part of the realignment. It is anticipated that similar widening will occur as further development progresses along this roadway. The flared left-turn treatment can be absorbed into future upgrades of Patience Lake Road.

5.0 CONCLUSION AND RECOMMENDATIONS

The purpose of this Traffic Impact Assessment is to ensure that the roadways and intersections within the study area will operate at satisfactory levels of service for the existing and future traffic conditions with the proposed developments.

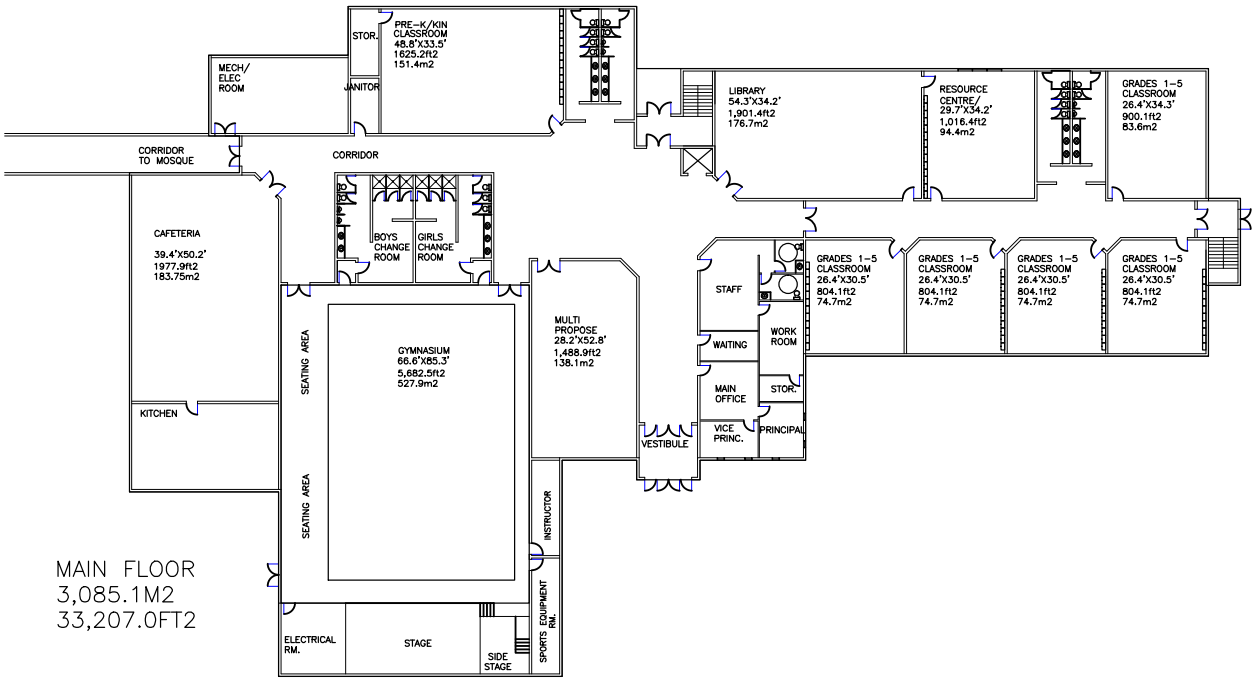
The analyses for future conditions in this report are based on the full build-out condition of the Rosewood neighbourhood with and without project trips.

It should be noted that the recommended transportation network within the study area are based on the Saskatoon planned roadway network as envisioned in Rosewood Concept Plan Traffic Impact Assessment Report.

The analysis of the TIA shows that the project trips will have very minimal impact on the study intersections. With the addition of Misbah Site Development trips on top of the background trips, the v/c ratio of only one movement will slightly increase at two intersections during the afternoon peak hour. However, level of service of these individual movements will remain at LOS D and the overall intersection will continue to operate at LOS C.

The preliminary site plan of the Misbah Site Development identifies two access points along Patience Lake Road located approximately 120 m apart. The west access is also identified approximately 70 m west of the CPR mainline crossing. Due to this proximity to the railway, a reconfiguration of the site to place emphasis on an access located at the east property line to serve as the main access point and the utilization of the west access as a right-in/right-out access will simplify operations and provide sufficient room for a flared left-turn treatment.

APPENDIX 1 – Plan and Elevation of Proposed School and Mosque



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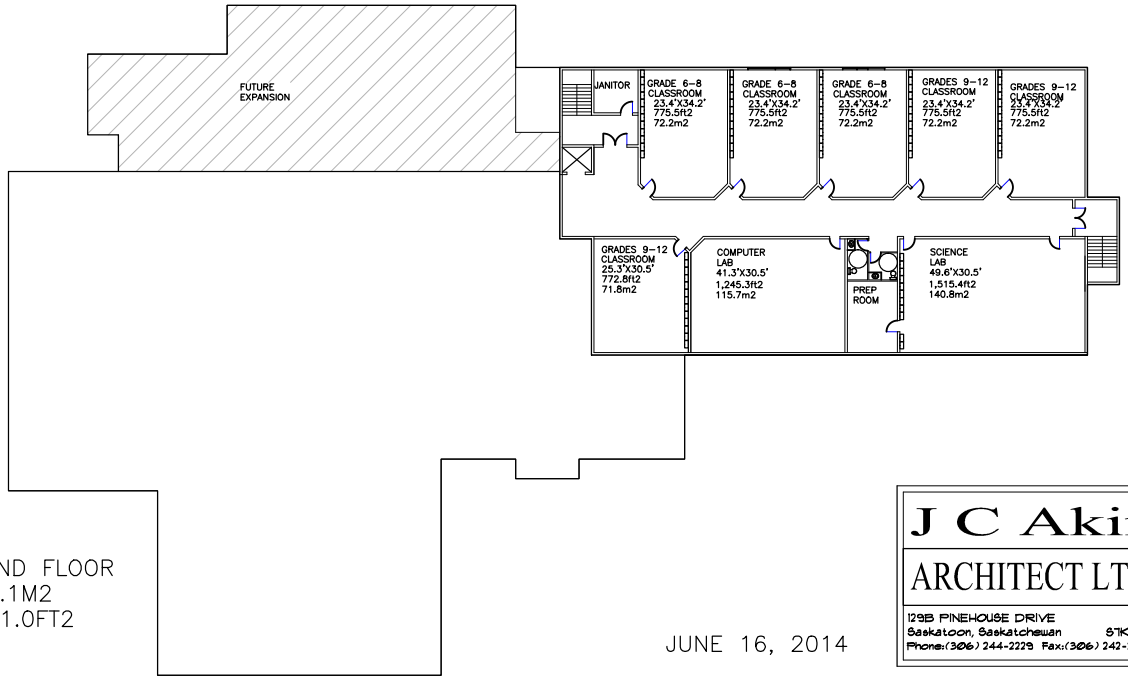
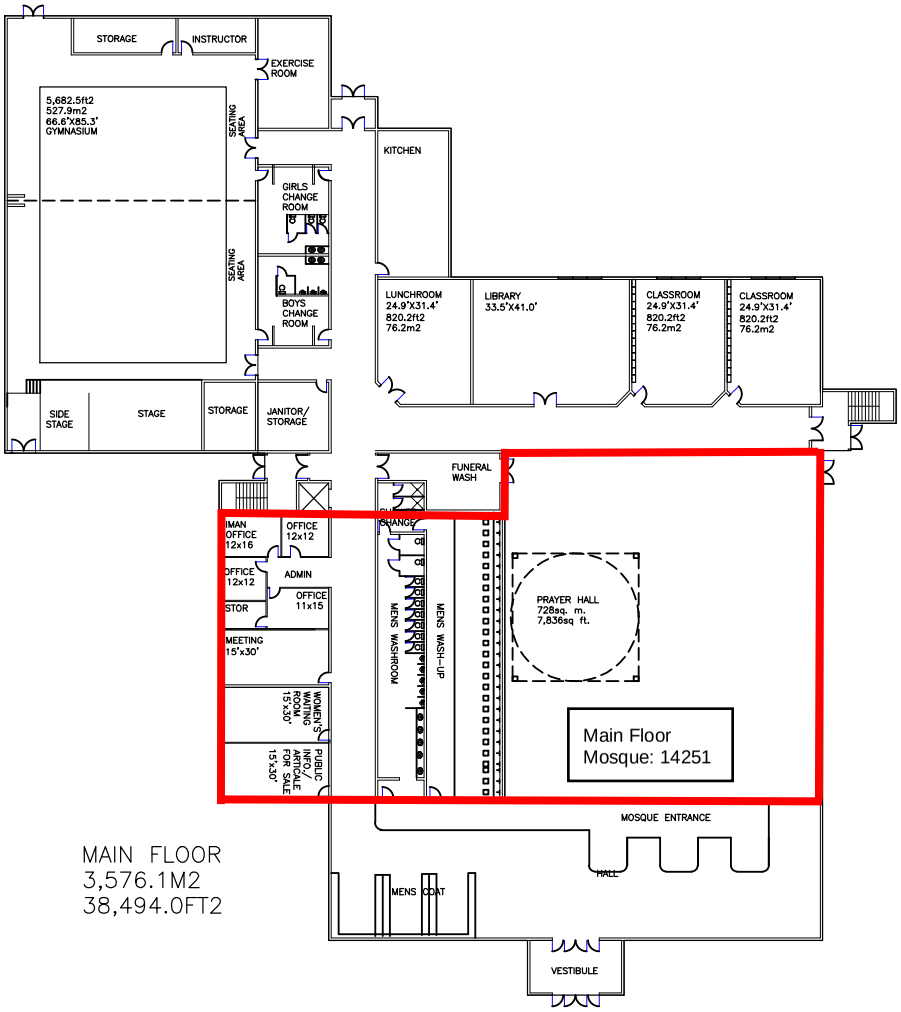


SECOND FLOOR
1,009.1M2
10,861.0FT2

JUNE 16, 2014

J C Akin
ARCHITECT LTD.
129B PINEHOUSE DRIVE
Saskatoon, Saskatchewan S7K 5W1
Phone:(306) 244-2229 Fax:(306) 242-2270



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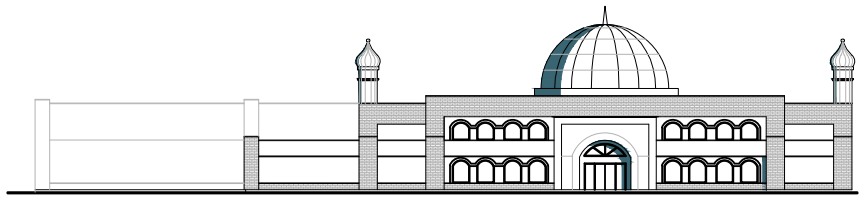
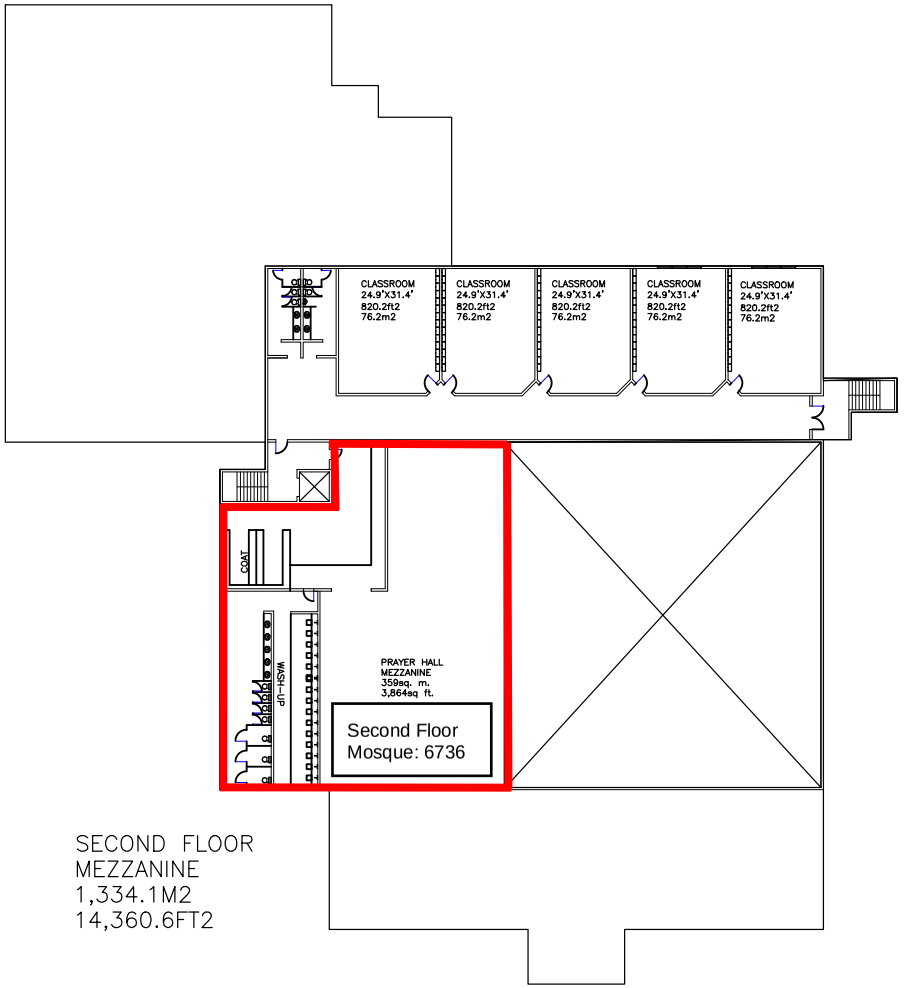


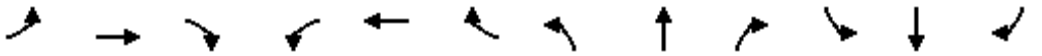


SECOND FLOOR
MEZZANINE
1,334.1M2
14,360.6FT2

JUNE 16, 2014

J C Akin
ARCHITECT LTD.
129B PINEHOUSE DRIVE
Saskatoon, Saskatchewan S7K 5W1
Phone:(306) 244-2229 Fax:(306) 242-2210

APPENDIX 2 – Results of Background Condition Analysis without Development



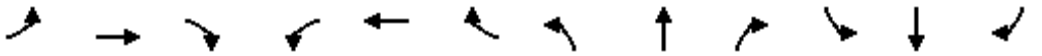
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	463	220	44	4	278	100	5	2	2	128	10	638
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		80.0	120.0		120.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	0		1	0		1	1		1
Taper Length (m)	100.0			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.999			0.966		0.950		
Satd. Flow (prot)	3433	3539	1583	0	3536	1583	0	1799	1583	1770	1863	1583
Flt Permitted	0.950				0.950			0.922		0.753		
Satd. Flow (perm)	3433	3539	1583	0	3362	1583	0	1717	1583	1403	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			109			109			693
Link Speed (k/h)		100			100			60			60	
Link Distance (m)		651.2			697.6			422.8			433.7	
Travel Time (s)		23.4			25.1			25.4			26.0	
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
Adj. Flow (vph)	503	239	48	4	302	109	5	2	2	139	11	693
Shared Lane Traffic (%)												
Lane Group Flow (vph)	503	239	48	0	306	109	0	7	2	139	11	693
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4			8			2			6	
Permitted Phases			4	8		8	2		2	6		Free
Detector Phase	7	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
Total Split (s)	23.0	46.0	46.0	23.0	23.0	23.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	32.9%	65.7%	65.7%	32.9%	32.9%	32.9%	34.3%	34.3%	34.3%	34.3%	34.3%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Act Effct Green (s)	15.1	31.9	31.9		11.8	11.8		28.1	28.1	28.1	28.1	70.0
Actuated g/C Ratio	0.22	0.46	0.46		0.17	0.17		0.40	0.40	0.40	0.40	1.00
v/c Ratio	0.68	0.15	0.06		0.54	0.30		0.01	0.00	0.25	0.01	0.44
Control Delay	30.0	10.4	2.9		29.7	7.8		16.0	0.0	27.5	25.8	2.4
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	10.4	2.9		29.7	7.8		16.0	0.0	27.5	25.8	2.4
LOS	C	B	A		C	A		B	A	C	C	A
Approach Delay		22.4			24.0			12.4			6.8	
Approach LOS		C			C			B			A	
90th %ile Green (s)	18.0	39.0	39.0	16.0	16.0	16.0	21.0	21.0	21.0	21.0	21.0	
90th %ile Term Code	Max	Hold	Hold	Ped	Ped	Ped	Coord	Coord	Coord	Coord	Coord	
70th %ile Green (s)	17.0	34.9	34.9	12.9	12.9	12.9	25.1	25.1	25.1	25.1	25.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
50th %ile Green (s)	15.4	32.0	32.0	11.6	11.6	11.6	28.0	28.0	28.0	28.0	28.0	
50th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
30th %ile Green (s)	13.7	29.0	29.0	10.3	10.3	10.3	31.0	31.0	31.0	31.0	31.0	
30th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
10th %ile Green (s)	11.3	24.7	24.7	8.4	8.4	8.4	35.3	35.3	35.3	35.3	35.3	
10th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
Queue Length 50th (m)	31.1	9.1	0.0		19.5	0.0		0.5	0.0	16.7	1.3	8.8
Queue Length 95th (m)	43.3	11.7	3.8		28.5	10.8		3.2	0.0	32.3	m3.6	23.7
Internal Link Dist (m)		627.2			673.6			398.8			409.7	
Turn Bay Length (m)	120.0		80.0			120.0						
Base Capacity (vph)	882	2072	947		864	488		688	700	562	747	1583
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	0.12	0.05		0.35	0.22		0.01	0.00	0.25	0.01	0.44

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
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: 0.68			
Intersection Signal Delay: 16.3		Intersection LOS: B	
Intersection Capacity Utilization 47.3%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Highway 16



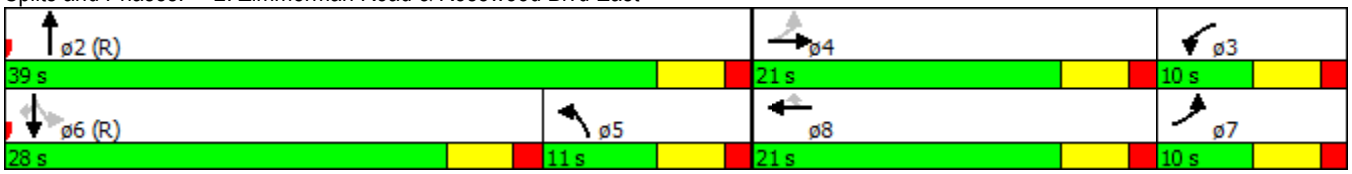
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	65	388	80	27	0	150	613	256	0	793	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		0.0	0.0		100.0	100.0		0.0	100.0		100.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	2.5			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850						0.850			0.850
Flt Protected	0.950			0.950			0.950					
Satd. Flow (prot)	1770	1863	1583	3433	1863	1863	3433	3539	1583	1863	3539	1583
Flt Permitted	0.738			0.950			0.950					
Satd. Flow (perm)	1375	1863	1583	3433	1863	1863	3433	3539	1583	1863	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			422						278			187
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		466.0			266.5			433.7			339.9	
Travel Time (s)		33.6			19.2			26.0			20.4	
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
Adj. Flow (vph)	125	71	422	87	29	0	163	666	278	0	862	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	125	71	422	87	29	0	163	666	278	0	862	47
Turn Type	pm+pt	NA	Free	Prot	NA	Perm	Prot	NA	Free	Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		Free			8			Free	6		6
Detector Phase	7	4		3	8	8	5	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	10.0	21.0		10.0	21.0	21.0	10.0	21.0		21.0	21.0	21.0
Total Split (s)	10.0	21.0		10.0	21.0	21.0	11.0	39.0		28.0	28.0	28.0
Total Split (%)	14.3%	30.0%		14.3%	30.0%	30.0%	15.7%	55.7%		40.0%	40.0%	40.0%
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lag	Lead		Lag	Lead	Lead	Lag			Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	16.9	9.1	70.0	6.4	8.2		6.0	44.7	70.0		32.7	32.7
Actuated g/C Ratio	0.24	0.13	1.00	0.09	0.12		0.09	0.64	1.00		0.47	0.47
v/c Ratio	0.31	0.29	0.27	0.28	0.13		0.55	0.29	0.18		0.52	0.06
Control Delay	20.7	29.0	0.4	32.2	26.9		44.1	11.3	0.2		17.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	20.7	29.0	0.4	32.2	26.9		44.1	11.3	0.2		17.3	0.1
LOS	C	C	A	C	C		D	B	A		B	A
Approach Delay		7.8			30.9			13.4			16.4	
Approach LOS		A			C			B			B	
90th %ile Green (s)	5.0	16.0		5.0	16.0	16.0	6.0	34.0		23.0	23.0	23.0
90th %ile Term Code	Max	Ped		Max	Ped	Ped	Max	Coord		Coord	Coord	Coord
70th %ile Green (s)	9.8	9.2		7.8	7.2	7.2	6.0	38.0		27.0	27.0	27.0

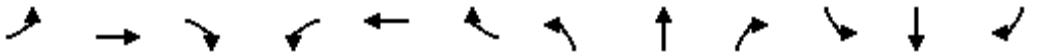
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Gap		Gap	Gap	Gap	Max	Coord		Coord	Coord	Coord
50th %ile Green (s)	20.1	8.0		7.1	0.0	0.0	6.0	39.9		28.9	28.9	28.9
50th %ile Term Code	Hold	Gap		Gap	Skip	Skip	Max	Coord		Coord	Coord	Coord
30th %ile Green (s)	18.3	6.9		6.4	0.0	0.0	6.0	41.7		30.7	30.7	30.7
30th %ile Term Code	Hold	Gap		Gap	Skip	Skip	Max	Coord		Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0		0.0	0.0	0.0	6.0	65.0		54.0	54.0	54.0
10th %ile Term Code	Skip	Skip		Skip	Skip	Skip	Max	Coord		Coord	Coord	Coord
Queue Length 50th (m)	12.5	8.7	0.0	5.5	3.6		11.5	37.1	0.0		44.4	0.0
Queue Length 95th (m)	21.3	16.9	0.0	12.0	8.9		20.6	54.7	0.0		71.4	0.0
Internal Link Dist (m)		442.0			242.5			409.7			315.9	
Turn Bay Length (m)	100.0						100.0					100.0
Base Capacity (vph)	399	425	1583	311	425		294	2261	1583		1654	839
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	0.31	0.17	0.27	0.28	0.07		0.55	0.29	0.18		0.52	0.06

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 13.9 Intersection LOS: B
Intersection Capacity Utilization 51.7% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Zimmerman Road & Rosewood Blvd East



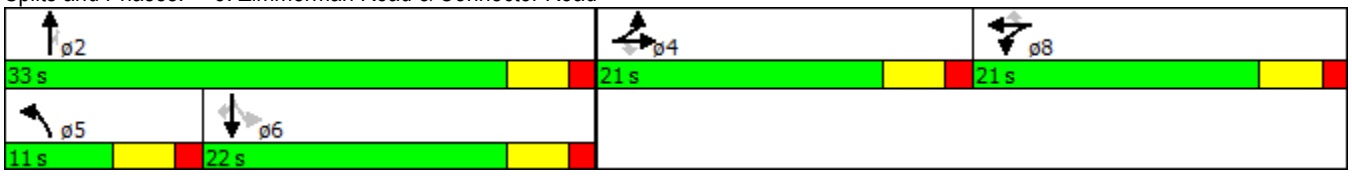


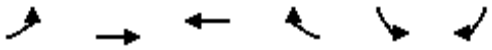
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	260	285	26	108	27	160	568	0	65	525	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	80.0			80.0			100.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850						0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1863	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.418		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1863	779	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310			175						175
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		366.9			405.9			339.9			275.6	
Travel Time (s)		26.4			29.2			20.4			16.5	
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
Adj. Flow (vph)	55	283	310	28	117	29	174	617	0	71	571	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	283	310	28	117	29	174	617	0	71	571	27
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8			2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	11.0	33.0	33.0	22.0	22.0	22.0
Total Split (%)	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	14.7%	44.0%	44.0%	29.3%	29.3%	29.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	Max	Max	Max
Act Effct Green (s)	11.6	11.6	11.6	8.6	8.6	8.6	6.2	28.8		17.5	17.5	17.5
Actuated g/C Ratio	0.19	0.19	0.19	0.14	0.14	0.14	0.10	0.47		0.28	0.28	0.28
v/c Ratio	0.16	0.42	0.56	0.11	0.24	0.08	0.51	0.37		0.32	0.57	0.05
Control Delay	23.7	25.1	7.8	25.7	26.2	0.4	35.3	13.6		26.3	23.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	23.7	25.1	7.8	25.7	26.2	0.4	35.3	13.6		26.3	23.7	0.2
LOS	C	C	A	C	C	A	D	B		C	C	A
Approach Delay		16.7			21.8			18.4			23.0	
Approach LOS		B			C			B			C	
90th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	6.0	28.0	28.0	17.0	17.0	17.0
90th %ile Term Code	Max	Max	Max	Ped	Ped	Ped	Max	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	14.2	14.2	14.2	8.2	8.2	8.2	6.0	28.0	28.0	17.0	17.0	17.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	12.1	12.1	12.1	7.4	7.4	7.4	6.0	28.0	28.0	17.0	17.0	17.0
50th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	10.0	10.0	10.0	6.7	6.7	6.7	6.0	28.0	28.0	17.0	17.0	17.0
30th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	7.0	7.0	7.0	0.0	0.0	0.0	6.0	28.0	28.0	17.0	17.0	17.0
10th %ile Term Code	Gap	Gap	Gap	Skip	Skip	Skip	Max	MaxR	MaxR	MaxR	MaxR	MaxR
Queue Length 50th (m)	5.3	15.1	0.0	3.0	6.6	0.0	10.1	23.6		6.5	29.8	0.0
Queue Length 95th (m)	15.2	28.6	18.6	9.3	13.5	0.0	#23.9	47.9		20.4	55.8	0.0
Internal Link Dist (m)		342.9			381.9			315.9			251.6	
Turn Bay Length (m)	100.0		100.0	80.0		100.0	100.0			100.0		100.0
Base Capacity (vph)	473	946	650	473	946	551	344	1656		221	1005	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	0.12	0.30	0.48	0.06	0.12	0.05	0.51	0.37		0.32	0.57	0.05

Intersection Summary	
Area Type:	Other
Cycle Length: 75	
Actuated Cycle Length: 61.5	
Natural Cycle: 75	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 19.5	Intersection LOS: B
Intersection Capacity Utilization 48.0%	ICU Level of Service A
Analysis Period (min) 15	
90th %ile Actuated Cycle: 75	
70th %ile Actuated Cycle: 65.4	
50th %ile Actuated Cycle: 62.5	
30th %ile Actuated Cycle: 59.7	
10th %ile Actuated Cycle: 45	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: Zimmerman Road & Connector Road



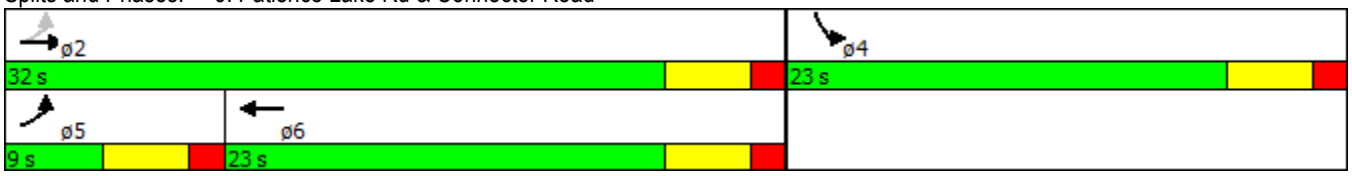


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	51	270	53	110	271	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			80.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	50.0				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.459				0.950	
Satd. Flow (perm)	855	3539	3539	1583	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				120		59
Link Speed (k/h)		50	50		50	
Link Distance (m)		266.5	263.3		405.9	
Travel Time (s)		19.2	19.0		29.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	293	58	120	295	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	293	58	120	295	59
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		4	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	21.0	21.0		21.0	
Total Split (s)	9.0	32.0	23.0		23.0	
Total Split (%)	16.4%	58.2%	41.8%		41.8%	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.5	1.5	1.5		1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	None	None		Max	
Act Effct Green (s)	12.1	12.1	8.9	42.5	20.2	42.5
Actuated g/C Ratio	0.28	0.28	0.21	1.00	0.48	1.00
v/c Ratio	0.17	0.29	0.08	0.08	0.35	0.04
Control Delay	10.3	11.3	13.9	0.1	10.8	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.3	11.3	13.9	0.1	10.8	0.0
LOS	B	B	B	A	B	A
Approach Delay		11.1	4.6		9.0	
Approach LOS		B	A		A	
90th %ile Green (s)	4.0	25.0	16.0		18.0	
90th %ile Term Code	Max	Hold	Ped		MaxR	
70th %ile Green (s)	4.0	15.5	6.5		18.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
70th %ile Term Code	Max	Hold	Gap		MaxR	
50th %ile Green (s)	0.0	8.2	8.2		18.0	
50th %ile Term Code	Skip	Gap	Hold		MaxR	
30th %ile Green (s)	0.0	7.5	7.5		18.0	
30th %ile Term Code	Skip	Gap	Hold		MaxR	
10th %ile Green (s)	0.0	6.8	6.8		27.4	
10th %ile Term Code	Skip	Gap	Hold		Dwell	
Queue Length 50th (m)	2.6	7.8	1.4	0.0	9.1	0.0
Queue Length 95th (m)	7.1	13.3	5.2	0.0	39.8	0.0
Internal Link Dist (m)		242.5	239.3		381.9	
Turn Bay Length (m)	80.0			80.0		
Base Capacity (vph)	330	2298	1532	1583	841	1583
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	0.17	0.13	0.04	0.08	0.35	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 42.5			
Natural Cycle: 55			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.35			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 32.8%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 53			
70th %ile Actuated Cycle: 43.5			
50th %ile Actuated Cycle: 36.2			
30th %ile Actuated Cycle: 35.5			
10th %ile Actuated Cycle: 44.2			

Splits and Phases: 6: Patience Lake Rd & Connector Road

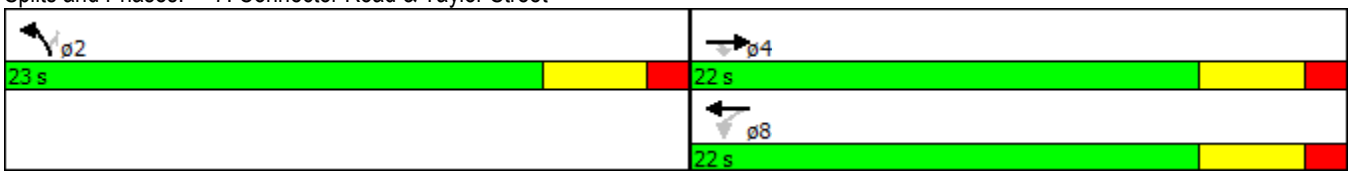


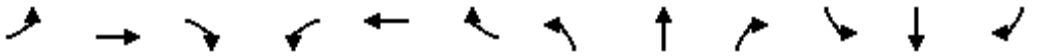
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	343	245	122	316	171	157
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		100.0	100.0		0.0	50.0
Storage Lanes		1	1		2	1
Taper Length (m)			80.0		80.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted			0.530		0.950	
Satd. Flow (perm)	3539	1583	987	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		266				171
Link Speed (k/h)	50			50	50	
Link Distance (m)	1318.4			508.0	275.0	
Travel Time (s)	94.9			36.6	19.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	373	266	133	343	186	171
Shared Lane Traffic (%)						
Lane Group Flow (vph)	373	266	133	343	186	171
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	10.9	10.9	10.9	10.9	18.1	18.1
Actuated g/C Ratio	0.28	0.28	0.28	0.28	0.46	0.46
v/c Ratio	0.38	0.42	0.49	0.35	0.12	0.21
Control Delay	12.1	4.1	17.8	11.9	7.3	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.1	4.1	17.8	11.9	7.3	2.7
LOS	B	A	B	B	A	A
Approach Delay	8.8			13.6	5.1	
Approach LOS	A			B	A	
90th %ile Green (s)	17.0	17.0	17.0	17.0	18.0	18.0
90th %ile Term Code	Hold	Hold	Max	Max	MaxR	MaxR
70th %ile Green (s)	13.6	13.6	13.6	13.6	18.0	18.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
70th %ile Term Code	Hold	Hold	Gap	Gap	MaxR	MaxR
50th %ile Green (s)	10.2	10.2	10.2	10.2	18.0	18.0
50th %ile Term Code	Hold	Hold	Gap	Gap	MaxR	MaxR
30th %ile Green (s)	8.1	8.1	8.1	8.1	18.0	18.0
30th %ile Term Code	Gap	Gap	Gap	Gap	MaxR	MaxR
10th %ile Green (s)	6.8	6.8	6.8	6.8	18.0	18.0
10th %ile Term Code	Gap	Gap	Hold	Hold	MaxR	MaxR
Queue Length 50th (m)	10.1	0.0	7.1	9.3	3.0	0.0
Queue Length 95th (m)	17.3	10.0	17.6	16.0	8.8	7.7
Internal Link Dist (m)	1294.4			484.0	251.0	
Turn Bay Length (m)		100.0	100.0			50.0
Base Capacity (vph)	1550	843	432	1550	1592	826
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	0.24	0.32	0.31	0.22	0.12	0.21

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 39.1			
Natural Cycle: 45			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.49			
Intersection Signal Delay: 9.4		Intersection LOS: A	
Intersection Capacity Utilization 33.6%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 45			
70th %ile Actuated Cycle: 41.6			
50th %ile Actuated Cycle: 38.2			
30th %ile Actuated Cycle: 36.1			
10th %ile Actuated Cycle: 34.8			

Splits and Phases: 7: Connector Road & Taylor Street



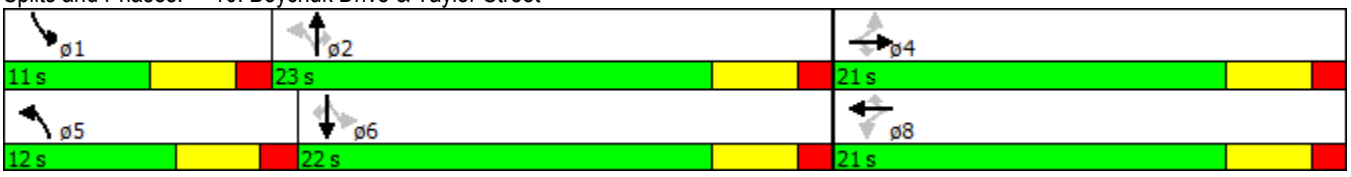


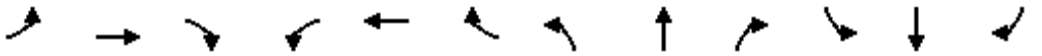
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	364	123	65	585	327	232	421	29	217	508	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	950
Flt Permitted	0.303			0.515			0.371			0.488		
Satd. Flow (perm)	564	3539	1583	959	3539	1583	691	3539	1583	909	3539	950
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139			355			139			139
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		575.1			1318.4			1152.3			504.5	
Travel Time (s)		41.4			94.9			83.0			36.3	
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
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	100
Adj. Flow (vph)	50	396	134	71	636	355	252	458	32	236	552	112
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	396	134	71	636	355	252	458	32	236	552	112
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	12.0	23.0	23.0	11.0	22.0	22.0
Total Split (%)	38.2%	38.2%	38.2%	38.2%	38.2%	38.2%	21.8%	41.8%	41.8%	20.0%	40.0%	40.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	15.0	15.0	15.0	15.0	15.0	15.0	24.9	18.0	18.0	23.1	17.1	17.1
Actuated g/C Ratio	0.28	0.28	0.28	0.28	0.28	0.28	0.46	0.33	0.33	0.43	0.32	0.32
v/c Ratio	0.32	0.40	0.25	0.27	0.65	0.51	0.55	0.39	0.05	0.49	0.49	0.28
Control Delay	21.8	17.2	4.6	18.2	20.7	5.2	12.6	15.3	0.2	11.6	17.1	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	17.2	4.6	18.2	20.7	5.2	12.6	15.3	0.2	11.6	17.1	4.4
LOS	C	B	A	B	C	A	B	B	A	B	B	A
Approach Delay		14.7			15.3			13.7			14.1	
Approach LOS		B			B			B			B	
90th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
70th %ile Term Code	Hold	Hold	Hold	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR
50th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
50th %ile Term Code	Hold	Hold	Hold	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR
30th %ile Green (s)	15.7	15.7	15.7	15.7	15.7	15.7	7.0	18.0	18.0	6.0	17.0	17.0
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap	Gap	Max	MaxR	MaxR	Max	MaxR	MaxR
10th %ile Green (s)	11.4	11.4	11.4	11.4	11.4	11.4	6.6	18.0	18.0	6.0	17.4	17.4
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap	Gap	Gap	MaxR	MaxR	Max	Hold	Hold
Queue Length 50th (m)	3.8	16.3	0.0	5.4	28.4	0.0	12.4	18.1	0.0	11.5	23.2	0.0
Queue Length 95th (m)	11.8	26.2	9.1	13.9	42.7	15.1	23.1	28.4	0.0	21.6	35.5	6.6
Internal Link Dist (m)		551.1			1294.4			1128.3			480.5	
Turn Bay Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Base Capacity (vph)	167	1049	567	284	1049	719	460	1180	620	484	1120	395
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.38	0.24	0.25	0.61	0.49	0.55	0.39	0.05	0.49	0.49	0.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 54			
Natural Cycle: 55			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 14.5		Intersection LOS: B	
Intersection Capacity Utilization 63.1%		ICU Level of Service B	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 55			
70th %ile Actuated Cycle: 55			
50th %ile Actuated Cycle: 55			
30th %ile Actuated Cycle: 54.7			
10th %ile Actuated Cycle: 50.4			

Splits and Phases: 10: Boychuk Drive & Taylor Street





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1042	345	5	10	421	249	60	19	2	245	10	961
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		80.0	120.0		120.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	0		1	0		1	1		1
Taper Length (m)	100.0			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.999			0.964		0.950		
Satd. Flow (prot)	3433	3539	1583	0	3536	1583	0	1796	1583	1770	1863	1583
Flt Permitted	0.950				0.940			0.772		0.540		
Satd. Flow (perm)	3433	3539	1583	0	3327	1583	0	1438	1583	1006	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76			271			131			765
Link Speed (k/h)		100			100			60			60	
Link Distance (m)		651.2			697.6			422.8			433.7	
Travel Time (s)		23.4			25.1			25.4			26.0	
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
Adj. Flow (vph)	1133	375	5	11	458	271	65	21	2	266	11	1045
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1133	375	5	0	469	271	0	86	2	266	11	1045
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4			8			2		1	6	
Permitted Phases			4	8		8	2		2	6		Free
Detector Phase	7	4	4	8	8	8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	
Total Split (s)	46.0	69.0	69.0	23.0	23.0	23.0	21.0	21.0	21.0	10.0	31.0	
Total Split (%)	46.0%	69.0%	69.0%	23.0%	23.0%	23.0%	21.0%	21.0%	21.0%	10.0%	31.0%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	37.9	60.6	60.6		17.7	17.7		16.8	16.8	29.4	29.4	100.0
Actuated g/C Ratio	0.38	0.61	0.61		0.18	0.18		0.17	0.17	0.29	0.29	1.00
v/c Ratio	0.87	0.17	0.01		0.80	0.54		0.36	0.01	0.76	0.02	0.66
Control Delay	36.8	8.5	0.0		50.5	8.9		42.3	0.0	50.9	35.1	6.2
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	8.5	0.0		50.5	8.9		42.3	0.0	50.9	35.1	6.2
LOS	D	A	A		D	A		D	A	D	D	A
Approach Delay		29.7			35.3			41.3			15.4	
Approach LOS		C			D			D			B	
90th %ile Green (s)	41.0	64.0	64.0	18.0	18.0	18.0	16.0	16.0	16.0	5.0	26.0	
90th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
70th %ile Green (s)	41.0	64.0	64.0	18.0	18.0	18.0	16.0	16.0	16.0	5.0	26.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
50th %ile Green (s)	39.4	64.0	64.0	19.6	19.6	19.6	16.0	16.0	16.0	5.0	26.0	
50th %ile Term Code	Gap	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
30th %ile Green (s)	36.2	59.5	59.5	18.3	18.3	18.3	16.0	16.0	16.0	9.5	30.5	
30th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Max	Coord	
10th %ile Green (s)	32.1	51.7	51.7	14.6	14.6	14.6	20.0	20.0	20.0	13.3	38.3	
10th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Gap	Coord	
Queue Length 50th (m)	100.5	14.0	0.0		45.1	0.0		15.1	0.0	54.7	1.8	81.9
Queue Length 95th (m)	123.6	19.8	0.0		#67.3	20.8		29.7	0.0	m#66.7	m2.3	m54.5
Internal Link Dist (m)		627.2			673.6			398.8			409.7	
Turn Bay Length (m)	120.0		80.0			120.0						
Base Capacity (vph)	1407	2264	1040		611	512		241	375	352	547	1583
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	0.81	0.17	0.00		0.77	0.53		0.36	0.01	0.76	0.02	0.66

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 25.9 Intersection LOS: C
Intersection Capacity Utilization 74.4% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 1: Highway 16

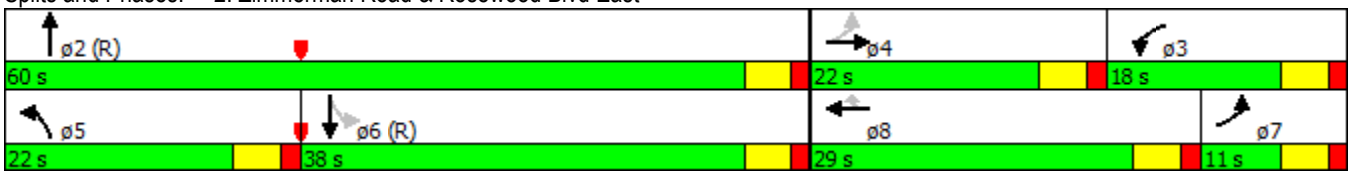
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	132	252	417	149	149	447	950	394	5	1037	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		0.0	0.0		100.0	100.0		0.0	100.0		100.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	2.5			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.500			0.950			0.950			0.277		
Satd. Flow (perm)	931	1863	1583	3433	1863	1583	3433	3539	1583	516	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			274			131			312			240
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		466.0			266.5			433.7			339.9	
Travel Time (s)		33.6			19.2			26.0			20.4	
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
Adj. Flow (vph)	100	143	274	453	162	162	486	1033	428	5	1127	139
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	143	274	453	162	162	486	1033	428	5	1127	139
Turn Type	pm+pt	NA	Free	Prot	NA	Perm	Prot	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		Free			8			Free	6		Free
Detector Phase	7	4		3	8	8	5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0	21.0	10.0	21.0		21.0	21.0	
Total Split (s)	11.0	22.0		18.0	29.0	29.0	22.0	60.0		38.0	38.0	
Total Split (%)	11.0%	22.0%		18.0%	29.0%	29.0%	22.0%	60.0%		38.0%	38.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lead		Lag	Lead	Lead	Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)	25.5	12.8	100.0	16.7	18.9	18.9	16.6	55.5	100.0	34.0	34.0	100.0
Actuated g/C Ratio	0.26	0.13	1.00	0.17	0.19	0.19	0.17	0.56	1.00	0.34	0.34	1.00
v/c Ratio	0.29	0.60	0.17	0.79	0.46	0.40	0.85	0.53	0.27	0.03	0.94	0.09
Control Delay	27.5	51.4	0.2	52.2	42.3	13.2	43.4	22.6	0.4	22.8	36.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.5	51.4	0.2	52.2	42.3	13.2	43.4	22.6	0.4	22.8	36.9	0.1
LOS	C	D	A	D	D	B	D	C	A	C	D	A
Approach Delay		19.7			42.0			22.9			32.8	
Approach LOS		B			D			C			C	
90th %ile Green (s)	10.0	17.0		13.0	20.0	20.0	17.0	55.0		33.0	33.0	
90th %ile Term Code	Hold	Max		Max	Gap	Gap	Max	Coord		Coord	Coord	
70th %ile Green (s)	13.9	14.9		15.1	16.1	16.1	17.0	55.0		33.0	33.0	

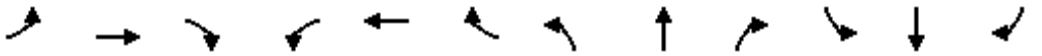
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Gap		Max	Gap	Gap	Max	Coord		Coord	Coord	
50th %ile Green (s)	16.0	12.9		17.1	14.0	14.0	17.0	55.0		33.0	33.0	
50th %ile Term Code	Hold	Gap		Max	Gap	Gap	Max	Coord		Coord	Coord	
30th %ile Green (s)	18.1	10.9		19.1	11.9	11.9	17.0	55.0		33.0	33.0	
30th %ile Term Code	Hold	Gap		Max	Gap	Gap	Max	Coord		Coord	Coord	
10th %ile Green (s)	0.0	8.1		19.2	32.3	32.3	14.9	57.7		37.8	37.8	
10th %ile Term Code	Skip	Gap		Gap	Hold	Hold	Gap	Coord		Coord	Coord	
Queue Length 50th (m)	13.2	26.5	0.0	43.7	29.9	5.4	50.6	96.7	0.0	0.6	73.2	0.0
Queue Length 95th (m)	24.8	43.7	0.0	#78.1	47.0	21.9	m#69.1	118.4	m0.0	m0.8	#148.2	m0.0
Internal Link Dist (m)		442.0			242.5			409.7			315.9	
Turn Bay Length (m)	100.0					100.0	100.0			100.0		100.0
Base Capacity (vph)	345	316	1583	573	478	503	583	1965	1583	175	1201	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.45	0.17	0.79	0.34	0.32	0.83	0.53	0.27	0.03	0.94	0.09

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 28.6 Intersection LOS: C
Intersection Capacity Utilization 76.9% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 2: Zimmerman Road & Rosewood Blvd East





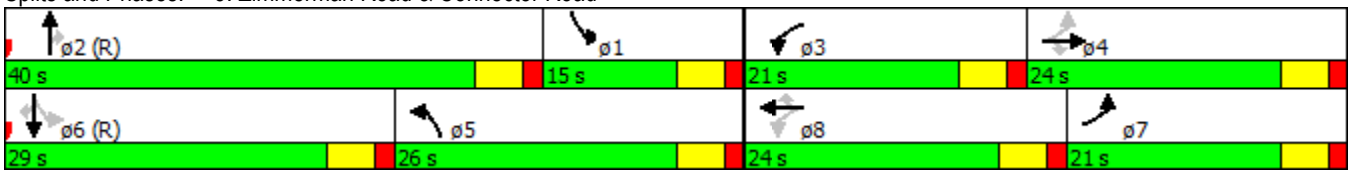
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	526	411	179	447	149	506	553	132	132	575	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	80.0			80.0			100.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.526			0.526			0.950			0.284		
Satd. Flow (perm)	980	3539	1583	980	3539	1583	3433	3539	1583	529	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			399			185			143			185
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		366.9			405.9			339.9			275.6	
Travel Time (s)		26.4			29.2			20.4			16.5	
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
Adj. Flow (vph)	70	572	447	195	486	162	550	601	143	143	625	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	70	572	447	195	486	162	550	601	143	143	625	74
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	21.0	24.0	24.0	21.0	24.0	24.0	26.0	40.0	40.0	15.0	29.0	29.0
Total Split (%)	21.0%	24.0%	24.0%	21.0%	24.0%	24.0%	26.0%	40.0%	40.0%	15.0%	29.0%	29.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	19.6	19.6	19.6	21.5	21.5	21.5	19.8	37.7	37.7	35.5	26.7	26.7
Actuated g/C Ratio	0.20	0.20	0.20	0.22	0.22	0.22	0.20	0.38	0.38	0.36	0.27	0.27
v/c Ratio	0.23	0.82	0.71	0.61	0.64	0.33	0.81	0.45	0.21	0.48	0.66	0.13
Control Delay	37.0	49.9	13.0	45.2	41.3	5.8	40.3	11.0	1.0	26.5	37.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.0	49.9	13.0	45.2	41.3	5.8	40.3	11.0	1.0	26.5	37.5	0.5
LOS	D	D	B	D	D	A	D	B	A	C	D	A
Approach Delay		33.9			35.4			22.4			32.4	
Approach LOS		C			D			C			C	
90th %ile Green (s)	16.0	19.0	19.0	16.0	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0
90th %ile Term Code	Ped	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	16.0	19.0	19.0	16.0	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0

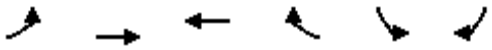
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Max	Max	Max	Max	Max	Max	Coord	Coord	Hold	Coord	Coord
50th %ile Green (s)	16.0	19.5	19.5	15.5	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0
50th %ile Term Code	Hold	Max	Max	Gap	Max	Max	Max	Coord	Coord	Hold	Coord	Coord
30th %ile Green (s)	17.2	22.2	22.2	12.8	17.8	17.8	19.0	37.0	37.0	8.0	26.0	26.0
30th %ile Term Code	Hold	Gap	Gap	Gap	Gap	Gap	Gap	Coord	Coord	Hold	Coord	Coord
10th %ile Green (s)	0.0	18.5	18.5	9.0	32.5	32.5	16.9	46.6	46.6	5.9	35.6	35.6
10th %ile Term Code	Skip	Gap	Gap	Gap	Hold	Hold	Hold	Coord	Coord	Gap	Coord	Coord
Queue Length 50th (m)	11.5	56.5	7.8	34.7	46.9	0.0	56.5	15.5	0.0	14.4	59.0	0.0
Queue Length 95th (m)	23.7	#83.4	40.2	57.2	64.3	12.3	74.3	22.8	0.6	25.2	78.4	0.0
Internal Link Dist (m)		342.9			381.9			315.9			251.6	
Turn Bay Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	322	698	632	336	768	488	720	1334	686	318	945	558
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.82	0.71	0.58	0.63	0.33	0.76	0.45	0.21	0.45	0.66	0.13

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 30.2 Intersection LOS: C
Intersection Capacity Utilization 71.5% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Zimmerman Road & Connector Road



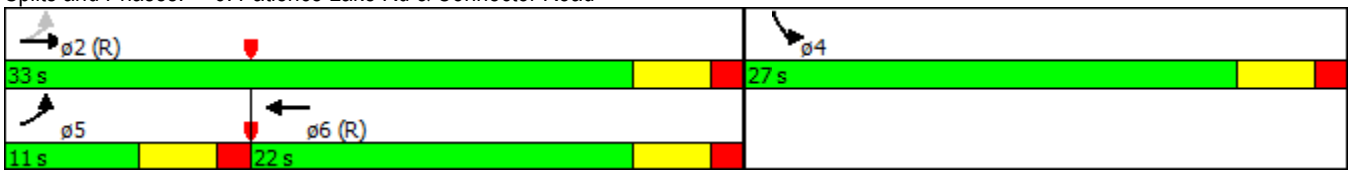


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	212	319	358	563	433	357
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			80.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	50.0				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.391				0.950	
Satd. Flow (perm)	728	3539	3539	1583	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				612		388
Link Speed (k/h)		50	50		50	
Link Distance (m)		266.5	263.3		405.9	
Travel Time (s)		19.2	19.0		29.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	230	347	389	612	471	388
Shared Lane Traffic (%)						
Lane Group Flow (vph)	230	347	389	612	471	388
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		4	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	21.0	21.0		21.0	
Total Split (s)	11.0	33.0	22.0		27.0	
Total Split (%)	18.3%	55.0%	36.7%		45.0%	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.5	1.5	1.5		1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max		Max	
Act Effct Green (s)	28.0	28.0	17.0	60.0	22.0	60.0
Actuated g/C Ratio	0.47	0.47	0.28	1.00	0.37	1.00
v/c Ratio	0.52	0.21	0.39	0.39	0.73	0.25
Control Delay	14.7	9.9	18.7	0.7	24.6	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.7	9.9	18.7	0.7	24.6	0.4
LOS	B	A	B	A	C	A
Approach Delay		11.8	7.7		13.7	
Approach LOS		B	A		B	
90th %ile Green (s)	6.0	28.0	17.0		22.0	
90th %ile Term Code	Max	Coord	Coord		MaxR	
70th %ile Green (s)	6.0	28.0	17.0		22.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
70th %ile Term Code	Max	Coord	Coord		MaxR	
50th %ile Green (s)	6.0	28.0	17.0		22.0	
50th %ile Term Code	Max	Coord	Coord		MaxR	
30th %ile Green (s)	6.0	28.0	17.0		22.0	
30th %ile Term Code	Max	Coord	Coord		MaxR	
10th %ile Green (s)	6.0	28.0	17.0		22.0	
10th %ile Term Code	Max	Coord	Coord		MaxR	
Queue Length 50th (m)	14.5	11.1	18.0	0.0	43.4	0.0
Queue Length 95th (m)	26.7	17.8	28.2	0.0	#82.5	0.0
Internal Link Dist (m)		242.5	239.3		381.9	
Turn Bay Length (m)	80.0			80.0		
Base Capacity (vph)	443	1651	1002	1583	649	1583
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	0.52	0.21	0.39	0.39	0.73	0.25

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 58.1%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 6: Patience Lake Rd & Connector Road



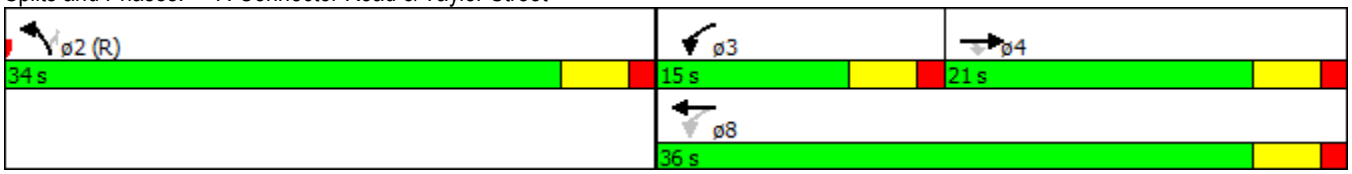
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	343	529	296	346	574	279
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		100.0	100.0		0.0	50.0
Storage Lanes		1	1		2	1
Taper Length (m)			80.0		80.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted			0.341		0.950	
Satd. Flow (perm)	3539	1583	635	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		575				303
Link Speed (k/h)	50			50	50	
Link Distance (m)	1318.4			508.0	275.0	
Travel Time (s)	94.9			36.6	19.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	373	575	322	376	624	303
Shared Lane Traffic (%)						
Lane Group Flow (vph)	373	575	322	376	624	303
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	3	8	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	10.0	21.0	21.0	21.0
Total Split (s)	21.0	21.0	15.0	36.0	34.0	34.0
Total Split (%)	30.0%	30.0%	21.4%	51.4%	48.6%	48.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	14.2	14.2	29.2	29.2	30.8	30.8
Actuated g/C Ratio	0.20	0.20	0.42	0.42	0.44	0.44
v/c Ratio	0.52	0.74	0.75	0.25	0.41	0.35
Control Delay	27.2	8.9	27.6	13.4	15.0	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	8.9	27.6	13.4	15.0	3.1
LOS	C	A	C	B	B	A
Approach Delay	16.1			20.0	11.1	
Approach LOS	B			B	B	
90th %ile Green (s)	16.0	16.0	10.0	31.0	29.0	29.0
90th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
70th %ile Green (s)	16.0	16.0	10.0	31.0	29.0	29.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
70th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
50th %ile Green (s)	16.0	16.0	10.0	31.0	29.0	29.0
50th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
30th %ile Green (s)	13.0	13.0	10.0	28.0	32.0	32.0
30th %ile Term Code	Gap	Gap	Max	Hold	Coord	Coord
10th %ile Green (s)	10.1	10.1	10.0	25.1	34.9	34.9
10th %ile Term Code	Gap	Gap	Max	Hold	Coord	Coord
Queue Length 50th (m)	22.2	0.0	27.4	15.4	29.1	0.0
Queue Length 95th (m)	34.0	24.8	#52.5	23.5	41.5	12.6
Internal Link Dist (m)	1294.4			484.0	251.0	
Turn Bay Length (m)		100.0	100.0			50.0
Base Capacity (vph)	808	805	427	1567	1509	866
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	0.46	0.71	0.75	0.24	0.41	0.35

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 15.3 Intersection LOS: B
Intersection Capacity Utilization 57.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Connector Road & Taylor Street



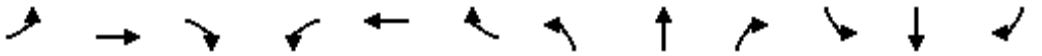
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	72	909	299	21	768	430	193	597	40	502	508	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	950
Flt Permitted	0.144			0.176			0.446			0.167		
Satd. Flow (perm)	268	3539	1583	328	3539	1583	831	3539	1583	311	3539	950
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			325			467			206			145
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		575.1			1318.4			1152.3			504.5	
Travel Time (s)		41.4			94.9			83.0			36.3	
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
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	100
Adj. Flow (vph)	78	988	325	23	835	467	210	649	43	546	552	86
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	988	325	23	835	467	210	649	43	546	552	86
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	10.0	37.0	37.0	27.0	27.0	27.0	16.0	23.0	23.0	30.0	37.0	37.0
Total Split (%)	11.1%	41.1%	41.1%	30.0%	30.0%	30.0%	17.8%	25.6%	25.6%	33.3%	41.1%	41.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	30.7	30.7	30.7	22.7	22.7	22.7	29.9	19.9	19.9	49.3	34.2	34.2
Actuated g/C Ratio	0.34	0.34	0.34	0.25	0.25	0.25	0.33	0.22	0.22	0.55	0.38	0.38
v/c Ratio	0.45	0.82	0.43	0.28	0.93	0.62	0.55	0.83	0.08	0.96	0.41	0.19
Control Delay	28.1	33.3	4.4	38.1	52.2	7.0	19.7	45.4	0.3	54.0	22.3	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	33.3	4.4	38.1	52.2	7.0	19.7	45.4	0.3	54.0	22.3	1.6
LOS	C	C	A	D	D	A	B	D	A	D	C	A
Approach Delay		26.3			36.0			37.3			35.4	
Approach LOS		C			D			D			D	
90th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
50th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	9.7	18.0	18.0	25.0	33.3	33.3
30th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Gap	Coord	Coord	Max	Coord	Coord
10th %ile Green (s)	0.0	25.7	25.7	25.7	25.7	25.7	7.4	27.3	27.3	22.0	41.9	41.9
10th %ile Term Code	Skip	Gap	Gap	Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
Queue Length 50th (m)	9.0	79.2	0.0	3.3	75.3	0.0	18.1	58.3	0.0	76.5	37.7	0.0
Queue Length 95th (m)	18.4	102.8	16.5	10.8	#112.7	24.0	30.3	#89.6	0.0	#140.3	51.8	2.1
Internal Link Dist (m)		551.1			1294.4			1128.3			480.5	
Turn Bay Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Base Capacity (vph)	174	1258	772	83	894	748	399	780	509	575	1346	451
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.79	0.42	0.28	0.93	0.62	0.53	0.83	0.08	0.95	0.41	0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 33.3		Intersection LOS: C	
Intersection Capacity Utilization 89.4%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 10: Boychuk Drive & Taylor Street

APPENDIX 3 – Results of Future Condition Analysis with Development Trips



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	562	220	44	4	278	110	5	2	2	134	10	702
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		80.0	120.0		120.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	0		1	0		1	1		1
Taper Length (m)	100.0			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.999			0.966		0.950		
Satd. Flow (prot)	3433	3539	1583	0	3536	1583	0	1799	1583	1770	1863	1583
Flt Permitted	0.950				0.950			0.920		0.753		
Satd. Flow (perm)	3433	3539	1583	0	3362	1583	0	1714	1583	1403	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			120			109			763
Link Speed (k/h)		100			100			60			60	
Link Distance (m)		651.2			697.6			422.8			433.7	
Travel Time (s)		23.4			25.1			25.4			26.0	
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
Adj. Flow (vph)	611	239	48	4	302	120	5	2	2	146	11	763
Shared Lane Traffic (%)												
Lane Group Flow (vph)	611	239	48	0	306	120	0	7	2	146	11	763
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Free
Protected Phases	7	4			8			2			6	
Permitted Phases			4	8		8	2		2	6		Free
Detector Phase	7	4	4	8	8	8	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
Total Split (s)	23.0	46.0	46.0	23.0	23.0	23.0	24.0	24.0	24.0	24.0	24.0	
Total Split (%)	32.9%	65.7%	65.7%	32.9%	32.9%	32.9%	34.3%	34.3%	34.3%	34.3%	34.3%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Act Effct Green (s)	16.4	33.3	33.3		11.8	11.8		26.7	26.7	26.7	26.7	70.0
Actuated g/C Ratio	0.23	0.48	0.48		0.17	0.17		0.38	0.38	0.38	0.38	1.00
v/c Ratio	0.76	0.14	0.06		0.54	0.33		0.01	0.00	0.27	0.02	0.48
Control Delay	31.5	9.7	2.8		29.7	7.8		16.3	0.0	27.1	25.2	2.8
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	9.7	2.8		29.7	7.8		16.3	0.0	27.1	25.2	2.8
LOS	C	A	A		C	A		B	A	C	C	A
Approach Delay		24.2			23.5			12.7			7.0	
Approach LOS		C			C			B			A	
90th %ile Green (s)	18.0	39.0	39.0	16.0	16.0	16.0	21.0	21.0	21.0	21.0	21.0	
90th %ile Term Code	Max	Hold	Hold	Ped	Ped	Ped	Coord	Coord	Coord	Coord	Coord	
70th %ile Green (s)	18.0	35.9	35.9	12.9	12.9	12.9	24.1	24.1	24.1	24.1	24.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Max	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
50th %ile Green (s)	17.4	34.0	34.0	11.6	11.6	11.6	26.0	26.0	26.0	26.0	26.0	
50th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
30th %ile Green (s)	15.7	31.0	31.0	10.3	10.3	10.3	29.0	29.0	29.0	29.0	29.0	
30th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
10th %ile Green (s)	13.0	26.4	26.4	8.4	8.4	8.4	33.6	33.6	33.6	33.6	33.6	
10th %ile Term Code	Gap	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Coord	Coord	
Queue Length 50th (m)	37.6	8.5	0.0		19.5	0.0		0.6	0.0	16.8	1.2	12.7
Queue Length 95th (m)	53.4	11.7	3.8		28.5	11.3		3.2	0.0	m32.4	m3.2	27.1
Internal Link Dist (m)		627.2			673.6			398.8			409.7	
Turn Bay Length (m)	120.0		80.0			120.0						
Base Capacity (vph)	882	2072	947		864	496		654	672	536	711	1583
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	0.12	0.05		0.35	0.24		0.01	0.00	0.27	0.02	0.48

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
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: 0.76
Intersection Signal Delay: 17.0 Intersection LOS: B
Intersection Capacity Utilization 50.4% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Highway 16

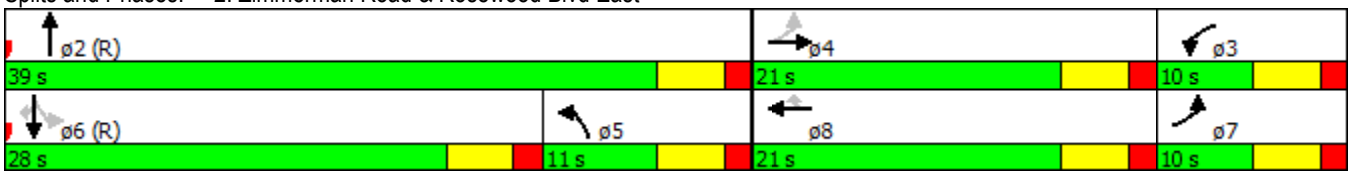
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	115	85	388	150	33	22	150	613	365	35	793	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		0.0	0.0		100.0	100.0		0.0	100.0		100.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	2.5			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.734			0.950			0.950			0.358		
Satd. Flow (perm)	1367	1863	1583	3433	1863	1583	3433	3539	1583	667	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			422			187			397			187
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		466.0			266.5			433.7			339.9	
Travel Time (s)		33.6			19.2			26.0			20.4	
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
Adj. Flow (vph)	125	92	422	163	36	24	163	666	397	38	862	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	125	92	422	163	36	24	163	666	397	38	862	47
Turn Type	pm+pt	NA	Free	Prot	NA	Perm	Prot	NA	Free	Perm	NA	Perm
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		Free			8			Free	6		6
Detector Phase	7	4		3	8	8	5	2		6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	10.0	21.0		10.0	21.0	21.0	10.0	21.0		21.0	21.0	21.0
Total Split (s)	10.0	21.0		10.0	21.0	21.0	11.0	39.0		28.0	28.0	28.0
Total Split (%)	14.3%	30.0%		14.3%	30.0%	30.0%	15.7%	55.7%		40.0%	40.0%	40.0%
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lag	Lead		Lag	Lead	Lead	Lag			Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	Yes
Recall Mode	None	None		None	None	None	None	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	17.9	9.6	70.0	7.6	8.5	8.5	6.0	39.9	70.0	28.9	28.9	28.9
Actuated g/C Ratio	0.26	0.14	1.00	0.11	0.12	0.12	0.09	0.57	1.00	0.41	0.41	0.41
v/c Ratio	0.30	0.36	0.27	0.44	0.16	0.07	0.55	0.33	0.25	0.14	0.59	0.06
Control Delay	19.5	30.0	0.4	34.5	27.2	0.4	43.9	12.6	0.4	17.7	19.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	30.0	0.4	34.5	27.2	0.4	43.9	12.6	0.4	17.7	19.7	0.2
LOS	B	C	A	C	C	A	D	B	A	B	B	A
Approach Delay		8.4			29.7			12.8			18.6	
Approach LOS		A			C			B			B	
90th %ile Green (s)	5.0	16.0		5.0	16.0	16.0	6.0	34.0		23.0	23.0	23.0
90th %ile Term Code	Max	Ped		Max	Ped	Ped	Max	Coord		Coord	Coord	Coord
70th %ile Green (s)	12.2	10.1		9.7	7.6	7.6	6.0	35.2		24.2	24.2	24.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Gap		Gap	Gap	Gap	Max	Coord		Coord	Coord	Coord
50th %ile Green (s)	10.9	8.8		8.8	6.7	6.7	6.0	37.4		26.4	26.4	26.4
50th %ile Term Code	Hold	Gap		Gap	Gap	Gap	Max	Coord		Coord	Coord	Coord
30th %ile Green (s)	20.4	7.5		7.9	0.0	0.0	6.0	39.6		28.6	28.6	28.6
30th %ile Term Code	Hold	Gap		Gap	Skip	Skip	Max	Coord		Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0		6.5	6.5	6.5	6.0	53.5		42.5	42.5	42.5
10th %ile Term Code	Skip	Skip		Gap	Hold	Hold	Max	Coord		Coord	Coord	Coord
Queue Length 50th (m)	11.8	11.3	0.0	10.3	4.5	0.0	11.6	39.4	0.0	3.2	47.6	0.0
Queue Length 95th (m)	21.3	20.8	0.0	#23.0	10.3	0.0	m18.8	56.0	0.0	10.2	71.4	0.0
Internal Link Dist (m)		442.0			242.5			409.7			315.9	
Turn Bay Length (m)	100.0					100.0	100.0			100.0		100.0
Base Capacity (vph)	413	425	1583	371	425	506	294	2019	1583	275	1462	764
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.22	0.27	0.44	0.08	0.05	0.55	0.33	0.25	0.14	0.59	0.06

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.59
Intersection Signal Delay: 14.9 Intersection LOS: B
Intersection Capacity Utilization 51.7% ICU Level of Service A
Analysis Period (min) 15
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.

Splits and Phases: 2: Zimmerman Road & Rosewood Blvd East

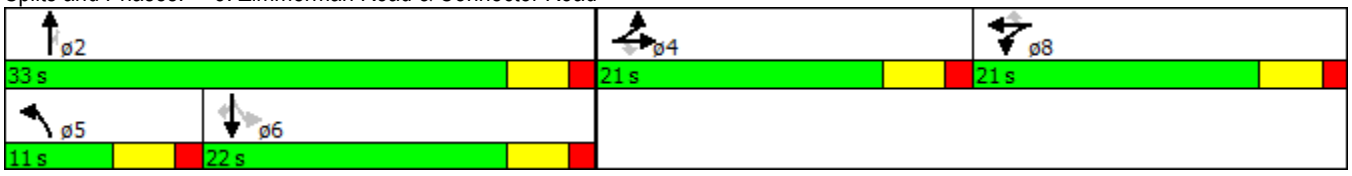


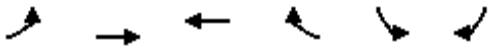
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	280	305	26	120	37	172	578	0	80	540	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	80.0			80.0			100.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850						0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1863	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.414		
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1863	771	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			332			175						175
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		366.9			405.9			339.9			275.6	
Travel Time (s)		26.4			29.2			20.4			16.5	
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
Adj. Flow (vph)	55	304	332	28	130	40	187	628	0	87	587	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	55	304	332	28	130	40	187	628	0	87	587	27
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Perm	NA	Perm
Protected Phases	4	4		8	8		5	2			6	
Permitted Phases			4			8			2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	11.0	33.0	33.0	22.0	22.0	22.0
Total Split (%)	28.0%	28.0%	28.0%	28.0%	28.0%	28.0%	14.7%	44.0%	44.0%	29.3%	29.3%	29.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	Max	Max	Max
Act Effct Green (s)	11.9	11.9	11.9	8.8	8.8	8.8	6.2	28.8		17.5	17.5	17.5
Actuated g/C Ratio	0.19	0.19	0.19	0.14	0.14	0.14	0.10	0.46		0.28	0.28	0.28
v/c Ratio	0.16	0.45	0.58	0.11	0.26	0.11	0.55	0.38		0.40	0.59	0.05
Control Delay	23.7	25.3	7.8	25.7	26.5	0.6	36.9	13.9		28.9	24.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	23.7	25.3	7.8	25.7	26.5	0.6	36.9	13.9		28.9	24.3	0.2
LOS	C	C	A	C	C	A	D	B		C	C	A
Approach Delay		16.8			21.2			19.2			23.9	
Approach LOS		B			C			B			C	
90th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	6.0	28.0	28.0	17.0	17.0	17.0
90th %ile Term Code	Max	Max	Max	Ped	Ped	Ped	Max	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	14.7	14.7	14.7	8.6	8.6	8.6	6.0	28.0	28.0	17.0	17.0	17.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	12.5	12.5	12.5	7.7	7.7	7.7	6.0	28.0	28.0	17.0	17.0	17.0
50th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	10.3	10.3	10.3	6.9	6.9	6.9	6.0	28.0	28.0	17.0	17.0	17.0
30th %ile Term Code	Gap	Gap	Gap	Gap	Gap	Gap	Max	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	7.2	7.2	7.2	0.0	0.0	0.0	6.0	28.0	28.0	17.0	17.0	17.0
10th %ile Term Code	Gap	Gap	Gap	Skip	Skip	Skip	Max	MaxR	MaxR	MaxR	MaxR	MaxR
Queue Length 50th (m)	5.4	16.5	0.0	3.0	7.4	0.0	11.0	24.7		8.3	31.4	0.0
Queue Length 95th (m)	15.2	30.5	19.1	9.3	14.7	0.0	#26.5	48.8		24.7	57.5	0.0
Internal Link Dist (m)		342.9			381.9			315.9			251.6	
Turn Bay Length (m)	100.0		100.0	80.0		100.0	100.0			100.0		100.0
Base Capacity (vph)	470	939	663	470	939	548	341	1644		217	998	572
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	0.12	0.32	0.50	0.06	0.14	0.07	0.55	0.38		0.40	0.59	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 75			
Actuated Cycle Length: 62			
Natural Cycle: 75			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 20.0		Intersection LOS: C	
Intersection Capacity Utilization 49.6%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 75			
70th %ile Actuated Cycle: 66.3			
50th %ile Actuated Cycle: 63.2			
30th %ile Actuated Cycle: 60.2			
10th %ile Actuated Cycle: 45.2			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Zimmerman Road & Connector Road



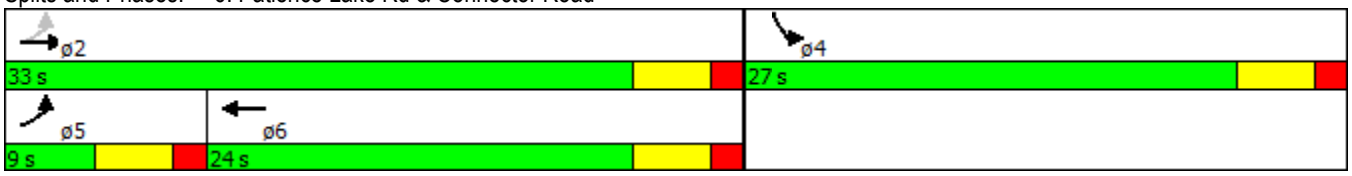


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	51	424	151	132	306	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			80.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	50.0				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.438				0.950	
Satd. Flow (perm)	816	3539	3539	1583	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				143		59
Link Speed (k/h)		50	50		50	
Link Distance (m)		266.5	263.3		405.9	
Travel Time (s)		19.2	19.0		29.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	461	164	143	333	59
Shared Lane Traffic (%)						
Lane Group Flow (vph)	55	461	164	143	333	59
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		4	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	21.0	21.0		21.0	
Total Split (s)	9.0	33.0	24.0		27.0	
Total Split (%)	15.0%	55.0%	40.0%		45.0%	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.5	1.5	1.5		1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	None	None		Max	
Act Effct Green (s)	13.5	13.5	10.4	46.1	22.4	46.1
Actuated g/C Ratio	0.29	0.29	0.23	1.00	0.49	1.00
v/c Ratio	0.17	0.44	0.21	0.09	0.39	0.04
Control Delay	11.9	14.0	16.1	0.1	11.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	14.0	16.1	0.1	11.1	0.0
LOS	B	B	B	A	B	A
Approach Delay		13.7	8.6		9.4	
Approach LOS		B	A		A	
90th %ile Green (s)	4.0	25.0	16.0		22.0	
90th %ile Term Code	Max	Hold	Ped		MaxR	
70th %ile Green (s)	4.0	17.3	8.3		22.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
70th %ile Term Code	Max	Hold	Gap		MaxR	
50th %ile Green (s)	0.0	10.6	10.6		22.0	
50th %ile Term Code	Skip	Gap	Hold		MaxR	
30th %ile Green (s)	0.0	9.5	9.5		22.0	
30th %ile Term Code	Skip	Gap	Hold		MaxR	
10th %ile Green (s)	0.0	8.0	8.0		22.0	
10th %ile Term Code	Skip	Gap	Hold		MaxR	
Queue Length 50th (m)	3.1	15.3	4.9	0.0	12.6	0.0
Queue Length 95th (m)	8.1	23.7	12.6	0.0	44.4	0.0
Internal Link Dist (m)		242.5	239.3		381.9	
Turn Bay Length (m)	80.0			80.0		
Base Capacity (vph)	323	2187	1484	1583	859	1583
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	0.17	0.21	0.11	0.09	0.39	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 46.1			
Natural Cycle: 55			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.44			
Intersection Signal Delay: 11.0		Intersection LOS: B	
Intersection Capacity Utilization 37.0%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 57			
70th %ile Actuated Cycle: 49.3			
50th %ile Actuated Cycle: 42.6			
30th %ile Actuated Cycle: 41.5			
10th %ile Actuated Cycle: 40			

Splits and Phases: 6: Patience Lake Rd & Connector Road

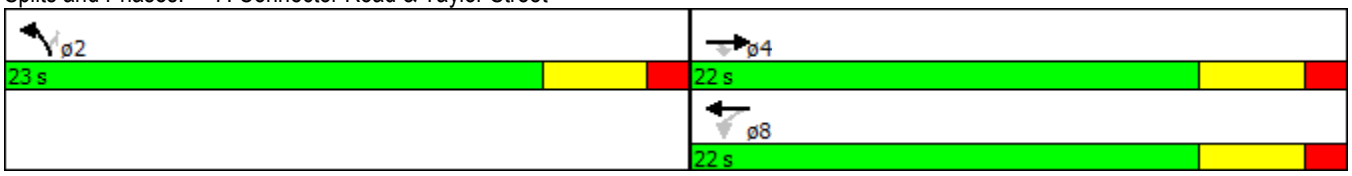


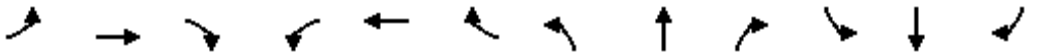
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	343	255	152	316	177	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		100.0	100.0		0.0	50.0
Storage Lanes		1	1		2	1
Taper Length (m)			80.0		80.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted			0.530		0.950	
Satd. Flow (perm)	3539	1583	987	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		277				190
Link Speed (k/h)	50			50	50	
Link Distance (m)	1318.4			508.0	275.0	
Travel Time (s)	94.9			36.6	19.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	373	277	165	343	192	190
Shared Lane Traffic (%)						
Lane Group Flow (vph)	373	277	165	343	192	190
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	8	8	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	22.0	22.0	22.0	22.0	23.0	23.0
Total Split (%)	48.9%	48.9%	48.9%	48.9%	51.1%	51.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	None	None	Max	Max
Act Effct Green (s)	12.1	12.1	12.1	12.1	18.2	18.2
Actuated g/C Ratio	0.30	0.30	0.30	0.30	0.45	0.45
v/c Ratio	0.35	0.41	0.56	0.32	0.12	0.23
Control Delay	11.6	3.9	19.4	11.4	7.9	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.6	3.9	19.4	11.4	7.9	2.8
LOS	B	A	B	B	A	A
Approach Delay	8.3			14.0	5.4	
Approach LOS	A			B	A	
90th %ile Green (s)	17.0	17.0	17.0	17.0	18.0	18.0
90th %ile Term Code	Hold	Hold	Max	Max	MaxR	MaxR
70th %ile Green (s)	16.5	16.5	16.5	16.5	18.0	18.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
70th %ile Term Code	Hold	Hold	Gap	Gap	MaxR	MaxR
50th %ile Green (s)	12.6	12.6	12.6	12.6	18.0	18.0
50th %ile Term Code	Hold	Hold	Gap	Gap	MaxR	MaxR
30th %ile Green (s)	9.1	9.1	9.1	9.1	18.0	18.0
30th %ile Term Code	Gap	Gap	Gap	Gap	MaxR	MaxR
10th %ile Green (s)	6.8	6.8	6.8	6.8	18.0	18.0
10th %ile Term Code	Gap	Gap	Hold	Hold	MaxR	MaxR
Queue Length 50th (m)	10.1	0.0	9.2	9.3	3.7	0.0
Queue Length 95th (m)	17.3	10.2	21.9	16.0	9.0	8.1
Internal Link Dist (m)	1294.4			484.0	251.0	
Turn Bay Length (m)		100.0	100.0			50.0
Base Capacity (vph)	1503	831	419	1503	1545	816
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	0.25	0.33	0.39	0.23	0.12	0.23

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 40.4			
Natural Cycle: 45			
Control Type: Semi Act-Uncoord			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 9.4		Intersection LOS: A	
Intersection Capacity Utilization 35.5%		ICU Level of Service A	
Analysis Period (min) 15			
90th %ile Actuated Cycle: 45			
70th %ile Actuated Cycle: 44.5			
50th %ile Actuated Cycle: 40.6			
30th %ile Actuated Cycle: 37.1			
10th %ile Actuated Cycle: 34.8			

Splits and Phases: 7: Connector Road & Taylor Street



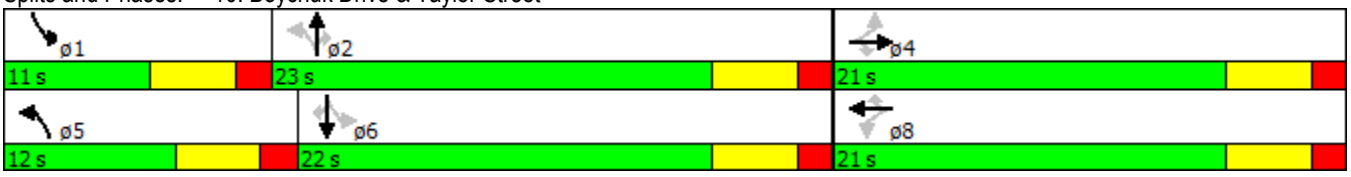


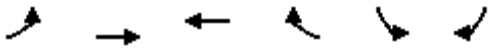
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	364	143	65	587	331	242	436	29	227	528	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	950
Flt Permitted	0.302			0.515			0.355			0.481		
Satd. Flow (perm)	563	3539	1583	959	3539	1583	661	3539	1583	896	3539	950
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			360			139			139
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		575.1			1318.4			1152.3			504.5	
Travel Time (s)		41.4			94.9			83.0			36.3	
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
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	100
Adj. Flow (vph)	50	396	155	71	638	360	263	474	32	247	574	112
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	396	155	71	638	360	263	474	32	247	574	112
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	12.0	23.0	23.0	11.0	22.0	22.0
Total Split (%)	38.2%	38.2%	38.2%	38.2%	38.2%	38.2%	21.8%	41.8%	41.8%	20.0%	40.0%	40.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	15.0	15.0	15.0	15.0	15.0	15.0	24.9	18.0	18.0	23.1	17.1	17.1
Actuated g/C Ratio	0.28	0.28	0.28	0.28	0.28	0.28	0.46	0.33	0.33	0.43	0.32	0.32
v/c Ratio	0.32	0.40	0.28	0.27	0.65	0.52	0.59	0.40	0.05	0.51	0.51	0.28
Control Delay	21.9	17.2	4.8	18.2	20.7	5.2	13.6	15.4	0.2	12.2	17.4	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	17.2	4.8	18.2	20.7	5.2	13.6	15.4	0.2	12.2	17.4	4.4
LOS	C	B	A	B	C	A	B	B	A	B	B	A
Approach Delay		14.4			15.3			14.2			14.4	
Approach LOS		B			B			B			B	
90th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
70th %ile Term Code	Hold	Hold	Hold	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR
50th %ile Green (s)	16.0	16.0	16.0	16.0	16.0	16.0	7.0	18.0	18.0	6.0	17.0	17.0
50th %ile Term Code	Hold	Hold	Hold	Max	Max	Max	Max	MaxR	MaxR	Max	MaxR	MaxR
30th %ile Green (s)	15.8	15.8	15.8	15.8	15.8	15.8	7.0	18.0	18.0	6.0	17.0	17.0
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap	Gap	Max	MaxR	MaxR	Max	MaxR	MaxR
10th %ile Green (s)	11.4	11.4	11.4	11.4	11.4	11.4	6.7	18.0	18.0	6.0	17.3	17.3
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap	Gap	Gap	MaxR	MaxR	Max	Hold	Hold
Queue Length 50th (m)	3.8	16.3	0.0	5.4	28.5	0.0	13.1	18.8	0.0	12.1	24.4	0.0
Queue Length 95th (m)	11.8	26.2	10.2	13.9	42.8	15.2	24.2	29.4	0.0	22.6	37.0	6.6
Internal Link Dist (m)		551.1			1294.4			1128.3			480.5	
Turn Bay Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Base Capacity (vph)	166	1049	578	284	1049	722	449	1180	620	480	1118	395
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.38	0.27	0.25	0.61	0.50	0.59	0.40	0.05	0.51	0.51	0.28

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 54	
Natural Cycle: 55	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 14.6	Intersection LOS: B
Intersection Capacity Utilization 64.2%	ICU Level of Service C
Analysis Period (min) 15	
90th %ile Actuated Cycle: 55	
70th %ile Actuated Cycle: 55	
50th %ile Actuated Cycle: 55	
30th %ile Actuated Cycle: 54.8	
10th %ile Actuated Cycle: 50.4	

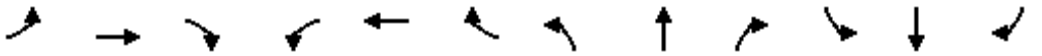
Splits and Phases: 10: Boychuk Drive & Taylor Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	190	250	250	10	6	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	60.0				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.995			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1853	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1853	0	1770	1583
Link Speed (k/h)		48	48		48	
Link Distance (m)		144.1	180.2		239.5	
Travel Time (s)		10.8	13.5		18.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	272	272	11	7	130
Shared Lane Traffic (%)						
Lane Group Flow (vph)	207	272	283	0	7	130
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.6%		ICU Level of Service A	
Analysis Period (min) 15			



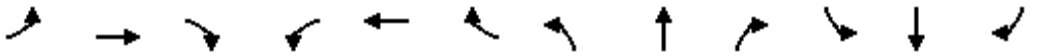
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1241	345	5	10	421	269	60	19	2	248	10	988
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	120.0		80.0	120.0		120.0	0.0		0.0	0.0		0.0
Storage Lanes	2		1	0		1	0		1	1		1
Taper Length (m)	100.0			2.5			2.5			2.5		
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950				0.999			0.964		0.950		
Satd. Flow (prot)	3433	3539	1583	0	3536	1583	0	1796	1583	1770	1863	1583
Flt Permitted	0.950				0.940			0.772		0.534		
Satd. Flow (perm)	3433	3539	1583	0	3327	1583	0	1438	1583	995	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			76			292			131			765
Link Speed (k/h)		100			100			60			60	
Link Distance (m)		651.2			697.6			422.8			433.7	
Travel Time (s)		23.4			25.1			25.4			26.0	
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
Adj. Flow (vph)	1349	375	5	11	458	292	65	21	2	270	11	1074
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1349	375	5	0	469	292	0	86	2	270	11	1074
Turn Type	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Free
Protected Phases	7	4			8			2		1	6	
Permitted Phases			4	8		8	2		2	6		Free
Detector Phase	7	4	4	8	8	8	2	2	2	1	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	
Total Split (s)	45.0	68.0	68.0	23.0	23.0	23.0	21.0	21.0	21.0	11.0	32.0	
Total Split (%)	45.0%	68.0%	68.0%	23.0%	23.0%	23.0%	21.0%	21.0%	21.0%	11.0%	32.0%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	
Lead/Lag	Lead			Lag	Lag	Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	None	None	C-Max	C-Max	C-Max	None	C-Max	
Act Effct Green (s)	40.0	62.3	62.3		17.3	17.3		16.0	16.0	27.7	27.7	100.0
Actuated g/C Ratio	0.40	0.62	0.62		0.17	0.17		0.16	0.16	0.28	0.28	1.00
v/c Ratio	0.98	0.17	0.00		0.82	0.57		0.37	0.01	0.83	0.02	0.68
Control Delay	51.0	8.1	0.0		52.2	9.1		42.9	0.0	54.9	33.2	6.4
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Delay	51.0	8.1	0.0		52.2	9.1		42.9	0.0	54.9	33.2	6.4
LOS	D	A	A		D	A		D	A	D	C	A
Approach Delay		41.5			35.6			41.9			16.3	
Approach LOS		D			D			D			B	
90th %ile Green (s)	40.0	63.0	63.0	18.0	18.0	18.0	16.0	16.0	16.0	6.0	27.0	
90th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
70th %ile Green (s)	40.0	63.0	63.0	18.0	18.0	18.0	16.0	16.0	16.0	6.0	27.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
50th %ile Green (s)	40.0	63.0	63.0	18.0	18.0	18.0	16.0	16.0	16.0	6.0	27.0	
50th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
30th %ile Green (s)	40.0	63.0	63.0	18.0	18.0	18.0	16.0	16.0	16.0	6.0	27.0	
30th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Coord	Coord	Coord	Max	Coord	
10th %ile Green (s)	40.0	59.6	59.6	14.6	14.6	14.6	16.0	16.0	16.0	9.4	30.4	
10th %ile Term Code	Max	Hold	Hold	Gap	Gap	Gap	Coord	Coord	Coord	Max	Coord	
Queue Length 50th (m)	130.7	14.4	0.0		46.1	0.0		15.1	0.0	54.8	1.7	81.3
Queue Length 95th (m)	#178.6	20.5	0.0		#67.3	21.8		29.7	0.0	m61.8	m2.4	m55.0
Internal Link Dist (m)		627.2			673.6			398.8			409.7	
Turn Bay Length (m)	120.0		80.0			120.0						
Base Capacity (vph)	1373	2229	1025		598	524		230	363	327	516	1583
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	0.98	0.17	0.00		0.78	0.56		0.37	0.01	0.83	0.02	0.68

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 31.7 Intersection LOS: C
Intersection Capacity Utilization 80.2% ICU Level of Service D
Analysis Period (min) 15
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.

Splits and Phases: 1: Highway 16



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	92	152	252	447	152	158	447	950	613	74	1037	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		0.0	0.0		100.0	100.0		0.0	100.0		100.0
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (m)	2.5			80.0			80.0			80.0		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.495			0.950			0.950			0.277		
Satd. Flow (perm)	922	1863	1583	3433	1863	1583	3433	3539	1583	516	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			274			148			485			240
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		466.0			266.5			433.7			339.9	
Travel Time (s)		33.6			19.2			26.0			20.4	
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
Adj. Flow (vph)	100	165	274	486	165	172	486	1033	666	80	1127	139
Shared Lane Traffic (%)												
Lane Group Flow (vph)	100	165	274	486	165	172	486	1033	666	80	1127	139
Turn Type	pm+pt	NA	Free	Prot	NA	Perm	Prot	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		Free			8			Free	6		Free
Detector Phase	7	4		3	8	8	5	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0	21.0	10.0	21.0		21.0	21.0	
Total Split (s)	14.0	21.0		22.0	29.0	29.0	19.0	57.0		38.0	38.0	
Total Split (%)	14.0%	21.0%		22.0%	29.0%	29.0%	19.0%	57.0%		38.0%	38.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lead		Lag	Lead	Lead	Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes			Yes	Yes	
Recall Mode	None	None		None	None	None	None	C-Max		C-Max	C-Max	
Act Effct Green (s)	27.8	13.4	100.0	17.1	18.3	18.3	15.8	54.5	100.0	33.6	33.6	100.0
Actuated g/C Ratio	0.28	0.13	1.00	0.17	0.18	0.18	0.16	0.54	1.00	0.34	0.34	1.00
v/c Ratio	0.27	0.66	0.17	0.83	0.49	0.42	0.90	0.54	0.42	0.46	0.95	0.09
Control Delay	25.3	53.8	0.2	53.2	43.0	12.0	46.6	23.4	0.7	30.4	38.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	53.8	0.2	53.2	43.0	12.0	46.6	23.4	0.7	30.4	38.6	0.1
LOS	C	D	A	D	D	B	D	C	A	C	D	A
Approach Delay		21.3			42.6			21.7			34.1	
Approach LOS		C			D			C			C	
90th %ile Green (s)	12.8	16.0		17.0	20.2	20.2	14.0	52.0		33.0	33.0	
90th %ile Term Code	Hold	Max		Max	Gap	Gap	Max	Coord		Coord	Coord	
70th %ile Green (s)	16.8	16.0		17.0	16.2	16.2	14.0	52.0		33.0	33.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Max		Max	Gap	Gap	Max	Coord		Coord	Coord	
50th %ile Green (s)	18.9	14.1		18.9	14.1	14.1	14.0	52.0		33.0	33.0	
50th %ile Term Code	Hold	Gap		Max	Gap	Gap	Max	Coord		Coord	Coord	
30th %ile Green (s)	17.8	12.0		17.8	12.0	12.0	17.2	55.2		33.0	33.0	
30th %ile Term Code	Hold	Gap		Gap	Gap	Gap	Max	Coord		Coord	Coord	
10th %ile Green (s)	0.0	8.9		14.9	28.8	28.8	20.0	61.2		36.2	36.2	
10th %ile Term Code	Skip	Gap		Gap	Hold	Hold	Gap	Coord		Coord	Coord	
Queue Length 50th (m)	12.5	30.5	0.0	46.2	30.5	4.1	~52.6	100.5	0.0	9.7	76.2	0.0
Queue Length 95th (m)	23.5	50.5	0.0	#71.5	47.7	20.9	m#65.4	m110.7	m0.0	m15.0	#149.0	m0.0
Internal Link Dist (m)		442.0			242.5			409.7			315.9	
Turn Bay Length (m)	100.0					100.0	100.0			100.0		100.0
Base Capacity (vph)	390	298	1583	602	465	506	543	1928	1583	173	1190	1583
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.55	0.17	0.81	0.35	0.34	0.90	0.54	0.42	0.46	0.95	0.09

Intersection Summary

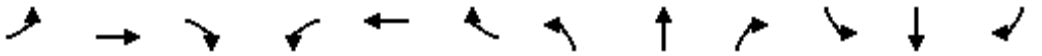
Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 28.6 Intersection LOS: C
Intersection Capacity Utilization 78.8% ICU Level of Service D
Analysis Period (min) 15

~ 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.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Zimmerman Road & Rosewood Blvd East



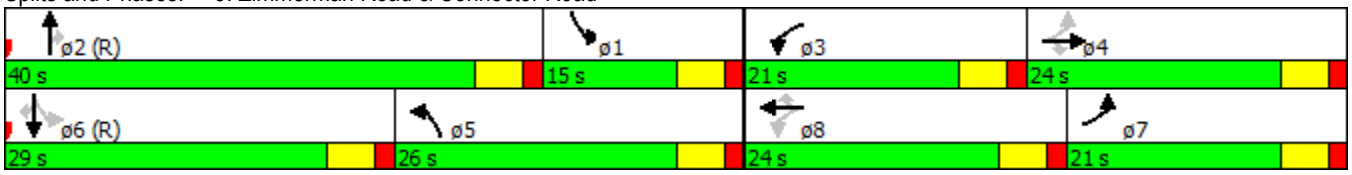
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	565	450	179	452	153	511	557	132	162	605	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (m)	80.0			80.0			100.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.500			0.500			0.950			0.274		
Satd. Flow (perm)	931	3539	1583	931	3539	1583	3433	3539	1583	510	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			396			185			143			185
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		366.9			405.9			339.9			275.6	
Travel Time (s)		26.4			29.2			20.4			16.5	
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
Adj. Flow (vph)	70	614	489	195	491	166	555	605	143	176	658	74
Shared Lane Traffic (%)												
Lane Group Flow (vph)	70	614	489	195	491	166	555	605	143	176	658	74
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2	6		6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	21.0	24.0	24.0	21.0	24.0	24.0	26.0	40.0	40.0	15.0	29.0	29.0
Total Split (%)	21.0%	24.0%	24.0%	21.0%	24.0%	24.0%	26.0%	40.0%	40.0%	15.0%	29.0%	29.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	20.3	20.3	20.3	21.8	21.8	21.8	19.9	37.0	37.0	34.8	26.0	26.0
Actuated g/C Ratio	0.20	0.20	0.20	0.22	0.22	0.22	0.20	0.37	0.37	0.35	0.26	0.26
v/c Ratio	0.23	0.85	0.77	0.61	0.64	0.34	0.81	0.46	0.21	0.61	0.72	0.14
Control Delay	36.8	51.7	17.4	45.2	41.0	6.1	39.2	10.4	0.9	33.4	39.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.8	51.7	17.4	45.2	41.0	6.1	39.2	10.4	0.9	33.4	39.5	0.5
LOS	D	D	B	D	D	A	D	B	A	C	D	A
Approach Delay		36.5			35.2			21.6			35.2	
Approach LOS		D			D			C			D	
90th %ile Green (s)	16.0	19.0	19.0	16.0	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0
90th %ile Term Code	Ped	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	16.0	19.0	19.0	16.0	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0

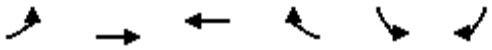
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	16.0	19.5	19.5	15.5	19.0	19.0	21.0	35.0	35.0	10.0	24.0	24.0
50th %ile Term Code	Hold	Max	Max	Gap	Max	Max	Max	Coord	Coord	Hold	Coord	Coord
30th %ile Green (s)	18.9	24.0	24.0	12.8	17.9	17.9	19.2	35.0	35.0	8.2	24.0	24.0
30th %ile Term Code	Hold	Max	Max	Gap	Gap	Gap	Gap	Coord	Coord	Hold	Coord	Coord
10th %ile Green (s)	0.0	20.2	20.2	8.9	34.1	34.1	17.1	44.8	44.8	6.1	33.8	33.8
10th %ile Term Code	Skip	Gap	Gap	Gap	Hold	Hold	Hold	Coord	Coord	Gap	Coord	Coord
Queue Length 50th (m)	11.5	61.5	15.5	34.7	47.4	0.0	57.5	14.9	0.0	18.2	62.8	0.0
Queue Length 95th (m)	23.7	#93.2	#64.3	57.2	65.0	13.2	75.3	20.2	0.5	30.4	83.0	0.0
Internal Link Dist (m)		342.9			381.9			315.9			251.6	
Turn Bay Length (m)	100.0		100.0	80.0		100.0	100.0		100.0	100.0		100.0
Base Capacity (vph)	328	719	637	337	779	492	720	1307	675	309	918	547
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.85	0.77	0.58	0.63	0.34	0.77	0.46	0.21	0.57	0.72	0.14

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 31.4 Intersection LOS: C
Intersection Capacity Utilization 73.5% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Zimmerman Road & Connector Road



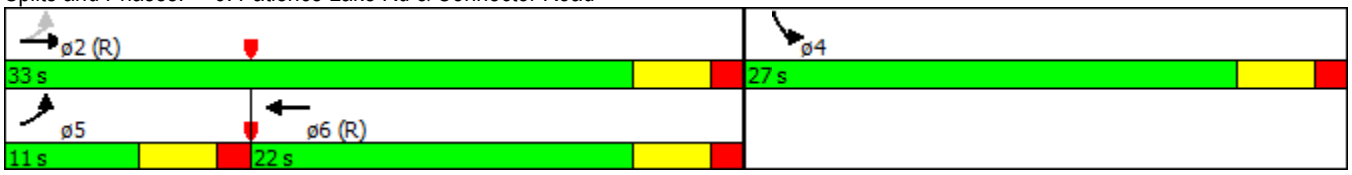


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	212	627	400	572	502	357
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			80.0	0.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	50.0				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.357				0.950	
Satd. Flow (perm)	665	3539	3539	1583	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				622		388
Link Speed (k/h)		50	50		50	
Link Distance (m)		266.5	263.3		405.9	
Travel Time (s)		19.2	19.0		29.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	230	682	435	622	546	388
Shared Lane Traffic (%)						
Lane Group Flow (vph)	230	682	435	622	546	388
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		4	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		4	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	21.0	21.0		21.0	
Total Split (s)	11.0	33.0	22.0		27.0	
Total Split (%)	18.3%	55.0%	36.7%		45.0%	
Yellow Time (s)	3.5	3.5	3.5		3.5	
All-Red Time (s)	1.5	1.5	1.5		1.5	
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	
Total Lost Time (s)	5.0	5.0	5.0		5.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max		Max	
Act Effct Green (s)	28.0	28.0	17.0	60.0	22.0	60.0
Actuated g/C Ratio	0.47	0.47	0.28	1.00	0.37	1.00
v/c Ratio	0.55	0.41	0.43	0.39	0.84	0.25
Control Delay	15.5	11.5	19.2	0.7	32.1	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.5	11.5	19.2	0.7	32.1	0.4
LOS	B	B	B	A	C	A
Approach Delay		12.5	8.3		18.9	
Approach LOS		B	A		B	
90th %ile Green (s)	6.0	28.0	17.0		22.0	
90th %ile Term Code	Max	Coord	Coord		MaxR	
70th %ile Green (s)	6.0	28.0	17.0		22.0	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
70th %ile Term Code	Max	Coord	Coord		MaxR	
50th %ile Green (s)	6.0	28.0	17.0		22.0	
50th %ile Term Code	Max	Coord	Coord		MaxR	
30th %ile Green (s)	6.0	28.0	17.0		22.0	
30th %ile Term Code	Max	Coord	Coord		MaxR	
10th %ile Green (s)	6.0	28.0	17.0		22.0	
10th %ile Term Code	Max	Coord	Coord		MaxR	
Queue Length 50th (m)	14.5	24.4	20.4	0.0	53.4	0.0
Queue Length 95th (m)	26.7	35.5	31.5	0.0	#103.1	0.0
Internal Link Dist (m)		242.5	239.3		381.9	
Turn Bay Length (m)	80.0			80.0		
Base Capacity (vph)	420	1651	1002	1583	649	1583
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	0.55	0.41	0.43	0.39	0.84	0.25

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 13.1	Intersection LOS: B
Intersection Capacity Utilization 63.1%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 6: Patience Lake Rd & Connector Road



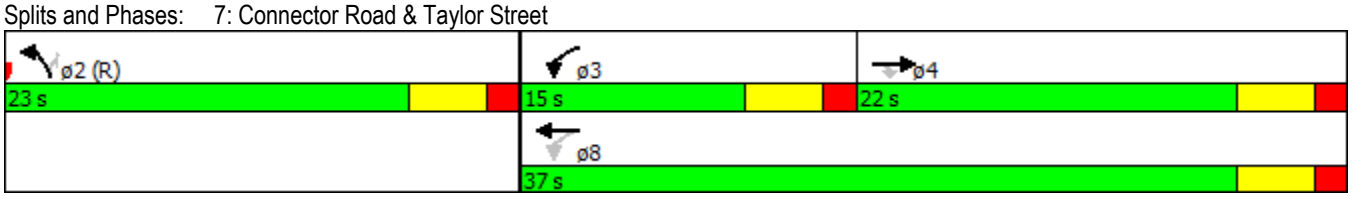
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	343	548	355	346	576	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)		100.0	100.0		0.0	50.0
Storage Lanes		1	1		2	1
Taper Length (m)			80.0		80.0	
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	3539	1583	1770	3539	3433	1583
Flt Permitted			0.376		0.950	
Satd. Flow (perm)	3539	1583	700	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		596				312
Link Speed (k/h)	50			50	50	
Link Distance (m)	1318.4			508.0	275.0	
Travel Time (s)	94.9			36.6	19.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	373	596	386	376	626	312
Shared Lane Traffic (%)						
Lane Group Flow (vph)	373	596	386	376	626	312
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases		4	8			2
Detector Phase	4	4	3	8	2	2
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	10.0	21.0	21.0	21.0
Total Split (s)	22.0	22.0	15.0	37.0	23.0	23.0
Total Split (%)	36.7%	36.7%	25.0%	61.7%	38.3%	38.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	14.3	14.3	29.3	29.3	20.7	20.7
Actuated g/C Ratio	0.24	0.24	0.49	0.49	0.34	0.34
v/c Ratio	0.44	0.72	0.74	0.22	0.53	0.42
Control Delay	20.6	7.5	20.0	8.7	18.5	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.6	7.5	20.0	8.7	18.5	4.3
LOS	C	A	C	A	B	A
Approach Delay	12.6			14.4	13.8	
Approach LOS	B			B	B	
90th %ile Green (s)	17.0	17.0	10.0	32.0	18.0	18.0
90th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
70th %ile Green (s)	17.0	17.0	10.0	32.0	18.0	18.0

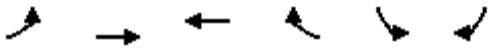
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
70th %ile Term Code	Max	Max	Max	Hold	Coord	Coord
50th %ile Green (s)	15.1	15.1	10.0	30.1	19.9	19.9
50th %ile Term Code	Gap	Gap	Max	Hold	Coord	Coord
30th %ile Green (s)	13.0	13.0	10.0	28.0	22.0	22.0
30th %ile Term Code	Gap	Gap	Max	Hold	Coord	Coord
10th %ile Green (s)	9.3	9.3	10.0	24.3	25.7	25.7
10th %ile Term Code	Gap	Gap	Max	Hold	Coord	Coord
Queue Length 50th (m)	18.0	0.0	24.9	11.1	28.4	0.0
Queue Length 95th (m)	27.2	20.1	#42.3	16.3	44.3	14.6
Internal Link Dist (m)	1294.4			484.0	251.0	
Turn Bay Length (m)		100.0	100.0			50.0
Base Capacity (vph)	1002	875	519	1887	1185	751
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.68	0.74	0.20	0.53	0.42

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 61.9% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Connector Road & Taylor Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	380	250	250	20	5	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	60.0				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.990			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1844	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1844	0	1770	1583
Link Speed (k/h)		48	48		48	
Link Distance (m)		157.3	172.3		214.6	
Travel Time (s)		11.8	12.9		16.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	413	272	272	22	5	57
Shared Lane Traffic (%)						
Lane Group Flow (vph)	413	272	294	0	5	57
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.8%		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												
Volume (vph)	72	909	338	21	768	432	198	603	40	521	548	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	80.0			80.0			80.0			80.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	950
Flt Permitted	0.143			0.175			0.427			0.175		
Satd. Flow (perm)	266	3539	1583	326	3539	1583	795	3539	1583	326	3539	950
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			367			470			206			145
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		575.1			1318.4			1152.3			504.5	
Travel Time (s)		41.4			94.9			83.0			36.3	
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
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	100
Adj. Flow (vph)	78	988	367	23	835	470	215	655	43	566	596	86
Shared Lane Traffic (%)												
Lane Group Flow (vph)	78	988	367	23	835	470	215	655	43	566	596	86
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	10.0	21.0	21.0	21.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	21.0
Total Split (s)	10.0	37.0	37.0	27.0	27.0	27.0	16.0	23.0	23.0	30.0	37.0	37.0
Total Split (%)	11.1%	41.1%	41.1%	30.0%	30.0%	30.0%	17.8%	25.6%	25.6%	33.3%	41.1%	41.1%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	30.9	30.9	30.9	22.9	22.9	22.9	28.8	18.7	18.7	49.1	34.0	34.0
Actuated g/C Ratio	0.34	0.34	0.34	0.25	0.25	0.25	0.32	0.21	0.21	0.55	0.38	0.38
v/c Ratio	0.45	0.81	0.47	0.28	0.93	0.62	0.59	0.89	0.09	0.97	0.45	0.19
Control Delay	28.0	33.0	4.5	38.2	50.9	7.0	21.2	51.2	0.3	54.9	22.9	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.0	33.0	4.5	38.2	50.9	7.0	21.2	51.2	0.3	54.9	22.9	1.7
LOS	C	C	A	D	D	A	C	D	A	D	C	A
Approach Delay		25.4			35.1			41.7			35.9	
Approach LOS		C			D			D			D	
90th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
90th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
70th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	11.0	18.0	18.0	25.0	32.0	32.0
50th %ile Term Code	Max	Max	Max	Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	5.0	32.0	32.0	22.0	22.0	22.0	9.8	18.0	18.0	25.0	33.2	33.2
30th %ile Term Code	Max	Hold	Hold	Max	Max	Max	Gap	Coord	Coord	Max	Coord	Coord
10th %ile Green (s)	0.0	26.7	26.7	26.7	26.7	26.7	7.6	21.7	21.7	26.6	40.7	40.7
10th %ile Term Code	Skip	Gap	Gap	Hold	Hold	Hold	Gap	Coord	Coord	Gap	Coord	Coord
Queue Length 50th (m)	9.0	79.2	0.0	3.3	75.3	0.0	18.6	58.8	0.0	80.4	41.4	0.0
Queue Length 95th (m)	18.4	102.8	17.2	10.8	#112.7	23.9	31.0	#90.8	0.0	#147.4	56.4	2.1
Internal Link Dist (m)		551.1			1294.4			1128.3			480.5	
Turn Bay Length (m)	80.0		80.0	70.0		70.0	80.0		60.0	120.0		60.0
Base Capacity (vph)	175	1258	799	82	902	754	382	736	492	583	1336	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.79	0.46	0.28	0.93	0.62	0.56	0.89	0.09	0.97	0.45	0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 33.7		Intersection LOS: C	
Intersection Capacity Utilization 90.7%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 10: Boychuk Drive & Taylor Street

APPENDIX 4 – SimTraffic Queuing Report

Intersection: 21: Patience Lake Rd & Acess Road

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (m)	21.7	2.8	9.0	22.3
Average Queue (m)	8.5	0.1	1.5	10.6
95th Queue (m)	18.1	1.4	6.8	17.5
Link Distance (m)		173.5	232.2	232.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	80.0			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

Intersection: 9: Patience Lake Rd & Access Road

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (m)	19.0	5.3	11.7
Average Queue (m)	12.3	1.6	6.9
95th Queue (m)	22.9	7.0	14.6
Link Distance (m)		207.1	207.1
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)	80.0		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 0

City of Saskatoon

Transportation & Utilities Department
222 3rd Avenue North
Saskatoon SK S7K 0J5

www.saskatoon.ca
tel (306) 975-2454
fax (306) 975-2971

October 7, 2015
File No. 6332-26

David Watt
PCL Construction Management Inc.
3120 Faithful Avenue
Saskatoon SK S7K 8H3

Dear Mr. Watt:

Re: Misbah Site Development TIA

Thank you for your submission of the Traffic Impact Study (TIS) for this project.

After completing the review of your TIS we are accepting it as submitted; however, for future reference please note the following:

- In general, it is our practice to avoid lagging left turns.
- Each signalized intersection cycle length is too short:
  - Pedestrian crossing times do not appear to be adequately incorporated into the signal timing plans;
  - Our typical left turn green is at least 15 seconds.

Thank you.

Sincerely,

David W. LeBoutillier, P.Eng.
Planning & Design Engineer, Transportation
david.leboutillier@saskatoon.ca
306-975-1451

DL:tm

cc: Valerie Hardy, Land Development Coordinator, Construction & Design Division
Nathan Gray, MMM Group, 175, 1810 - 8th Street East, Saskatoon, SK S7H 0T6

JM

David Watt

From: Parisien, Jordan HI <jordan.parisien@gov.sk.ca>
Sent: Friday, October 09, 2015 10:33 AM
To: David Watt
Cc: marina.melchiorre@saskatoon.ca; david.leboutillier@saskatoon.ca; Brisebois, Jacquelyn HI
Subject: Saskatoon Misbah School - TIA Final Report

David,

Thank you for providing the Ministry with the Misbah Site Development TIA. Our office has reviewed the TIA and have the following comments:

1. The TIA references the "Rosewood Concept Plan Traffic Impact Study Report" as a major input into the development of the Misbah TIA. Has the Rosewood report been approved?
2. Any new approach to a Ministry roadway requires a permit from our office. If direct access is permitted to a Ministry owned roadway, the Ministry's normal practice allows for a single access from the roadway.
3. The report indicates that a channelized intersection is warranted and a flared intersection treatment is recommended. Sufficient justification to build a flared intersection treatment instead of a channelized intersection treatment has not been provided. Please include the completed warrants for the intersection improvements.
4. The report indicates that if two accesses are permitted, the west access would operate as a right-in/right-out intersection. What measures will be taken to ensure that the drivers will only use the access as a right-in/right-out access (i.e. what will prevent eastbound drivers from turning left off of Patience Lake Road)?
5. The report states that it is anticipated that widening will occur on Patience Lake Road in the future. The Ministry currently has no plans to make improvements to this section of Patience Lake Road.
6. Are there any requirements for approach lighting or intersection lighting? Please reference the Ministry's warrants for lighting.
7. How will the site generated traffic impact the at-grade rail crossing? Does the proposed layout conform to the railway crossing regulations and are upgrades required to the crossing as a result of this development?

If you have any questions regarding the Ministry's comments, please feel free to contact Jacquelyn Brisebois at 306-933-8499.

Regards,

Jordan Parisien, P.Eng., M.Sc.
Government of Saskatchewan
A/Senior Project Manager
Asset Management, Ministry of Highways and Infrastructure

18-3603 Millar Avenue
Saskatoon SK S7P 0B2

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