LETHBRIDGE COUNTY

AGENDA
Council Meeting
9:00 AM - Thursday, April 6, 2023
Council Chambers

Page

A. CALL TO ORDER

B. ADOPTION OF AGENDA

C. ADOPTION OF MINUTES

4 - 9 1. **County Council Meeting Minutes**
Council Meeting - 16 Mar 2023 - Minutes

D. DELEGATIONS

1. **9:15 a.m. - Travis Geremia, SMRID & Jeff Olitch, MPE**

E. SUBDIVISION APPLICATIONS

10 - 18 1. **Subdivision Application #2023-0-013 – Groenenboom Farms - NW1/4 34-09-23-W4M**
Subdivision Application #2023-0-013 – Groenenboom Farms - NW1/4 34-09-23-W4M

19 - 26 2. **Subdivision Application #2023-0-018 Koot - Lot 1, Block 2, Plan 021 0172 within SE1/4 6-10-20-W4M**
Subdivision Application #2023-0-018 Koot - Lot 1, Block 2, Plan 021 0172 within SE1/4 6-10-20-W4M

F. DEPARTMENT REPORTS

F.1. COMMUNITY SERVICES

27 - 716 F.1.1. **Bylaw 23-008 - Amendment to Bylaw 18-012 being the Chinook Industrial Park Area Structure Plan and Bylaw and Bylaw 23-009 - Land Use Bylaw Amendment from Lethbridge Urban Fringe To Rural General Industrial and Business Light Industrial - First Reading**

Town of Picture Butte Council Meet & Greet Invitation

790 - 791 3. **Town of Barrhead - EPR Program Exemption**

Town of Barrhead - EPR Program Exemption

H. COUNTY COUNCIL AND COMMITTEE UPDATES

1. **Rural Municipalities of Alberta Committee Participation - Councillor John Kuerbis**

I. CLOSED SESSION

1. **10:15 a.m. Delegation - Financial Matters (*FOIP Section 16(1) - Disclosure harmful to business interests of a third party & Section 25(1) - Disclosure harmful to economic and other interests of a public body)***
2. **11:00 a.m. Delegation - MPE (*FOIP Section 24(1)(g) - Advice from Officials)***
3. **Water Co-op Discussion - Director of Public Operations (*FOIP 16 - Disclosure harmful to business interests of a third party)***
4. **Request for Contribution Discussion (*FOIP Section 21 - Disclosure harmful to intergovernmental relations)***

J. NEW BUSINESS

K. ADJOURN

MINUTES
Council Meeting

9:00 AM - Thursday, March 16, 2023
Council Chambers

The Council Meeting of Lethbridge County was called to order on Thursday, March 16, 2023, at 9:00 AM, in the Council Chambers, with the following members present:

PRESENT:	Reeve Tory Campbell Deputy Reeve John Kuerbis Councillor Lorne Hickey Councillor Eric Van Essen Councillor Klaas VanderVeen Councillor Morris Zeinstra Interim Chief Administrative Officer, Larry Randle Director of Public Operations, Jeremy Wickson Director of Infrastructure, Devon Thiele Director of Finance & Administration, Jennifer Place Interim Director of Community Services, Hilary Janzen Executive Assistant, Candice Robison Municipal Intern – Finance, Jeremy Vander Meulen

A. CALL TO ORDER

Reeve Tory Campbell called the meeting to order at 9:03 a.m.

Reeve Campbell acknowledged the recent announcement made by McCain to make their largest global investment in their 65-year history in the amount of $600 million to their facility in Lethbridge County that will more than double the size of the facility and workforce. The expansion will create 260 new jobs and two new state-of-the-art production lines which is tremendous news for Lethbridge County and Southern Alberta as a whole.

Reeve Campbell congratulated Fire Services Manager, Byron Fraser for receiving a Queen Elizabeth II Platinum Jubilee Medal. The award is given to citizens of the United Kingdom and Commonwealth countries who have made a significant impact in their communities. Byron has been the County's Fire Services Manager since 2022 and previously served as Chief of the Barons and District Fire Department, where he was a member for 17 years.

B. ADOPTION OF AGENDA

The following item was added to the agenda:

I.1 - Closed Session - Infrastructure Project Discussion (FOIP Section 24 - Advice from Officials)

67-2023	Deputy Reeve Kuerbis	MOVED that the March 16, 2023 Lethbridge County Council Meeting Agenda be adopted as amended. CARRIED

C. ADOPTION OF MINUTES

C.1. ***County Council Meeting Minutes***

68-2023	Councillor Van Essen	MOVED that the March 2, 2023 Lethbridge County Council Minutes be adopted as presented. CARRIED

E. DEPARTMENT REPORTS

E.1. COMMUNITY SERVICES

E.1.1. ***Bylaw 23-002 - Country Crossroads Estate Area Structure Plan and Bylaw 23-003 Land Use Bylaw Amendment (Rural Agriculture to Grouped Country Residential) - First Reading***

69-2023 Councillor Hickey MOVED that Bylaw 23-002 (Country Crossroad Estate ASP) be read a first time.

CARRIED

70-2023 Deputy Reeve Kuerbis MOVED that Bylaw 23-003 (Land Use Bylaw Amendment - RA to GCR) be read a first time.

CARRIED

E.2. CORPORATE SERVICES

E.2.1. ***2023 Bursary and Bursary Ad-Hoc Selection Committee***

71-2023 Councillor VanderVeen MOVED that County Council increase the number of bursary award recipients to three, receiving $1,500 each, with the additional funding to come from the Council Discretionary Reserve.

CARRIED

72-2023 Deputy Reeve Kuerbis MOVED that an Ad Hoc Bursary Selection Committee of three council members be established to review the 2023 bursary applications and that the committee members are Councillor Mark Sayers, Councillor John Kuerbis and Councillor Lorne Hickey.

CARRIED

E.2.2. ***2022 Year End Surplus/Deficit Report***

73-2023 Deputy Reeve Kuerbis MOVED that the reallocation of funds from Restricted Surplus (Reserves) to Unrestricted Surplus be transferred from the Tax Equalization Reserve in the amount of $395,000 to offset the 2022 deficit.

CARRIED

Reeve Campbell recessed the meeting at 9:52 a.m.

Reeve Campbell reconvened the meeting at 10:02 a.m.

D. PUBLIC HEARINGS - 10:00 A.M.

D.1. ***Bylaw 22-021 - Road Closure, Sale and Consolidation- Public Hearing***

Reeve Campbell called a recess to the Council Meeting, for the Public Hearing for Bylaw 22-021 at 10:02 a.m.

74-2023 Councillor Zeinstra MOVED that the Public Hearing for Bylaw 22-021 commence at 10:03 a.m.

CARRIED

The Interim Director of Community Services reviewed the Bylaw.

Reeve Campbell asked if anyone wished to speak in favour or opposition of Bylaw 22-021.

No comments were provided.

75-2023 Deputy Reeve Kuerbis MOVED that the Public Hearing for Bylaw 22-021 adjourn at 10:09 a.m.

CARRIED

Reeve Campbell reconvened the Council meeting at 10:09 a.m.

76-2023 Councillor VanderVeen MOVED that Bylaw 22-021 be sent to the Minister of Transportation for Approval.

CARRIED

77-2023 Councillor Van Essen MOVED that County Council waive the land cost fees associated with Bylaw 22-021.

CARRIED

E. DEPARTMENT REPORTS

E.2. CORPORATE SERVICES

E.2.3. *2023 Business Tax Bylaw 23-010*

78-2023 Councillor VanderVeen MOVED that Bylaw 23-010 being the 2023 Business Tax Bylaw be read a first time.

CARRIED

79-2023 Deputy Reeve Kuerbis MOVED that Bylaw 23-010 being the 2023 Business Tax Bylaw be read a second time.

CARRIED

80-2023 Councillor Van Essen MOVED that Council consider third reading of Bylaw 23-010 being the 2023 Business Tax Bylaw.

CARRIED

81-2023 Councillor Hickey MOVED that Bylaw 23-010 being the 2023 Business Tax Bylaw be read a third time.

CARRIED

E.2.4. *2023 Business Tax Rate Bylaw 23-011*

82-2023 Councillor VanderVeen MOVED that Bylaw 23-011 being the 2023 Business Tax Rate Bylaw be read a first time.

CARRIED

83-2023 Councillor Van Essen MOVED that Bylaw 23-011 being the 2023 Business Tax Rate Bylaw be read a second time.

CARRIED

84-2023 Councillor VanderVeen MOVED that Council consider third reading of Bylaw 23-011 being the 2023 Business Tax Rate Bylaw.

DEFEATED

E.3. MUNICIPAL SERVICES

E.3.1. *Road Ban Information*

The Director of Public Operations provided Council an update on the Road Ban Bylaw and Policy.

E.3.2. ***Public Works - 2023 Level of Service***

85-2023	Councillor VanderVeen	MOVED that Council adopt the 2023 Level of Service Policy for Public Works maintenance, this will be the basis for the budget estimated for 2023 operations.

CARRIED

E.4. INFRASTRUCTURE

E.5. ADMINISTRATION

F. CORRESPONDENCE

F.1. ***Minister of Transportation***

Council reviewed the correspondence received from the Minister of Transportation regarding reverting the current paved surface of the 19.4 kilometer stretch of Highway 25 from Highway 521 to Highway 526 to gravel.

F.2. ***Minister of Municipal Affairs***

Council reviewed the correspondence from the Minister of Municipal Affairs regarding the transition from MSI to LGFF.

F.3. ***MP Thomas***

Council reviewed the invitation from MP Thomas's office to set up a meeting during the week of April 11-14, 2023.

F.4. ***Fortis Alberta Invitation***

Council reviewed the invitation from Fortis Alberta to attend the grand opening of their flagship Net-Zero Building in the Town of Coaldale on April 20, 2023.

F.5. ***SouthGrow's Southern Alberta Economic Development Forum***

Council reviewed the invitation from SouthGrow to attend the Southern Alberta Economic Development Forum on March 30, 2023.

F.6. ***Prentice Institute for Global Population and Economy Invitation***

Council reviewed the invitation from the Prentice Institute for Global Population and Economy to attend the Canadian Rural Revitalization Foundation (CRRF) conference on June 20-23, 2023.

F.7. ***United Way Red Tie Gala Invitation***

Council reviewed the invitation from United Way Lethbridge to attend the United Way Red Tie Gala on April 1, 2023.

F.8. ***Vimy Dinner Invitation***

Council reviewed the invitation from the 20th Independent Field Battery and 1908 League of Military Associations to attend the 15th Annual Vimy Dinner on April 22, 2023.

F.9. ***Link Pathway Committee Invitation***

86-2023	Councillor Zeinstra	MOVED to appoint three members of Council and a staff member to the Link Pathway Committee

DEFEATED

87-2023	Councillor Van Essen	MOVED to direct administration to reach out to the Link Pathway Committee to request that two Councillors sit on the committee and that administration bring back further information to the next Council meeting.

CARRIED

G. COUNTY COUNCIL AND COMMITTEE UPDATES

G.1. *Lethbridge County Council Attendance Update - February 2023*

Council reviewed the highlights from the Lethbridge County Council Attendance Update for February 2023.

Division 1
Councillor Lorne Hickey

February 1	FCSS Meeting
February 2	Lethbridge County Council Meeting
February 15	Green Acres Finance Meeting
February 22	Green Acres Board Meeting

Division 2
Reeve Tory Campbell

February 1	Exhibition Park Board Meeting
February 2	Lethbridge County Council Meeting
February 2	Exhibition Park AGM
February 13	Lethbridge County/City of Lethbridge IDP Meeting
February 14-16	Exhibition Park/Travel Alberta Ottawa Trade Mission
February 28	Meeting with William Wang, Director, Alberta China Offices
February 28	Meeting with Mayor Van Rijn, Coaldale Admin, County Admin

Division 3
Councillor Mark Sayers

February 2	Lethbridge County Council Meeting
February 16	RMA Asset Management Workshop
February 22	Coaldale Chamber of Commerce AGM

Division 4
Deputy Reeve John Kuerbis

February 2	Lethbridge County Council Meeting
February 3	Mayors and Reeves
February 13	Lethbridge County/City of Lethbridge IDP Meeting
February 16	RMA Asset Management Workshop
February 17	Emperor of Japan Birthday Celebration

Division 5
Councillor Eric Van Essen

February 2	Lethbridge County Council Meeting
February 7-8	Alberta Irrigation Districts Association Conference
February 16	RMA Asset Management Workshop
February 17	Highway 3Twinning Development Association Board Meeting

Division 6
Councillor Klaas VanderVeen

February 2	Lethbridge County Council Meeting
February 27	SAEWA Board Meeting

Division 7
Councillor Morris Zeinstra

February 2	Lethbridge County Council Meeting
February 6-8	Alberta Irrigation Districts Association Conference
February 28	AgExpo

H. NEW BUSINESS

I. CLOSED SESSION

I.1 - Infrastructure Project Discussion (FOIP Section 24 - Advice from Officials)

88-2023	Deputy Reeve Kuerbis	MOVED that the Lethbridge County Council Meeting move into Closed Session, pursuant to Section 197 of the *Municipal Government Act,* the time being 11:32 a.m. for the discussion on the following: I.1. - Infrastructure Project Discussion (FOIP Section 24 - Advice from Officials) Present during the Closed Session: Lethbridge County Council Chief Administrative Officer Senior Management Administrative Staff CARRIED
89-2023	Councillor Zeinstra	MOVED that the Lethbridge County Council Meeting move out of the closed session at 12:16 p.m. CARRIED

J. ADJOURN

90-2023	Councillor Zeinstra	MOVED that the Lethbridge County Council Meeting adjourn at 12:16 p.m. CARRIED

Reeve

CAO

AGENDA ITEM REPORT

Title: Subdivision Application #2023-0-013 – Groenenboom Farms - NW1/4 34-09-23-W4M
Meeting: Council Meeting - 06 Apr 2023
Department: ORRSC
Report Author: Steve Harty

APPROVAL(S):

Hilary Janzen, Supervisor of Planning & Development	Approved - 22 Mar 2023
Larry Randle, Interim Chief Administrative Officer	Approved - 23 Mar 2023

STRATEGIC ALIGNMENT:

☐ **Governance** ☐ **Relationships** ☐ **Region** ☒ **Prosperity**

EXECUTIVE SUMMARY:

The application is to enable a land swap and reconfigure two titles within a ¼-section, by consolidating an existing 5.72-acre parcel into the NW¼-34-9-23-W4M and in turn, subdividing out a vacant 3.0-acre title for country residential use. The proposal meets the subdivision criteria of the Land Use Bylaw.

RECOMMENDATION:

That S.D. Application #2023-0-013 be approved subject to the conditions as outlined in the draft resolution.

REASON(S) FOR RECOMMENDATION(S):

The proposed subdivision meets the provincial Subdivision and Development Regulations and the municipal reconfiguration subdivision policies as stated in the Land Use Bylaw.

PREVIOUS COUNCIL DIRECTION / POLICY:

- LUB No. 1404 contains policies that enable the subdivision and consolidation of land in consideration of a reconfiguration of titles, with no additional titles being created above what presently exist. In this situation the applicant starts with two titles and will end up with two but in a different orientation and location.
- The reduced country residential title parcel size complies with the size requirements (2 to 3 acres) of the bylaw as established by Council. The adjusted agricultural parcel title also complies.
- The Subdivision Authority has the discretion to decide on the suitability of the reconfigured titles and to determine if the proposal results in an improved development situation.

BACKGROUND INFORMATION:

Located approximately 2½-miles due southeast of the Hamlet of Monarch, between Highway 3 and the Oldman River (1-mile east of the Highway 23 interchange). The proposal is to enable a land title reconfiguration by amalgamating an older yard subdivision in the southwest corner back into the ¼-section, so it no longer is a separate title (5.72-acres). In return, a new yard and smaller 3.0-acre subdivision located approximately 120 m to the northeast and further way from the coulee and Oldman River, will be subdivided out.

The current yard is 65 m east from the boundary of the Oldman River whereas the new subdivision would be over 285 metres to the northeast of the river. The new 3.0-acre site would be more suitably located away from the coulee edge and away from sloughing issues, such as the current lot is experiencing. The proposed new subdivision is vacant grassland and would be outside the area of an irrigation pivot on the cultivated land portion to the north. As a result of the reconfiguration, the north agricultural parcel will be enlarged by 2.71-acres to 155.52-acres in size. Access is unaffected and will remain as is currently provided, from the Highway 3 service road to Range Road 23-3 to an existing registered easement. The easement provides legal access to the existing yard as the southern portion of the undeveloped municipal road allowance (Range Rd 23-3) cannot be physically developed due to the Oldman River. The new 3.0-acre parcel will be physically connected to the current registered access easement right-of-way. There are no abandoned gas wells located in proximity and no confined feeding operations where an MDs would be compromised.

Overall, the proposal meets the criteria of the County's Land Use Bylaw No. 1404 for a reconfiguration/realignment of titles and no additional titles are being created. The resulting agricultural parcel size still exceeds the land use bylaw's minimum 70-acres size stipulation.

The application was circulated to the required external agencies with no objections or requests for utility easements. The province identifies the area potentially contains a historical resource of a category HRV 5h,a,p. However, Alberta Culture states the subdivision will not require Historical Resources Act approval.

ALTERNATIVES / PROS / CONS:

The Subdivision Authority could decide to not approve if it is determined the proposed realignment is not suitable and the titles would remain as is.

Pros:

- there are no advantages to denying the subdivision as it meets the subdivision criteria of the County

Cons:

- the existing yard sloughing problem would not be resolved by relocating to a better site, and the decision would likely be appealed as the County's criteria have been met

FINANCIAL IMPACT:

None, but a new dwelling would be constructed.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

5A Lethbridge County 2023-0-013

Diagrams for Lethbridge County 2023-0-013

RESOLUTION

2023-0-013

Lethbridge County **Country Residential** subdivision of NW1/4 34-9-23-W4M

THAT the Country Residential subdivision of NW1/4 34-9-23-W4M (Certificate of Title No. 171 080 413, 171 080 414 +15), to accommodate a land swap and reconfigure two titles within a ¼-section, by consolidating an existing 5.72-acre (2.31 ha) parcel into the NW¼-34-9-23-W4M and in turn subdivide out a vacant 3.0-acre (1.21 ha) title for country residential use; BE APPROVED subject to the following:

CONDITIONS:

1. That, pursuant to Section 654(1)(d) of the Municipal Government Act, all outstanding property taxes shall be paid to Lethbridge County.
2. That, pursuant to Section 655(1)(b) of the Municipal Government Act, the applicant or owner or both enter into and comply with a Development Agreement with Lethbridge County which shall be registered concurrently with the final plan against the title(s) being created.
3. That the titles and portions of land to be subdivided and consolidated to relocate/ reconfigure the two parcel titles be done by a plan prepared by a certified Alberta Land Surveyor in a manner such that the resulting titles cannot be further subdivided without approval of the Subdivision Authority.
4. That the applicant provides at their expense a professional soils analysis by an accredited agency or engineer to ensure suitability for a private on-site septic treatment system on the new 3.0-acre vacant parcel.
5. That the applicant provides at their expense a professional geotechnical report for the proposal, to verify a suitable building site with sound soil footings and outline acceptable setbacks to the top of coulee edge.

REASONS:

1. The proposed subdivision is consistent with the South Saskatchewan Regional Plan and complies with both the Municipal Development Plan and Land Use Bylaw.
2. The Subdivision Authority is satisfied that the proposed subdivision is suitable for the purpose for which the subdivision is intended pursuant to Section 9 of the Matters Related to Subdivision and Development Regulation.
3. The Subdivision Authority is satisfied there are no concerns or objections to the subdivision application and Alberta Water Infrastructure and Operations Branch has no concerns (due to the boundary of the Oldman River).
4. The subdivision proposal is eligible for subdivision in accordance with the County's subdivision criteria as a realignment/reconfiguration of titles. The applicant starts with two titles and will end up with two but in a different orientation.
5. The land use bylaw parcel size criteria are met, as the 3.0-acres exceeds the 2.0-acre minimum and the resulting agricultural parcel size exceeds the minimum 70-acre size stipulation.

INFORMATIVE:

(a) Since the proposed subdivision complies with Section 663(a) of the Municipal Government Act, Reserve is not required.

(b) That a legal description for the proposed parcel be approved by the Surveys Branch, Land Titles Office, Calgary.

(c) The applicant/owner is advised that other municipal, provincial or federal government or agency approvals may be required as they relate to the subdivision and the applicant/owner is responsible for verifying and obtaining any other approval, permit, authorization, consent or license that may be required to subdivide, develop and/or service the affected land (this may include but is not limited to Alberta Environment and Protected Areas, Alberta Transportation, and the Department of Fisheries and Oceans.)

(d) Telus Communications Inc has no objection.

(e) Thank you for contacting FortisAlberta regarding the above application for subdivision. We have reviewed the plan and determined that no easement is required by FortisAlberta.

FortisAlberta is the Distribution Wire Service Provider for this area. The developer can arrange installation of electrical services for this subdivision through FortisAlberta. Please have the developer contact 310-WIRE (310-9473) to make application for electrical services.

Please contact FortisAlberta land services at landserv@fortisalberta.com or by calling (403) 514-4783 for any questions.

(f) In reference to the above request, please be advised of ATCO Gas' response and notify the landowner of the following:

- ATCO Gas has no objection
- ATCO Gas' existing and future lines are protected by an existing Utility Right of Way

ATCO Gas would also like to make the MD/County and Landowner/Developer aware of the following:

- If conducting any ground disturbance on the subject property, the landowner/developer must ensure the location of all utilities by contacting Utility Safety Partners at 1-800-242-3447 or https://utilitysafety.ca/
- For any ground disturbance within 30m of an existing gas line please contact Crossings@atcogas.com to obtain permission (submit locate slip as back up)
- ATCO Gas requires a minimum of 6 months' notice to design and construct a new gas line, or alter an existing gas line. New Service installations, pipeline alterations, and Main extensions will be performed at the landowner/developers expense.
- If the landowner requires a single gas service please visit https://gas.atco.com/en-ca/products-services-rates/new-services-changes/new-natural-gas-line.html

Any further questions please email southlandadmin@atco.com.

(g) Historical Resources – Barry Newton, Land Use Planner:

"We have reviewed the captioned subdivision application and determined that in this instance formal *Historical Resources Act* approval is not necessary, and submission of a Historic Resources application is not required."

(h) Alberta Agriculture and Irrigation, Water Infrastructure and Operations Branch has reviewed the lands in question and has no comments concerns to add.

(i) Alberta Transportation – Leah Olsen, Development/Planning Technologist:

"This will acknowledge receipt of your circulation regarding the above noted proposal. The subdivision application would be subject to the requirements of Sections 18 and 19 of the Matters Related to Subdivision and Development Regulation (The Regulation), due to the proximity of Highway(s) 3, 23

Alberta Transportation offers the following comments with respect to this application:

The requirements of Section 18 of the Regulation are not met. The department anticipates minimal impact on the highway from this proposal. Pursuant to Section 20(1) of the Regulation, Alberta Transportation grants approval for the subdivision authority to vary the requirements of Section 18 of the Regulation.

The requirements of Section 19 of the Regulation are not met. There is no direct access to the highway and there is sufficient local road access to the subdivision and adjacent lands. Pursuant to Section 20(1) of the Regulation, Alberta Transportation grants approval for the subdivision authority to vary the requirements of Section 19 of the Regulation.

Further, should the approval authority receive any appeals in regard to this application and as per Section 678(2.1) of the Municipal Government Act and Section 7(6)(d) of the regulation, Transportation and Economic Corridors agrees to waive the referral distance for this particular subdivision application. As far as Transportation and Economic Corridors is concerned, an appeal of this subdivision application may be heard by the local Subdivision and Development Appeal Board provided that no other provincial agency is involved in the application

Alberta Transportation and Economic Corridors has the following additional comments and/or requirements with respect to this proposal:

1. The department expects that the municipality will mitigate the impacts of traffic generated by developments approved on the local road connections to the highway system, pursuant to Policy 7 of the Provincial Land Use Policies and Section 618.4 of the Municipal Government Act

Please contact Alberta Transportation and Economic Corridors through the RPATH Portal if you have any questions, or require additional information."

(j) Lethbridge Northern Irrigation District (LNID) – Alan Harrold, General Manager:

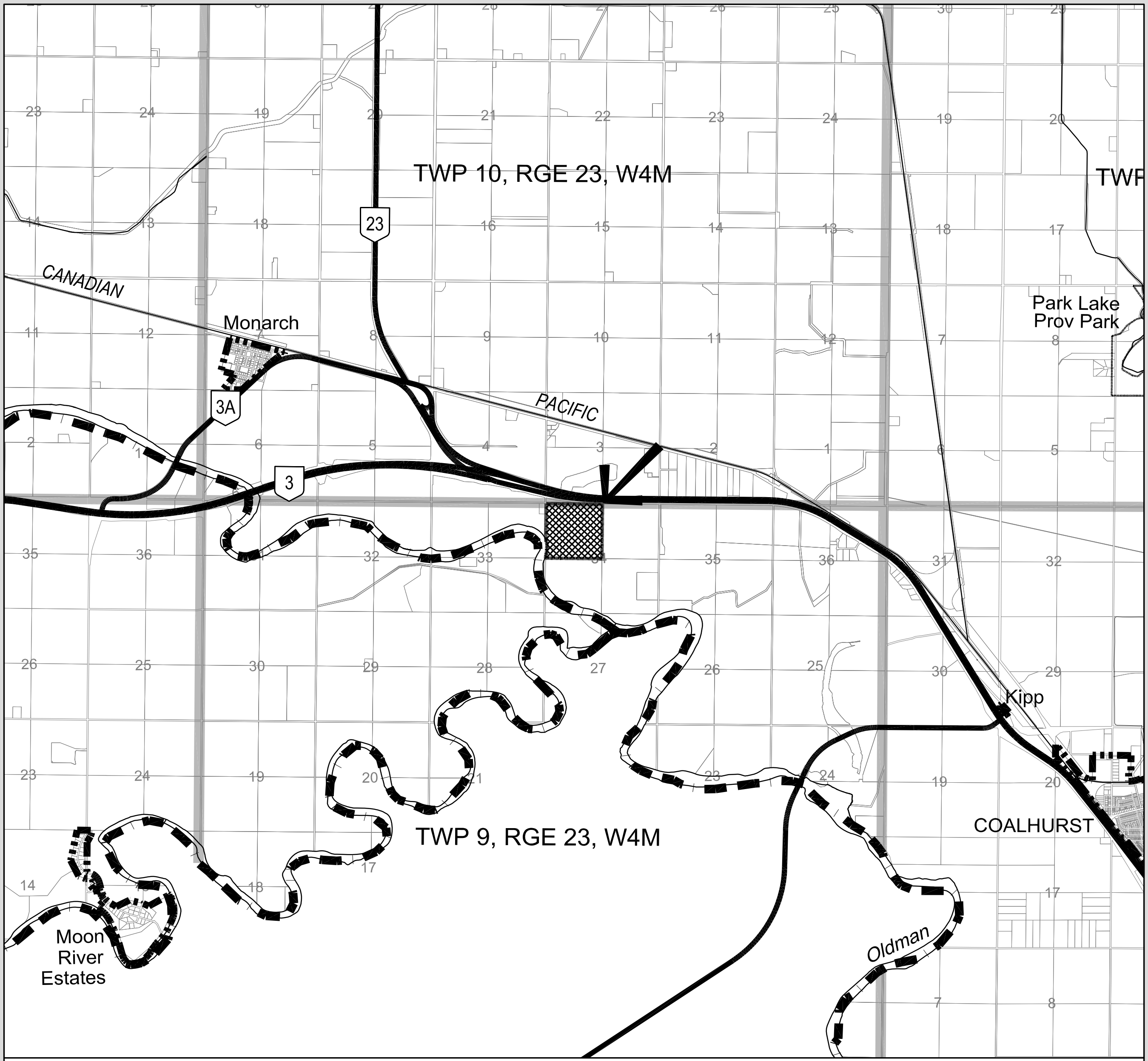
"The above noted Application for Subdivision has been reviewed by the Lethbridge Northern Irrigation District (LNID) and is approved subject to the following conditions:

1. Payment in full of any outstanding irrigation rates that may be assessed on the original parcel at the time of finalization of the subdivision.
2. Payment of the District's subdivision administration fee. The current fee is **$630.00** (includes GST).
3. A water agreement suitable to meet the needs of the proposed 3.0-acre subdivision may be required if the proposed new subdivision requires the use of irrigation water. In addition, since the delivery would be from the Lateral B6 Pipeline, a landowner construction contribution would be required at the time of signing a Water Agreement for this parcel. The current 2023 low pressure pipeline rate is $3,000 **plus GST** plus the cost of a water delivery turnout, if one is required.
4. Due to the proposed subdivision location, acres assessed as "irrigation acres" may have to be re-arranged to suitable areas within the parcel.
5. An Easement for the proposed 3.0-acre subdivision for access to water from the District's works must be in place prior to the supply of domestic/yard usage water.
6. Any alteration to District works required as a result of this subdivision is subject to District approval and payment by the applicant of all applicable costs.

Thank you for the opportunity to comment. If you require more information or would like to set up an appointment to discuss the conditions above, please contact Janet Beck, Administration & Land Manager, at the Lethbridge Northern Irrigation District Office, 403-327-3302."

MOVER REEVE

DATE



SUBDIVISION LOCATION SKETCH
WITHIN NW 1/4 SEC 34, TWP 9, RGE 23, W 4 M

MUNICIPALITY: LETHBRIDGE COUNTY

DATE: FEBRUARY 13, 2023

FILE No: 2023-0-013

MAP PREPARED BY:
OLDMAN RIVER REGIONAL SERVICES COMMISSION
3105 16th AVENUE NORTH, LETHBRIDGE, AB T1H 5E8

OLDMAN RIVER REGIONAL SERVICES COMMISSION

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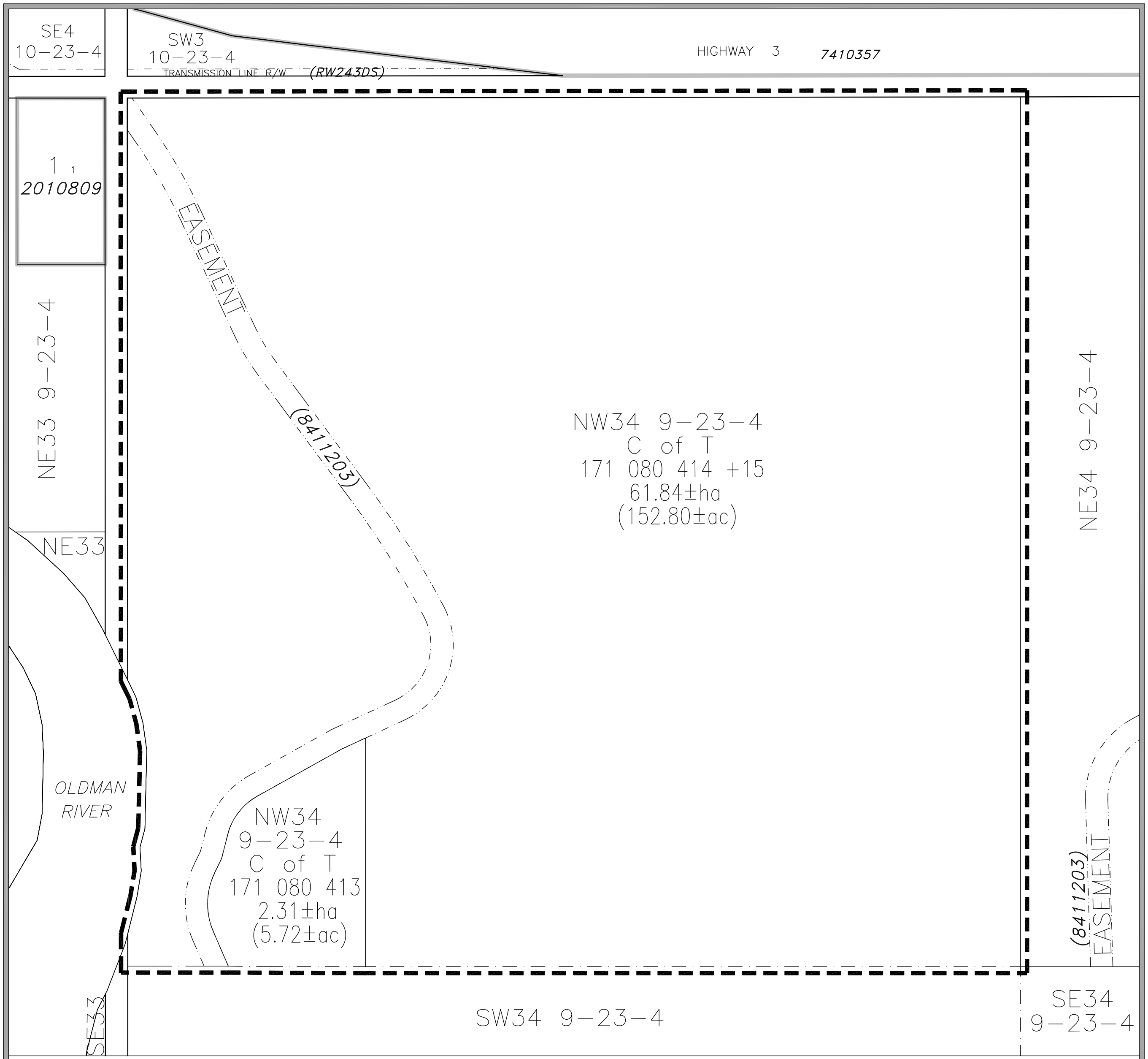

SUBDIVISION SKETCH - **EXISTING**
WITHIN NW 1/4 SEC 34, TWP 9, RGE 23, W 4 M
MUNICIPALITY: LETHBRIDGE COUNTY
DATE: FEBRUARY 13, 2023
FILE No: 2023-0-013

OLDMAN RIVER REGIONAL SERVICES COMMISSION

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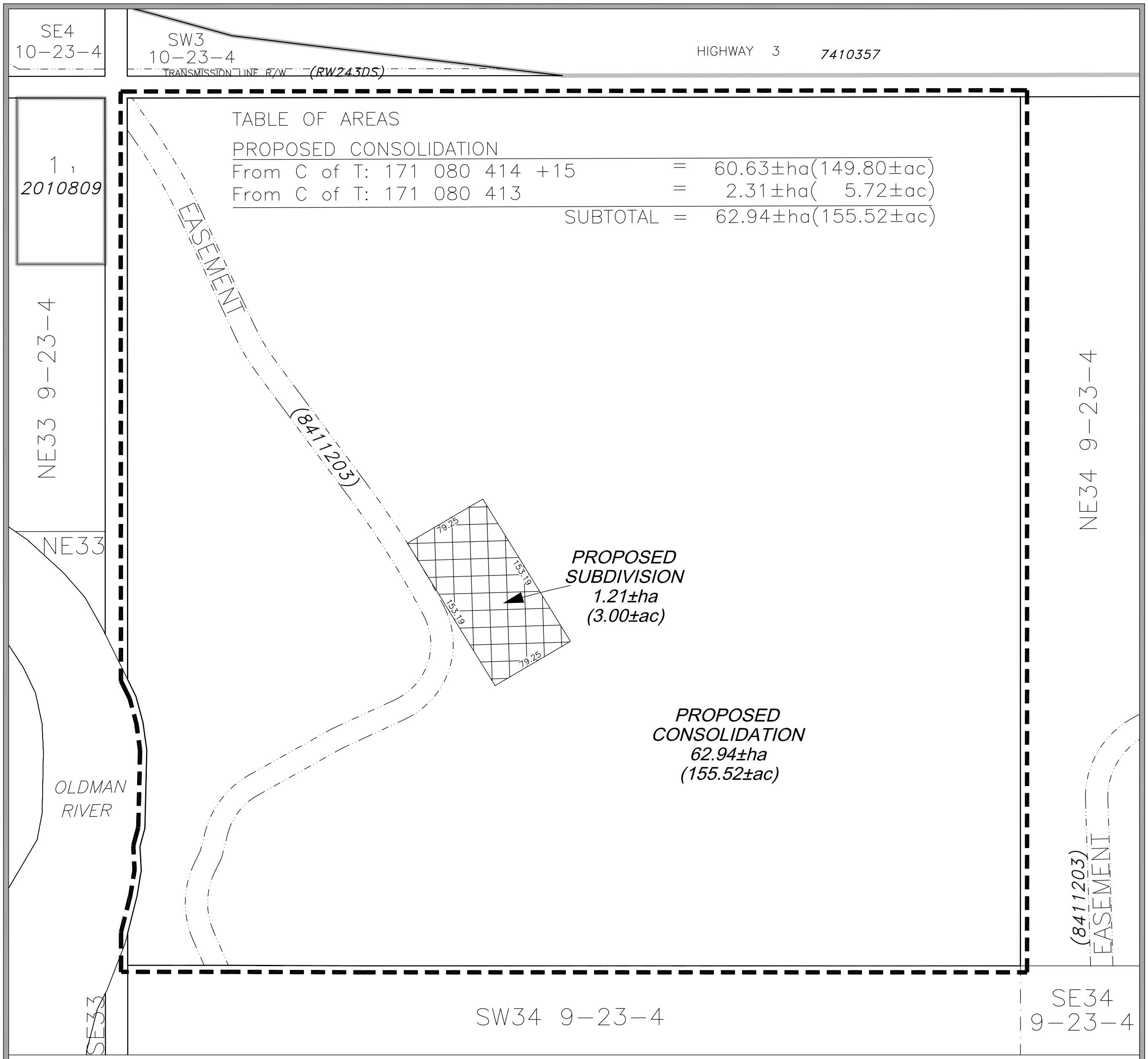

TABLE OF AREAS

PROPOSED CONSOLIDATION

From C of T: 171 080 414 +15	=	60.63±ha(149.80±ac)
From C of T: 171 080 413	=	2.31±ha(5.72±ac)
SUBTOTAL	=	62.94±ha(155.52±ac)

SUBDIVISION SKETCH - **PROPOSED**
WITHIN NW 1/4 SEC 34, TWP 9, RGE 23, W 4 M
MUNICIPALITY: LETHBRIDGE COUNTY
DATE: FEBRUARY 13, 2023
FILE No: 2023-0-013

OLDMAN RIVER REGIONAL SERVICES COMMISSION

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SUBDIVISION SKETCH - **PROPOSED**
WITHIN NW 1/4 SEC 34, TWP 9, RGE 23, W 4 M
MUNICIPALITY: LETHBRIDGE COUNTY
DATE: FEBRUARY 13, 2023
FILE No: 2023-0-013

OLDMAN RIVER REGIONAL SERVICES COMMISSION

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February 14, 2023 N:\Subdivision\2023\2023-0-013.dwg

AERIAL PHOTO DATE: 2018

AGENDA ITEM REPORT

Title:	Subdivision Application #2023-0-018 Koot - Lot 1, Block 2, Plan 021 0172 within SE1/4 6-10-20-W4M
Meeting:	Council Meeting - 06 Apr 2023
Department:	ORRSC
Report Author:	Steve Harty

APPROVAL(S):

Hilary Janzen, Supervisor of Planning & Development	Approved - 22 Mar 2023
Larry Randle, Interim Chief Administrative Officer	Approved - 23 Mar 2023

STRATEGIC ALIGNMENT:

☐	☐	☐	☒
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

The application is to subdivide a vacant 2.0- lot from a 7.27-acre title for grouped country residential use. The proposal meets the subdivision criteria of the Land Use Bylaw.

RECOMMENDATION:

That S.D. Application #2023-0-018 be approved subject to the conditions as outlined in the draft resolution.

REASON(S) FOR RECOMMENDATION(S):

The proposed subdivision meets the provincial Subdivision and Development Regulations and the municipal GCR subdivision policies as stated in the Land Use Bylaw.

PREVIOUS COUNCIL DIRECTION / POLICY:

- County Council designated the land parcel in January 2023 for Grouped Country Residential use (Bylaw No. 22-019) and the application complies with the grouped country residential subdivision criteria.
- The GCR subdivision criteria and standards are within the Land Use Bylaw No. 1404 and the lots meet and exceed the bylaw's minimum 2.0-acre size.
- This proposal aligns with the County's Grouped County Residential Land Use Strategy as it is a small-scale subdivision on fragmented, poor-quality land.

BACKGROUND INFORMATION:

Located just to the north of Eight Mile Lake, 3-½-miles northeast of the City of Lethbridge. The proposal is to resplit the existing title and create an additional title on a parcel of 20.0 acres or less of poor-quality agricultural land designated for GCR.

The proposed 2.0-acre area is grass and is vacant with no buildings on it, while the remnant 5.27-acres contains an existing yard with improvements. The yard contains a dwelling, shop building, large dugout, and tree shelterbelt. The dugout is used as the source of water for the existing dwelling and an on-site private septic field system located to the west of the house is used to manage sewage. The new 2.0-acre lot is proposed to be serviced in the same manner, or by the rural water coop if available in the future. A soils analysis was not provided at the redesignation stage and is to be provided as a condition of approval. There is an existing approach and access to the south municipal road; however, the proposed 2.0-acre lot on the east corner would require its own approach. There are no abandoned gas wells or confined feeding operations (CFOs) located in proximity of this proposal where the MDS is compromised.

Overall, the proposal conforms to the County land use bylaw subdivision criteria for both a single resplit (resubdivision) as well as the GCR criteria of the County's Land Use Bylaw No. 1404. The application was circulated to the required external agencies. No concerns have been expressed and no easements are requested (at time of agenda preparation).

ALTERNATIVES / PROS / CONS:

The Subdivision Authority could decide to not approve if it is not satisfied the subdivision is suitable.
Pros:

- there are no advantages to denying the subdivision as it meets the Grouped Country Residential subdivision criteria of the County

Cons:

- a refusal would likely be appealed by the applicants as the County's subdivision criteria have been met and the zoning approved by Council.

FINANCIAL IMPACT:

Non direct, but the future tax situation may improve with additional residential development. The County will benefit from an MR payment of $29,080.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

5A Lethbridge County 2023-0-018
2023-0-018 Diagrams for Lethbridge County

RESOLUTION

2023-0-018

Lethbridge County **Country Residential** subdivision of Lot 1, Block 2, Plan 021 0172 within SE1/4 6-10-20-W4M

THAT the Country Residential subdivision of Lot 1, Block 2, Plan 021 0172 within SE1/4 6-10-20-W4M (Certificate of Title No. 021 024 900), to subdivide a vacant 2.0-acre (0.81 ha) lot from a 7.27-acre (2.94 ha) title for grouped country residential use; BE APPROVED subject to the following:

RESERVE: The 10% reserve requirement, pursuant to Sections 666 and 667 of the Municipal Government Act, be provided as money in place of land on the 7.27-acres at the market value of $40,000 per acre with the actual acreage and amount to be paid to Lethbridge County be determined at the final stage (approx. $29,080), for Municipal Reserve purposes.

CONDITIONS:

1. That, pursuant to Section 654(1)(d) of the Municipal Government Act, all outstanding property taxes shall be paid to Lethbridge County.
2. That, pursuant to Section 655(1)(b) of the Municipal Government Act, the applicant or owner or both enter into and comply with a Development Agreement with Lethbridge County which shall be registered concurrently with the final plan against the title(s) being created.
3. That the applicant has a professional soils analysis completed for the 2.0-acre east lot to demonstrate suitability of a private on-site septic treatment system on the land, with results to be as determined satisfactory to the Subdivision Authority.
4. That the applicant submits a plan of survey as prepared by an Alberta Land Surveyor that certifies the exact location and dimensions of the parcel being subdivided.
5. That any easement(s) as required by utility agencies shall be established prior to finalization of the application.

REASONS:

1. The proposed subdivision is consistent with the South Saskatchewan Regional Plan and complies with both the Municipal Development Plan and Land Use Bylaw.
2. The Subdivision Authority is satisfied that the proposed subdivision with the conditions imposed is suitable for the purpose for which the subdivision is intended pursuant to Section 9 of the Matters Related to Subdivision and Development Regulation.
3. County Council designated the land parcel in January 2023 for Grouped Country Residential use (Bylaw No. 22-019) and the application complies with the grouped country residential subdivision criteria.
4. The title at 7.25-acres in size consists of less than 20 acres of farmable land and conforms to the County land use bylaw subdivision criteria, and the 2.0-acre parcel meets the minimum size requirements.

INFORMATIVE:

(a) If the applicant desires to continue to use the existing dugout for the smaller 2.0-acre lot being subdivided, they should consider registering a private water/dugout access easement between the two titles. It is noted that the SMRID will require a water co-op to be established.

(b) That a legal description for the proposed parcel be approved by the Surveys Branch, Land Titles Office, Calgary.

(c) The applicant/owner is advised that other municipal, provincial or federal government or agency approvals may be required as they relate to the subdivision and the applicant/owner is responsible for verifying and obtaining any other approval, permit, authorization, consent or license that may be required to subdivide, develop and/or service the affected land (this may include but is not limited to Alberta Environment and Protected Areas, Alberta Transportation, and the Department of Fisheries and Oceans.)

(d) Telus Communications Inc has no objection.

(e) Thank you for contacting FortisAlberta regarding the above application for subdivision. We have reviewed the plan and determined that no easement is required by FortisAlberta.

FortisAlberta is the Distribution Wire Service Provider for this area. The developer can arrange installation of electrical services for this subdivision through FortisAlberta. Please have the developer contact 310-WIRE (310-9473) to make application for electrical services.

Please contact FortisAlberta land services at landserv@fortisalberta.com or by calling (403) 514-4783 for any questions.

(f) In reference to the above request, please be advised of ATCO Gas' response and notify the landowner of the following:

- ATCO Gas has no objection
- ATCO Gas' existing and future lines are protected by an existing Utility Right of Way

ATCO Gas would also like to make the MD/County and Landowner/Developer aware of the following:

- If conducting any ground disturbance on the subject property, the landowner/developer must ensure the location of all utilities by contacting Utility Safety Partners at 1-800-242-3447 or https://utilitysafety.ca/
- For any ground disturbance within 30m of an existing gas line please contact Crossings@atcogas.com to obtain permission (submit locate slip as back up)
- ATCO Gas requires a minimum of 6 months' notice to design and construct a new gas line, or alter an existing gas line. New Service installations, pipeline alterations, and Main extensions will be performed at the landowner/developers expense.
- If the landowner requires a single gas service please visit https://gas.atco.com/en-ca/products-services-rates/new-services-changes/new-natural-gas-line.html

Any further questions please email southlandadmin@atco.com.

(g) SMRID – Linda Park, Land Administrator:

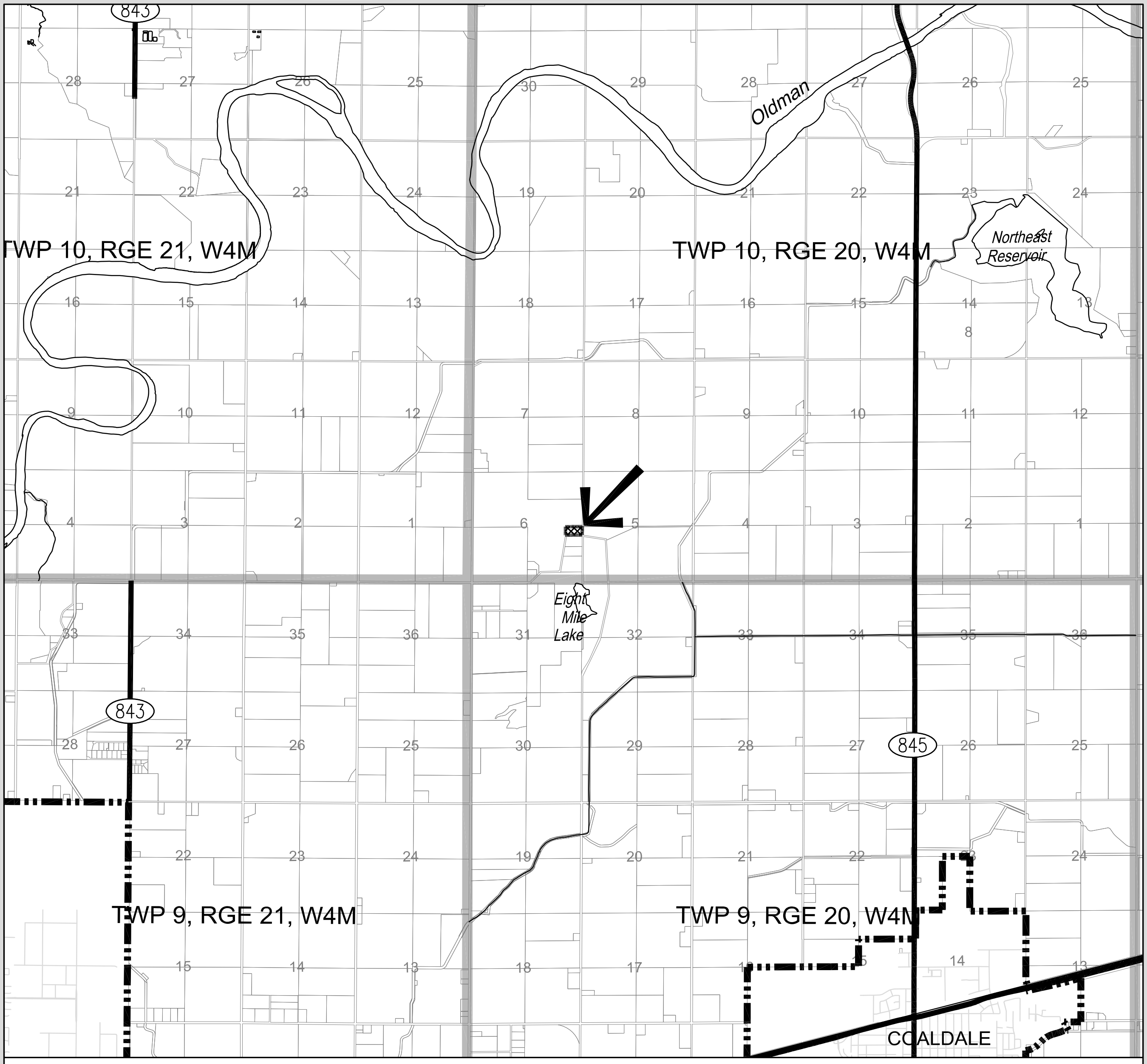
"Further to your March 2, 2023 application, due to the growing number of subdivisions within the district, the Board has established a policy stating if there is more than one subdivision within a quarter section, the owner(s) are now required to set up a Water Co-op.

If they currently have an active Household Purposes Agreement with the district, the Household Purposes Agreement will be canceled and they will be grandfathered 1-acre foot of water. If they require additional acre feet, they can be purchased at the current rate of $2,500.00 an acre foot. The District will require that a meter be installed at the point of delivery and they will be charged based on the metered amount (the current rate is $75.00 per acre foot) or a minimum charge of $750.00 (10-acre feet) whichever is greater.

All easements, agreements, works, etc., to guarantee supply of water to the co-op will be the responsibility of the landowners. A Service Fee of $250.00 plus GST is due prior to consent approval."

MOVER REEVE

DATE



SUBDIVISION LOCATION SKETCH
LOT 1; BLOCK 2; PLAN 0210172
WITHIN SE 1/4 SEC 6, TWP 10, RGE 20, W 4 M
MUNICIPALITY: LETHBRIDGE COUNTY
DATE: FEBRUARY 21, 2023
FILE No: 2023-0-018

MAP PREPARED BY:
OLDMAN RIVER REGIONAL SERVICES COMMISSION
3105 16th AVENUE NORTH, LETHBRIDGE, AB T1H 5E8
"NOT RESPONSIBLE FOR ERRORS OR OMISSIONS"

OLDMAN RIVER REGIONAL SERVICES COMMISSION

February 22, 2023 N:\Subdivision\2023\2023-0-018.dwg

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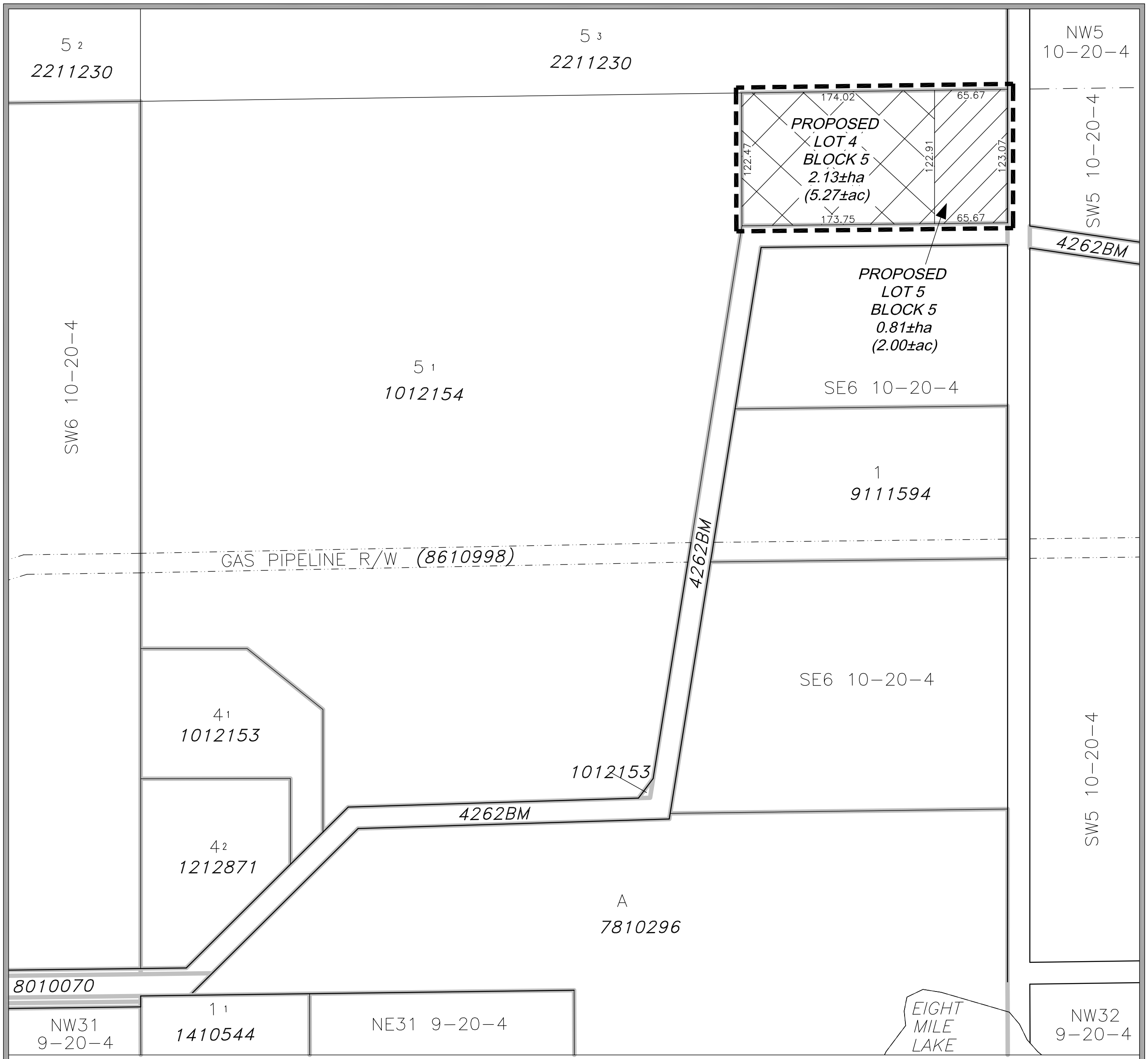

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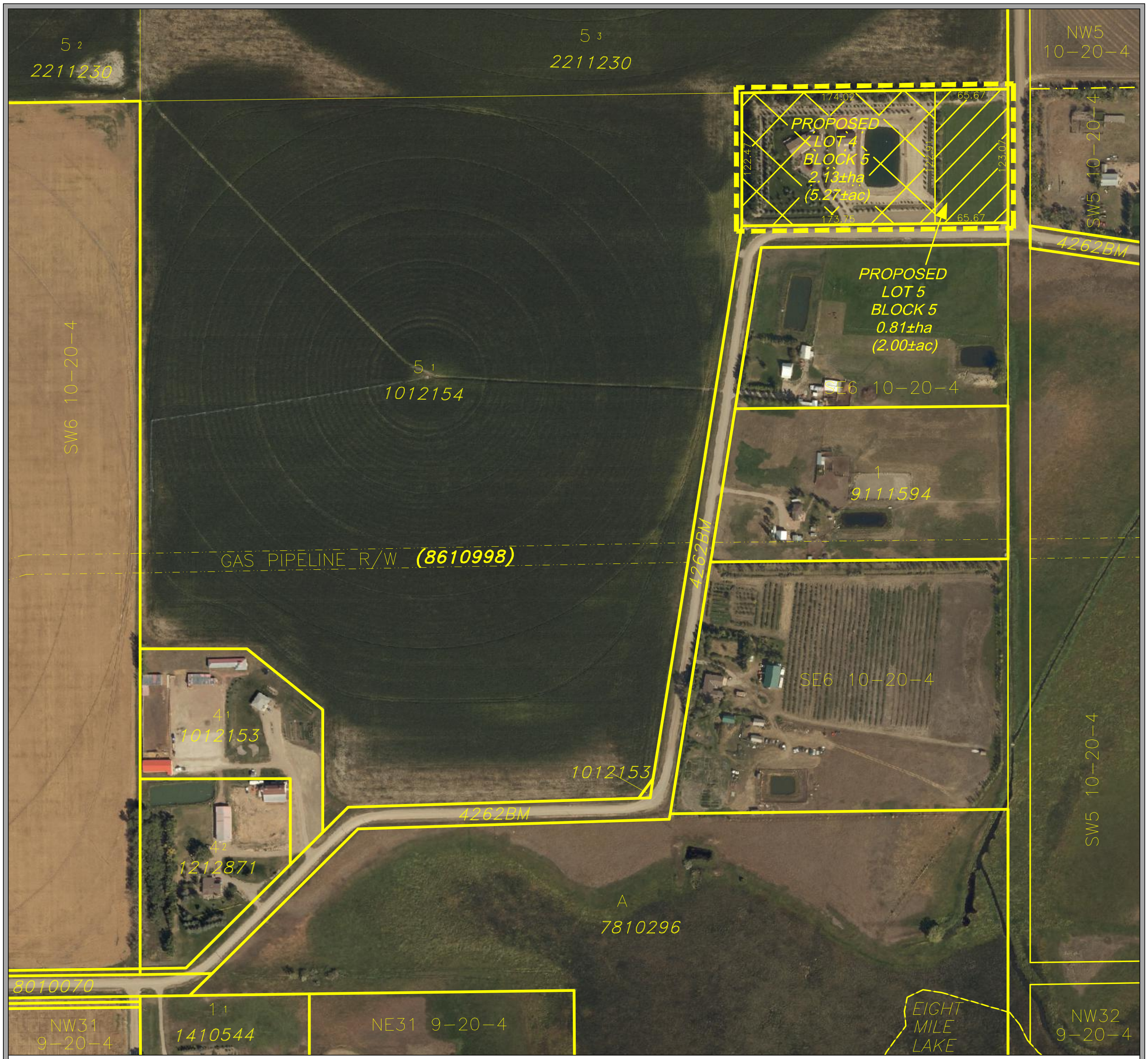
DATE: FEBRUARY 21, 2023
FILE No: 2023-0-018

OLDMAN RIVER REGIONAL SERVICES COMMISSION

0 Metres 100 200 300 400

N

February 22, 2023 N:\Subdivision\2023\2023-0-018.dwg



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DATE: FEBRUARY 21, 2022
FILE No: 2023-0-018

OLDMAN RIVER REGIONAL SERVICES COMMISSION

0 Metres 100 200 300 400

N

February 21, 2023 N:\Subdivision\2023\2023-0-018.dwg

AERIAL PHOTO DATE: 2018

SUBDIVISION AUTHORITY

OLDMAN RIVER REGIONAL SERVICES COMMISSION

FILE: ________

P 254

SURVEYOR: MICHAEL A. THOMPSON, ALS

CLIENT:

HANK & ANN KOOT
BOX 335
LETHBRIDGE, AB
T1J 3Y7

DESCRIPTION OF PROPERTY:

CIVIC ADDRESS:

ATS DESCRIPTION: SE 1/4 SEC 6, TWP 10, RGE 20, W 4th MER

C of T 021 024 900

REGISTERED OWNERS: HENDRIKUS JOHANNES KOOT
ANNA CORNELIA KOOT

ABBREVIATIONS:

Δ	Central Angle of Curve	Mp	2 metre standard Alberta Survey Marker Post
φ	Diameter	MR	Municipal Reserve
A	Arc	N,E,S,W	North, East, South, West
ac	Acres	NAD	North American Datum
ASCM	Alberta Survey Control Marker	PPP	Precise Point Positioning
A/R	Access Road	Pit	4 Pits
C of T	Certificate of Title	Pits	4 Road Pits
ckm	Check Measured	Pl	Placed
cs	Countersunk	P/L	Pipeline
CSRS	Canadian Spatial Reference System	PUL	Public Utility Lot
FCP	Fence Corner Post	R	Radius
Fd	Found	(R)	Radial Bearing
ha	Hectares	R/W	Right of Way
I	Statutory Iron Post	Re-est	Re-established
km	Kilometre	Rest	Restored
LSD	Legal Subdivision	RGE	Range
m	Metre	SEC	Section
M	Mound	TWP	Township
MER	Meridian	URW	Utility Right-of-Way
Mk	Mark	UTM	Universal Transverse Mercator

LEGEND:

◬	Alberta Survey Control Marker	Concrete	▨
●	Statutory iron post found	Gravel	▨
○	Statutory iron post placed, marked P254	Fence Line	—— X ——
IRR	Irrigation Box	Overhead Power	—— OH ——
☼	Light Standards		
Ⓢ	Sign		
⋈	Water Valve		
⊗	Power Pole		
GW●	Guy Wire		
⊕	Riser		
RP○	Georeferenced Point		

- Distances are ground and are in metres and decimals thereof, and are between survey monuments unless otherwise shown.
- Bearings are grid (UTM NAD'83), derived from GNSS observations, and are referred to the meridian through 111° West Longitude.
- Lands dealt with by this plan are bounded thus ———— and contain 2.941 ha.

NOTES:

1. The georeferenced point is a found statutory iron post, UTM NAD'83 (ORIGINAL) Coordinate: 5,516,951.07 N, 378,454.59 E.
2. The georeferenced coordinate was calculated using the published ATS Ver. 4.1 coordinate value for E 1/4 SEC 6-10-20-4.
3. A combined factor of 0.999648 was used to scale ground distances to the projected plane.
4. Field survey was completed between the dates of February 8, 2023 and February 9, 2023.
5. Fence lines along property lines are within 0.2m of the property line unless noted otherwise.

THE EXISTENCE OR LOCATION OF ALL UTILITIES AS SHOWN ON OR OMITTED FROM THIS PLAN MAY BE BASED ON INFORMATION RECEIVED FROM THE RESPECTIVE AUTHORITIES AND ARE NOT GUARANTEED BY THE LAND SURVEYOR. NO RESPONSIBILITY IS IMPLIED OR ASSUMED BY THE LAND SURVEYOR AS TO THE LOCATION OR ANY OMISSIONS. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXISTENCE AND LOCATION OF ALL SUCH UTILITIES AND MUST CONTACT THE VARIOUS UTILITY COMPANIES FOR ON SITE INFORMATION PRIOR TO COMMENCEMENT OF ANY OPERATIONS.

0	2023-02-15	ORIGINAL SUBMISSION	D.L.	M.T.
ISSUE	DATE	REVISION	CAD	CHK

HANK & ANN KOOT

TENTATIVE PLAN

SHOWING PROPOSED SUBDIVISION OF
LOT 1, BLOCK 2, PLAN 021 0172
(SE 1/4 SEC 6-10-20-4)

LETHBRIDGE COUNTY
ALBERTA

SUBJECT TO APPROVAL OF THE LOCAL APPROVING AUTHORITY

SCALE 1:1000 0 10 25 50

HALMA THOMPSON LAND SURVEYS LTD.
200-410 Stafford Drive S
Lethbridge AB, T1J 2L2
Phone (403) 381-1320
Fax (403) 381-1366

JOB H01923
DRAWING H01923T

AGENDA ITEM REPORT

Title:	Bylaw 23-008 - Amendment to Bylaw 18-012 being the Chinook Industrial Park Area Structure Plan and Bylaw and Bylaw 23-009 - Land Use Bylaw Amendment from Lethbridge Urban Fringe To Rural General Industrial and Business Light Industrial - First Reading
Meeting:	Council Meeting - 06 Apr 2023
Department:	Community Services
Report Author:	Hilary Janzen

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer	Approved - 22 Mar 2023

STRATEGIC ALIGNMENT:

☐	☐	☐	☒
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

- Bylaw 23-008 proposes to amend the Chinook Industrial Area Structure Plan to align with the development objectives of the current landowner and development group. The amendments address servicing (water and on-site waste water treatment), access, storm-water management, and future land use of the area.
- Bylaw 23-009 proposing to amend the Land Use Bylaw by re-designating a portion of Plan 1113173 Block 1 Lot 5 from Lethbridge Urban Fringe to Rural General Industrial and Business Light Industrial.

RECOMMENDATION:

That Bylaw 23-008 be read a first time.
That Bylaw 23-009 be read a first time.

REASON(S) FOR RECOMMENDATION(S):

First reading of Bylaw 22-013 will allow County Administration to set the date for the Public Hearing and send out the notices for the proposed bylaw.

PREVIOUS COUNCIL DIRECTION / POLICY:

The Chinook Industrial Park Area Structure Plan (Bylaw 18-012) was approved by County Council on November 15, 2018.

BACKGROUND INFORMATION:

Bylaw 23-008 proposes to amend the existing Chinook Industrial Park Area Structure Plan. The proposed amendments align with the development objectives of the current landowner and address the following:

- servicing of the sites for water and on-site waste water treatment as they no longer desire municipal waste water services
- amend the road network within the plan area and update the Traffic Impact Assessment
- update the storm-water management plan
- update the land use districts proposed within the plan area
- update the phasing and implementation of development for the plan area

Bylaw 23-009 proposes to re-designate a portion of Plan 1113171 Block 1 Lot 5 from Lethbridge Urban Fringe to Rural General Industrial and Business Light Industrial. The intent of this application is to allow for the future subdivision and development of the parcel for industrial and commercial uses.

The application has been circulated to all County Departments, the City of Lethbridge and external agencies for review and their comments as well as any planning/strategic planning considerations, will be presented at the public hearing. It is anticipated that the public hearing will be held in April 2023.

ALTERNATIVES / PROS / CONS:

County Council may refuse first reading of the Bylaw. Refusing the bylaw would be contrary to legal advice which has been that first reading of the bylaw shall be given as the applicant and the public have the right to attend and speak at a public hearing which is set upon first reading of the bylaw. The public hearing process allows County Council the opportunity to hear all positions (in favour and opposed) on the bylaw and make an informed decision. If first reading of the bylaw is not given the applicant could appeal that decision to the Alberta Court of Appeal.

FINANCIAL IMPACT:

If the bylaw was approved, future development would be taxed at the County's tax rate.

LEVEL OF PUBLIC PARTICIPATION:

☐ **Inform** ☒ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

Bylaw 23-008 Amendment to the Chinook Industrial Park ASP
Bylaw 23-009 - Land Use Redesignation_20230213
Bylaw 23-008 - Appendix C - Chinook Industrial Park ASP - Geotechnical Evaluation
Bylaw 23-008 - Appendix D - Chinook Industrial Park - Phase I ESA
Bylaw 23-008 - Amendments to Chinook Industrial Par ASP - March Draft
Bylaw 23-009 - Amendment to LUB - Chinook Industrial Park ASP
5A FORM C Application for Land Use Bylaw AMENDMENT - Leth County

LETHBRIDGE COUNTY
IN THE PROVINCE OF ALBERTA

BYLAW NO. 23-008

A BYLAW OF LETHBRIDGE COUNTY BEING A BYLAW PURSUANT TO SECTION 633(1) OF THE MUNICIPAL GOVERNMENT ACT, REVISED STATUTES OF ALBERTA 2000, CHAPTER M.26

Bylaw 23-008 of Lethbridge County, being a Bylaw for the purpose of amending the Chinook Industrial Park Area Structure Plan Bylaw 18-012.

WHEREAS the developer wishes to update the Chinook Industrial Park Area Structure Plan to better align with the future subdivision and development of the area;

AND WHEREAS the County's Municipal Development Plan requires that developers prepare an amendment to the Area Structure Plan to ensure sound development occurs within the County;

AND WHEREAS the landowner/developer have prepared amendment to the "Chinook Industrial Park Area Structure Plan" which contains engineering, survey, and geotechnical information to support the above conditions.

NOW THEREFORE BE IT RESOLVED, under the Authority and subject to the provisions of the Municipal Government Act, Revised Statutes of Alberta, 2000, Chapter M-26, as amended, the Council of Lethbridge County in the Province of Alberta duly assembled does hereby enact the following:

1. The "Bylaw 18-012 - Chinook Industrial Park Structure Plan" as amended by Bylaw No.23-002, is attached as "Appendix A".

GIVEN first reading this 6th day of April, 2023.

____
Reeve

____
CAO

GIVEN second reading this _______ day of ____________________, 20___.

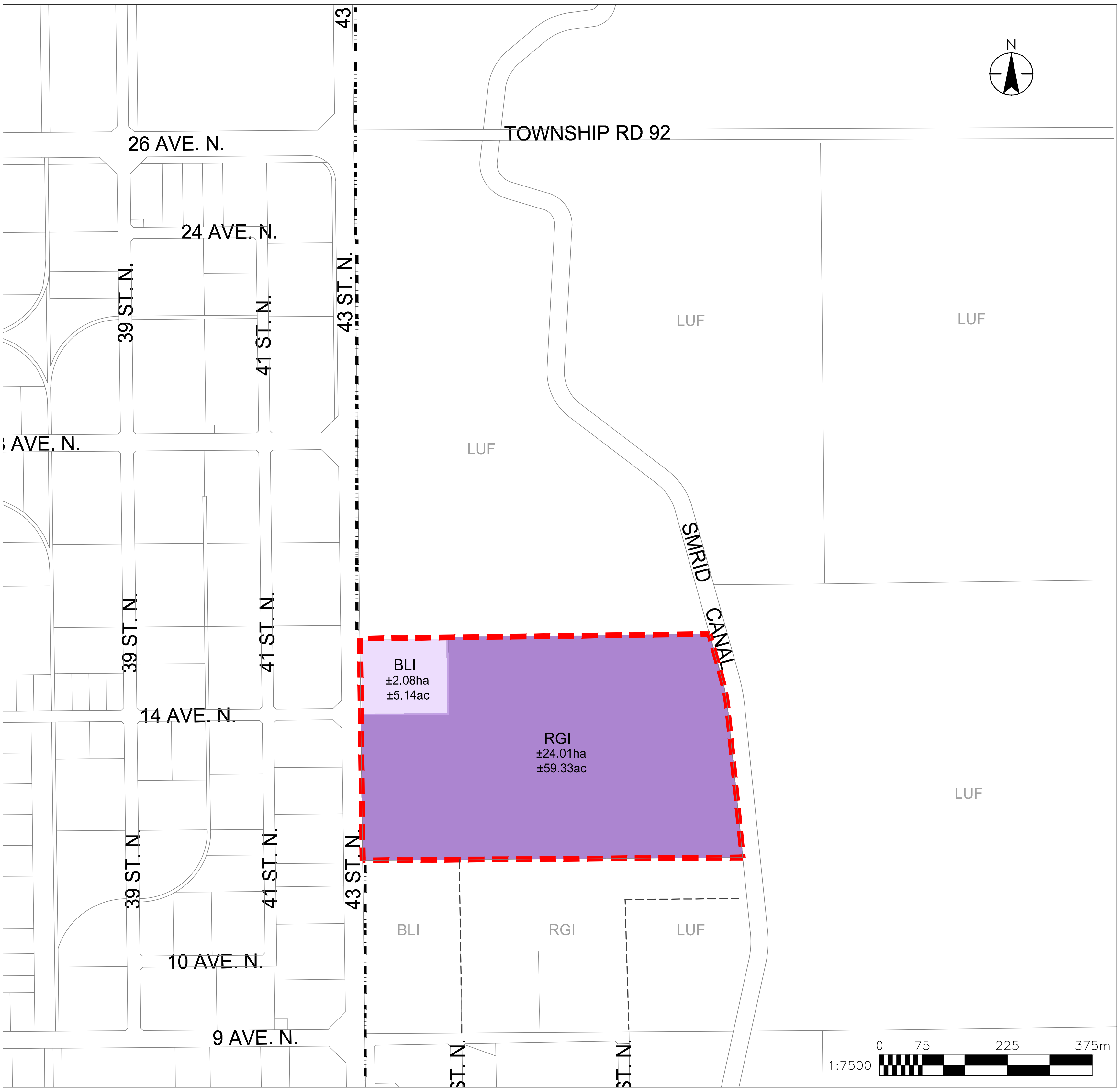
____
Reeve

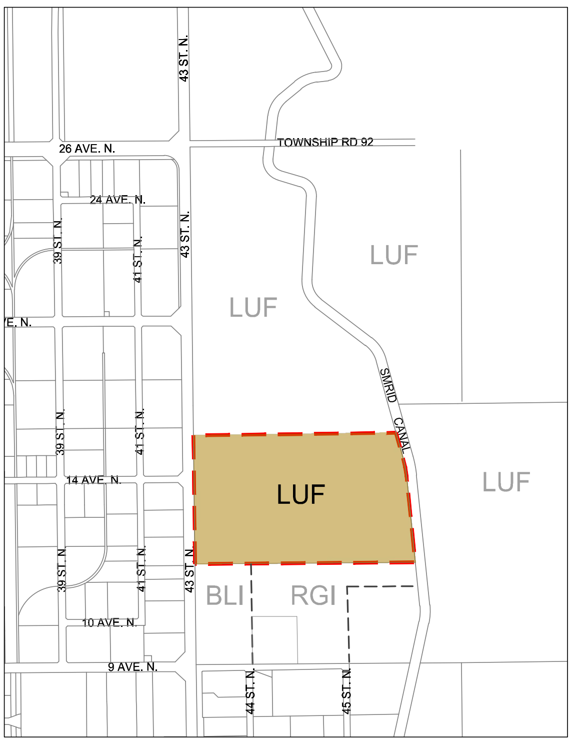
____
CAO

GIVEN third reading this _______ day of ____________________, 20_____.

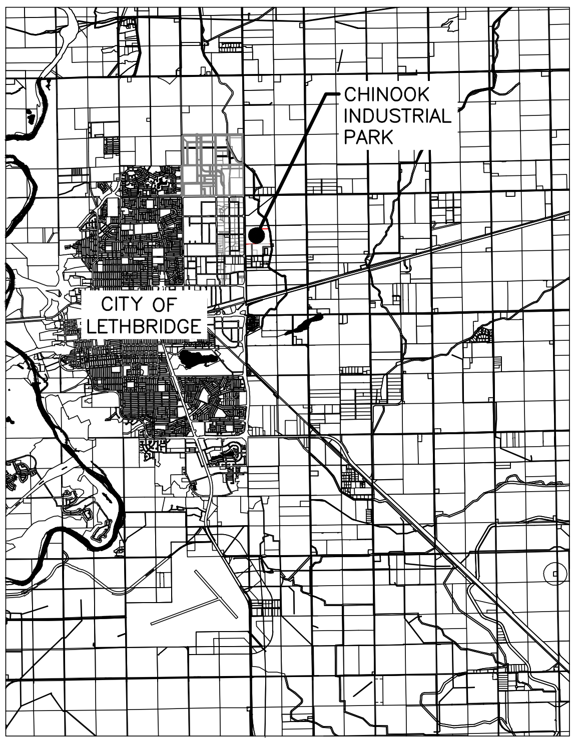
____
Reeve

____
CAO





EXISTING LAND USE



LOCATION PLAN

LEGEND

LAND USE REDESIGNATION BOUNDARY

COUNTY/CITY BOUNDARY

LAND USE REDESIGNATION STATISTICS

LUF TO BLI: ±2.08ha (±5.14ac)
LUF TO RGI: ±24.01ha (±59.33ac)

LEGAL DESCRIPTION

SW-10-9-21-W4M

FIGURE 1.0 | CHINOOK INDUSTRIAL PARK

LAND USE REDESIGNATION

PREPARED FOR: SUMUS DEVELOPMENT GP LTD.

V:\1165\Active\116549063\drawings\figures\Land Use Redesignation\49063_CIP_Fig 1.0-Land Use Redesignation.dwg
2023/02/13 2:57 PM By: Benis, Connor

Stantec

116549063
February 13, 2023

Geotechnical Evaluation
Chinook Industrial Park Area Structure Plan
Within W ½ of Section 10 TWP 9 RGE 21 W4M
Lethbridge County, Alberta

PRESENTED TO

Sumus Property Group Ltd.

MARCH 2023
ISSUED FOR REVIEW
FILE: ENG.LGEO04625-01.001

This document has been "Issued for Review" to allow the client/design team to review and provide comments back to Tetra Tech Canada Inc. This document is subject to revision based on input received and therefore any decisions based on this unsigned document should be reviewed in relation to the subsequent "Issued for Use" document.

Tetra Tech Canada Inc.
442 - 10 Street N.
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

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APPENDIX SECTIONS

FIGURES

APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Sumus Property Group Ltd., and his agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Sumus Property Group Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Tetra Tech's Limitations on Use of this Document are provided in Appendix A of this report.

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation conducted by Tetra Tech Canada Inc. (Tetra Tech) for the proposed Phase 2 and Phase 3 development of the Chinook Industrial Park Area Structure Plan (ASP) to be located in the Lethbridge County, Alberta (Figure 1).

The objective of this evaluation was to determine the general subsurface stratigraphy and groundwater conditions in the area of the proposed development and to provide general recommendations for the geotechnical aspects of the development. This evaluation has been conducted with limited project details available at this stage and with an understanding that a site-specific geotechnical evaluation will be conducted after further project details become available for each of the proposed building structures.

The scope of work for the geotechnical evaluation was set out in Tetra Tech's proposal (PENG.LGEO04625-01) dated January 17, 2023. The scope of work for this evaluation comprised the drilling of 15 boreholes, a laboratory program to assist in classification of the subsurface soils, and provision of this geotechnical report with the following design and construction recommendations:

- Design parameters for shallow foundations and below-grade structures.
- Design parameters for deep foundation systems.
- Design and installation of floor slabs-on-grade.
- Design and construction of stormwater facilities.
- Site classification for seismic site response.
- Trench excavation and backfill.
- General site grading.
- Volumetric changes of soil due to changes in moisture content and/or frost.
- Mitigation for high water table, if encountered.
- Construction of subgrades, backfill materials, and compaction.
- Concrete type for structured elements in contact with soil.
- Asphalt pavement structure as per the Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

Tetra Tech has also conducted a Phase I Environmental Site Assessment (ESA) for the proposed development. The findings of the Phase I ESA have been provided in a separate report.

Authorization to proceed with the evaluation was provided by Mr. Michael Kelly, of MSK Developments, on behalf of Sumus Property Group Ltd. (Sumus), via a signed Services Agreement dated January 23, 2023.

2.0 PROJECT DESCRIPTION AND SCOPE OF WORK

The proposed Phase 2 and Phase 3 development will be located within the west half of Section 10 TWP 9 RGE 21 W4M. Tetra Tech understands that Phase 2 and Phase 3 are adjacent and to the north of Phase 1A and 1B of the Chinook Industrial Park, which is currently developed and serviced.

Based on the information provided by the client, it is understood that the proposed Phase 2 and Phase 3 project will comprise an industrial/commercial business park with major development including industrial lots, utilities and street infrastructure, as well as stormwater management facilities. The total planned area of Phase 2 and Phase 3 is approximately 60.12 hectares.

It is understood that the proposed development will be designed and constructed to the Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

Further details of the proposed development, including building locations, foundation loads, floor elevations, and locations of the other facilities such as roadways and stormwater management facilities, are not available at the time of preparation of this report.

3.0 GEOLOGY

Based on Tetra Tech's previous experience near the project site and available surficial geological map by Shetsen[1], the native soil at the project site is expected to consist of lacustrine silts and clays which were deposited in the proglacial Lethbridge Lake, underlain by glacial upper till unit that forms the Lethbridge Moraine. The glacial upper till is of even thickness, consisting of unsorted mixture of clay, silt, sand, and gravel with local water-sorted material overlying bedrock. The site assessment results reported herein are generally consistent with the published data; however, bedrock was not encountered in the boreholes up to their termination depths.

4.0 FIELD AND LABORATORY WORK

4.1 Geotechnical Fieldwork

The fieldwork for this evaluation was carried out on February 2 and 3, 2023, using a truck-mounted drilling rig, contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The rig was equipped with 150 mm diameter solid stem continuous flight augers. Tetra Tech's field representative was Mr. Syed Alam, E.I.T. Buried utility locating was carried out through Alberta One-Call and a private utility locator, contracted by Tetra Tech (LandScan Locating Ltd.).

During the fieldwork, a total of 15 boreholes, designated as 23BH001 through 23BH015, were drilled within the proposed development footprint to depths varying from 6.6 m to 9.6 m below the existing ground surface. The borehole locations are shown on Figure 2.

The borehole locations were laid out on site by Tetra Tech using a handheld GPS. The borehole ground elevations were surveyed by Tetra Tech via a laser level and a rod. The south side of a survey stake denoted as 'FD.1', located on the southwest corner of the site (and shown on Figure 2), was used as a benchmark; with an assumed elevation of 1000.00 m. The borehole coordinates (with accuracy of ±2 m) and the surveyed ground elevations are presented on the borehole logs in Appendix B and summarized in Table A.

---

[1] Shetsen 1989. Quaternary Geology, Southern Alberta. Alberta Research Council, Bulletin No. 53.

Table A: Summary of Borehole Depths

Borehole No.	Existing Ground Elevation (m)[2]	Easting (m)[1]	Northing (m)[1]	Borehole Depth Below Existing Ground Surface (m)	Standpipe Depth Below Existing Ground Surface (m)
23BH001	999.61	371849	5508582	9.6	9.6
23BH002	997.44	372128	5508641	6.6	6.6
23BH003	996.71	372397	5508601	9.6	9.6
23BH004	996.60	372340	5508804	6.6	6.6
23BH005	998.40	372087	5508832	6.6	6.6
23BH006	999.49	371894	5508792	6.6	6.6
23BH007	999.13	371835	5509001	6.6	6.6
23BH008	997.70	372126	5509018	9.6	9.6
23BH009	996.20	372360	5508990	6.6	6.6
23BH010	996.93	372159	5509196	6.6	6.6
23BH011	998.04	371906	5509221	6.6	6.6
23BH012	997.26	371849	5509493	6.6	6.6
23BH013	997.22	372083	5509440	9.6	9.6
23BH014	995.95	372080	5509659	6.6	6.6
23BH015	996.41	371926	5509752	9.6	9.6

Notes: [1] Coordinates are based on UTM System Zone 12.
[2] Elevations are not geodetic. They are referenced to a site benchmark.

In all the boreholes drilled, disturbed grab samples were obtained at depth intervals of approximately 600 mm. Standard Penetration Tests (SPT) using an automatic SPT hammer (with an approximate efficiency of 90%) were completed at intervals of 1.5 m. All soil samples were visually classified in the field, and the individual soil strata and the interfaces between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

Slotted 25 mm diameter polyvinyl chloride (PVC) standpipes were installed in all the boreholes to monitor the short-term groundwater levels. Auger cuttings were used to backfill around the standpipes and the boreholes were sealed at the ground surface with bentonite chips.

4.2 Laboratory Program

Soil classification tests, including natural moisture content, Atterberg Limits, grain size distribution (hydrometer), soluble sulphate content, moisture-density relationship (proctor), and constant head hydraulic conductivity (also referred to as permeability) tests were subsequently performed in the laboratory on selected samples collected from the boreholes to aid in the determination of engineering properties. The results of the laboratory tests are presented on the borehole logs and the test reports for hydrometer, proctor and permeability are included as Appendix C.

5.0 SITE CONDITIONS

5.1 Location and Surface Features

The project site for Phase 2 and Phase 3 of the Chinook Industrial Park is located within the west half of Section 10 TWP 9 RGE 21 W4M and is bounded by 43 Street North to the west; 9 Avenue North to the south; the St. Mary River Irrigation District (SMRID) Canal to the east; and Township Road 92 to the north.

According to information provided by the client, the proposed Phase 2 and Phase 3 site comprises of two (2) lots in the northern portion of the Chinook Industrial: Lot 5 Block 1 Plan 1113171, and Lot 1 Block 1 Plan 0013201.

Lot 5 Block 1 Plan 1113171 is the larger half, comprising of 59.56 hectares of undeveloped farmland.

The remaining portion is Lot 1 Block 1 Plan 0013201, which is a 0.56-hectare portion of land (i.e., Lethbridge Regional Water Services commission lot) with a small building that primarily houses a water filling station.

The project site is relatively flat with drainage generally tending to the southeast except for the northern portion where there is an existing break in topography with the natural drainage tending in the northeast direction.

At the time of the geotechnical fieldwork, the site was sparsely covered with snow with the upper 0.3 m of the ground estimated to be frozen. This thickness of the frozen ground is expected to vary across the site.

5.2 Historical Aerial Photograph Review

As part of the evaluation, Tetra Tech reviewed historical aerial photographs and Google Earth Pro images of the proposed development site and surrounding area from 1950 to 2023. The following observations were noted:

- The proposed Phase 2 and Phase 3 project site has remained as undeveloped farmland since 1950 to date except for the construction of the water filling station in the northeast corner; estimated to have been constructed between 1999 and 2011.
- A winding irrigation channel exists at the eastern boundary with agricultural lands to the east and north.
- The existing 43 Street North was observed in all of the reviewed aerial photographs; thus, its construction is expected to have undertaken prior to 1950. 43 Street North borders the western boundary of the project site with undeveloped agricultural lands to its west in the 1950s; however, from 1979, industrial/commercial developments were observed in the reviewed photographs on the west side of 43 Street North.
- Additional industrial/commercial developments were observed in aerial photographs after 1979, most notably the Rave Industrial Park located at the south boundary, which was likely developed sometime between 1985 and 1991.
- Between 2012 and 2022, development of industrial lots comprising Phase 1A and 1B of the ASP was observed in the aerial photographs to the south of the Phase 2 and Phase 3 project site, with a stormwater pond in the southeast corner.

5.3 Mining Activity

Tetra Tech reviewed the possible existence of mine workings within the boundary of the proposed development area, including a review of the Alberta Energy Regulator (AER) coal mine mapping archive and other literature contained in Tetra Tech’s library. The review indicated that no mine workings exist within the proposed development area.

5.4 Background Geotechnical Review

As part of the site assessment, Tetra Tech reviewed the subsurface conditions of boreholes within 450 m of the project site, available in Tetra Tech’s library. The review indicates that subsurface conditions encountered on site, are generally consistent with those encountered earlier in the surrounding areas.

6.0 SUBSURFACE CONDITIONS

The general subsurface stratigraphy of the site comprised of a surficial layer of topsoil underlain by native clay and clay till deposits. The following subsections provide a summary of the stratigraphic units encountered at the specific borehole locations across the site. A more detailed description is provided on the borehole logs attached in Appendix B.

All noted depths in the following subsections refer to depth below the ground surface that existed at the time of the fieldwork.

6.1 Soils

6.1.1 Topsoil

A surficial layer of topsoil was encountered at all the borehole locations, with a thickness ranging from 20 mm to 130 mm. The topsoil was generally described as clay, silty, sandy, frozen to moist, and dark brown with trace rootlets and organics. Due to previous grading activities (agricultural practices) and depositional processes (i.e., wind), the thickness of the topsoil layer is expected to vary across the project site.

6.1.2 Clay

Native clay was encountered in all the boreholes underlying the topsoil and extending to depths ranging from 0.4 m and 2.0 m below ground surface. The clay was generally described as silty, some sand to sandy, damp to very moist, low to medium plastic, firm to very stiff, and brown. Silt and sand lenses/pockets, precipitates, and occasional high plastic clay inclusions were noted in the clay. Moisture contents of the selected clay samples varied from 7.7% to 23.0%. Two (2) Atterberg Limits tests conducted on clay samples indicated Plastic Limits of 14% and 15%; and Liquid Limits of 31% and 35%; indicative of low to medium plasticity. One (1) hydrometer test indicated a particle size distribution of the sand, silt, and clay size as 31%, 48%, and 21%, respectively.

SPT “N” values indicated between 5 and 10 blows per 300 mm of penetration, indicative of firm to stiff consistency.

6.1.3 Clay Till

Clay till was encountered beneath the native clay at depths varying from 0.4 m to 2.0 m below the existing ground surface in all the boreholes and extended to the borehole termination depths. The clay till was generally described as silty, some sand to sandy, trace gravel, damp to very moist, firm to very stiff, low to high plastic, and brown to dark brown with grey mottling. Silt and sand pockets up to 100 mm thick, precipitates, coal and oxide specks/staining or coal fragments were encountered within the clay till. Moisture contents of the selected samples of the clay till varied from 9.9% to 32.0%. Five (5) Atterberg Limits tests conducted on the clay till samples indicated Liquid Limits of 36%, 37%, 36%, 61%, and 29%; and Plastic Limits of 14%, 15%, 15%, 23%, and 12%; indicative of low to high plastic. High plasticity was observed only in sample D6 recovered from an approximate depth of 9.0 m from 23BH013. One (1) hydrometer test indicated a particle size distribution of the sand, silt, and clay size as 31%, 48%, and clay fraction as 21%, respectively.

SPT “N” values in the clay till ranged between 4 and 22 blows per 300 mm of penetration, indicative of firm to very stiff consistency.

Although not encountered in the boreholes, till deposits commonly contain cobbles and occasional boulders, which may be encountered during construction excavation, if any, and during installation of pile foundation.

6.2 Borehole Sloughing and Groundwater Conditions

During the field drilling, minor sloughing was encountered in 23BH009 and 23BH014 at depths of 6.1 m and 6.0 m respectively, below the existing ground. At the time of drilling, groundwater seepage was encountered in 23BH009, 23BH013, and 23BH015 at depths of 1.5 m, 7.8 m, and 6.3 m below the existing ground surface, respectively. Standpipes were installed in all the boreholes after completion of drilling. The groundwater levels were measured in the installed standpipes 7 to 8 days after completion of drilling on February 10, 2023. Table B summarizes the groundwater monitoring data.

Table B: Groundwater Monitoring Data – February 10, 2023

Borehole Number	Depth of Standpipe (m)	Borehole Elevation** (m)	Depth to Groundwater on February 10, 2023* (m)	Groundwater Elevation** (m)
23BH001	9.6	999.61	8.26	991.35
23BH002	6.6	997.44	6.37	991.07
23BH003	9.6	996.71	2.97	993.74
23BH004	6.6	996.60	5.83	990.77
23BH005	6.6	998.40	5.70	992.70
23BH006	6.6	999.49	6.42	993.07
23BH007	6.6	999.13	4.92	994.21
23BH008	9.6	997.70	5.20	992.50
23BH009	6.6	996.20	1.54	994.66
23BH010	6.6	996.93	3.65	993.28
23BH011	6.6	998.04	5.72	992.32
23BH012	6.6	997.26	Dry	-
23BH013	9.6	997.22	3.19	994.03
23BH014	6.6	995.95	2.05	993.90
23BH015	9.6	996.41	4.54	991.87

* February 10, 2023, is approximately 7 to 8 days after the completion of the borehole drilling

**Elevations are not geodetic and are referenced to a site benchmark

Based on the available groundwater information, groundwater levels were measured at depths varying from 1.54 m to 8.26 m below the existing ground surface. Groundwater levels within 3.0 m of the existing ground surface were measured in a total of three boreholes (23BH003, 23BH009, and 23BH014) located along the east boundary of the project site.

The water levels measured in the standpipes may not have stabilized at the time of the last measurement reported above. Groundwater levels may fluctuate seasonally (seasonally high in the late spring and early summer) and in response to climatic conditions; thus, they may be encountered at different depths when construction commences. Higher groundwater levels may be considered in the event construction is to occur during the late spring season and early summer. some of the observed groundwater level/seepage and sloughing noted in the boreholes is expected to be due to the presence of wet/saturated sand or silt seams within the clay or clay till.

7.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations provided in this report are valid for the project details discussed in Section 2.0. The recommendations that follow provide varying options intended to aid in the development of project concepts and specifications.

The following recommendations are based on subsurface conditions encountered in the boreholes drilled at the project site. Note that geological conditions are innately variable. At the time of preparation of this report, information on the subsurface stratigraphy was available only at discreet borehole locations. In order to develop design recommendations from this information, it is necessary to make some assumptions concerning conditions other than those present at the borehole locations.

The recommendations are based on the understanding and condition that Tetra Tech will be retained to review the relevant aspects of the final design (drawings and specifications) and to conduct such field reviews as are necessary to ensure compliance with the geotechnical aspects of the 2019 National Building Code – Alberta Edition (Building Code), Lethbridge County Engineering Guidelines and Minimum Servicing Standards, this report, and the final plans and specifications. Tetra Tech accepts no liability for any use of this report in the event that Tetra Tech is not retained to provide these review services.

Pursuant to Sections 2.2 and 2.4 of the Building Code, the proposed project will require compliance with the professional design and review requirements set out in Section 2.4 of the Building Code. These require that a geotechnical engineer be retained as a Registered Professional of Record to provide such field reviews as are necessary to certify compliance with the Building Code and to ensure that the geotechnical aspects of the project are constructed so as to substantially comply with the plans and specifications, as well as the requirements of this report.

Given that this geotechnical evaluation was completed with a limited number of boreholes and limited project details, it is advised that the recommendations presented in this report be confirmed and/or updated, as required, by conducting a site-specific geotechnical evaluation prior to design and construction of each building/development.

7.1 General

Based on the subsurface conditions encountered in the boreholes, potential geotechnical constraints exist within the site that could impact the proposed design and construction, including:

- The presence of a shallow groundwater table (as shallow as 1.54 m, 2.05 m, 2.97 m, and 3.19 m below the existing ground surface in 23HB009, 23BH014, 23BH003, and 23BH013, respectively).
- The presence of frost-susceptible soils.
- The presence of low to medium plastic clay/clay till (with occasional high plastic) below the topsoil, with firm to very stiff consistency.

On the premise of subsurface conditions encountered in the boreholes, the potential for methane generation is not expected, provided the topsoil containing organics is completely removed from potential building footprint areas and approximately 5.0 m beyond potential building footprint areas.

Considering the groundwater levels measured in the standpipes, temporary and permanent dewatering measures would be required, depending on the depth of excavation, and particularly in areas of shallow groundwater along the east boundary of the project site.

Clay till with high plasticity (i.e., Liquid Limit of 61% and Plasticity Index of 38%) was encountered in 23BH013 at a depth of 9.1 m below the existing ground surface. The high plastic clay typically has relatively higher potential of swelling and shrinkage upon wetting and drying; thus, the performance of settlement-sensitive structures may be impacted if the high plastic clay is present immediately beneath them. The presence of high plastic clay, if any, should be assessed during the site-specific geotechnical evaluation within the footprint of the settlement-sensitive structures.

All foundation design recommendations presented in this report are based on the assumption that an adequate level of monitoring by Tetra Tech will be provided during construction and that all construction will be carried out by suitably qualified contractors, experienced in foundation and earthworks construction. An adequate level of monitoring is considered to be:

- For shallow foundations; inspection of bearing surfaces prior to placement of concrete or mudslab, and design review during construction.
- For deep foundations; full-time monitoring and design review during construction.
- For earthworks; full-time monitoring and compaction testing.

Suitably qualified persons, independent of the contractor, should carry out all such monitoring. One of the purposes of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the site.

7.2 Site Development

7.2.1 Topsoil Depth

The initial topsoil stripping depth should be considered as being of particular importance with regard to site subgrade grading design elevations. Based on the findings of the field drilling program, the surficial topsoil (A Horizon) layer thickness generally varies from 20 mm to 130 mm; however, may be variable in thickness due to historical cultivation practices of the land surface and/or depositional processes (i.e., wind). However, consideration can be given to incorporating the underlying B Horizon layer (organic content <5%) into the fill mass to be removed during general site grading. Full-time monitoring by experienced personnel is recommended in order to avoid over-stripping and to ensure appropriate material mixing and placement. To accurately estimate the topsoil stripping volume (if required), it is recommended that a site-specific field drilling program be conducted.

7.2.2 Lot Grading

The lot grading should be designed and carried out to the current Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

All lots should be graded for drainage at a minimum gradient of 3.0%. Backfill materials and compaction requirements, as to be discussed in Section 7.2.3, should be followed. Where encountered, all organics, localized soft and/or wet soils, or deleterious material must be removed to expose the underlying suitable clay soil. The excavated areas must be backfilled with general engineered fill.

If the development is to consider a raised site grading, additional settlement due to consolidation of the fill and the native soil should be expected and should be considered in the design. After the completion of the raised site grading, the construction of structures supported on raised grade should be delayed to allow for the majority of the consolidation settlement to occur prior to construction.

7.2.3 Backfill Materials and Compaction

The existing site soils comprising the predominantly low to medium plastic clay and clay till are considered suitable for use as both landscape fill and general engineered fill materials, as defined in Appendix D. Any soil containing deleterious materials should be removed from site. Sand, silt, and high plastic clay soils, if any, should be separated and used for landscape fill. The final decision on approved backfill materials should be made during site construction.

The moisture content of the site soil materials is expected to be variable with respect to the optimum moisture content (OMC); therefore, it is anticipated that moisture conditioning will be required at the site for proper backfill placement. The earthworks contractor should make their own estimate of the requirements for moisture conditioning to the recommended standards and should consider such factors as weather and construction procedures. A contingency for importation of general engineered fill is recommended in the event that the site soils cannot be moisture conditioned.

General engineered fill materials should be moisture conditioned to within a range of OMC to +2% of the OMC prior to compaction and compacted to a minimum of 98% Standard Proctor Density (SPD). The compacted thickness of each lift of backfill shall not exceed 150 mm.

Further recommendations regarding backfill materials and compaction are contained in Appendix D.

7.2.4 Construction Excavations

Excavations should be carried out in accordance with Alberta Occupational Health and Safety Regulations. The depth for the trench excavations is unknown at this time and is anticipated to be less than 6 m below existing ground surface for below-grade structures and/or utility infrastructure. The following recommendations notwithstanding, the responsibility of all excavation cutslopes resides with the Contractor, who should take into consideration site-specific conditions concerning soil stratigraphy and groundwater. All excavations should be reviewed by the Contractor and experienced geotechnical personnel prior to working within the base of the excavation.

Based on the findings of the drilling program, firm to very stiff clay soils, in moist to very moist conditions, are generally anticipated to be encountered within 6.0 m below grade during excavation. All excavations which are to be deeper than 1.5 m should have the sides shored and braced or the slopes should be cut back no steeper than 1.0 horizontal to 1.0 vertical (1.0H:1.0V). In areas where seepage is encountered, the cutslope would need to be flattened to 1.5H:1V and dewatering equipment should be on hand. When excavations are open for longer than one month or where the excavation is required deeper than 6.0 m, the slopes should be cut back flatter than 1.0H:1.0V and should be assessed during construction by a qualified geotechnical engineer.

Any encountered groundwater seepage should be directed towards sumps for removal. Conventional construction sump pumps should be capable of groundwater control.

Spoil piles or temporary surcharge loads should not be allowed within a distance equal to the depth of the excavation from an unsupported excavation face, while mobile equipment should be kept back at least 3.0 m. All excavations should be checked regularly for signs of sloughing, especially after rainfall periods. Small earth falls from the sideslopes are a potential danger to workers and must be guarded against by the contractor.

General recommendations regarding construction excavations are contained in Appendix D.

7.2.5 Trench Backfill and Compaction

Trenches must be backfilled in such a way as to minimize the potential differential settlement and/or frost heave movements. A minimum compaction level of 95% of Standard Proctor Maximum Dry Density (SPMDD) is recommended for backfill within the pipe zone of the trench (to 300 mm above the top of pipe). For the remainder of the trench backfill, a minimum compaction standard of 98% of SPMDD should be utilized in all areas. The compacted thickness of each lift of backfill shall not exceed 150 mm. Moisture conditioning to OMC and 2% over OMC of the soils should be specified for general trench backfill. The upper 1.5 m of service trenches should be cut back at a maximum slope of 1.0H:1.0V to avoid an abrupt transition between backfill and in situ soil.

It should be noted that the ultimate performance of the trench backfill is directly related to the uniformity of the backfill compaction. In order to achieve the uniformity, the lift thickness and compaction criteria should be strictly enforced.

General recommendations regarding backfill materials and compaction are contained in Appendix D.

7.3 Foundations

The following foundation recommendations have been provided assuming that no significant site grading would be undertaken at the project and foundation design recommendations would be confirmed/updated by conducting a site-specific geotechnical evaluation.

Based on the available borehole logs, firm to very stiff clay or clay till (with SPT blow count varying from 4 to 10 in the majority of the boreholes) was generally encountered at/near the anticipated depth of shallow foundation (i.e., within the upper 2.1 m below the existing ground surface). Considering the soil conditions encountered in the boreholes, shallow foundations are considered suitable to support only lightly loaded structures. Further recommendations and parameters for the design of shallow foundations are provided in Section 7.3.2.

Alternatively, deep foundation systems consisting of bored cast-in-place (CIP) concrete piles or Continuous Flight Auger (CFA) concrete piles founded in stiff to very stiff clay/clay till may be used to support the proposed development. Helical piles may also be considered to support the structures of the proposed developed; however, helical piles should be used to support only static loads (i.e., no dynamic loads). Further recommendations for bored CIP piles and CFA piles are provided in Sections 7.3.3 and 7.3.4, respectively.

7.3.1 Limit States Design

For the Limit States Design (LSD) methodology, in order to calculate the factored load capacity, the appropriate Soil Resistance Factors must be applied to each loading condition as follows:

Factored Capacity = Ultimate Capacity x Soil Resistance Factors

In general, the following soil resistance factors must be incorporated into the foundation design. These factors are considered to be in accordance with the Canadian Foundation Engineering Manual (CFEM) (2006) as well as the Building Code.

Table C: Soil Resistance Factors

Description		Resistance Factor
Shallow Foundations		
Bearing resistance		0.5
Passive resistance		0.5
Horizontal resistance (sliding)		0.8
Deep Foundations		
Resistance to Axial Compressive Load	From Semi-Empirical Analysis	0.4
	From Static Loading Test Results	0.6
	From Dynamic Monitoring Results (i.e., Pile Driver Analyzer Testing)	0.5
Uplift Resistance	From Semi-Empirical Analysis	0.3
	From Loading Test Results	0.4
Horizontal Load Resistance		0.5

Under LSD methodology, foundations are to be designed with consideration to both the factored Ultimate Limit State (ULS) and Serviceability Limit States (SLS).

7.3.2 Shallow Foundations

Shallow foundations consisting of strip, spread, or mat foundations bearing on firm to stiff clay may be used to support lightly loaded structures, provided other recommendations of this report are followed. Shallow footings should be constructed to a minimum of 1.4 m below the final design ground surface (frost protection requirement for footings under heated structures). For unheated structures, the footings should be constructed a minimum of 2.1 m below grade. All footings should be founded on firm to stiff native soils only. Any fill (except for the general engineered fill) and deleterious materials must be removed from the building footprint areas to expose native subgrade soils.

The future site grading plan is unknown at this time which may require footings to be placed within general engineered fill. It is noted that placement of foundations on engineered fill with thicknesses greater than 2.0 m requires special consideration regarding long-term consolidation of the fill and underlying native soils and subsequent performance issues with the foundations/floor slabs-on-grade. Recommendations and parameters for the design of the shallow foundations within the engineered fill, if any, should be assessed during site-specific geotechnical evaluation considering the grading details.

Footings should be founded on native firm to stiff native soils only. The ultimate and factored static bearing resistance may be taken as 150 kPa and 75 kPa, respectively, subject to other recommendations in this report and confirmation/update during the site-specific geotechnical evaluation. Footing dimensions should be in accordance with the minimum requirements of the Building Code.

Specific bearing certification by a geotechnical engineer in conjunction with a site-specific geotechnical evaluation is recommended for each industrial structure to ensure that the shallow foundations are placed on competent native soils. Any soft/wet/loose/weak soils encountered at footing level, should be replaced with low strength lean mix concrete. Alternatively, it may be possible to lower the footing elevation to more competent native soils, but this should be looked at on a case-by-case basis.

It is recommended to use a smooth edge-trimming bucket or Grade-All for final excavation to the foundation subgrade elevation to minimize disturbance of the founding soils. A minimum 50 mm concrete mudslab should be placed immediately following excavation and inspection, to protect the bearing surface from disturbance and inclement weather.

Gradients of 1H:1V or flatter should be maintained between the bases of adjacent footings at different elevations to avoid load transfer from one to the other.

Foundations subjected to significantly inclined, eccentric, or dynamic loading require special considerations and should be geotechnically assessed on an individual basis.

Considering the groundwater levels measured in the standpipes, groundwater seepage may be encountered during foundation excavation in some areas of the project site.

Recommendations for minimum depth of cover for footings are presented under the heading ‘Frost Protection’ in Section 7.10. Further recommendations regarding shallow foundations are given in Appendix D.

7.3.3 Bored Cast-in-Place Piles

As an alternative to shallow foundation, bored CIP piles may be considered to support the proposed structures.

Bored CIP piles, founded in stiff to very stiff native clay till, may be designed to resist axial compressive loads on the basis of the shaft and the base resistance parameters provided in Table D. The parameters provided in Table D should be confirmed/updated based on the site-specific geotechnical evaluation.

Table D: Bored Cast-in-Place Concrete Pile Design Parameters (for Compressive Loads)

Depth Below Existing Ground Surface (m)	Ultimate Shaft Resistance (kPa)	Factored Shaft Resistance (kPa)	Ultimate Base Resistance (kPa)	Factored Base Resistance (kPa)
0.0 to 2.0	0	0	N/A	N/A
2.0 to 6.0 (Native Clay / Clay Till)	40	16	N/A	N/A
6.0 to 9.6 (Clay till)	60	24	900	360

Straight shaft piles should have an overall concreted pile length not less than 6.0 m below final grade and a minimum shaft diameter of 400 mm. Longitudinal reinforcement in straight shaft piles should extend a minimum of 6.0 m below final grade to provide adequate uplift resistance against frost jacking.

Bored CIP piles should be spaced no closer than 2.5 times the base diameter (measured centre-to-centre). Bells of the CIP piles, where chosen to be constructed, should also be spaced 2.5 times the bell diameter (measured centre-to-centre).

The shaft and base resistances presented in Table D are based on the assumption that mechanical cleaning of the pile sides and bases will be undertaken during installation. Soft, loose, or wet soils, and accumulated water, if any, should be removed from the base and the side of the pile bore immediately prior to the placement of concrete. Base resistance should only be considered in the design where base cleaning can be verified during construction.

Under-reaming or belling of bored CIP piles in clay till should only be considered if a pile bell free of groundwater seepage can be constructed, and if sloughing of the pile bell is not encountered. The feasibility of construction of bell piles in clay till should be assessed and confirmed by the piling contractor prior to construction. Difficulty in bell construction may occur where silty, sandy, or gravelly clay till is encountered at the bell elevation or where groundwater seepage is encountered at the bell elevation. Accordingly, an alternate design option should also be prepared and implemented where belled piles cannot be constructed.

Bell diameters should be two to three times the shaft diameter. End-bearing should not be used for small diameter (less than 760 mm base diameter) piles because of the difficulties associated with ensuring a clean base. For bored CIP belled piles, shaft resistance should be neglected over the height of the bell and for a height of one shaft diameter above the top of the bell. A minimum depth of cover of 2.5 times the base or bell diameter has been assumed to determine the base resistances provided in Table D. Should less cover be provided, the base resistance would have to be reduced.

Pile bells cannot be formed within sloughing layers such as silt, sand, gravel, and gravelly layers of the clay till. To provide adequate support for the roof of a bell where wet sloughing layers are encountered, the minimum distance from the underside of a sloughing layer to the top of the roof of a bell should be 0.6 m.

It is noted that the clay till will require confirmation of soil conditions at pile bottom elevations for piles with base resistance consideration, as local weaker layers may be encountered during pile installation. Where weaker layers are encountered at the pile bases, additional measures considering the design details of the piles would be required.

Groundwater seepage is expected to be encountered during pile installation at the project site, primarily where wet/saturated sand/silt seams or perched groundwater are intercepted.

Temporary casing should be on hand before drilling starts and used to seal off groundwater and to prevent sloughing of the pile bore. The piling contractor should make their own estimate of temporary casing requirements and should consider such factors as construction procedures and bore diameter.

The piling contractor selected should be experienced in the placement of concrete below water using tremie pipes in light of the potential for groundwater inflows to be encountered during pile installation. The contractor should have all required and/or reasonably anticipated equipment on site prior to the construction of any pile.

Difficult drilling conditions of the bored CIP piles and bell formation in the clay till, if chosen, may be encountered due to potential presence of cobbles and/or boulders. Such drilling difficulties should be assessed by the piling contractor.

Field adjustments of pile dimensions (i.e., length and/or diameter) based on the encountered subsurface conditions may be required and should be included in contract documents.

General recommendations for the design and construction of bored CIP piles are provided in Appendix D.

7.3.4 Continuous Flight Auger Concrete Piles

As an alternative to bored CIP piles, CFA concrete piles, also known as auger-cast piles, are considered feasible for the proposed development. CFA piles are formed by drilling a continuous flight hollow stem auger into the ground, followed by pressure injection of concrete and simultaneous extraction of the auger. The sides of the hole are supported at all times by the auger, eliminating the need for temporary casing or drilling slurry. Reinforcement is placed immediately after withdrawal of the auger.

CFA piles may be designed on the basis of shaft resistance and base resistance provided in Table E.

Table E: Continuous Flight Auger Pile Design Parameters (for Compressive Loads)

Depth Below Existing Ground Surface (m)	ULS Ultimate Shaft Resistance (kPa)	ULS Factored Shaft Resistance (kPa)	ULS Ultimate Base Resistance (kPa)	ULS Factored Base Resistance (kPa)
0 to 2.0	0	0	N/A	N/A
2.0 to 6.0 (Native Clay / Clay Till)	40	16	N/A	N/A
6.0 to 9.6 (Clay till)	60	24	900	360

The base resistances provided in Table E are based on the assumption that stiff to very stiff clay till soils and a clean base are to be expected. It is impractical to confirm the base soil conditions with a clean base during pile installation, due to the CFA installation method; therefore, precautions, including, but not limited to, those discussed below, would need to be taken and should be included in the contract documents. Additional boreholes or trial CFA piles may be required prior to, or during, construction to further delineate the subsurface conditions.

Prior to design and construction, the suitability of CFA piles should also be confirmed by the designer and the contractor for the project site, considering the subsurface conditions and the potential variations. Installation records of CFA piles, such as concrete volume, concrete pressure, installation depth, pile profile, etc., should be provided by the piling contractor during construction monitoring for review. Based on the review of installation records, Pile Integrity Tests and/or Pile Driving Analyzer (PDA) tests may be required on selected CFA piles to confirm their capacities or integrities.

Pile reinforcement must be adequate to withstand all vertical, lateral, and tensile forces within the pile. A minimum pile diameter of 400 mm is recommended.

A minimum centre-to-centre pile spacing of 2.5 pile diameters is recommended. Short length (up to 10.0 m) reinforcing cages can be installed by the manual means of pushing the cage into the wet concrete, but longer cages will require the use of a vibrator, in which case it is essential that the reinforcement cages are welded. Centralizers are recommended to ensure adequate concrete cover of the reinforcing steel cages.

An important feature in the formation of CFA piles is the use of comprehensive instrumentation to monitor the performance of the rig at the time of boring. The piling rig must be capable of continuous pile monitoring using computerized technology (i.e., Pile Installation Recorder) to verify the pile cross-sectional area, concrete injection pressures, auger rotation per unit depth, boring rate, and the pressure in the rig hydraulic system. The capacity of CFA piles is highly dependent on the concrete injection pressure and on the properties of the soil into which the concrete is being injected. Continuous monitoring during pile installation is recommended to document the details of each CFA pile installed.

7.3.5 Serviceability Limit State Design for Cast-in-Place and Continuous Flight Auger Piles

The SLS must be addressed in addition to analyzing the ULS resistance of a foundation. The SLS is an analysis of the amount of settlement that a foundation element would undergo using unfactored structural loads.

Elastic compression of the pile shaft must be considered, regardless of whether the pile is designed on the basis of shaft resistance and/or base resistance. Note that the elastic compression of the pile shaft is typically small compared to the amount of compression of the soil at the base of the pile that is required to fully mobilize either the shaft resistance or base resistance.

For piles designed primarily on the basis of shaft resistance, the ultimate shaft resistance is typically mobilized after a relatively small pile displacement (approximately 5 mm to 10 mm). Full mobilization of the shaft resistance occurs prior to full mobilization of the base resistance (i.e., additional settlement is required to mobilize the base resistance).

The following expression should be used to estimate the settlement of a pile under SLS conditions, using unfactored structural loads:

$$S = (K)x\ (P/B\ E)$$

Where:

S = Foundation settlement (m).

K = 0.91.

P = Unfactored structural load (live load plus dead load, kN) applied at the pile base.

B = Pile base diameter (m).

E = Elastic modulus of the foundation soil, use 26,000 kPa at depths 6.0 m to 9.6 m below the existing ground surface.

The pile base diameter used in the above expression should be determined from the analysis of factored (ULS) structural loads and factored (ULS) base resistance for each loading case. If the calculated settlement is higher than tolerable for the structure, SLS may govern the pile design. Under such conditions, Tetra Tech should be contacted to provide further direction regarding suitable methods of settlement control. The above expression is anticipated to provide an estimate of the settlement, excluding the elastic compression of the pile.

7.3.6 Helical Piles

Helical piles are considered as an alternative option for this development, particularly preferred for lightly loaded structures. It is recommended that helical piles be considered only for statically loaded foundations (i.e., no dynamic load component). Design and construction recommendations for helical piles are provided in this section; however, it is noted that for the final design of this type of pile consideration should be given to the installation methodology of the specialty contractor, as the design capacity of helical piles is a function of the pile installation methodology.

Tetra Tech recommends using the CFEM (2006) design method for helical piles (CFEM Section 18.2.1.4). Using this methodology, the geotechnical parameters required to calculate the ultimate foundation capacity are provided in Table F. A minimum recommended depth for the upper helix is 2.1 m below the existing grade.

Table F: Geotechnical Parameters for Helical Piles

Depth (m)	Bulk Unit Weight (kN/m³)	Avg. Undrained Shear Strength Cu (kPa)	Drained Friction Angle* (Degrees)
0 to 2.0	19	-	-
2.0 to 6.0	19	50	26
6.0 to 9.6	19	100	28

*Only for long-term strength consideration with zero cohesion; friction angle should not be used together with undrained shear strength.

The total helical pile capacity is presented in the CFEM (Equation 18.10) as follows:

$R = Q_t + Q_f$

Where:

R = Total ultimate capacity of the pile (kN).

Q_t = Total ultimate multi-helix pile capacity (kN).

Q_f = Ultimate capacity due to pile shaft skin friction (kN) (for pile shafts greater than 100 mm diameter only).

To calculate the multi-helix bearing capacity, the individual bearing method presented in CFEM Equations 18.11 and 18.12 should be used, provided the helical bearing plates are spaced a minimum of three times the diameter of the largest helix. Otherwise, the cylinder shear method should be used, with consideration of overlapping stress zones between helices. This method sums up the bearing capacity of the bottom plate and the cylindrical shear capacity developed between the upper and lower plate(s).

The factored geotechnical capacity for each pile may be determined as follows, using the soil resistance factors presented in Section 7.3.1:

- Factored Pile Compression Capacity = 0.4R
- Factored Pile Uplift Capacity = 0.3R

For helical piles, the helix or helices should be founded in competent clay till and below the depth of frost penetration. Vertically installed helical piles generally require an enlarged shaft diameter in order to adequately resist lateral loads, where applicable. For bottom helices with load influence depths lower than the maximum borehole termination depth of 9.6 m, a field drill program should be conducted to confirm the soil conditions in depth. Should any of these parameters become limiting factors in the design, Tetra Tech should be contacted for more detailed review and analysis.

Construction of helical piles should consider, but not be limited to, the following recommendations:

- As the helical piles are installed, the rate of rotation and advancement should match the pitch of the helix plate. This will help to avoid “churning” of the foundation soils. It is critical that the foundation bearing soil is not excessively disturbed in order to minimize the risk of excessive foundation settlement.
- An estimate of pile capacity may be obtained by correlating capacity to installation torque. This method requires that an appropriate torque factor be selected by the pile designer (in consultation with the piling contractor). Torque factors are selected based on soil type as well as pile shaft size and shape. This method of estimating pile capacity should be used as a quality control check only and is not suitable to replace proper design procedures. Installation torque should be recorded using calibrated equipment, and the piling contractor should provide a recent calibration certificate (conducted a maximum of 1 year from pile installation) for each piling setup used on site.
- It should be noted that a high torque value can sometimes mislead estimation of bearing capacity. The occurrence of soft zones beneath the final pile depth are not represented in the recorded torque value but may adversely impact the load carrying capacity of the helical pile.
- Pile load testing is recommended. The results of the pile load tests can be correlated to the measured installation torque to develop site-specific installation criteria. In addition, a higher geotechnical resistance factor for compressive loading of 0.6 can be used if pile load testing is conducted prior to construction.

If lateral loading is considered critical to the pile performance, care must be taken during pile installation to identify voids developing around the pile shaft. Due to the nature of the pile installation process, it is common to develop voids that can significantly influence lateral loading on a pile. If voids develop, they should be backfilled with granular fill, sand, fillcrete, or grout depending on the size of the voids.

7.3.7 Laterally-Loaded Piles (Modulus of Horizontal Subgrade Reaction)

The resistance of vertical piles to horizontal load involves soil-structure interaction and is commonly analyzed using computer structural analysis software. If required, detailed lateral analysis can be carried out by Tetra Tech using commercially available software to confirm the results of structural analysis. Additional information pertaining to foundations (including but not limited to loading conditions, size, depth, and spacing) would be required prior to completing the detailed lateral analysis. Alternatively, lateral pile performance may be analyzed using a modulus of horizontal subgrade reaction (k_s) and spring constant (K).

In the event that the soil conditions do not provide adequate lateral foundation capacity for a vertical pile, battered piles may be considered. Battering or inclining piles significantly increases the resistance of a laterally-loaded pile; however, the potential impacts of ground deformation should be considered in the decision to use battered piles.

The modulus of the horizontal subgrade reaction has been estimated based on the soil properties at the project site. It is recommended that the design k_s value increase linearly from zero at the ground surface to the value calculated from the formula provided at a depth of 2.0 m below the ground surface. Below this depth, the modulus of horizontal subgrade reaction may be assumed to be constant for a given soil layer.

The SLS modulus of horizontal subgrade reaction for a pile diameter ‘B’ is calculated as follows:

$$\mathrm{k_s = k'_s/B\ (Mpa/m)}$$

Where:

k'_s = Coefficient of horizontal subgrade reaction (MPa).

= 10 MPa for the native soil from 2.0 m to 6.0 m below the existing grade.

= 20 MPa for the native soil from 6.0 m to 9.6 m below the existing grade.

B = Pile diameter (m).

The spring constant (K) for use in modelling lateral pile capacity may be obtained as follows:

$$\mathrm{K = k'_s L\ (MN/m)}$$

Where:

L = Length of pile segment (m).

7.4 Foundation Perimeter Drainage Requirements

It is recommended that a weeping tile and sump system be constructed around the outside perimeter of the buildings (at the base of the footings or grade beam to maintain a relatively consistent moisture profile of the subgrade soils beneath the floor slabs). The weeping tile system should comprise a perforated weeping tile, in turn surrounded with a minimum of 150 mm thick blanket of washed rock (maximum size 20 mm) with the granular layer wrapped in non-woven geotextile. The weeping tile should have a minimum 0.5% slope leading to a sump.

7.5 Surface Grading and Drainage

Drainage of surface water away from proposed structures should be maintained during and after construction. The finished grade of the proposed development should be designed so that surface water is drained away from structures by the shortest route. All drains should discharge well clear of structures. For construction of roof drains, caution should be taken where downspouts discharge due to the high probability of ice forming in the winter. Downspouts may be discharged onto landscaped areas, provided the water is carried, by means of a concrete splash pad or extendable section so the point of discharge of the water is at least 2 m from the structures. Landscaped surfaces adjacent to buildings should be graded to slope away from the building at a gradient of at least 5% within 2 m of the building structures' perimeter. General landscaped areas should have grades of no less than 2% to minimize ponding.

7.6 Floor Slab System

7.6.1 Floor Slabs-on-Grade

Construction of slabs-on-grade (not including basements) must consider the following precautions and construction recommendations.

In native soil areas, following removal of topsoil, soft, loose, wet, or disturbed portions of the native soils the subgrade should be scarified to a minimum depth of 300 mm, and moisture conditioned to a range of optimum to 2% over OMC and re-compacted to minimum 98% of SPMDD. High plastic clay, if any, observed on the subgrade should be removed and replaced with low to medium plastic clay, compacted to minimum 98% of SPMDD. In areas of general engineered fill placed during site grading, a minimum depth of 150 mm subgrade preparation is recommended; if weathering is evident, 300 mm subgrade preparation is required. In areas where general engineered fill is placed during site grading, a waiting period (dependent on fill thickness) prior to installation of floor slabs should be provided to reduce the potential settlement after construction. The minimum compaction should be 98% of SPMDD. The prepared subgrade should be proof-rolled and any soft or loose pockets detected should be reconditioned as recommended above or over-excavated and replaced with general engineered fill.

A levelling course of clean well-graded crushed gravel, at least 150 mm in compacted thickness, is recommended directly beneath the slabs-on-grade, unless a thicker course is required for structural purposes. The subgrade beneath slabs-on-grade should be protected at all times from moisture, frost or exposure which may cause softening or disturbance of the subgrade soils. This applies during and after the construction period (and before and after replacement of the required general engineered fill). Should the exposed surface become saturated or disturbed, it should be reworked to achieve the above standards.

If the subgrade is properly prepared as noted above, floor slab movements should be limited to less than approximately 25 mm. Slabs-on-grade should be separated from bearing members to allow some differential movement. If this range of differential movement is unacceptable, the owner should consider a structurally supported floor.

Recommended procedures for backfill materials, and further recommendations for slabs-on-grade construction are included in Appendix D.

7.6.2 Structural Slabs

If slab movements cannot be tolerated, a structurally supported floor slab system is recommended as the preferred option for this development; however, with a structurally supported floor slab system, there is a risk of ground movement relative to the slab. This relative movement can lead to problems if piping and other utilities that are connected to the slab are embedded within the ground beneath the slab. Utilities beneath the structurally supported floor slabs should be protected from differential movement by placing utilities within boxes suspended from the structural slab. In addition, a void form is recommended below the floor slab in order to prevent transfer of uplift pressures due to swelling clay soil

7.7 Below-Grade Walls

All below-grade walls, if any, should be designed to resist lateral earth pressures in an "at-rest" condition. This condition assumes a triangular pressure distribution and may be calculated using the following expression:

$$P_o = K_o (\gamma H+Q)$$

Where:

P_o = Lateral earth pressure "at-rest" condition (no wall movement occurs at a given depth).

K_o = Coefficient of earth pressure "at-rest" condition (use 0.5 for cohesive backfill and 0.45 for sand and gravel backfill).

γ = Bulk unit weight of backfill soil (use 19 or 21 kN/m³ for cohesive or granular backfill, respectively).

H = Depth below final grade (m).

Q = Surcharge pressure at ground level (kPa).

Installation of a weeping tile system along the base of the below-grade walls is recommended to avoid build-up of hydrostatic pressures. The weeping tile should have a minimum 0.5% slope leading to a sump. The preferred method would be to have provision to tie the sump into the property's on-site drainage system.

Backfill around concrete walls should not commence before the concrete has reached a minimum two-thirds of its design strength and first floor framing is in place or the walls are laterally braced. Only hand-operated compaction equipment should be employed within 600 mm of the concrete walls. Caution should be used when compacting backfill to avoid high lateral loads caused by excessive compactive effort. A compaction standard of 95% of SPMDD is recommended. To avoid differential wall pressures, the backfill should be brought up evenly around the walls. A minimum 600 mm thick clay cap should be placed at the ground surface to reduce the infiltration of surface water.

7.8 Pavement Structures

7.8.1 Subgrade Preparation

Subgrade preparation should be undertaken prior to pavement construction. In native soil areas, topsoil, soft, loose, wet, or disturbed portions of the existing soils, and soils containing organics should be removed from the subgrade areas. The recommended compaction standard for subgrade preparation is a minimum of 98% of SPMDD. Cohesive soils should be compacted at optimum to 2% over the OMC. Granular soils (granular base and sub-base layers) should be compacted with moisture content within ±1% of the OMC. A minimum depth of subgrade preparation of 600 mm within clay fill (subject to a proof-roll) or 300 mm within the native clay is recommended for all paved areas.

Backfill to raise these areas to subgrade level should be general engineered cohesive fill materials, as defined in this report, moisture conditioned and compacted as noted previously. Proof-rolling of the prepared surface is recommended to identify localized soft areas and for an indication of overall subgrade support characteristics. Where soft subgrade conditions exist below the design subgrade elevation, these materials should be subexcavated and replaced with general engineered fill.

Depending on the construction scheduling for placement of the granular sub-base and base layers, and the asphalt concrete pavement surface, further subgrade preparation may be required if the placed subgrade materials dry out or weather. This should be determined prior to the placement of the pavement structure. Should the subgrade materials be shown to deteriorate from construction completion, a minimum 300 mm of subgrade preparation is recommended prior to pavement structure placement.

It is recommended to include a contingency for woven geotextile, should localized areas of subgrade instability be encountered. Use of a woven geotextile should not be considered as a substitute for subgrade preparation, but as an option for improvement should subgrade instability exist after subgrade preparation. The woven geotextile should have a minimum grab tensile strength of 890 N.

The subgrade should be prepared and graded to allow drainage towards stormwater facilities. It is imperative that positive surface drainage be provided to prevent ponding of water within the pavement structure and subsequent softening and loss of strength of the subgrade materials. Surrounding landscaping should be such that runoff water is prevented from ponding beside paved areas in order to avoid softening and premature failure of the pavement surface.

7.8.2 Pavement Design and Construction

The minimum materials required for the pavement structures of roadways for this project should meet the Lethbridge County Engineering Guidelines and Minimum Servicing Standards. Specific roadway pavement structures should be reviewed by the Transportation Business Unit based on the following: roadway use, traffic volumes, heavy vehicles, and equivalent single-axle loads. This information was not available at the time of writing this report.

For asphalt pavement structure, all asphalt paving lifts should be compacted to a minimum of Marshall Design Density, as per current Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

The pavement design should include provisions for subsurface drainage of the pavement granular layers. Subdrains will provide a means of evacuating water that infiltrates the pavement structure, either through cracks and vertical details (i.e., face of gutter), or from peripheral surface runoff. The subdrain should comprise a perforated flexible plastic drainpipe (100 mm diameter), complete with filter sock. The drain should be placed along the edge of the pavement section in a recessed area of the prepared subgrade.

7.9 Concrete Type

For this development, two (2) tests were conducted to determine the water-soluble sulphate content of the soil samples recovered from the project site. The test results indicated sulphate concentrations of 0.008% and 0.075% in the soil samples recovered from 23BH005 and 23BH013, respectively. These results indicate the potential degree of a sulphate attack on the concrete as “negligible”.

Accordingly, there are no specific requirements for the concrete related to the sulphate exposure from the site soils.

A more stringent exposure classification may be required due to structural requirements of other exposure considerations (Refer to CSA A23.1-19, Table 1).

Imported fill, if placed in contact with concrete should be tested for water-soluble sulphate content and the above recommendations should be re-evaluated.

7.10 Frost Protection

For protection against frost action, all perimeter footings must be placed a minimum of 1.4 m below final grade for heated structures. All the footings for unheated structures should be placed at a depth minimum depth 2.1 m below surrounding final grade.

Deep foundation system including CIP concrete piles, CFA piles, and helical piles, if considered and exposed to frost action, should be drilled to a minimum depth of 6.0 m and should have full-length steel reinforcement. Grade beams spanning concrete piles should have a minimum 100 mm void space on the underside of the grade beam and around the pile caps to reduce the risk of interaction with the underlying soil.

It is also preferable to backfill the final 600 mm of the exterior of the grade beam with a medium-plastic clay in order to prevent infiltration of excessive moisture and softening of the soils adjacent to the grade beam.

Pipes buried with less than 2.1 m of soil cover should be protected with insulation to avoid frost effects that might cause damage to, or breakage of, the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

7.11 Seismic Design

In accordance with the Building Code and based on soil stratigraphy, the project site can generally be classified as Class D for seismic site response.

7.12 Stormwater Pond Development

7.12.1 General

In the preparation of the recommendations provided in this report for the geotechnical aspects of design and construction of the stormwater management facility, Tetra Tech reviewed pertinent sections of "*Design and Construction of Liners for Municipal Wastewater Stabilization Ponds*" prepared by Komex Consultants Ltd. for the Municipal Engineering Branch of Alberta Environmental Protection (AEP), and the "*Stormwater Management Guidelines for the Province of Alberta*", dated March 2013, prepared by the Municipal Program Development Branch of AEP.

It is understood that a wet pond is being considered for this development, to be located in the northeast corner of the site, in the vicinity of 23BH014. Such facilities are normally constructed as an excavation below ground surface to provide overland stormwater storage, in accordance with the applicable municipal regulations/guidelines. Further details of the wet pond including its base elevation, normal water elevation, and high water elevation have not been provided.

7.12.2 Availability of Suitable Clay Liner Materials

As discussed in the previous sections, the subsurface stratigraphy of the site generally comprises lacustrine clay overlying glacial clay till.

Constant head hydraulic conductivity (permeability) testing was conducted on one (1) remoulded sample recovered from 23BH014, representing the clay till material at 1.5 m to 3.0 m below ground surface, within the proposed pond area. The test sample was compacted to 98% of SPMDD with a moisture content between OMC and +2% of OMC. The test result indicates a hydraulic conductivity (K Value) of 1.6 x 10^{-8} cm/sec. The laboratory test reports are included in Appendix C.

Based on the AEP publications (referenced above) and assuming a minimum liner thickness of 1.0 m, the maximum hydraulic conductivity of compacted clay liners soils should be 1.7 x 10^{-7} cm/sec or less permeable. As recommended by the AEP publications, the liner design should be based on a K value (in situ or design) that is one order of magnitude greater than the average K value (laboratory). Based on the one (1) test result, the design hydraulic conductivity value of 1.6 x 10^{-7} cm/sec is slightly lower than the minimum K value of 1.7 x 10^{-7} cm/sec. Given that the result of hydraulic conductivity test barely meets the design requirement, additional testing is recommended to be conducted during the site-specific geotechnical evaluation, considering the design details of the pond.

Any localized silts, sands, or low plastic clay soils encountered, should be removed and cannot be use as clay liner materials. Additional hydraulic conductivity testing should be completed on the potential clay liner material prior to, and during, construction to confirm their suitability as clay liner material.

Alternate liner types, such as geosynthetics, may be used but are expected to be substantially more expensive.

7.12.3 Stormwater Management Facility Concept and Design

Based on Tetra Tech's understanding of a typical stormwater management facility design, a typical wet pond might have a base elevation ranging between 3 m and 5 m below final ground surface.

Once the operational water level elevation of the wet pond is designed, it is recommended that the proposed interior sideslopes be between 5.0H:1.0V to 7.0H:1.0V for the pond in the active storage zone and 4.0H:1.0V to 5.0H:1.0V for above the active storage zone. The maximum exterior sideslopes should be 3.0H:1.0V. All the interior and the exterior sideslope should also follow the applicable municipal guidelines. Slope stability of the pond's sideslope should be confirmed prior to construction, once pond design become available.

Based on the site soil conditions, laboratory test results, and Tetra Tech's experience with the permeability of local clay till soils, it is recommended that a preliminary thickness for the remoulded compacted clay liner be 0.6 m along the base of the wet pond and 1.2 m along the sidewalls of the pond, up to design highwater elevation (minimum recommended).

Assuming the embankment between the normal water level and high water level is constructed with an engineered clay liner, the potential for erosion from wave action should be considered. Slope protection comprising rip-rap designed for potential wave erosion or other means of erosion control should be given consideration for the sideslope. The use of a filter fabric median between the native soils and rip-rap is also recommended. Design recommendations for this type of protection are beyond the scope of this report.

Given that shallow groundwater was encountered in 23BH014 at a depth of 2.05 m below ground surface, dewatering may be necessary during construction. Groundwater seepage, where encountered during construction, should be directed towards sumps for removal from the excavation. Conventional construction sump pumps should be capable of providing groundwater control.

Considering the groundwater levels measured in 23BH014 (i.e., at a depth of 2.05 m below the existing ground surface), installation of a permanent perimeter drainage below the pond's liner may be required to avoid damage to liner from groundwater's hydrostatic pressure, particularly when the pond is emptied for maintenance/cleaning or for other reasons.

The liner material should typically comprise remoulded medium- to high-plastic clay till soil. Care should be taken to reject all significant silty, low to non-plastic, local sand layers, gravel with particle size greater than 50 mm, and other deleterious materials from the liner material source. Full-time on-site construction monitoring is required to identify and reject pockets of unsuitable material if the initial liner lift comprises clay till soil that is reworked in situ.

Large pockets of silt or sand soils exhibiting seepage may be encountered during pond sideslope excavation, resulting in short-term cutslope instabilities that may require localized drainage and re-grading during construction. As well, additional temporary and permanent drainage control may also be required if vigorous seepage characteristics are observed within the exposed pond sideslopes prior to liner construction.

The liner should be placed in lifts with maximum compacted thickness of 150 mm. If compacted lift surfaces become too smooth to facilitate a good bond with the subsequent lift, they should be scarified to a minimum depth of 50 mm and moisture conditioned, as necessary, prior to placement of the subsequent lift.

The feasibility of liner placement considering the proposed pond sideslope should be confirmed by the contractor prior to construction.

The liner material should be compacted to a minimum of 98% of SPMDD at moisture content varying from 1% to 3% of the OMC.

Liner materials that freeze, dry out, or become excessively wet during construction should be rejected and removed.

The liner should be protected from construction activities and post-construction damages, as necessary. Placement of a gravel layer with a minimum thickness of 250 mm is recommended to protect the liner after its placement.

All penetrating structures into the liner should be sealed with bentonite chips or powder. Pinholes from nuclear densometer tests in the liner should be filled with bentonite powder.

Field and laboratory testing is recommended to confirm the hydraulic conductivity of the liner during and after construction. Conformance testing of on-site soils excavated within the pond area and selected for use as clay liner material must be confirmed by further laboratory testing to verify acceptable hydraulic conductivities at the time of construction.

Pipe connections to the pond including all the inlets and the outlets should be provided with clay plug to control exfiltration from the pond.

8.0 DESIGN AND CONSTRUCTION GUIDELINES

General design and construction guidelines are provided in Appendix D, under the following supplemental headings:

- Shallow Foundations
- Bored Cast-in-Place Concrete Piles
- Floor Slabs-on-Grade
- Construction Excavations
- Backfill Materials and Compaction

These guidelines are intended to present standards of good practice. Although supplemental to the main text of this report, they should be interpreted as part of the report. Design recommendations presented herein are based on the premise that these guidelines will be followed. The design and construction guidelines are not intended to represent detailed specifications for the works although they may prove useful in the preparation of such specifications. In the event of any discrepancy between the main text of this report and Appendix D, the main text should govern.

9.0 REVIEW OF DESIGN AND CONSTRUCTION

Tetra Tech should be given the opportunity to review details of the design and specifications related to geotechnical aspects for the project site prior to construction.

Full-time monitoring and compaction testing should be undertaken during subgrade preparation and fill placement to ensure that suitable subgrade conditions are prepared and that suitable fill materials are placed and properly compacted. Qualified persons, independent of the contractor, should undertake this monitoring.

10.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully Submitted,
Tetra Tech Canada Inc.

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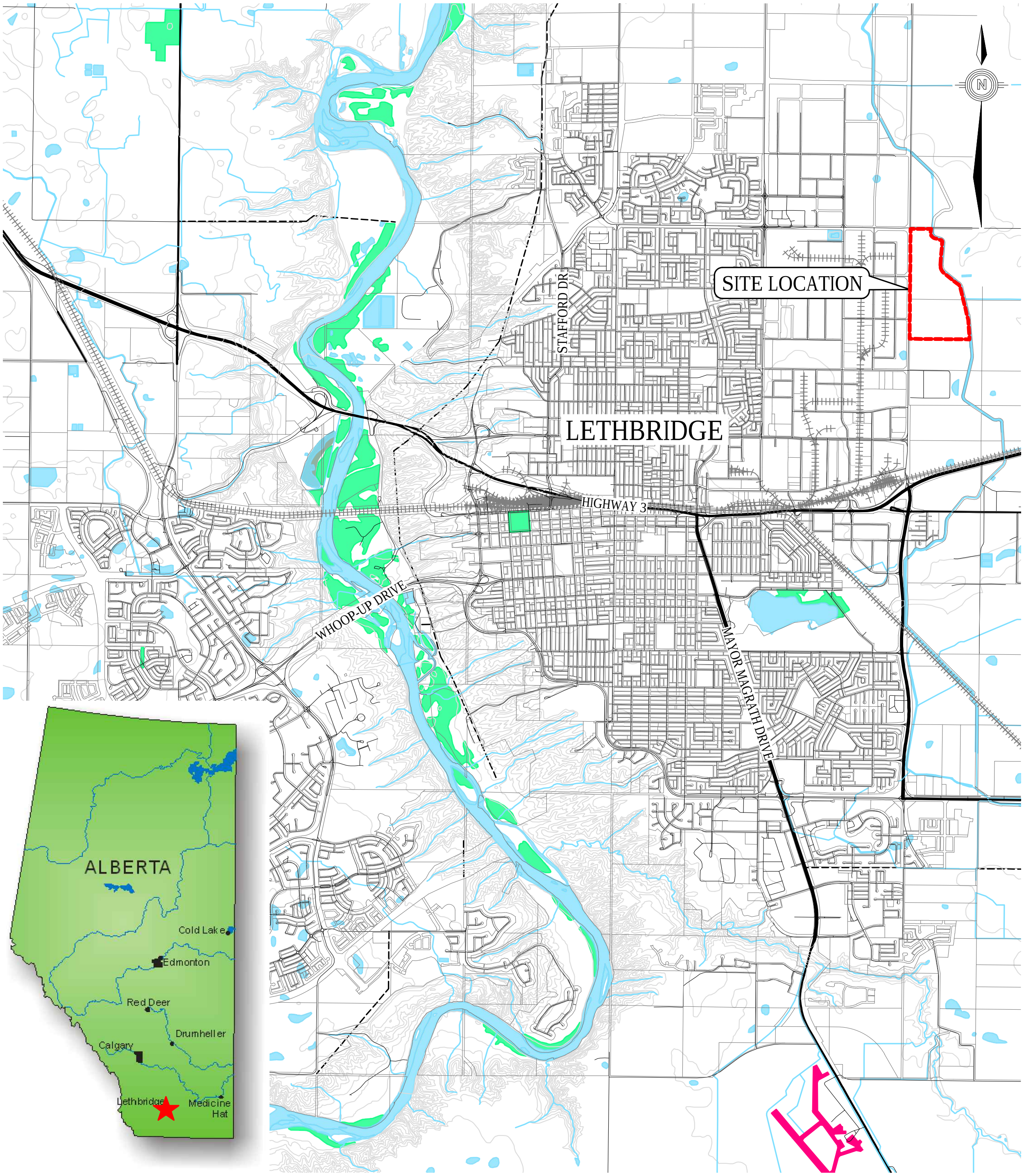
FIGURES



NOTES

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0 3,000m

Scale: 1:60,000 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

GEOTECHNICAL EVALUATION
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

SITE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-001	LCH	VO	0

OFFICE	DATE
Tt Leth	March 2023

Figure 1

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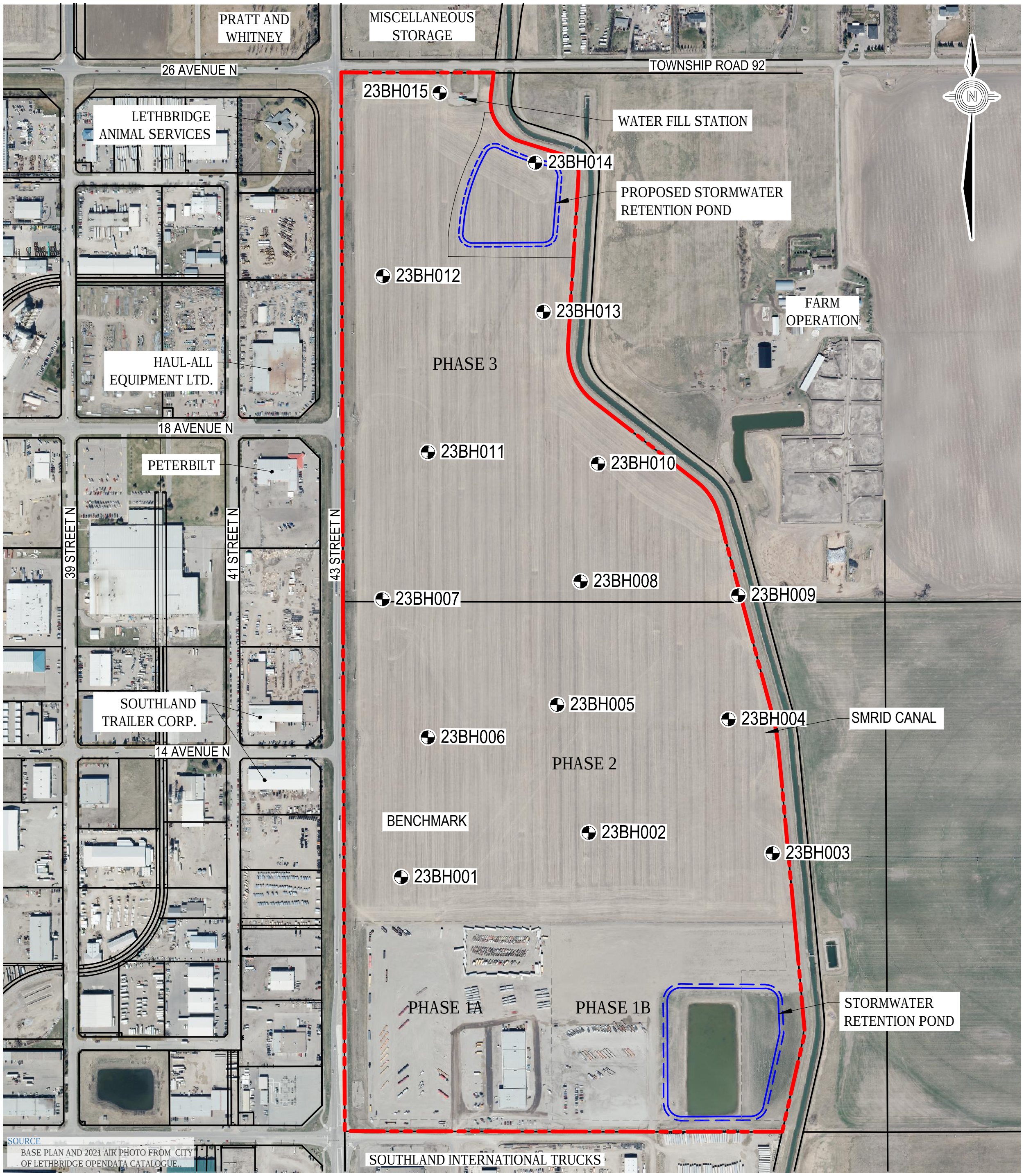

SOURCE
BASE PLAN AND 2021 AIR PHOTO FROM CITY OF LETHBRIDGE OPENDATA CATALOGUE.

LEGEND

▬ ▬ ▬ SITE BOUNDARY

◐ BOREHOLE LOCATION

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Scale: 1:10,000 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

GEOTECHNICAL EVALUATION
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

BOREHOLE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-001	LCH	VO	0

OFFICE	DATE
Tt Leth	March 2023

Figure 2

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APPENDIX A

LIMITATIONS ON USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client’s expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

BOREHOLE LOGS

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 TO 20%	0 to 4
Loose	20 TO 40%	4 to 10
Compact	40 TO 75%	10 to 30
Dense	75 TO 90%	30 to 50
Very Dense	90 TO 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (KPA)
Very Soft	Less than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

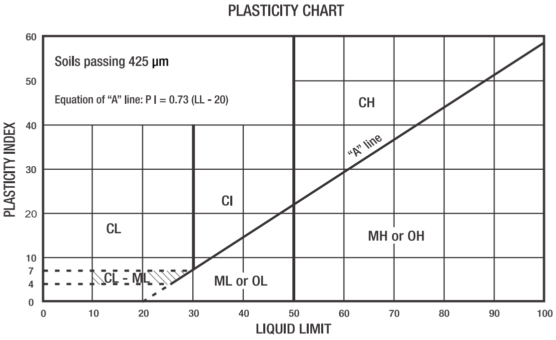
GENERAL DESCRIPTIVE TERMS

Slickensided - having inclined planes of weakness that are slick and glossy in appearance.
Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated - composed of thin layers of varying colour and texture.
Interbedded - composed of alternate layers of different soil types.
Calcareous - containing appreciable quantities of calcium carbonate.;
Well graded - having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate size missing.

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION				GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS More than 50% retained on 75 μm sieve*	GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve	CLEAN GRAVELS		GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% Pass 75 μm sieve — GW, GP, SW, SP More than 12% Pass 75 μm sieve — GM, GC, SM, SC 5% to 12% Pass 75 μm sieve — Borderline Classification requiring use of dual symbols	$C_U = D_{60} / D_{10}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		GRAVELS WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
				GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
	SANDS More than 50% of coarse fraction passes 4.75 mm sieve	CLEAN SANDS		SW	Well-graded sands and gravelly sands, little or no fines		$C_U = D_{60}/D_{10}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
				SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		SANDS WITH FINES		SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
				SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 μm sieve*	SILTS	Liquid limit	<50	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity			
			>50	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CLAYS Above "A" line on plasticity chart negligible organic content	Liquid limit	<30	CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			30-50	CI	Inorganic clays of medium plasticity, silty clays			
			>50	CH	Inorganic clays of high plasticity, fat clays			
	ORGANIC SILTS AND CLAYS	Liquid limit	<50	OL	Organic silts and organic silty clays of low plasticity			
			>50	OH	Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils			

For classification of fine-grained soils and fine fraction of coarse-grained soils.



*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

SOIL COMPONENTS				
FRACTION	SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS	
	PASSING	RETAINED	PERCENTAGE	DESCRIPTOR
GRAVEL				
coarse	75 mm	19 mm	>35 %	"and"
fine	19 mm	4.75 mm	21 to 35 %	"y-adjective"
SAND				
coarse	4.75 mm	2.00 mm	10 to 20 %	"some"
medium	2.00 mm	425 μm		
fine	425 μm	75 μm	>0 to 10 %	"trace"
SILT (non plastic) or CLAY (plastic)	75 μm		as above but by behavior	

OVERSIZE MATERIAL	
Rounded or subrounded	
COBBLES	75 mm to 300 mm
BOULDERS	> 300 mm
Not rounded	
ROCK FRAGMENTS	>75 mm
ROCKS	> 0.76 cubic metre in volume

Tt_Modified Unified Soil Classification.cdr

TETRA TECH

BOREHOLE KEYSHEET

Water Level Measurement

▼ Measured in standpipe, piezometer or well

▽ Inferred

Sample Types

- ▤ A-Casing
- ◫ Core
- ■ Disturbed, Bag, Grab
- ◧ HQ Core
- ⧄ Jar
- ⧄ Jar and Bag
- ⧓ NQ Core
- ◪ No Recovery
- ☒ Split Spoon/SPT
- ▥ Tube

Backfill Materials

- ■ Asphalt
- ■ Bentonite
- ▩ Cement/ Grout
- ▧ Drill Cuttings
- ▩ Grout
- ▩ Gravel
- ▩ Sand
- ▥ Slough
- ▩ Topsoil Backfill

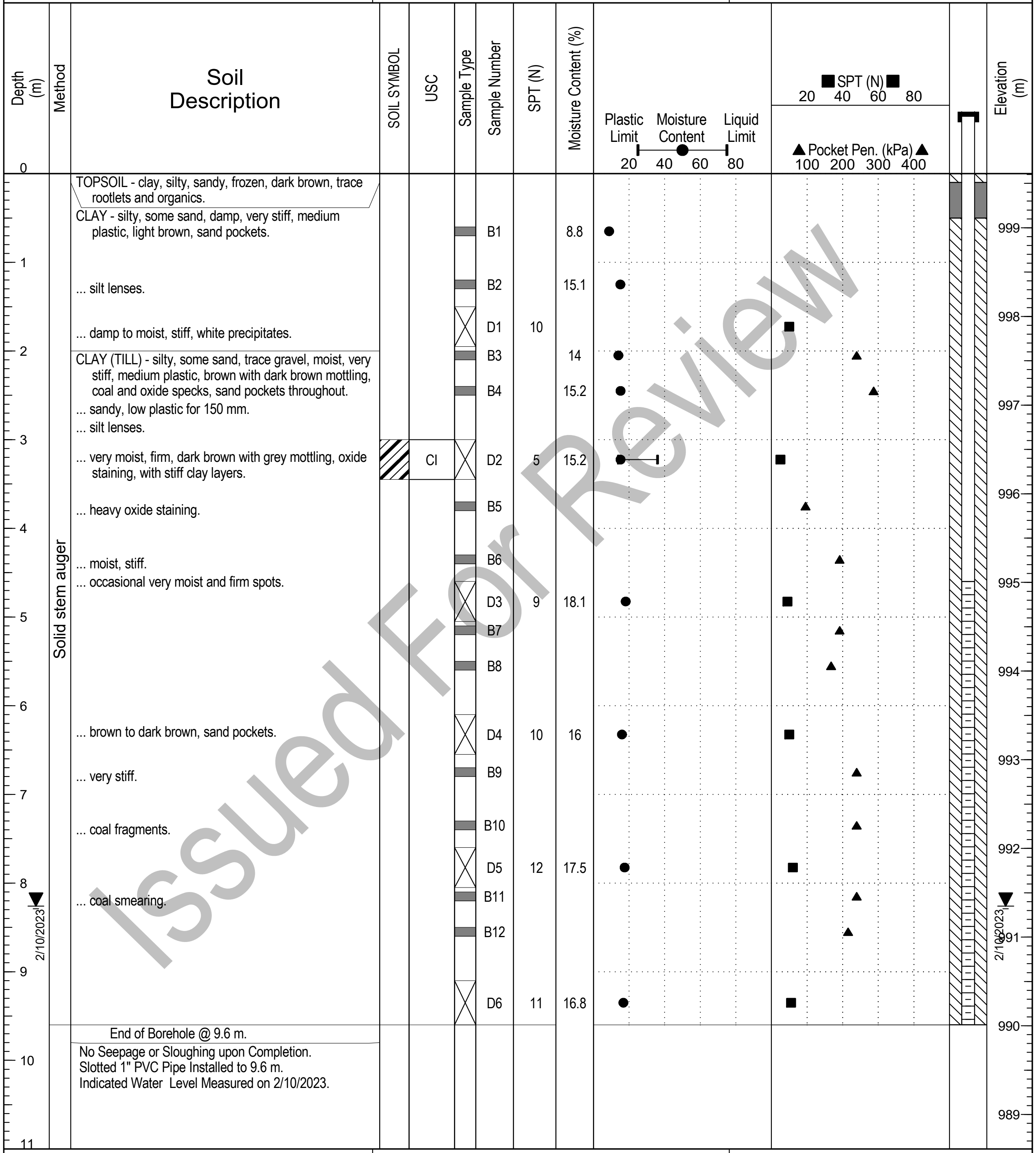
Lithology - Graphical Legend[1]

- ■ Asphalt
- ▩ Bedrock
- ▩ Cobbles/Boulders
- ▨ Clay
- ■ Coal
- ▩ Concrete
- ▩ Fill
- ▩ Gravel
- ▦ Limestone
- ▩ Mudstone
- ▩ Organics
- ▩ Peat
- ▩ Sand
- ▩ Sandstone
- ▤ Shale
- ▥ Silt
- ▩ Siltstone
- ▩ Till
- ▩ Topsoil

1. The graphical legend is an approximation and for visual representation only. Soil strata may comprise a combination of the basic symbols shown above. Particle sizes are not drawn to scale

TETRA TECH

Sumus Property Group Ltd.	**Borehole No: 23BH001**	
	Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
	Location: 10-9-21-W4M	Ground Elev: 999.61 m
	Lethbridge County, AB	UTM: 371849 E; 5508582 N; Z



Soil Description
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.
CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pockets.
... silt lenses.
... damp to moist, stiff, white precipitates.
CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, sand pockets throughout.
... sandy, low plastic for 150 mm.
... silt lenses.
... very moist, firm, dark brown with grey mottling, oxide staining, with stiff clay layers.
... heavy oxide staining.
... moist, stiff.
... occasional very moist and firm spots.
... brown to dark brown, sand pockets.
... very stiff.
... coal fragments.
... coal smearing.
End of Borehole @ 9.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		8.8
B2		15.1
D1	10	
B3		14
B4		15.2
D2	5	15.2
B5		
B6		
D3	9	18.1
B7		
B8		
D4	10	16
B9		
B10		
D5	12	17.5
B11		
B12		
D6	11	16.8

TETRA TECH	Contractor: Chilako Drilling	Completion Depth: 9.6 m
	Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
	Logged By: SA	Completion Date: February 2, 2023
	Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH002**

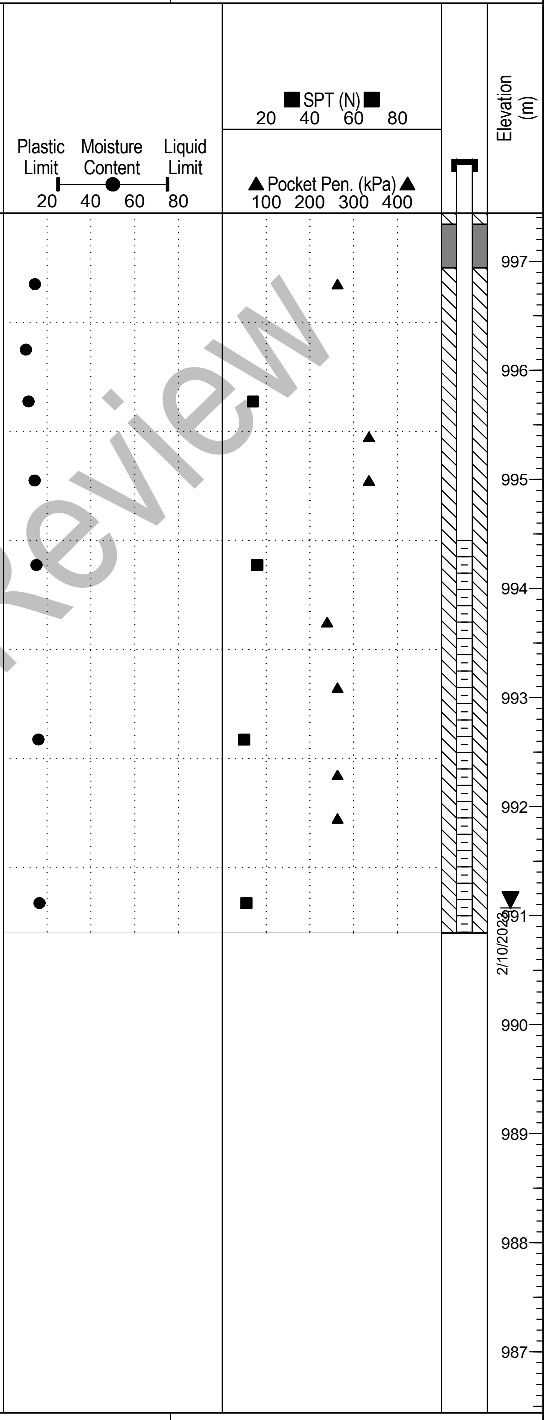
Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.44 m
Lethbridge County, AB	UTM: 372128 E; 5508641 N; Z

Method: Solid stem auger

Soil Description	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.			
CLAY - silty, some sand, damp to moist, very stiff, medium plastic, light brown, sand pockets.	B1		14.4
... white precipitates, oxide specks.	B2		10.3
CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, brown to dark brown, coal and oxide specks, white precipitates, sand pockets.	D1	14	11.5
... grey mottling, white precipitates throughout.	B3		
	B4		14.3
... coal fragments.	D2	16	15.1
... moist, heavy sand inclusions for 100 mm.	B5		
... oxide staining.	B6		
... stiff to very stiff.	D3	10	16
	B7		
	B8		
	D4	11	16.5

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.



Depth (m): 0 1 2 3 4 5 6 7 8 9 10 11

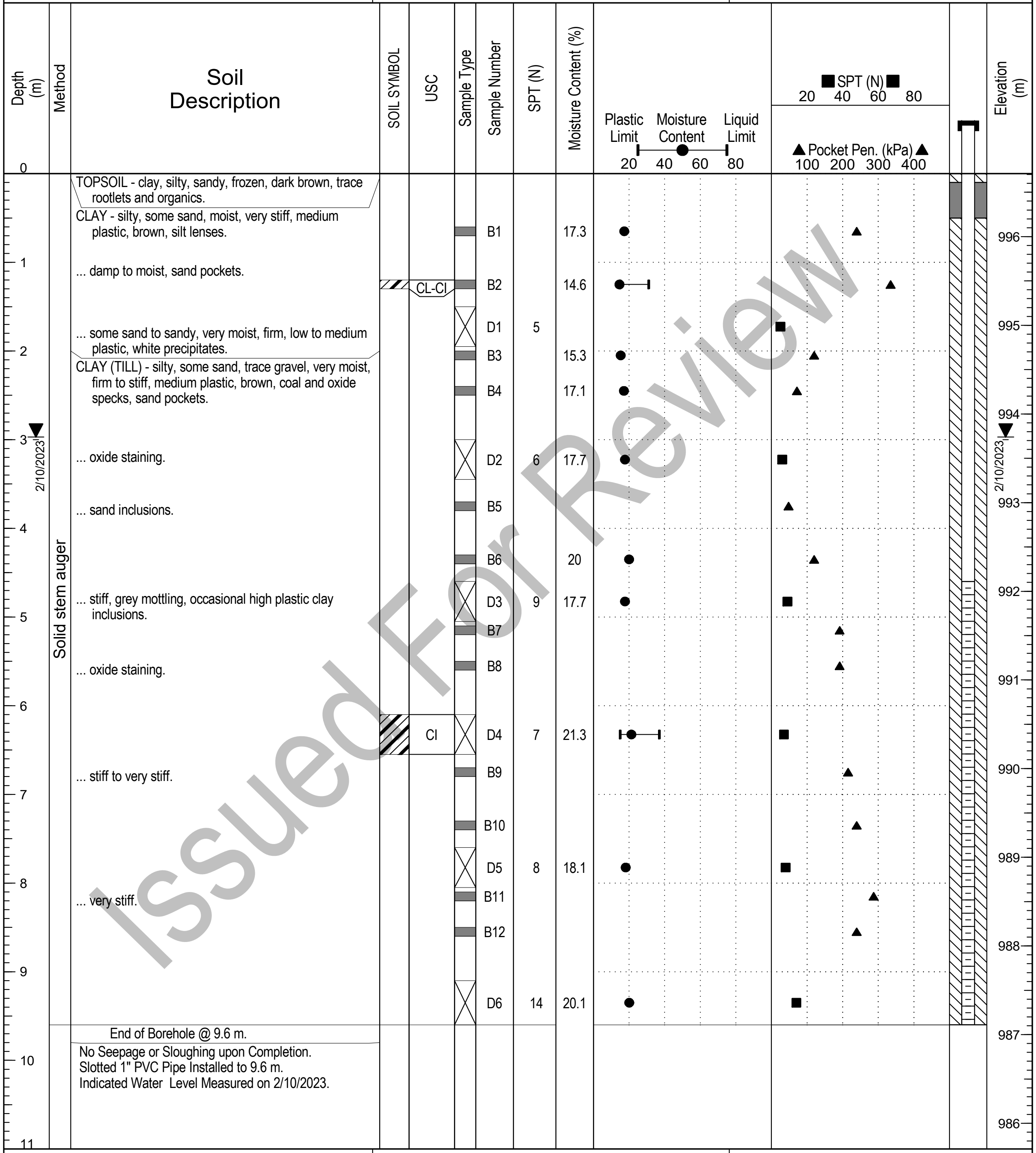
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH003**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.71 m
Lethbridge County, AB	UTM: 372397 E; 5508601 N; Z



TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, moist, very stiff, medium plastic, brown, silt lenses.

... damp to moist, sand pockets.

... some sand to sandy, very moist, firm, low to medium plastic, white precipitates.

CLAY (TILL) - silty, some sand, trace gravel, very moist, firm to stiff, medium plastic, brown, coal and oxide specks, sand pockets.

... oxide staining.

... sand inclusions.

... stiff, grey mottling, occasional high plastic clay inclusions.

... oxide staining.

... stiff to very stiff.

... very stiff.

End of Borehole @ 9.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

USC	Sample Number	SPT (N)	Moisture Content (%)
	B1		17.3
CL-CI	B2		14.6
	D1	5	
	B3		15.3
	B4		17.1
	D2	6	17.7
	B5		
	B6		20
	D3	9	17.7
	B7		
	B8		
CI	D4	7	21.3
	B9		
	B10		
	D5	8	18.1
	B11		
	B12		
	D6	14	20.1

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH004**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.6 m
Lethbridge County, AB	UTM: 372340 E; 5508804 N; Z

Depth (m) | Method: Solid stem auger

Soil Description

TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, brown, white precipitates, sand pockets.

... stiff, silt pockets.

CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown, coal and oxide specks, sand pockets throughout.

... coal fragments.

... sand pockets throughout.

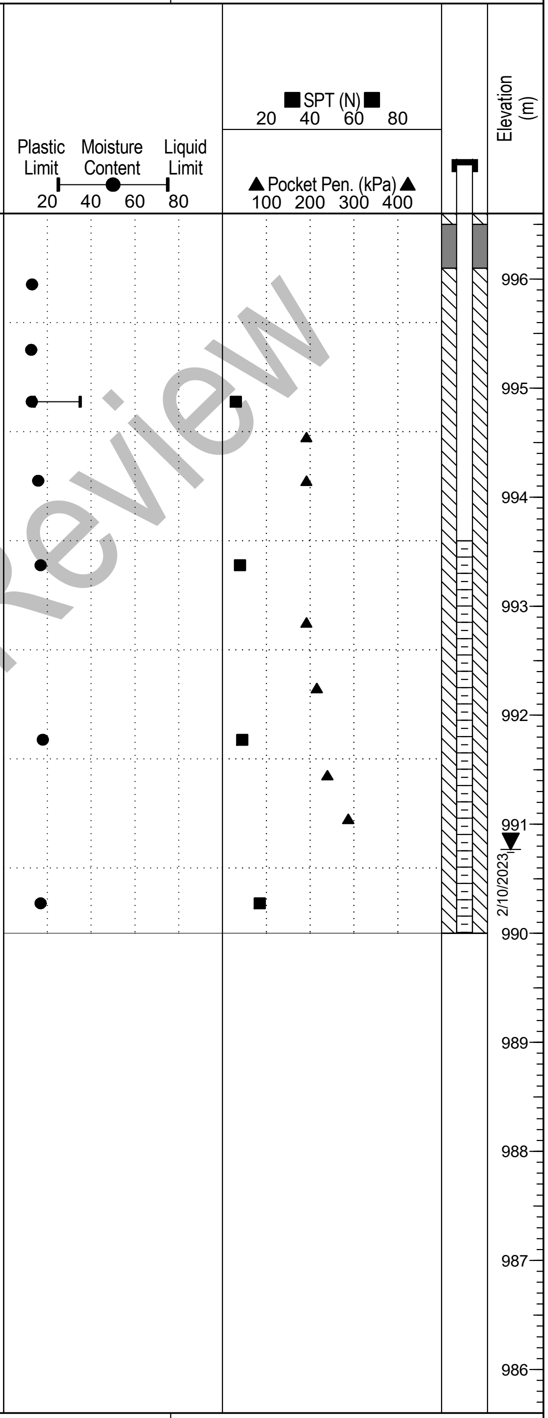
... very stiff, grey mottling, oxide staining.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

USC	Sample Number	SPT (N)	Moisture Content (%)
	B1		13
	B2		12.6
CI	D1	6	12.9
	B3		
	B4		15.8
	D2	8	16.9
	B5		
	B6		
	D3	9	17.9
	B7		
	B8		
	D4	17	16.9

2/10/2023



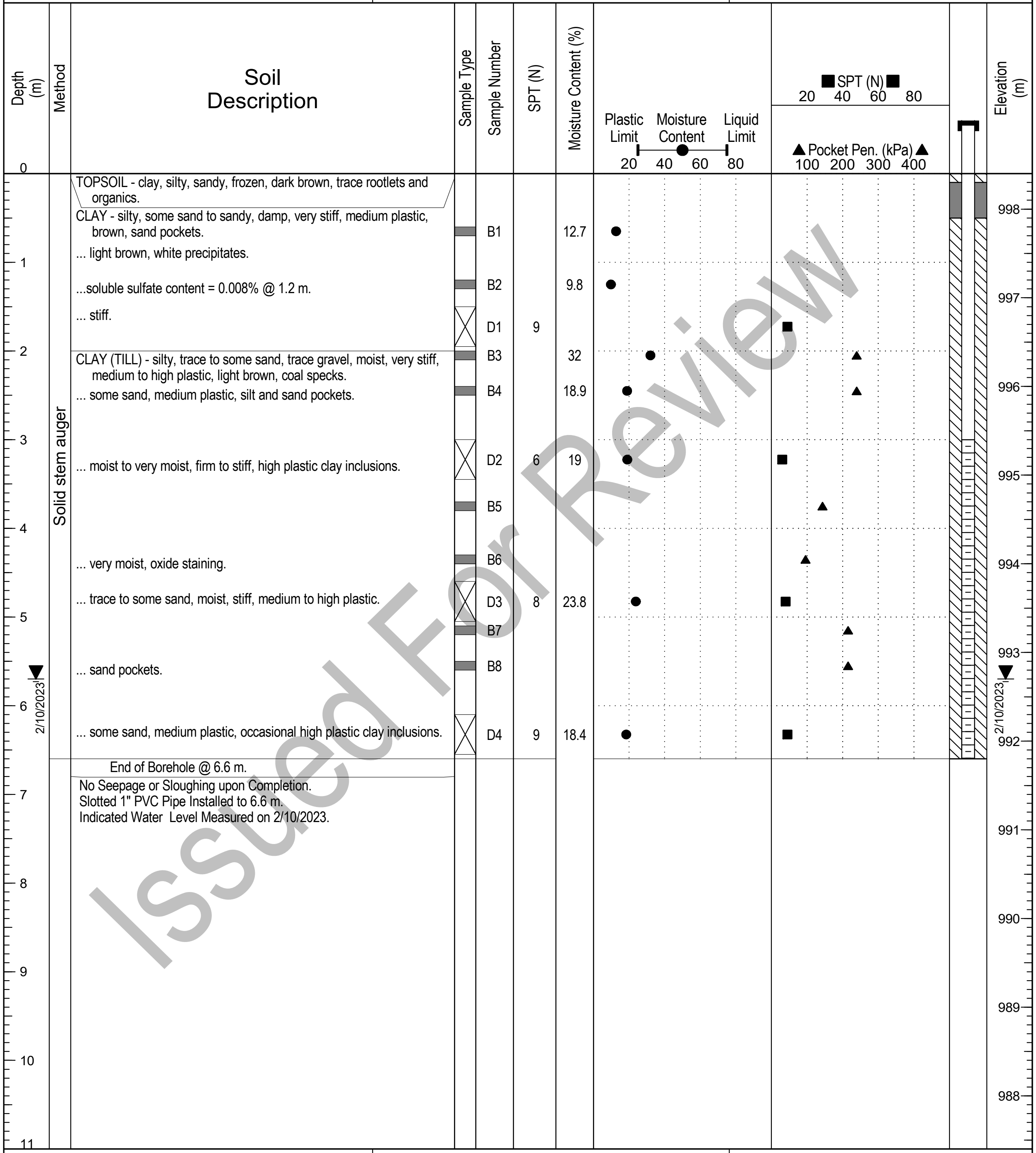
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH005**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 998.4 m
Lethbridge County, AB	UTM: 372087 E; 5508832 N; Z



Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand to sandy, damp, very stiff, medium plastic, brown, sand pockets.	▬	B1		12.7
... light brown, white precipitates.				
...soluble sulfate content = 0.008% @ 1.2 m.	▬	B2		9.8
... stiff.	☒	D1	9	
CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, light brown, coal specks.	▬	B3		32
... some sand, medium plastic, silt and sand pockets.	▬	B4		18.9
... moist to very moist, firm to stiff, high plastic clay inclusions.	☒	D2	6	19
	▬	B5		
... very moist, oxide staining.	▬	B6		
... trace to some sand, moist, stiff, medium to high plastic.	☒	D3	8	23.8
	▬	B7		
... sand pockets.	▬	B8		
... some sand, medium plastic, occasional high plastic clay inclusions.	☒	D4	9	18.4

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

TETRA TECH

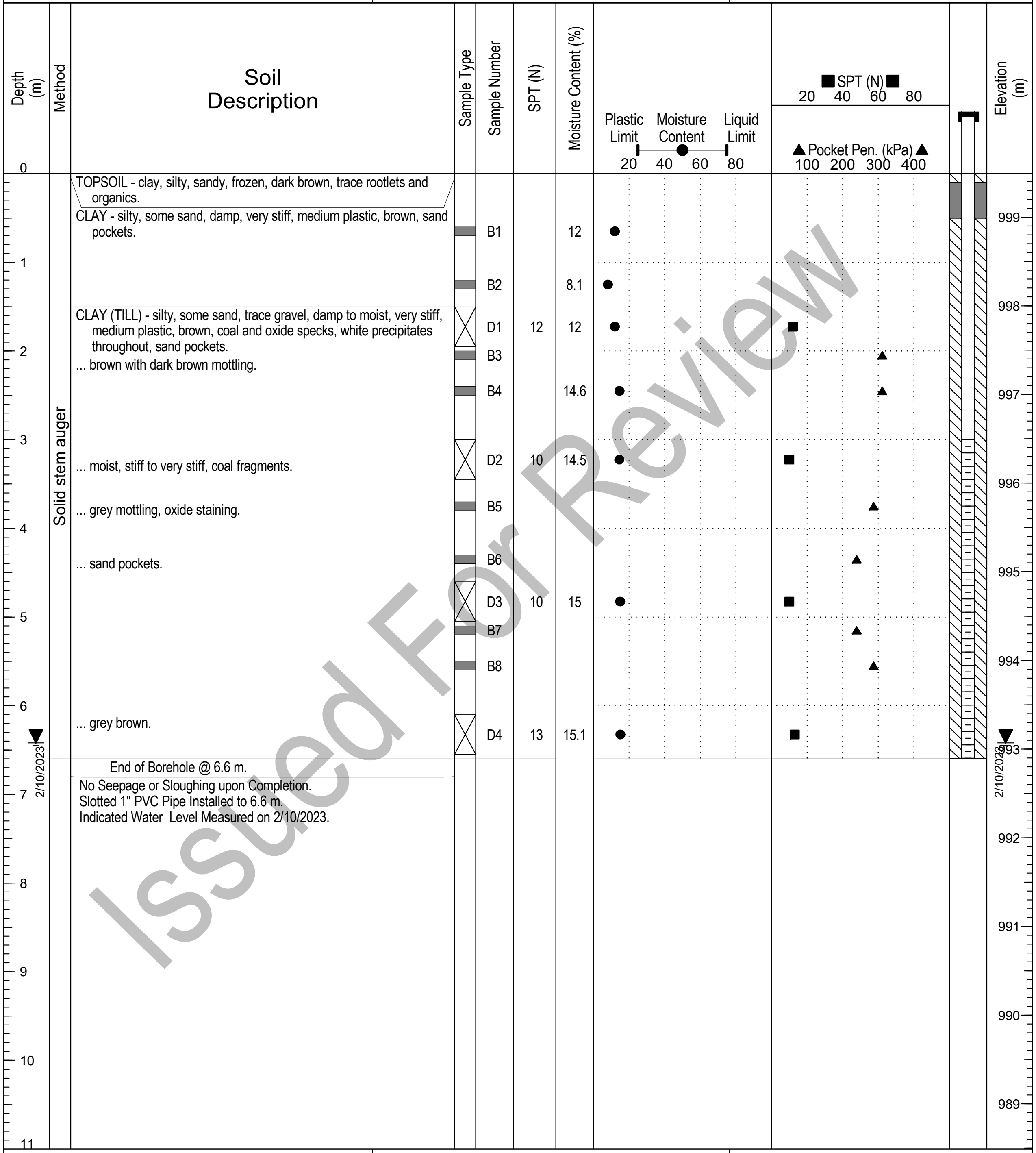
Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH006**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 999.49 m
Lethbridge County, AB	UTM: 371894 E; 5508792 N; Z



TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, brown, sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, brown, coal and oxide specks, white precipitates throughout, sand pockets.

... brown with dark brown mottling.

... moist, stiff to very stiff, coal fragments.

... grey mottling, oxide staining.

... sand pockets.

... grey brown.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		12
B2		8.1
D1	12	12
B3		
B4		14.6
D2	10	14.5
B5		
B6		
D3	10	15
B7		
B8		
D4	13	15.1

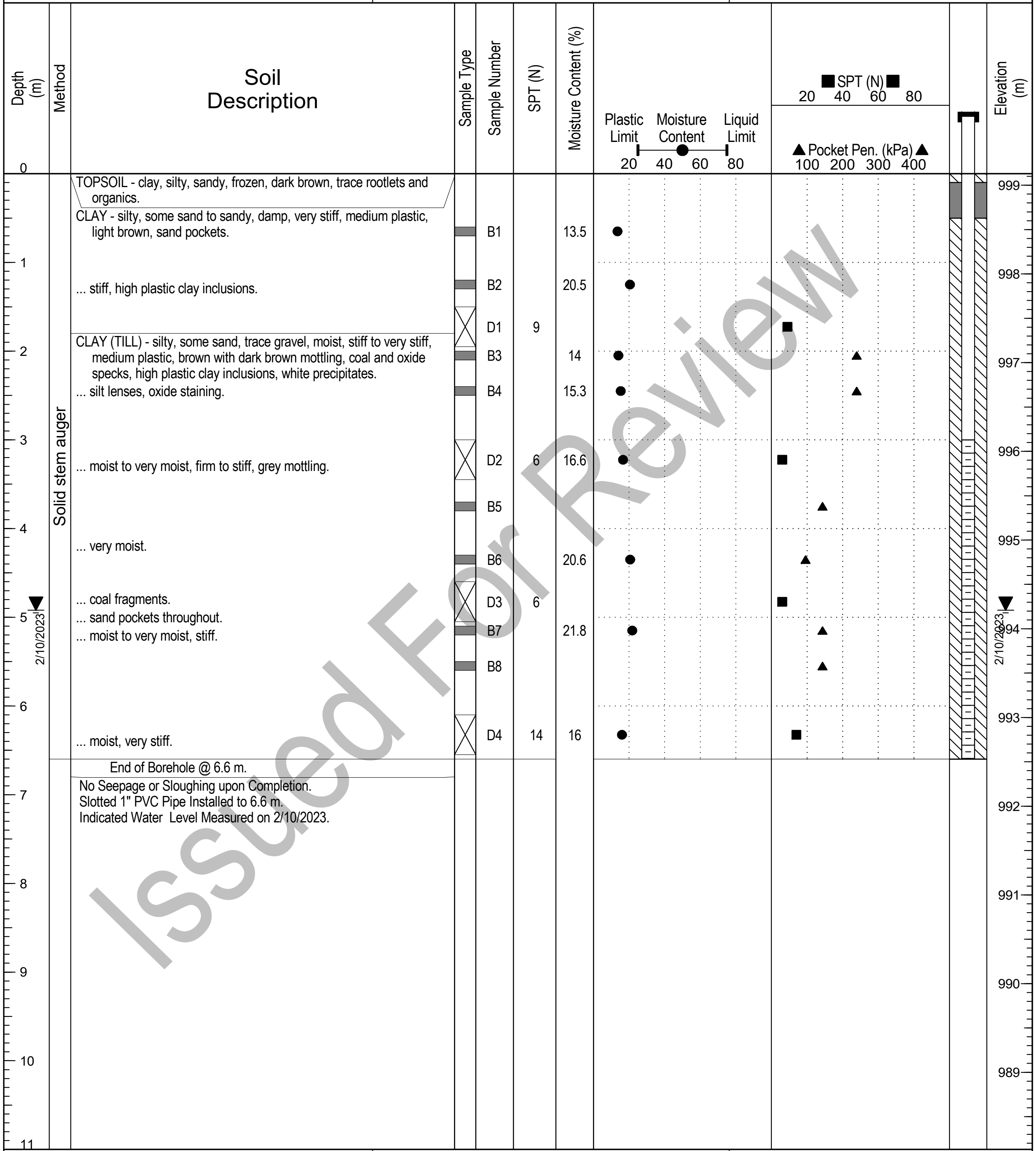
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH007**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 999.13 m
Lethbridge County, AB	UTM: 371835 E; 5509001 N; Z



Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand to sandy, damp, very stiff, medium plastic, light brown, sand pockets.	▬	B1		13.5
... stiff, high plastic clay inclusions.	▬	B2		20.5
	⊠	D1	9	
CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, high plastic clay inclusions, white precipitates.	▬	B3		14
... silt lenses, oxide staining.	▬	B4		15.3
... moist to very moist, firm to stiff, grey mottling.	⊠	D2	6	16.6
	▬	B5		
... very moist.	▬	B6		20.6
... coal fragments.	⊠	D3	6	
... sand pockets throughout. ... moist to very moist, stiff.	▬	B7		21.8
	▬	B8		
... moist, very stiff.	⊠	D4	14	16

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

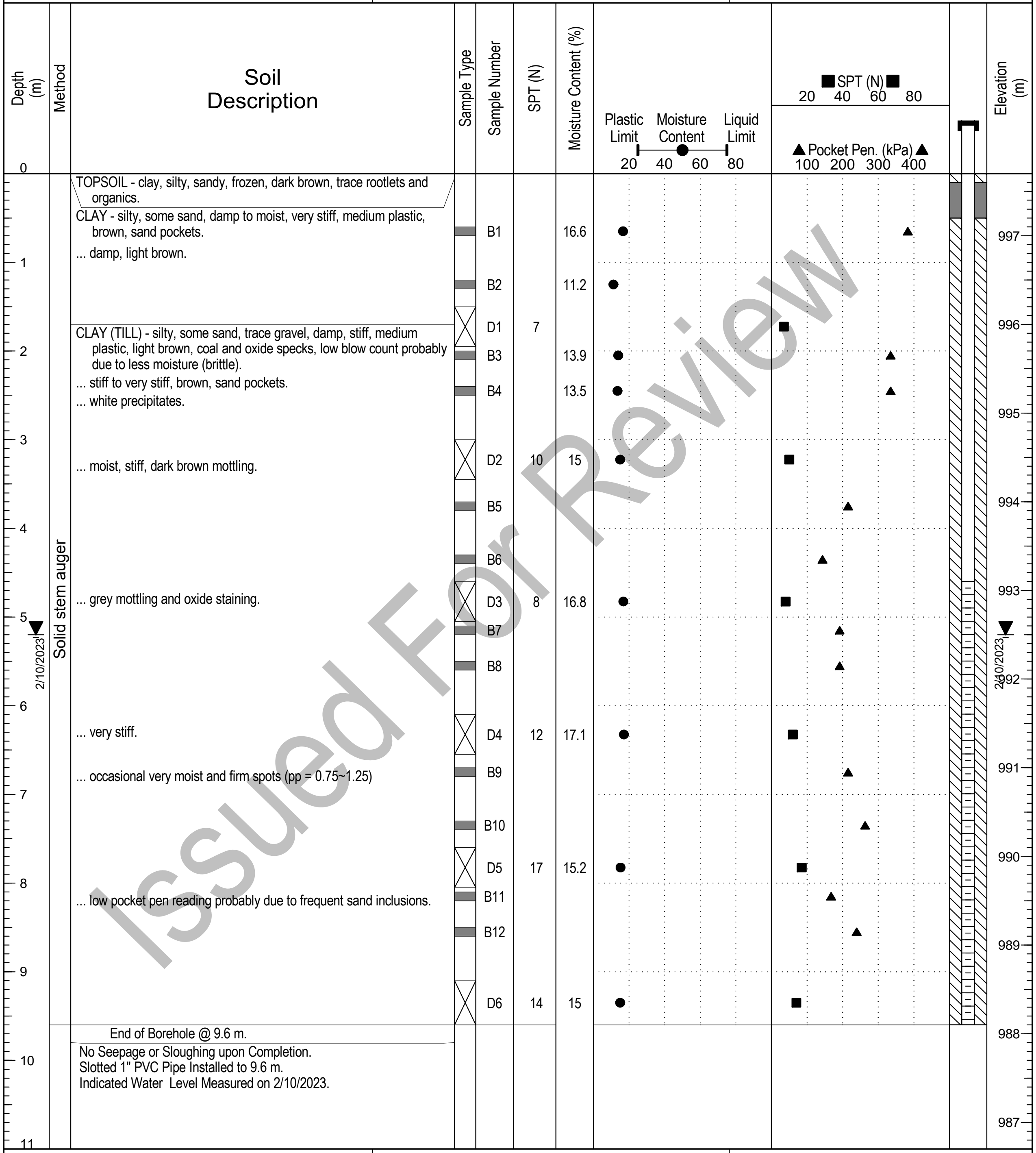
Sumus Property Group Ltd.

Borehole No: **23BH008**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.7 m
Lethbridge County, AB	UTM: 372126 E; 5509018 N; Z

Method	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
Solid stem auger	TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
	CLAY - silty, some sand, damp to moist, very stiff, medium plastic, brown, sand pockets.	▬	B1		16.6
	... damp, light brown.	▬	B2		11.2
		⊠	D1	7	
	CLAY (TILL) - silty, some sand, trace gravel, damp, stiff, medium plastic, light brown, coal and oxide specks, low blow count probably due to less moisture (brittle).	▬	B3		13.9
	... stiff to very stiff, brown, sand pockets. ... white precipitates.	▬	B4		13.5
	... moist, stiff, dark brown mottling.	⊠	D2	10	15
		▬	B5		
		▬	B6		
	... grey mottling and oxide staining.	⊠	D3	8	16.8
		▬	B7		
		▬	B8		
	... very stiff.	⊠	D4	12	17.1
	... occasional very moist and firm spots (pp = 0.75~1.25)	▬	B9		
		▬	B10		
		⊠	D5	17	15.2
	... low pocket pen reading probably due to frequent sand inclusions.	▬	B11		
		▬	B12		
		⊠	D6	14	15

End of Borehole @ 9.6 m.
No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.



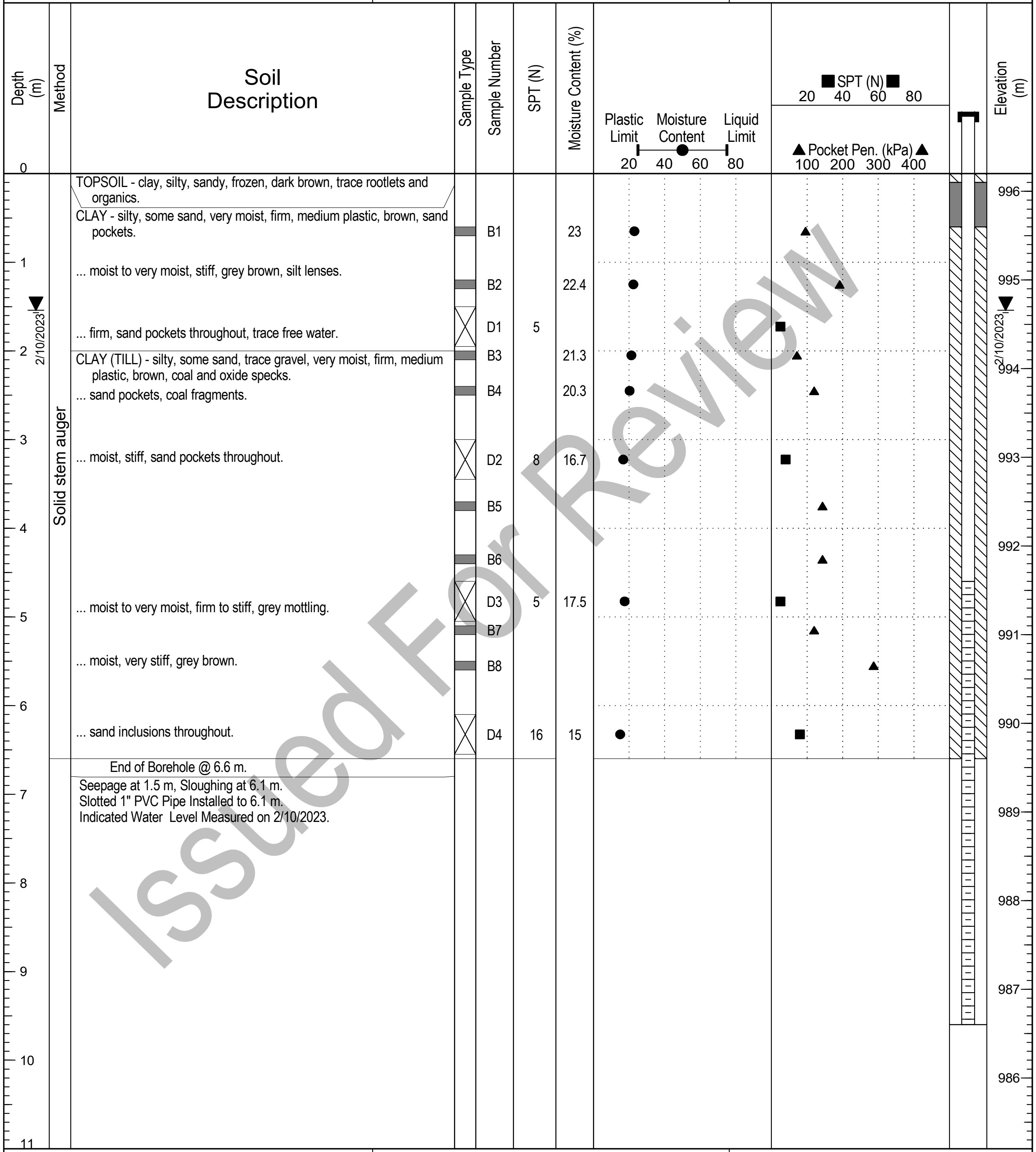
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH009**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.2 m
Lethbridge County, AB	UTM: 372360 E; 5508990 N; Z



Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand, very moist, firm, medium plastic, brown, sand pockets.	▬	B1		23
... moist to very moist, stiff, grey brown, silt lenses.	▬	B2		22.4
... firm, sand pockets throughout, trace free water.	☒	D1	5	
CLAY (TILL) - silty, some sand, trace gravel, very moist, firm, medium plastic, brown, coal and oxide specks.	▬	B3		21.3
... sand pockets, coal fragments.	▬	B4		20.3
... moist, stiff, sand pockets throughout.	☒	D2	8	16.7
	▬	B5		
	▬	B6		
... moist to very moist, firm to stiff, grey mottling.	☒	D3	5	17.5
	▬	B7		
... moist, very stiff, grey brown.	▬	B8		
... sand inclusions throughout.	☒	D4	16	15

End of Borehole @ 6.6 m.

Seepage at 1.5 m, Sloughing at 6.1 m.
Slotted 1" PVC Pipe Installed to 6.1 m.
Indicated Water Level Measured on 2/10/2023.

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH010**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.93 m
Lethbridge County, AB	UTM: 372159 E; 5509196 N; Z

Depth (m)

Method: Solid stem auger

Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, damp, very stiff, medium plastic, light brown, coal and oxide specks, sand pockets, white precipitates.

... moist, brown.

... damp to moist, stiff, grey mottling, white precipitates.

... very moist, firm, oxide staining.

... firm to stiff, sand pockets throughout.

... coal fragments.

... moist, stiff.

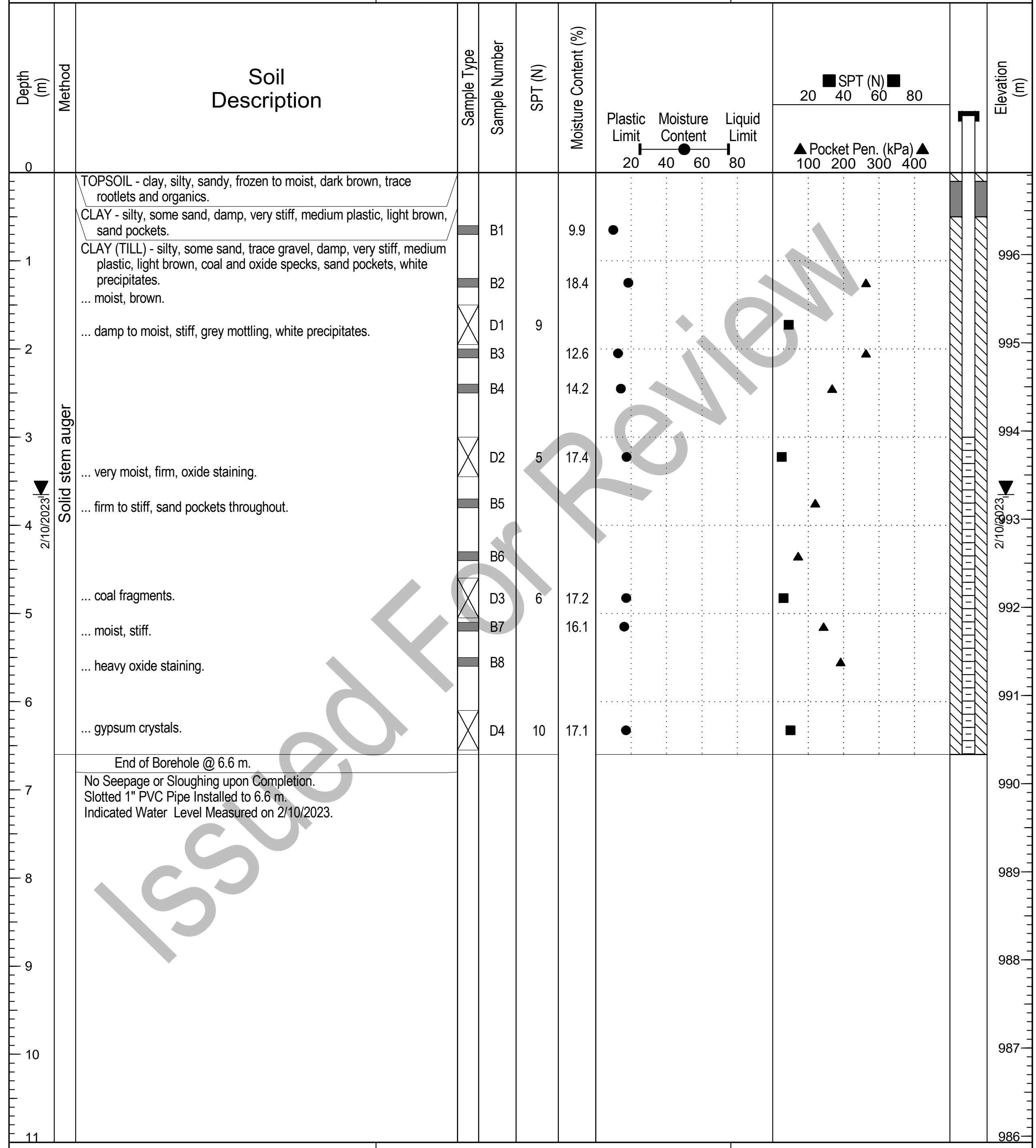
... heavy oxide staining.

... gypsum crystals.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		9.9
B2		18.4
D1	9	
B3		12.6
B4		14.2
D2	5	17.4
B5		
B6		
D3	6	17.2
B7		16.1
B8		
D4	10	17.1



TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

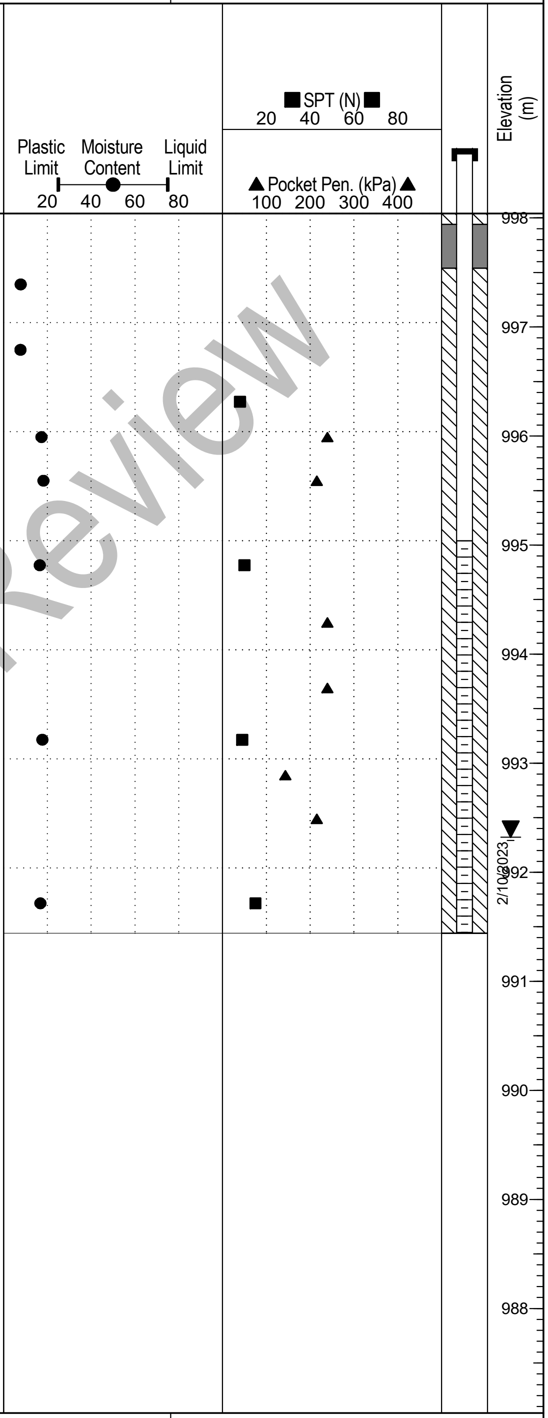
Borehole No: **23BH011**

Project: Chinook Industrial Park ASP
Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M
Ground Elev: 998.04 m
Lethbridge County, AB
UTM: 371906 E; 5509221 N; Z

Depth (m): 0 – 11
Method: Solid stem auger
▼ 2/10/2023

Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.				
CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, silt and sand pockets.	▬	B1		7.8
	▬	B2		7.7
CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown, coal and oxide specks, white precipitates.	☒	D1	8	
... stiff to very stiff, sand pockets.	▬	B3		17.3
	▬	B4		18.2
... coal fragmnets.	☒	D2	10	16.5
... grey mottling.	▬	B5		
	▬	B6		
... coal smearing.	☒	D3	9	17.7
	▬	B7		
... moist, very stiff.	▬	B8		
... oxide staining.	☒	D4	15	16.8

End of Borehole @ 6.6 m.
No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.



TETRA TECH

Contractor: Chilako Drilling
Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem
Start Date: February 3, 2023
Logged By: SA
Completion Date: February 3, 2023
Reviewed By: JZ
Page 1 of 1

Sumus Property Group Ltd.

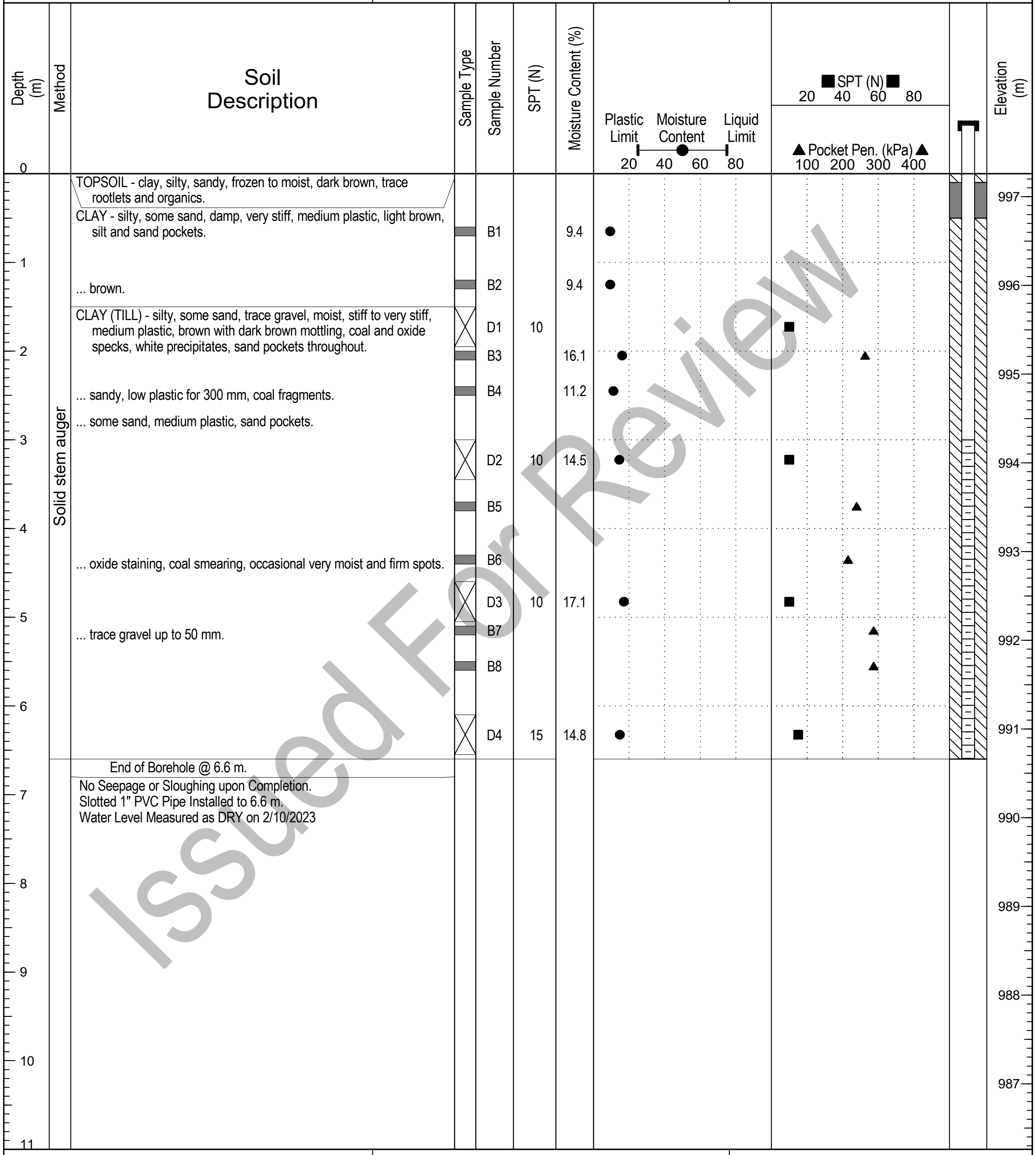
Borehole No: **23BH012**

Project: Chinook Industrial Park ASP
Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M
Ground Elev: 997.26 m
Lethbridge County, AB
UTM: 371849 E; 5509493 N; Z

Method	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
Solid stem auger	TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.				
	CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, silt and sand pockets.	▬	B1		9.4
	... brown.	▬	B2		9.4
	CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, white precipitates, sand pockets throughout.	☒	D1	10	
		▬	B3		16.1
	... sandy, low plastic for 300 mm, coal fragments.	▬	B4		11.2
	... some sand, medium plastic, sand pockets.				
		☒	D2	10	14.5
		▬	B5		
	... oxide staining, coal smearing, occasional very moist and firm spots.	▬	B6		
		☒	D3	10	17.1
	... trace gravel up to 50 mm.	▬	B7		
		▬	B8		
		☒	D4	15	14.8

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Water Level Measured as DRY on 2/10/2023



TETRA TECH

Contractor: Chilako Drilling
Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem
Start Date: February 3, 2023
Logged By: SA
Completion Date: February 3, 2023
Reviewed By: JZ
Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH013**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.22 m
Lethbridge County, AB	UTM: 372083 E; 5509440 N; Z

Depth (m) — Method: Solid stem auger

Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand to sandy, damp, very stiff, low to medium plastic, light brown, silt inclusions throughout.

CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown, coal and oxide specks, sand pockets.

...soluble sulfate content = 0.075% @ 1.5 m.

... very moist, firm, grey mottling.

... moist, very stiff for 300 mm, white precipitates.

... very moist to moist, firm to stiff.

... moist, stiff, brown with grey mottling, coal fragments.

... oxide staining.

... occasional sand pockets.

... occasional very moist and firm spots, heavy oxide staining, sand pockets throughout.

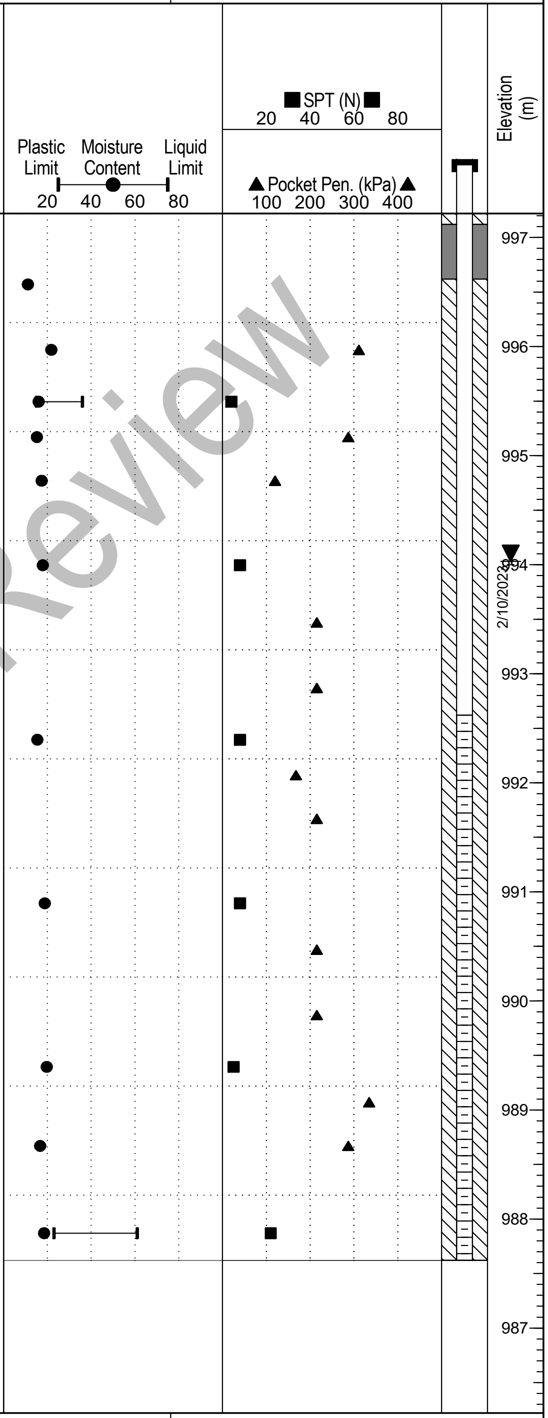
... heavy sand inclusions for 100 mm, trace free water.

... high plastic, light grey.

End of Borehole @ 9.6 m.

Seepage at 7.8 m, No Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

USC	Sample Number	SPT (N)	Moisture Content (%)
	B1		11.1
	B2		21.8
CI	D1	4	16
	B3		15.2
	B4		17.4
	D2	8	17.9
	B5		
	B6		
	D3	8	15.4
	B7		
	B8		
	D4	8	18.8
	B9		
	B10		
	D5	5	19.7
	B11		
	B12		16.7
CH	D6	22	18.5

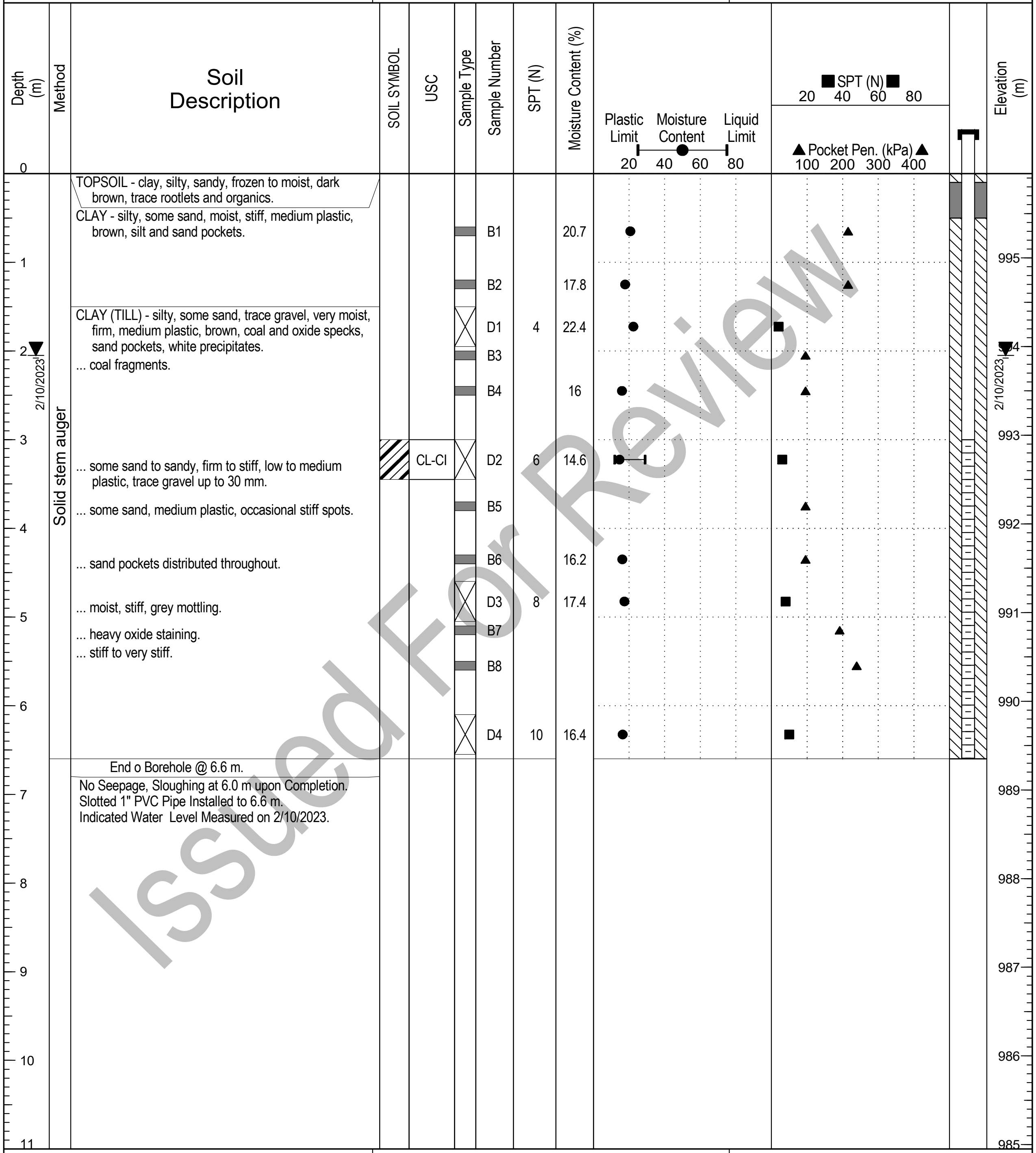


Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

TETRA TECH

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.	# Borehole No: **23BH014**	
	Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
	Location: 10-9-21-W4M	Ground Elev: 995.95 m
	Lethbridge County, AB	UTM: 372080 E; 5509659 N; Z



Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, moist, stiff, medium plastic, brown, silt and sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, very moist, firm, medium plastic, brown, coal and oxide specks, sand pockets, white precipitates.

... coal fragments.

... some sand to sandy, firm to stiff, low to medium plastic, trace gravel up to 30 mm.

... some sand, medium plastic, occasional stiff spots.

... sand pockets distributed throughout.

... moist, stiff, grey mottling.

... heavy oxide staining.

... stiff to very stiff.

End o Borehole @ 6.6 m.

No Seepage, Sloughing at 6.0 m upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		20.7
B2		17.8
D1	4	22.4
B3		
B4		16
D2	6	14.6
B5		
B6		16.2
D3	8	17.4
B7		
B8		
D4	10	16.4

TETRA TECH	Contractor: Chilako Drilling	Completion Depth: 6.6 m
	Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
	Logged By: SA	Completion Date: February 3, 2023
	Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH015**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.41 m
Lethbridge County, AB	UTM: 371926 E; 5509752 N; Z

Depth (m) | Method: Solid stem auger

Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pocket.

CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown to dark brown, sand pockets, white precipitates.

... coal fragments.

... moist to very moist, stiff.

... very moist, firm, heavy oxide staining, sand pockets distributed throughout.

... firm to stiff.

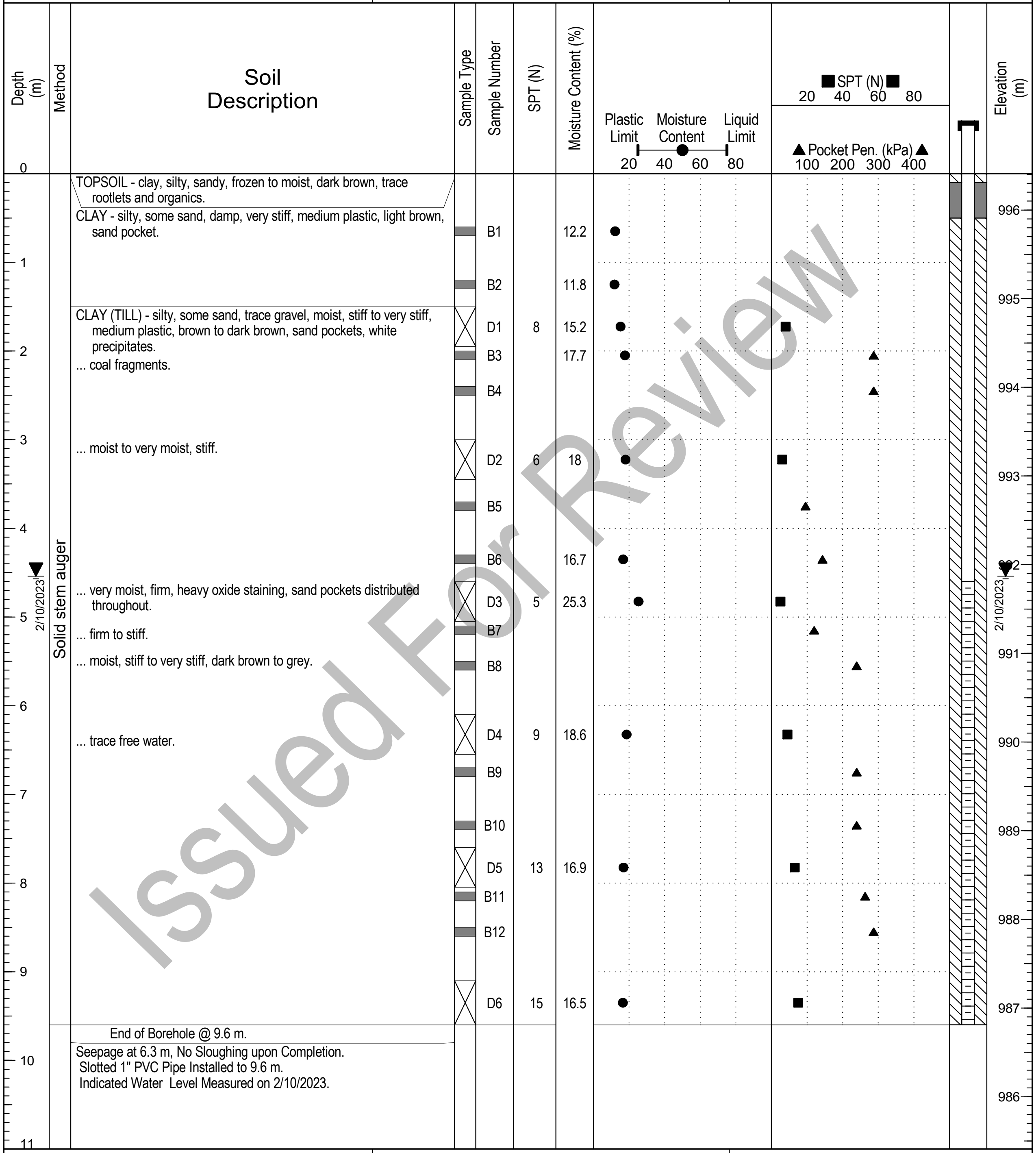
... moist, stiff to very stiff, dark brown to grey.

... trace free water.

End of Borehole @ 9.6 m.

Seepage at 6.3 m, No Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Type	Sample Number	SPT (N)	Moisture Content (%)
▬	B1		12.2
▬	B2		11.8
☒	D1	8	15.2
▬	B3		17.7
▬	B4		
☒	D2	6	18
▬	B5		
▬	B6		16.7
☒	D3	5	25.3
▬	B7		
▬	B8		
☒	D4	9	18.6
▬	B9		
▬	B10		
☒	D5	13	16.9
▬	B11		
▬	B12		
☒	D6	15	16.5



TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

APPENDIX C

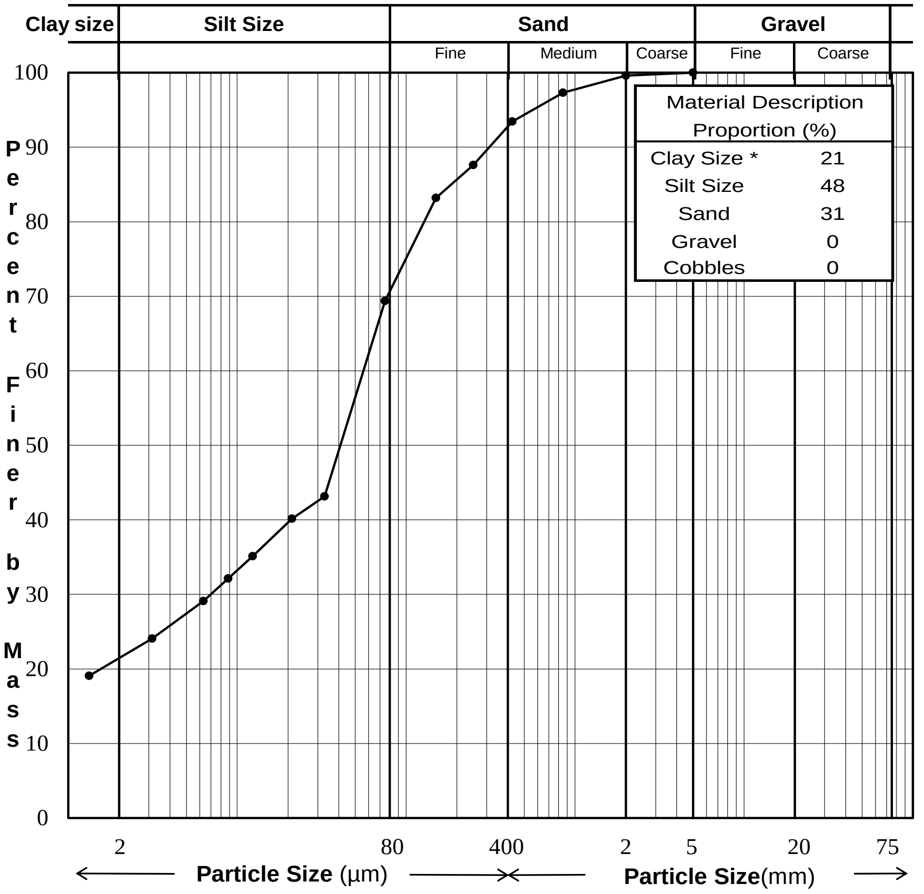
LABORATORY RESULTS

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project:	Chinook Industrial Park - ASP	Sample No.:	
Client:	Sumus Property Group Ltd.	Borehole/ TP:	23BH001
Project No.:	ENG.LGEO04625-01	Depth:	D2 (3.0 - 3.45 m)
Location:		Date Tested	February 13, 2023
Description **:	CLAY - silty, sandy.	Tested By:	SA

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	100
2 mm	100
850 µm	97
425 µm	93
250 µm	88
150 µm	83.2
75 µm	69.4
33 µm	43.2
21 µm	40.1
12 µm	35.1
9 µm	32.1
6 µm	29.1
3 µm	24.1
1 µm	19.1



Material Description	Proportion (%)
Clay Size *	21
Silt Size	48
Sand	31
Gravel	0
Cobbles	0

Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: ______________________________ P.Eng.

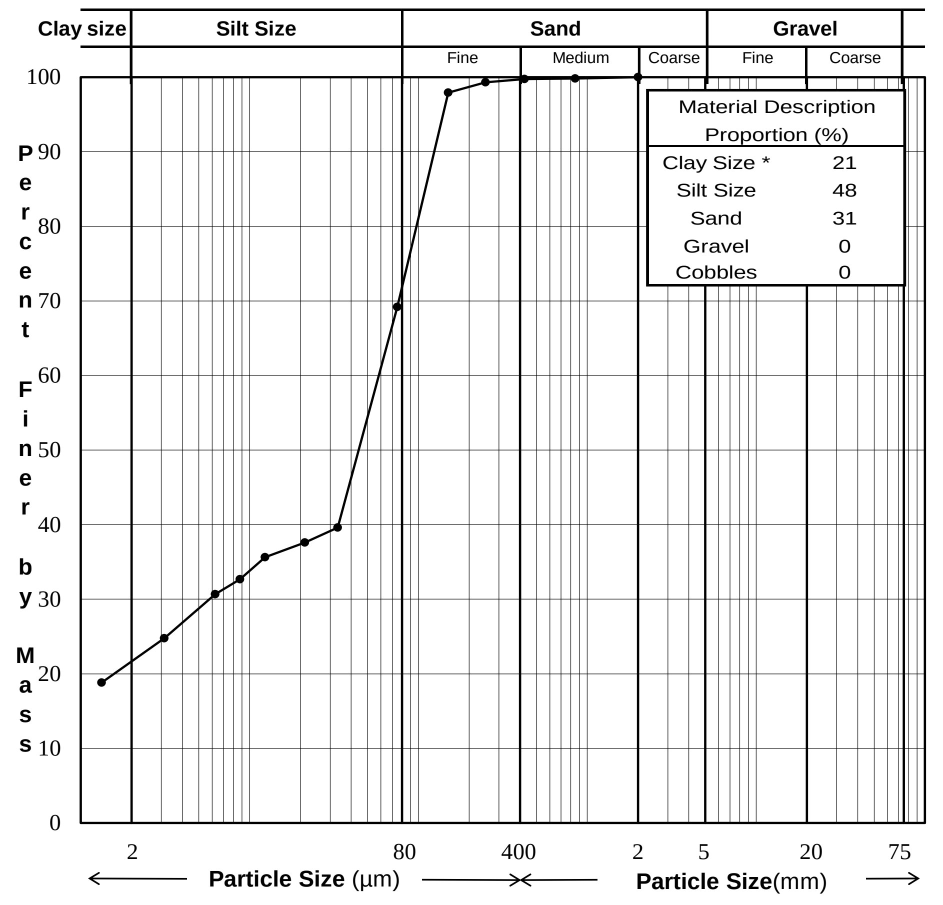
TETRA TECH

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project:	Chinook Industrial Park - ASP	Sample No.:	
Client:	Sumus Property Group Ltd.	Borehole/ TP:	23BH003
Project No.:	ENG.LGEO04625-01	Depth:	B2 (1.2 m)
Location:		Date Tested	February 13, 2023
Description **:	CLAY - silty, sandy.	Tested By:	SA

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	
2 mm	100
850 µm	100
425 µm	100
250 µm	99
150 µm	97.9
75 µm	69.2
33 µm	39.6
21 µm	37.6
12 µm	35.6
9 µm	32.7
6 µm	30.7
3 µm	24.7
1 µm	18.8



Material Description Proportion (%)	
Clay Size *	21
Silt Size	48
Sand	31
Gravel	0
Cobbles	0

Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: ______________________________ P.Eng.

TETRA TECH

CONSTANT HEAD HYDRAULIC CONDUCTIVITY TEST REPORT

ASTM D5084

Project: Chinook Industrial Park ASP
Project No.: ENG.LGEO04625-01
Client: Sumus Property Group Ltd.
Attention: Michael Kelly

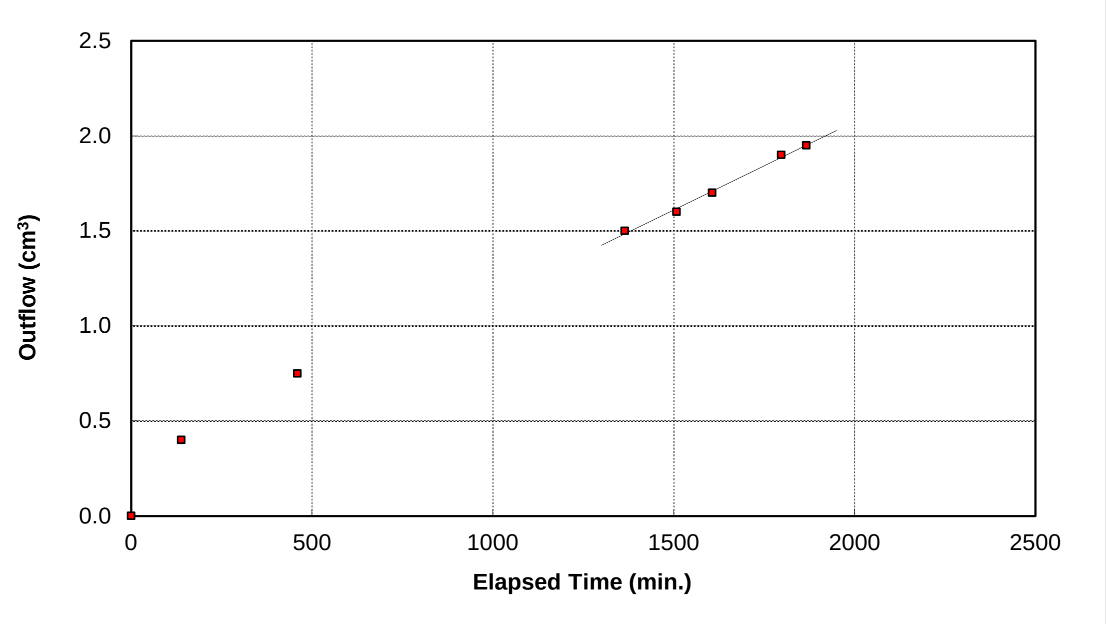
Sample No.: L-24 (P-1)
Borehole No.: 23BH-014
Depth: 1.5-3.0 m
Date Tested: February 17, 2023
Tested By: TD

Soil Description: CLAY, silty, some sand, brown

	Initial	Final
Moisture Content (%)	15.0	16.9
Dry Density (kg/m3)	1824	1835
Compaction SPD (if applicable)	97.6%	98.1%

Sample Height = 5.14 cm
Sample Diameter = 7.08 cm
Head Differential = 14 kPa
Flow Q = 1.8E-05 cm^3/sec
Hydraulic Gradient i = 27.78
Area of Sample A = 39.39 cm^2

Hydraulic Conductivity $\mathbf{k_{20}}$ = **1.6E-08 cm/sec**



Remarks: Remolded Sample

Reviewed By: V. O P.Eng.

TETRA TECH

Moisture-Density Relationship - Proctor Report

ASTM D698

Proj No: LGE04625-01 Sample #: L-24

Project: Chinook Industrial Park ASP Site: Densities Rpt #: 1

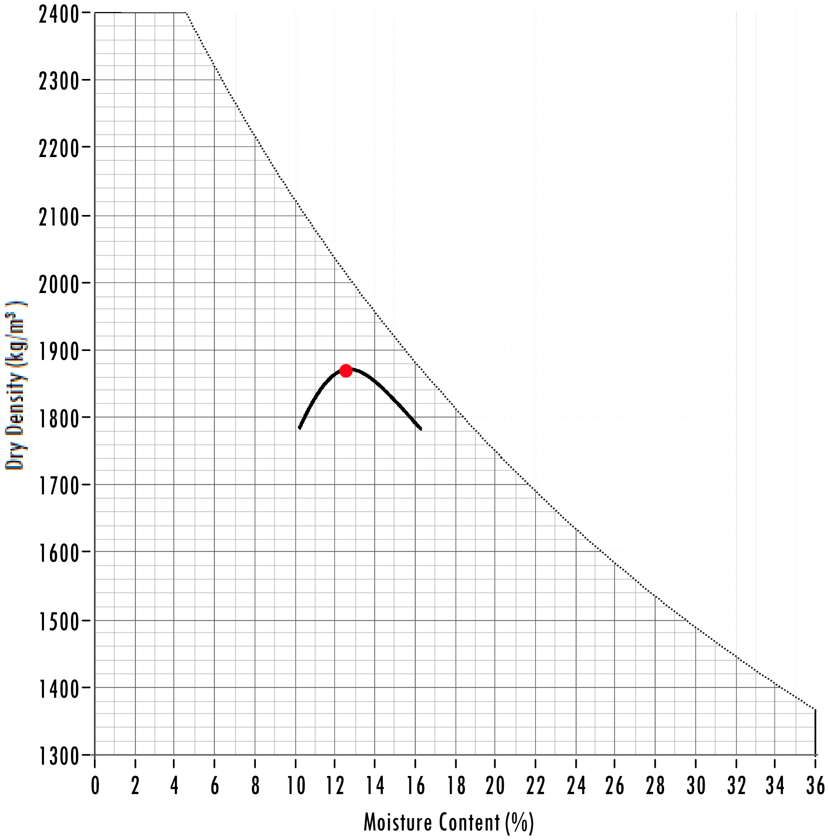
Client: Sumus Property Group Ltd Date Received: Feb 03,2023 By: SA

Address: PO Box 932 (MSK Developments), Lethbridge Alberta T1J3Z8 Date Tested: Feb 13,2023 By: MS

Description: Clay, silty, some sand

Soil Source: Native Location: 23BH-014 @ 1.5-3.0m

Attention: Michael Kelly



Maximum Density: 1870 kg/m³

Optimum Moisture: 12.5 %

as-Received Moisture: 17.3 %

Method: ☑ A ☐ B ☐ C

Compaction: Manual

Zero Air Voids SG: 2.70

Reviewed by: Christa Toles

Christa Toles, C.E.T.

Remarks:

CC:

APPENDIX D

DESIGN AND CONSTRUCTION GUIDELINES

SHALLOW FOUNDATIONS

Design and construction of shallow foundations should comply with relevant Building Code requirements.

The term ‘shallow foundations’ includes strip and spread footings, mat slab, and raft foundations.

Minimum footing dimensions in plan should be in accordance with the applicable design code of the local jurisdiction.

No loose, disturbed or sloughed material should be allowed to remain in open foundation excavations. Hand cleaning should be undertaken to prepare an acceptable bearing surface.

Foundation excavations and bearing surfaces should be protected from rain, snow, freezing temperatures, excessive drying, and the ingress of free water before, during, and after footing construction.

Footing excavations should be carried down into the designated bearing stratum.

After the bearing surface is approved, a mud slab should be poured to protect the soil against inclement weather and provide a working surface for construction.

All constructed foundations should be placed on unfrozen soils, which should be at all times protected from frost penetration.

All foundation excavations and bearing surfaces should be inspected by a qualified geotechnical engineer to check that the recommendations contained in this report have been followed.

Where over-excavation has been carried out through a weak or unsuitable stratum to reach into a suitable bearing stratum or where a foundation pad is to be placed above stripped natural ground surface such over-excavation may be backfilled to subgrade elevation utilizing either structural fill or lean-mix concrete. These materials are defined below:

- “Structural engineered fill” should comprise clean, well-graded granular soils.
- “Lean-mix concrete” should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

CONSTRUCTION GUIDELINES

Revision No: 01 | Last Revised: March 31, 2016

BORED CAST-IN-PLACE CONCRETE PILES

Design and construction of piles should comply with relevant Building Code requirements.

Piles should be installed under full-time inspection of qualified geotechnical personnel. Pile design parameters should be reviewed in light of the findings of the initial bored shafts drilled on a site. Further design review may be necessary if conditions observed during site construction do not conform to design assumptions.

Where fill material or lenses or strata of sand, silt or gravel are present within the designed pile depth, these may be incompetent and/or water bearing and may cause sloughing. Casing should be on hand before drilling starts and be used, if necessary, to seal off water and/or prevent sloughing of the bore.

If piles are to be underreamed (belled), the underreams should be formed entirely in self-supporting soil and entirely within the competent bearing stratum. Where sloughing occurs at design elevation it may be necessary to extend the base of the pile bell to a greater depth. Piles may be constructed with bells having outside diameters up to approximately three times the diameters of their shafts. Piles with shaft diameters of less than 400 mm should not be underreamed due to difficulties associated with ensuring a clean base.

Prior to pouring concrete, bottoms of pile bells or of straight shaft end bearing piles should be mechanically cleaned of all disturbed material.

Pile bores should be visually inspected after completion to ensure that disturbed materials and/or water are not present on the base so that recommended allowable bearing and skin friction parameters may apply.

Other procedures to inspect the pile shafts may be used where shaft diameters of less than 760 mm (30 inch) are constructed, such as, inspection with a light or with the use of a downhole camera.

For safety reasons, where hand cleaning and/or 'down shaft' inspection by personnel are required, the pile shaft must be cased full length prior to personnel entering the shaft.

Reinforcing steel should be on hand and should be placed as soon as the bore has been completed and approved.

Longitudinal reinforcing steel is recommended to counteract the possible tensile stresses induced by frost action and should extend to a minimum depth of 3.5 m. A minimum steel of 0.5 percent of the gross shaft area is recommended or per applicable building code requirements.

Where a limited quantity of water is present on the pile base (<50 mm), it should be removed. Where significant quantities of water are present (>50 mm), and it is impracticable to exclude water from the pile bore, concrete should be placed by tremie techniques or a concrete pump.

A "dry" pile should be poured by "free fall" of concrete only where impact of the concrete against the reinforcing cage, which can cause segregation of the concrete, will not occur. A hopper should be used to direct concrete down the centre of the pile base and to prevent impact of concrete against reinforcing steel.

Concrete used for "dry" uncased piles should be self-compacting and should have a target slump of 125 mm. Where casing is required to prevent sloughing or seepage, the slump should be increased to 150 mm. The casing should be filled with concrete and then the casing should be withdrawn smoothly and continuously. Sufficient concrete should be placed to allow for the additional volume of the casing and reduction in level of the concrete as the casing is withdrawn. Concrete should not be poured on top of previously poured concrete, after the casing is withdrawn. In order to comply with maximum water:cement ratios for the concrete, the use of chemicals (or superplasticizers) to temporarily increase the slump may be required. Concrete for each pile should be poured in one continuous operation and should be placed immediately after excavation and inspection of piles, to reduce the opportunity for the ingress of free water or deterioration of the exposed soil or rock.

If piles cannot be formed in dry conditions then the concrete should be placed by tremie tube or concrete pump. Concrete placed by tremie should have a slump of not less than 150 mm. A ball or float should be used in the tremie tube to separate the initial charge of concrete from the water in the pile bore. The outlet of the tremie tube should be maintained at all times 1.0 m to 2.0 m below the surface of the concrete. The diameter of the tremie tube should be at least 200 mm. The tube should be water tight and not be made of aluminum. Smaller diameter pipes may be used with a concrete pump. The surface of the concrete should be allowed to rise above the cut off level of the pile, so that when the temporary casing is withdrawn and the surface level of the concrete adjusts to the new volume, the top of the uncontaminated concrete is at or above the cut off level. The concrete should be placed in one continuous smooth operation without any halts or delays. Placing the lower portion of the pile by tremie tube and placing the upper portion of the pile by "free fall" should not be permitted, to ensure that defects in the pile shaft at the top of the tremie concrete do not occur. As the surface of the concrete rises in the pile bore the water in the pile bore will be displaced upwards and out of the top of the pile casing.

When concreting piles by tremie techniques, allowance should be made for the removal of contaminated or otherwise defective concrete at the tops of the piles.

An accurate record of the volume of concrete placed should be maintained as a check that a continuous pile had been formed.

Concrete should not be placed if its temperature is less than 5°C or exceeds 30°C, or if it is more than two hours old.

Where tension, horizontal or bending moment loading on the pile is foreseen, steel reinforcing should be extended and tied into the grade beam or pile cap. The steel should be designed to transfer loads to the required depth in the pile and to resist resultant bending moments and shear forces.

Void formers should be placed beneath all grade beams to reduce the risk of damage due to frost effects or soil moisture changes.

Where the drilling operation might affect the concrete in an adjacent pile (i.e., where pile spacing is less than approximately three diameters) drilling should not be carried out before the previously poured pile concrete has set for at least 24 hours.

Where a group of four or more piles are used the allowable working load on the piles may need to be modified to allow for group effects.

Piles should be spaced no closer than 2.5 times the pile shaft diameter, measured centre-to-centre. Strict control of pile location and verticality should be exercised to provide accurate locations and spacings of piles. In general, piles should be constructed within a tolerance of 75 mm plan distance in any direction and within a verticality of 1%.

A detailed record should be kept of pile construction; the following information should be included, pile number, shaft/base diameter, date and time bored, date and time concreted, elevation of piling platform, depths (from piling platform level) to pile base and to concrete cut off level, length of casing used, details of reinforcement, details of any obstructions, details of any groundwater inflows, brief description of soils encountered in the bore and details of any unusual occurrences during construction.

If a large number of piles are to be installed, it may be possible to optimize the design on the basis of pile load tests or conducting high strain dynamic pile testing.

FLOOR SLABS-ON-GRADE

All soft, loose or organic material should be removed from beneath slab areas. If any local 'hard spots' such as old basement walls or abandoned pile foundation are revealed beneath the slab area, these should be over-excavated and removed to not less than 0.9 m below underside of slab level. The exposed soil should be proof-rolled and the final grade restored by engineered fill placement. If proof-rolling reveals any soft or loose spots, these should be excavated and the desired grade restored by engineered fill placement. The subgrade should be compacted to a depth of not less than 0.3 m to a density of not less than 98 percent Standard Proctor Maximum Dry Density (ASTM Test Method D698).

If, for economic reasons, it is considered desirable to leave low quality material in-place, such as existing fills, beneath a slab-on-grade, special ground treatment procedures may be considered, Tetra Tech could provide additional advice on this aspect if required.

A levelling course of well graded granular fill (with maximum size of 20 mm), at least 150 mm in compacted thickness, is recommended directly beneath all slabs-on-grade. The type of granular fill should be selected based on the design floor loadings. Alternatively a minimum thickness of 150 mm of 80 mm pit-run gravel overlain by a minimum thickness of 50 mm of 20 mm crushed gravel may be used. Coarse gravel particles larger than 25 mm diameter should be avoided directly beneath the slab-on-grade to limit potential stress concentrations within the slab. All levelling courses directly under floor slabs should be compacted to 100 percent of Standard Proctor Maximum Dry Density (ASTM Test Method D698).

Engineered fill, pit-run gravel and crushed gravel are defined under the heading 'Backfill Materials and Compaction' elsewhere in this Appendix.

The excavated subgrade beneath slabs-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water. This applies before, during, and after the construction period.

CONSTRUCTION EXCAVATIONS

Construction should be in accordance with good practice and comply with the requirements of the responsible regulatory agencies.

All excavations greater than 1.5 m deep should be sloped or shored for worker protection.

Shallow excavations up to about 3 m depth may use temporary sideslopes of 1H:1V. A flatter slope of 2H:1V should be used if groundwater is encountered. Localized sloughing can be expected from these slopes.

Deep excavations or trenches may require temporary support if space limitations or economic considerations preclude the use of sloped excavations.

For excavations greater than 3 m depth, temporary support should be designed by a qualified geotechnical engineer. The design and proposed installation and construction procedures should be submitted to Tetra Tech for review.

The construction of a temporary support system should be monitored. Detailed records should be taken of installation methods, materials, in situ conditions and the movement of the system. If anchors are used, they should be load tested. Tetra Tech can provide further information on monitoring and testing procedures if required.

Attention should be paid to structures or buried service lines close to the excavation. For structures, a general guideline is that if a line projected down, at 45 degrees from the horizontal from the base of foundations of adjacent structures intersects the extent of the proposed excavation, these structures may require underpinning or special shoring techniques to avoid damaging earth movements. The need for any underpinning or special shoring techniques and the scope of monitoring required can be determined when details of the service ducts and vaults, foundation configuration of existing buildings and final design excavation levels are known.

No surface surcharges should be placed closer to the edge of the excavation than a distance equal to the depth of the excavation, unless the excavation support system has been designed to accommodate such surcharge.

Revision No: 02 | Last Revised: October 2, 2015

BACKFILL MATERIALS AND COMPACTION (GENERAL)

1.0 DEFINITIONS

“Landscape fill” is typically used in areas such as berms and grassed areas where settlement of the fill and noticeable surface subsidence can be tolerated. “Landscape fill” may comprise soils without regard to engineering quality.

“General engineered fill” is typically used in areas where a moderate potential for subgrade movement is tolerable, such as asphalt (i.e., flexible) pavement areas. “General engineered fill” should comprise clean, granular or clay soils.

“Select engineered fill” is typically used below slabs-on-grade or where high volumetric stability is desired, such as within the footprint of a building. “Select engineered fill” should comprise clean, well-graded granular soils or inorganic low to medium plastic clay soils.

“Structural engineered fill” is used for supporting structural loads in conjunction with shallow foundations. “Structural engineered fill” should comprise clean, well-graded granular soils.

“Lean-mix concrete” is typically used to protect a subgrade from weather effects including excessive drying or wetting. “Lean-mix concrete” can also be used to provide a stable working platform over weak subgrades. “Lean-mix concrete” should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

Standard Proctor Density (SPD) as used herein means Standard Proctor Maximum Dry Density (ASTM Test Method D698). Optimum moisture content is defined in ASTM Test Method D698.

2.0 GENERAL BACKFILL AND COMPACTION RECOMMENDATIONS

Exterior backfill adjacent to abutment walls, basement walls, grade beams, pile caps and above footings, and below highway, street, or parking lot pavement sections should comprise “general engineered fill” materials as defined above.

Exterior backfill adjacent to footings, foundation walls, grade beams and pile caps and within 600 mm of final grade should comprise inorganic, cohesive “general engineered fill”. Such backfill should provide a relatively impervious surficial zone to reduce seepage into the subsoil against the structure.

Backfill should not be placed against a foundation structure until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction. During compaction, careful observation of the foundation wall for deflection should be carried out continuously. Where deflections are apparent, the compactive effort should be reduced accordingly.

In order to reduce potential compaction induced stresses, only hand-held compaction equipment should be used in the compaction of fill within 1 m of retaining walls or basement walls. If compacted fill is to be placed on both sides of the wall, they should be filled together so that the level on either side is within 0.5 m of each other.

All lumps of materials should be broken down during placement. Backfill materials should not be placed in a frozen state, or placed on a frozen subgrade.

Where the maximum-sized particles in any backfill material exceed 50% of the minimum dimension of the cross-section to be backfilled (e.g., lift thickness), such particles should be removed and placed at other more suitable locations on site or screened off prior to delivery to site.

Excavation and construction operations expose materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration of performance. Unless otherwise specifically indicated in this report, the walls and floors of excavations, and stockpiles, must be protected from the elements, particularly moisture, desiccation, frost, and construction activities. Should desiccation occur, bonding should be provided between backfill lifts. For fine-grained materials the previous lift should be scarified to the base of the desiccated layer, moisture-conditioned, and recompacted and bonded thoroughly to the succeeding lift. For granular materials, the surface of the previous lift should be scarified to about a 75 mm depth followed by proper moisture-conditioning and recompaction.

3.0 COMPACTION AND MOISTURE CONDITIONING

“Landscape fill” material should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90% of SPD unless a higher percentage is specified by the jurisdiction.

“General engineered fill” and “select engineered fill” materials should be placed in layers of 150 mm compacted thickness and should be compacted to not less than 98% of SPD. Note that the contract may specify higher compaction levels within 300 mm of the design elevation. Cohesive materials placed as “general engineered fill” or “select engineered fill” should be compacted at 0 to 2% above the optimum moisture content. Note that there are some silty soils which can become quite unstable when compacted above optimum moisture content. Granular materials placed as “general engineered fill” or “select engineered fill” should be compacted at slightly below (0 to 2%) the optimum moisture content.

“Structural engineered fill” material should be placed in compacted lifts not exceeding 150 mm in thickness and compacted to not less than 100% of SPD at slightly below (0 to 2%) the optimum moisture content.

4.0 “GENERAL ENGINEERED FILL”

Cohesive or granular soils are considered acceptable for use as “general engineered fill,” providing the soils are inorganic and free of deleterious materials.

5.0 “SELECT ENGINEERED FILL”

Low to medium plastic clay with the following range of plasticity properties is generally considered suitable for use as “select engineered fill”:

Liquid Limit	= 20 to 40%
Plastic Limit	= 10 to 20%
Plasticity Index	= 10 to 30%

Test results should be considered on a case-by-case basis.

“Pit-run gravel” and “fill sand” are generally considered acceptable for use as “select engineered fill.” See exact project or jurisdiction for specifications.

The “pit-run gravel” should be free of any form of coating and any gravel or sand containing clay, loam or other deleterious materials should be rejected. No material oversize of the specified maximum sieve size should be tolerated. This material would typically have a fines content of less than 10%.

The materials above are also suitable for use as “general engineered fill.”

6.0 “STRUCTURAL ENGINEERED FILL”

Crushed gravel used as “structural engineered fill” should be hard, clean, well graded, crushed aggregate, free of organics, coal, clay lumps, coatings of clay, silt, and other deleterious materials. The aggregates should conform to the requirement when tested in accordance with ASTM C136 and C117. See exact project or jurisdiction for specifications. This material would typically have a fines content of less than 10%.

In addition to the above, further specification criteria identified below should be met:

“Structural Engineered Fill” – Additional Material Properties

Material Type	Percentage of Material Retained on 5 mm Sieve having Two or More Fractured Faces	Plasticity Index (<400 μm)	L.A. Abrasion Loss (percent Mass)
Various sized Crushed Gravels	See exact project or jurisdiction for specifications	See exact project or jurisdiction for specifications	See exact project or jurisdiction for specifications

Materials that meet the grading limits and material property criteria are also suitable for use as “select engineered fill.”

7.0 DRAINAGE MATERIALS

“Coarse gravel” for drainage or weeping tile bedding should be free draining. Free-draining gravel or crushed rock generally containing no more than 5% fine-grained soil (particles passing No. 200 sieve) based on the fraction passing the 3/4-inch sieve or material with sand equivalent of at least 30.

“Coarse sand” for drainage should conform to the following grading limits:

“Coarse Sand” Drainage Material – Percent Passing by Weight

Sieve Size	Coarse Sand*
10 mm	100
5 mm	95 – 100
2.5 mm	80 – 100
1.25 mm	50 – 90
630 μm	25 – 65
315 μm	10 – 35
160 μm	2 – 10
80 μm	0 – 3

* From CSA A23.1-09, Table 10, “Grading Limits for Fine Aggregate”, Class FA1

Note that the “coarse sand” above is also suitable for use as pipe bedding material. See exact project or jurisdiction for specifications.

8.0 BEDDING MATERIALS

The “Coarse Sand “gradation presented above in Section 7.0 is suitable for use as pipe bedding and as backfill within the pipe embedment zone, however see exact project or jurisdiction for specifications.

Phase I Environmental Site Assessment
Chinook Industrial Park ASP
Portions of West ½ Section 10 TWP 9 RGE 21 W4M
Lethbridge County, Alberta

PRESENTED TO

Sumus Property Group Ltd.

FEBRUARY 28, 2023
ISSUED FOR USE
FILE: ENG.LGEO04625-01.002

Tetra Tech Canada Inc.
442 – 10 Street North
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

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EXECUTIVE SUMMARY

Foreword

Sumus Property Group Ltd., care of MSK Developments, retained Tetra Tech Canada Inc. (Tetra Tech) to conduct a Phase I environmental site assessment (ESA) on the Chinook Industrial Park, located within the west half of Section 10, Township 9, Range 21, West of the Fourth Meridian (W1/2 10-009-21 W4M).

Tetra Tech understands this Phase I ESA is being conducted for due diligence in support of an area structure plan (ASP) for the Chinook Industrial Park (Phase 2 and Phase 3). Phase 2 and Phase 3 of the ASP are adjacent to the north of Phase 1A and 1B of the ASP. The proposed land consists of two legal properties: Plan 1113171, Block 1, Lot 5, and Plan 0013201, Block 1, Lot 1.

The objective of the Phase I ESA is to comment on whether any past or present land use, either offsite or onsite, may have a potential to cause environmental impairment to the site.

The Phase I ESA was completed in general accordance with the Alberta Environment and Parks Alberta Environmental Site Assessment Standard and with the methods outlined in the document titled "*Canadian Standards Association Standard (CSA) Z768-01 Phase I ESA*", published by the CSA (reaffirmed 2022).

Findings and Conclusions

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential contamination from on-site land use. This would include potential accidental spills or site practices that may contaminate the property directly. The second type of risk is from contamination caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater, or in overland runoff onto the site.

Potential for Impairment from On-Site Source(s)

There were no on-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

Potential for Impairment from Off-Site Source(s)

There were no off-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

Further Action/Rendering an Opinion

Based on the present study, Tetra Tech recommends that no further environmental investigation is required at this time.

Tetra Tech recommends the following for consideration:

- If buried debris or staining are encountered during future investigation or ground disturbance, a qualified environmental professional should be contacted.
- If soils containing organics are encountered during future investigation or ground disturbance, they should be removed from building footprints and not be reburied; a qualified environmental professional should be contacted.

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APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Sumus Property Group Ltd. and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Sumus Property Group Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

1.1 General

Sumus Property Group Ltd. care of MSK Developments retained Tetra Tech Canada Inc. (Tetra Tech) to conduct a Phase I environmental site assessment (ESA) for the Chinook Industrial Park, located within the west half of Section 10, Township 9, Range 21, West of the Fourth Meridian (W1/2 10-009-21 W4M).

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The objective of the Phase I ESA is to comment on whether any past or present land use, either offsite or onsite, may have a potential to cause environmental impairment to the site.

The Phase I ESA was completed in general accordance with the 2016 Alberta Environment and Parks Alberta Environmental Site Assessment Standard and with the methods outlined in the document titled "*Canadian Standards Association Standard (CSA) Z768-01 Phase I ESA*", published by the CSA (reaffirmed 2022).

1.2 Authorization

Michael Kelly of MSK Developments provided written authorization to proceed with the present study to Tetra Tech on January 23, 2023.

1.3 Scope of Work

Tetra Tech conducted the following scope of work for the Phase I ESA:

- Conducted a records review for the site and surrounding properties, for a minimum search distance of 100 m. The records review included the following current and historical information searches:
  - Provincial regulatory information including the Alberta Safety Codes Authority (ASCA); Alberta Energy Regulator (AER) via Abacus Datagraphics Database (AbaData); Alberta Environment and Protected Areas (AEPA) ESA Repository (ESAR), Online Water Well Database, Authorization Viewer; Historical Environmental Enforcement Search; and the Alberta Land Titles Spatial Information System (SPIN2).
  - Regional and municipal regulatory information, including Lethbridge County.
  - Historical information sources including business directories, fire insurance plans, land titles, and historical aerial photographs.
  - Geological and hydrogeological information including published topographic, geologic, soil, and groundwater maps and reports.
- Conducted a site visit to evaluate the extent and manner that current and historical surrounding activities may impact upon the site and the environment. Sampling was not included as part of the Phase I ESA scope of work.
- Conducted interviews with persons familiar with the site and surrounding properties.
- Evaluated the results and prepared this report discussing the site history and identified any potential for environmental concerns resulting from past or present land use on site and in the surrounding area.

1.4 Qualifications of Assessors

Jaymes Going, B.Sc., EP, conducted the site visit, historical review, and wrote this report. Jaymes is an Environmental Scientist with Tetra Tech's Environment and Water Practice and has over 15 years of experience in the environmental industry.

Henri Carriere, P.Eng., M.N.R.M., provided the senior review of this report. Henri is a Senior Project Engineer with Tetra Tech's Environment and Water Practice in Calgary, Alberta. He has more than 30 years of experience in the environmental industry.

1.5 General Site Details

The irregular shaped site consists of two legal properties and is approximately 60.12 hectares (ha) in size. The site is located adjacent to the east municipal boundary of the City of Lethbridge, within Lethbridge County. The site consists of cultivated agricultural cropland with the exception of a small building/structure located on the northern portion of the site that houses a water fill station. The water fill station is within one of the two legal properties (Plan 0013201, Block 1, Lot 1). An electrical transmission line is also present on the west site boundary.

The site is bound to the north by Township Road 92 (TWP RD 92), to the east by a St. Mary River Irrigation District (SMRID) irrigation canal, to the south by Phase 1A and Phase 1B of the Chinook Industrial Park and to the west by 43 Street North.

Adjacent to the north of the site beyond TWP RD 92 is a rural property with miscellaneous storage (irrigation pipes and various equipment), to the northeast by a rural residence and to the northwest by Pratt & Whitney. Beyond the SMRID canal to the east is agricultural land and a farm operation including numerous corrals. South of the site within Phase 1A and Phase 1B of the Chinook Industrial Park are Southland International Trucks and trailer storage and a stormwater retention pond. West of the site is the Churchill Industrial Park located within the City of Lethbridge. Adjacent commercial/industrial properties to the west of the site include the City of Lethbridge Animal Services, Haul-All Equipment Ltd., Peterbilt Lethbridge, Southland Trailer Corp., and miscellaneous storage associated with the industrial businesses.

Figure 1 shows the site location plan and Figure 2 shows the detailed site plan showing surrounding land use. Photographs of the site are provided in Appendix B.

2.0 RECORDS REVIEW

The results of regulatory searches are provided in Appendix C. Records were reviewed for the site and for adjacent properties within a minimum distance of 100 m from the site boundary.

2.1 Location, Size, and Ownership

The site is located in Lethbridge County, Alberta. The legal description, legal land description, size, and ownership are summarized in Table A.

Table A: Legal Description, Legal Land Description, Size, and Ownership

Legal Description	Legal Land Description	Size (ha)*	Ownership*
Plan 1113171, Block 1, Lot 5	W 10-009-21 W4M	59.56	1000824 Alberta Ltd.
Plan 0013201, Block 1, Lot 1	NW 10-009-21 W4M	0.56	Lethbridge Regional Water Services Commission

* Size and ownership were obtained from the current land title.

2.2 Historical Records Review

A historical records review was undertaken for the site. The review dates were based on available records.

2.2.1 Historical Land Title Records

A historical and current land title search was initiated for the site. The results of the historical land title search had not been received at the time of report issuance. Should the review of the historical land tiles change the findings, an addendum letter will be issued. The current land titles are included in Appendix C.

Table B: Land Titles Summary

Year(s) of Ownership	Owner(s)	Tetra Tech Evaluation
Plan 1113171, Block 1, Lot 5		
2011 to present	1000824 Alberta Ltd.	Based on the name, there is no obvious potential for environmental concern.
Plan 0013201, Block 1, Lot 1		
2002 to present	Lethbridge Regional Water Services Commission	Based on the name, there is no obvious potential for environmental concern.

2.2.2 Aerial Photographs

Aerial photographs provide visual evidence of site occupancy, operational activities, and general site details. Aerial photographs capture a view of the site and the surrounding areas at a given time. The results of the aerial photograph review are summarized in Table C.

Table C: Historical Aerial Photo Summary

Year	Scale	Observations
1950	1:40,000	**On-site:** Site appears as agricultural cropland.
		Off-site: The surrounding land is predominantly agricultural cropland. Linear features are visible to the west (43 Street North), north (TWP RD 92), and east (SMRID canal). Structures are also visible to the east at the location of the farm operation.
1961	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1970	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1979	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Generally similar to the previous aerial photograph although corrals have been constructed to the east at the farm operation location and a building has been constructed to the west (current Haul-All Equipment Ltd.). Outdoor storage is also visible to the north of Haul-All Equipment Ltd.
1991	1:30,000	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1999	1:30,000	**On-site:** Similar to the previous aerial photograph.
		Off-site: Additional structures have been constructed to the west of the site at the current location of Southland Trailer Corp. Additional outside storage is visible to the west of the site.

Table C: Historical Aerial Photo Summary

Year	Scale	Observations
2011	*	**On-site:** Similar to the previous aerial photograph although the building and access for the water fill station has been constructed on the northern portion of the site.
		Off-Site: Additional structures have been constructed to the west of the site at the current location of Peterbilt and the Lethbridge Animal Services.
2022	*	**On-site:** Similar to the previous aerial imagery.
		Off-Site: South of the site a building has been constructed (Southland International Trucks) and trailer storage is visible. The stormwater retention pond has also been constructed south of the site.

Notes:
To be read in conjunction with the accompanying report.
The aerial photographs are enlarged (where possible) for the review.
* Aerial photograph was obtained from Google Earth's satellite image archive.

Based on the aerial photograph review, the site has been agricultural land since 1950 with the only change being the construction of the water fill station between 1999 and 2011.

The surrounding area has also been predominantly agricultural land since 1950 with development occurring to the west of the site within the City of Lethbridge since 1979 and most recently with the development to the south of the site with Phase 1A and Phase 1B of the ASP prior to 2022.

2.2.3 Museum Archives

Tetra Tech inquired with the Galt Museum and Archives for indications of historical land use at the site and the surrounding area. Museum personnel indicated that there was no information specific to the site.

2.2.4 Business Directories

No business directories were available for Tetra Tech to review for the site.

2.2.5 Fire Insurance Plans

No fire insurance plans were available for Tetra Tech to review for the site.

2.2.6 Other Archival Records

No additional archival records were reviewed by Tetra Tech for the site.

2.3 Provincial Regulatory Information

This section describes the results of provincial regulatory searches. Copies of the search results and correspondence are provided in Appendix C.

2.3.1 Alberta Safety Codes Authority

Tetra Tech contacted the Alberta Safety Codes Authority (ASCA) regarding the potential for registered petroleum storage tanks (PSTs) at the site (Plan 1113171, Block 1, Lot 5 and W1/2 10-009-21 W4M and Plan 0013201, Block 1, Lot 1 and NW 10-009-21 W4M) and at the location of Haul-All Equipment Ltd. (4115 – 18 Avenue North; NE 09-009-21 W4M) due to the age of this property dating to the late 1970s.

The ASCA indicated that no records exist for the site or for the location of Haul-All Equipment Ltd.

The ASCA requires that all underground storage tanks (USTs) be registered; however, only above-ground storage tanks (ASTs) with a capacity greater than 2,500 L require registration. The database is based on a limited survey conducted in 1992 and voluntary information submitted thereafter; therefore, it is not considered a comprehensive inventory of PSTs in Alberta.

2.3.2 Alberta Energy Regulator

2.3.2.1 AbaData Database

Tetra Tech acquires AER database information through AbaData. The AbaData database was searched to determine if oil/gas wells and/or pipelines exist or have existed at the site and on the surrounding properties. The information provided by the AER indicated that there are available records for two high pressure gas lines owned and operated by ATCO Gas and Pipelines Ltd. (one active and one to be constructed) near the western and eastern site boundaries.

The operating high pressure gas line (natural gas) is oriented north to south along 43 Street North and the yet to be constructed high pressure gas line is proposed to the east of the SMRID canal.

No other records for oil/gas wells and/or pipelines and spills/complaints were identified within 100 m of the site boundaries. AbaData also shows a buried cable right-of-way (ROW) transecting the approximate middle of the site in a diagonal direction. No additional information on the ROW was available.

Several low-pressure gas lines (owned by ATCO Gas) are identified offsite and within 100 m of the site boundaries to the north and east that service rural properties.

High-pressure pipeline and well information provided by AbaData is current to January 1, 2023 and information on low-pressure pipelines is current to December 20, 2022.

The Coal Mine Atlas was reviewed, and it was determined that no abandoned or active coal mines are present at the site or within 100 m of the site.

2.3.3 Alberta Environment and Parks

2.3.3.1 Environmental Site Assessment Repository

The AEP ESAR is an online, searchable database that provides scientific and technical information about assessed sites throughout Alberta. The search of ESAR indicated that there were no records available for the site or within 100 m from the site boundary. Several records were available greater than 100 m to the east and west of the site.

2.3.3.2 Online Authorization Viewer

The AEP Online Authorization Viewer allows the public to view approvals, licenses, registrations and permits issued under the Water Act and EPEA. There were no records available for the site by the legal description (Plan 1113171, Block 1, Lot 5 or Plan 0013201, Block 1, Lot 1), however, six records were available for the section in which the site is located (10-009-21 W4M). The available records are for the Lethbridge Regional Water Distribution System, the Rave Industrial Area Storm Drainage System, and for the Coaldale/Management/Lethbridge County (stormwater drainage).

2.3.3.3 Water Well Information Database

The AEP Water Well Database was searched to view records of water wells within the site or within an approximate 1,000 m radius from the approximate centre of the site. The search identified no records of water wells located on or offsite within a 1,000 m radius.

2.3.4 Alberta Government – Alberta Land Titles Spatial Information System

The SPIN2 website map for the site and surrounding area shows the legal property boundaries for the site and surrounding area including the ROW for the SMRID irrigation canal adjacent to the east of the site. The SPIN2 map also shows a buried cable ROW transecting the approximate middle of the site.

2.3.5 Historical Environmental Enforcement Search

The historical environmental enforcement search provides records taken against a company or individual related to AEP's legislation. The search was conducted for each of the current site owners as per the land title records listed in Section 2.2.1. The search resulted in no records for the individuals or companies listed.

2.4 Regional and Municipal Regulatory Information

This section describes the results of regional and municipal regulatory searches. Copies of the search results and correspondence are provided in Appendix C.

2.4.1 Lethbridge County

Tetra Tech requested a site inquiry with Lethbridge County for information on the site (W1/2 10-009-21 W4M). The response indicated that there are no records of storage tanks, chemical storage, spills, fires or landfills for the site including Phase 1A and Phase 1B of the ASP (located within the W1/2 10-009-21 W4M). It was also indicated that existing development approvals for the area exist.

A copy of the letter from Lethbridge County is presented in Appendix C.

2.5 Land Forms and Geology

2.5.1 Topography

Surface topography can influence the direction of migration of contaminants at the soil surface. The local topography is the topography at the site, whereas regional topography is the overall expression of the surface in a given region. The local topography of the site was generally flat with no overall surface drainage pattern observed. Regional topography in the area is generally flat to undulating, and slopes northerly towards the Oldman River valley.

2.5.2 Surficial and Bedrock Geology

The surficial geology in the area is characterized by moraine till deposits with sporadic lenses of gravel, sand, and silt (Shetsen 1981).

The stratigraphy of the Lethbridge area is generally comprised of 65 m to 70 m of surficial deposits overlying bedrock. Bedrock in the Lethbridge area consists of strata from the upper Oldman Formation and the lower Bearpaw Formation, both of the late Cretaceous Age (Tokarsky 1974). The bedrock has a relatively flat surface dipping slightly to the northwest and is locally encountered at about geodetic elevation 843 m. The bedrock strata consist of thin beds of predominantly weak mudstones, siltstones, and sandstones with occasional bentonite and coal seams.

2.5.3 Hydrogeology

Groundwater has the potential to be of significance as a means of contaminant transport. Regional groundwater flow is the overall direction of groundwater flow in a given region. Groundwater in a local area within the region, may travel in a different direction from the regional flow, due to influence by local topography and/or subsurface soil conditions.

There are currently no surface water bodies located at the site. The nearest surface water body is the SMRID canal adjacent to the east of the site. There is also a stormwater retention pond approximately 100 m south of the site (within Phase 1B of the ASP) and a dugout located east of the SMRID canal at the farm operation. The Oldman River is located approximately 6 km northwest of the site.

Regional groundwater flow is expected to be northerly toward the Oldman River. Perched groundwater tables are common and have been encountered in many areas of southern Alberta. The depth to these perched tables can vary from approximately 2 m below ground level to considerable depths within gravel, sand, and/or silt seams. The flow of these perched tables can differ from regional flow direction, or be relatively stagnant, depending on the geometry and the extent of the sand and/or silt seams.

It should be noted that topography, geologic materials, land development (including the irrigation canal), and soil disturbances can also cause localized variances in groundwater movement and pattern. Also, groundwater levels will fluctuate seasonally and in response to climatic conditions.

2.6 Previous Reports

No previous environmental reports were available to review for the site.

2.7 Other Information Sources

There were no other information sources reviewed for the site.

3.0 SITE VISIT

Jaymes Going, of Tetra Tech, visited the site on February 14, 2023. Full access to all outdoor areas of the site was granted, however, the water fill station building was not accessed. Weather conditions were favorable (i.e., no snow cover) and the site was walked over with visual observations made of adjacent properties from the site boundaries.

3.1 Building Details and Site Servicing

There is currently one building on the site. The building is for the water fill station and was constructed between 1999 and 2011.

The following table describes the site servicing.

Table D: Site Servicing

Item	Present	Type	Comments
Water Supply	Yes	Potable	The water fill station building owned and operated by the Lethbridge Regional Water Services Commission provides a source of potable water.
Storm Sewer	No	Not applicable	Overland surface drainage would follow the local topography; however, no specific site drainage patterns were observed.
Sanitary Sewer	No	None	There was no indication of sanitary sewer services located at the site.
Other Storage	No	Not applicable	No storage areas were observed at the site.
Pits	No	Not applicable	No pits were observed on the site.
Lagoons	No	Not applicable	No lagoons were observed on the site.

3.2 Special Attention Items

Some construction materials contain compounds that may be hazardous to building occupants or users of the site. The following table summarizes these special attention items; further background information on these materials is provided in Appendix D.

Table E: Special Attention Items

Item	Presence/ Potential	Comments
Asbestos	Low	Based on age of the building at the site (after 1999), there is a low potential that the building contains asbestos and/or lead.
Lead	Low	
Urea Formaldehyde Foam Insulation (UFFI)	Low	No indication of UFFI at the site was observed. If this type of insulation was used, the fugitive emissions were likely the most harmful within two years of installation.
Ozone-depleting Substances (ODS)	Low	Based on the nature of the site building, it is unlikely that ODS are located at the site.
Polychlorinated Biphenyls (PCBs)	Low	Pole mounted transformers were observed at the site near the water fill station. Transformers are owned and maintained by the utility company.
Radon	Moderate to High	There was no radon gas testing reported for the site; however, natural radon concentrations are considered moderate to high in Alberta. A radon test was not completed by Tetra Tech as part of this investigation. There were no anthropogenic sources of radon gas identified.
Methane	Low	There was no methane gas testing reported for the site. Based upon information collected during this investigation (i.e., aerial photograph review, site reconnaissance), there is no evidence of deposits of buried organics at the site that could produce methane. Refer to Section 3.3.5 regarding potential fill areas.
Electromagnetic (EM)	Low	A high voltage transmission line is present on the west site boundary which could generate EMFs. No EMF assessment was completed by Tetra Tech for the site.
Noise and Vibration	Low	There were no major sources of noise or vibration on or adjacent to the site during the site visit.

The above evaluation is based on building age and basic site observations. Intrusive investigation and sampling are not within the scope of a Phase I ESA.

3.3 Site Observations

This section describes observations made of the site during the site visit on February 14, 2023.

3.3.1 Surficial Stains

There were no surficial stains observed during the site visit.

3.3.2 Vegetation

Vegetation at the site was predominantly agricultural cropland with some weedy species expected in disturbed areas such as near the SMRID canal and near adjacent roadways. There was no evidence of stressed vegetation at the site, however, the site visit was conducted outside the growing season when vegetation was dormant.

3.3.3 Ponding of Water

There was no ponded water observed on the site at the time of the site visit.

3.3.4 Washouts and Erosion

There were no washouts or indications of erosion observed.

3.3.5 Fill Areas and Soil Conditions

There was no evidence of fill materials having been brought to the site. The potential for methane generation is described in Section 3.2.

Further information on soil conditions are presented in the geotechnical evaluation report completed at the site by Tetra Tech (Tetra Tech 2023, currently not issued).

3.3.6 Oil/Gas Wells and Pipelines

There were no well sites observed at the time of the site visit.

Refer to Section 2.3.2 for AER information.

3.3.7 Chemical Storage

There were no hazardous chemicals or large drums observed at the site during the site visit.

3.3.8 Transformers

There was a pole-mounted electrical transformer observed near the water fill station. Generally, pole-mounted transformers are owned and maintained by the utility companies.

3.3.9 Hydraulic Elevators and Hoists

There were no hydraulic elevators or hoists observed at the site visit.

3.3.10 Vent Pipes and Underground Storage Tanks

There were no vent pipes or USTs identified during the site visit.

3.3.11 Above-Ground Storage Tanks and Drum Storage

No ASTs or drum storage were present at the site during the site visit.

3.3.12 Waste Storage

No waste storage areas were observed at the site during the site visit.

3.3.13 General Housekeeping

The general housekeeping of the site was in good condition and no obvious evidence of negligent acts or illegal dumping were observed during the site visit.

3.4 Off-Site Observations

The following table summarizes the surrounding land use.

Table F: Surrounding Land Use

Direction	Zoning*	Observations	Tetra Tech Evaluation
North	Lethbridge Urban Fringe	Agricultural land	No obvious concerns which may cause environmental impairment to the site were identified.
East		SMRID canal, agricultural land, and farm operation	
South		Southland International Trucks and trailer storage and stormwater retention pond	
West	General Industrial	Various commercial and industrial properties	

*Land use obtained from Lethbridge County (Lethbridge County - Online Maps (lethcounty.ca)) and the City of Lethbridge (Property Information WebMAP (lethbridge.ca)).

The surrounding land is primarily agricultural with commercial and industrial properties to the west within the City of Lethbridge. Key surrounding land use is indicated on Figure 2.

4.0 PERSONNEL INTERVIEWS

Due to the land use being primarily agricultural from 1950 to current, no personnel interviews were conducted.

5.0 DISCUSSION AND CONCLUSIONS

5.1 General

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential contamination from on-site land use. This would include potential accidental spills or site practices that may contaminate the property directly. The second type of risk is from contamination caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater, or in overland runoff onto the site.

5.2 Potential for Impairment from On-Site Source(s)

There were no on-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

5.3 Potential for Impairment from Off-Site Source(s)

There were no off-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

6.0 FURTHER ACTION/RENDERING AN OPINION

Based on the present study, Tetra Tech recommends that no further environmental investigation is required at this time.

Tetra Tech recommends the following for consideration:

- If buried debris or staining are encountered during future investigation or ground disturbance a qualified environmental professional should be contacted.
- If soils containing organics are encountered during future investigation or ground disturbance, they should be removed from building footprints and not be reburied; a qualified environmental professional should be contacted.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

Prepared by:
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Environmental Scientist
Environment & Water Practice
Direct Line: 403.308.4293
Jaymes.Going@tetratech.com

H.P CARRIERE
57284

2023-Feb-28

Reviewed by:
Henri Carriere, P.Eng., M.N.R.M.
Senior Project Engineer
Environment & Water Practice
Direct Line: 403.993.4176
Henri.Carriere@tetratech.com

/jmt

PERMIT TO PRACTICE
TETRA TECH CANADA INC.

RM SIGNATURE:

RM APEGA ID #: **64479**

DATE: **2023-Feb-28**

PERMIT NUMBER: P013774
The Association of Professional Engineers and
Geoscientists of Alberta (APEGA)

REFERENCES

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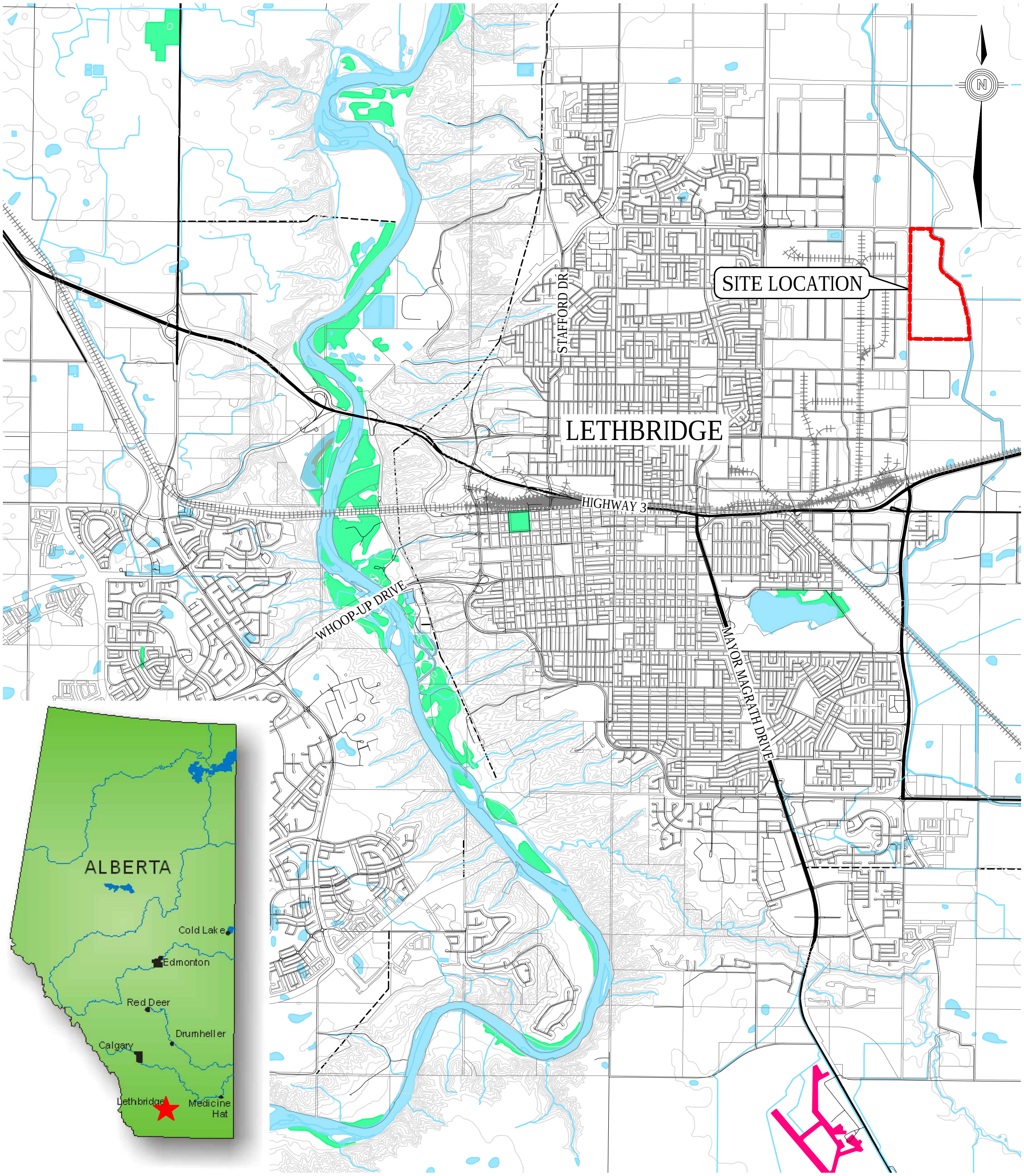
FIGURES



NOTES

DRAWING PROVIDED BY "© Department of Natural Resources Canada. All rights reserved."

0 3,000m

Scale: 1:60,000 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

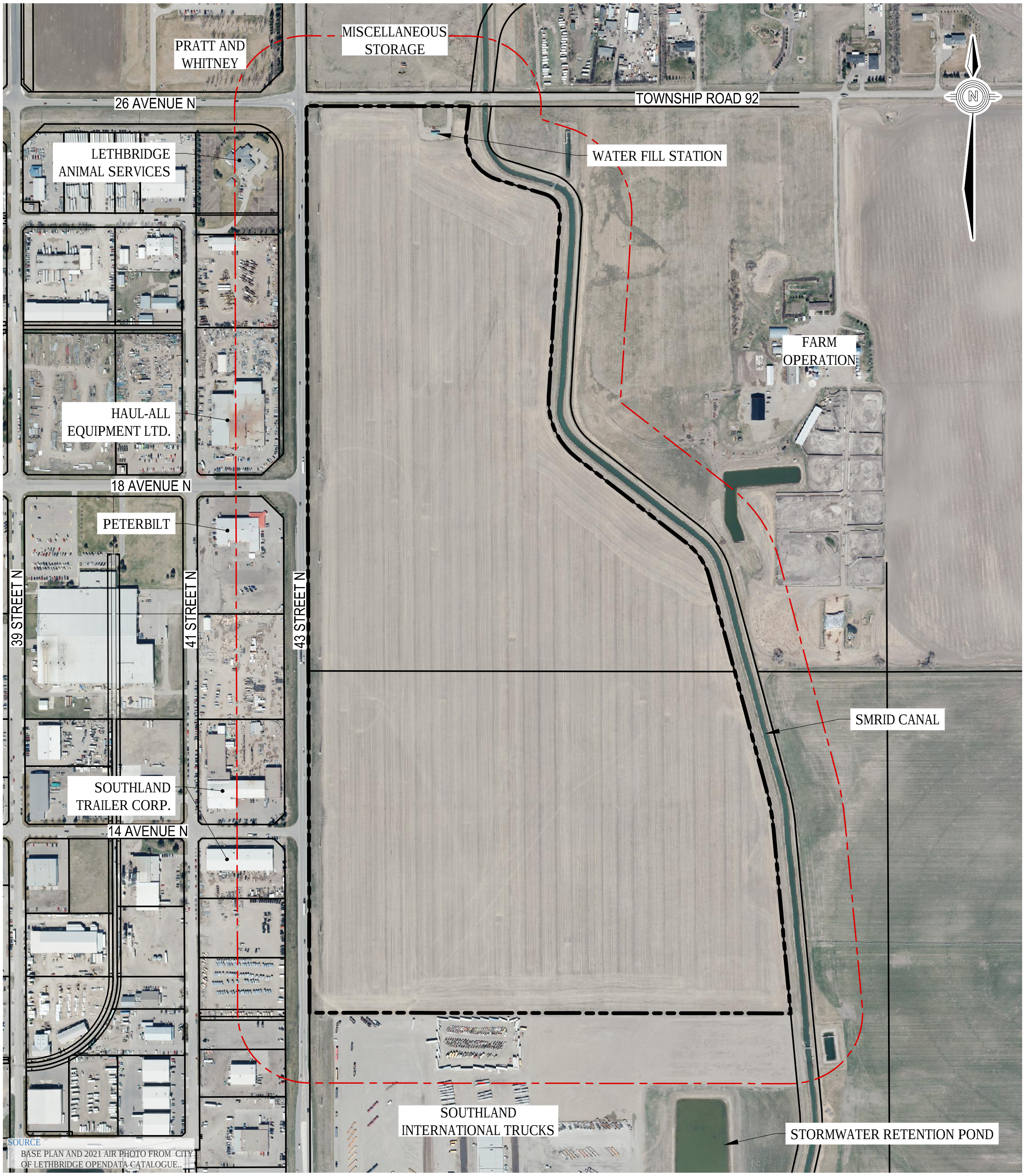
SITE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-002	LCH	JG	0

OFFICE	DATE
Tt Leth	February 2023

Figure 1

C:\Lethbridge\Drafting\ENG.LGEO.LGEO04625\002\CAD\LGEO04625-01-002 Figure 1.dwg [FIGURE 1] February 06, 2023 - 1:40:12 pm (BY: HUGHES, LEANNE)



SOURCE
BASE PLAN AND 2021 AIR PHOTO FROM CITY OF LETHBRIDGE OPENDATA CATALOGUE.

LEGEND

- SITE BOUNDARY
- 100 m BOUNDARY

0 250m

Scale: 1:7,500 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

DETAILED SITE PLAN SHOWING
SURROUNDING LAND USE

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-002	LCH	JG	0

OFFICE	DATE
Tt Leth	February 2023

Figure 2

C:\Lethbridge\Drafting\ENG.LGEO\LGEO04625\002\CAD\LGEO04625-01-002 Figure 2.dwg [FIGURE 2] February 21, 2023 - 1:55:10 pm (BY: HUGHES, LEANNE)

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

SITE PHOTOGRAPHS

Photo 1: View looking west at the approximate south site boundary.

Photo 2: View looking northwest at the site from the approximate southeast corner of the site.

Photo 3: View looking southwest at the site from near the middle of the east site boundary.

Photo 4: View looking south at the site from near the northeast corner of the site. The SMRID canal and access road are visible.

Photo 5: View looking west at water fill station located on the northern portion of the site.

Photo 6: View of adjacent property to the north beyond Township Road 92.

Photo 7: View of adjacent property to the east beyond the SMRID canal.

Photo 8: View of adjacent land use to the south; stormwater retention pond located within Phase 1B of the ASP.

Photo 9: View of one of the commercial/industrial businesses (Haul-All Equipment Ltd.) to the west of the site beyond 43 Street North.

Photo 10: View of one of the commercial/industrial businesses (Southland Trailer Corp.) to the west of the site beyond 43 Street North.

APPENDIX C

REGULATORY SEARCHES AND RESPONSES

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 989 632	1113171;1;5	111 286 315 +1

LEGAL DESCRIPTION
PLAN 1113171
BLOCK 1
LOT 5
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 59.56 HECTARES (147.18 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;21;9;10;W

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 091 136 885 +3
091 136 885 +2

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 286 315	03/11/2011	SUBDIVISION PLAN		

OWNERS

1000824 ALBERTA LTD.
OF 2365 ASPEN DRIVE
COALDALE
ALBERTA T1M 0E6
(DATA UPDATED BY: CHANGE OF ADDRESS 231007775)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1049KD .	05/02/1968	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PORTION DESCRIBED"
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
881 219 612	01/12/1988	UTILITY RIGHT OF WAY GRANTEE - ALBERTA GOVERNMENT TELEPHONES. AS TO PORTION OR PLAN:8810684 "TAKES PRIORITY OF CAVEAT 871131928 REGISTERED 27/07/1987"
991 249 227	30/08/1999	IRRIGATION DISTRICT RESOLUTION PART OF AN IRRIGABLE UNIT " AFFECTS PART OF THIS TITLE "
081 230 993	02/07/2008	MORTGAGE MORTGAGEE - ROYAL BANK OF CANADA. 180 WELLINGTON STREET WEST, 5TH FLOOR TORONTO ONTARIO M5J1J1 ORIGINAL PRINCIPAL AMOUNT: $1,150,000

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF FEBRUARY, 2023 AT 08:57 A.M.

ORDER NUMBER: 46536252

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0028 725 811	0013201;1;1	021 267 993

LEGAL DESCRIPTION

PLAN 0013201
BLOCK 1
LOT 1
CONTAINING 0.559 HECTARES (1.38 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES)	MORE OR LESS
ROAD	0110313	0.054	0.13	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;21;9;10;NW
ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 011 025 754 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
021 267 993	01/08/2002	TRANSFER OF LAND	$212,000	$1

OWNERS

LETHBRIDGE REGIONAL WATER SERVICES COMMISSION.
OF 100,905-4 AVE. SOUTH
LETHBRIDGE
ALBERTA T1J 4E4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
359EM .	31/01/1934	EASEMENT "(SUBJECT TO) IN FAVOUR OF NE 1/4 OF SECTION 10, PORTION LSD 6, ALL OF LSD 7 & 8"

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1049KD .	05/02/1968	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PORTION DESCRIBED"
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF FEBRUARY, 2023 AT 08:57 A.M.

ORDER NUMBER: 46536252

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

Safety Codes Council
Alberta Safety Codes Authority

February 13, 2023

Jaymes M Going
Tetra Tech
442-10 Street North
Lethbridge, AB T1H 2C7

Email: jaymes.going@tetratech.com

Re: ASCA Storage Tank Search Request- Your File ENG.LGEO04625-01.002

Dear Jaymes M Going ,

As per As per your search requests received February 13, 2023 , Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following address:

1. Lethbridge County | Lot 111317 Block 1 Plan 5 | 10-9-21-W4
2. Lethbridge County | Lot 001320 Block 1 Plan 1 |NW- 10-9-21-W4

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

Amanda McIntyre (she/her)
ASCA Tanks
Alberta Safety Codes Authority
Safety Codes Council | safetycodes.ab.ca
Tel. 780.392-1551 | Toll-Free 1-888-413-0099

Safety Codes Council
Alberta Safety Codes Authority

February 24, 2023

Jaymes M Going
Tetra Tech
442-10 Street North
Lethbridge, Alberta T1H 2C7

Email: jaymes.going@tetratech.com

Re: ASCA Storage Tank Search Request

Dear Melody Crozier-Smith,

As per As per your search requests received February 23, 2023 , Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following address:

1. 4115 18 Ave N Lethbridge| Lot 1 Block 5 Plan 7710884 | NE-9-9-21-W4

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

Amanda McIntyre (she/her)
ASCA Tanks
Alberta Safety Codes Authority
Safety Codes Council | safetycodes.ab.ca
Tel. 780.392-1551 | Toll-Free 1-888-413-0099

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Monday, February 13, 2023

1:14,237

0 170 340 680 m

AbaData

Pipeline Information

ATCO GAS AND PIPELINES LTD. | AB00002185 - 11

Government Pipeline Data Current to January 1, 2023

Permit Date:	April 30, 2008	**License Date:**	
From Location:	9-16-9-21 W4M PL	**To Location:**	1-9-9-21 W4M PL
Length:	2.5 kms | 1.56 mi	**Status:**	O
Substance:	NG	**H_2S:**	0 mol/kmol | 0 ppm
Outside Diameter:	273.1 mm | 10.75 "	**Wall Thickness:**	6.4 mm | 0.25 "
Material:	S	**Type:**	5L
Grade:	X42	**Max Operating Pressure:**	2380 kPa | 345 psi
Joints:	W	**Internal Coating:**	U
Stress Level:	18 %	**Environment:**	
Original Permit Date:		**Construction Date:**	
Original License/Line No:	0 - 0	**NEB Registration:**	
Last Occurrence Year:	2008	**Abacus No:**	N/A

Pipeline Information

ATCO GAS AND PIPELINES LTD. | AB00002027 - 182

Government Pipeline Data Current to January 1, 2023

Permit Date:	August 10, 2022	**License Date:**	
From Location:	14-27-9-21 W4M PL	**To Location:**	14-3-9-21 W4M PL
Length:	8.13 kms | 5.08 mi	**Status:**	P
Substance:	NG	**H_2S:**	0.01 mol/kmol | 10 ppm
Outside Diameter:	219.1 mm | 8.63 "	**Wall Thickness:**	4.8 mm | 0.19 "
Material:	S	**Type:**	Z245.1
Grade:	3592	**Max Operating Pressure:**	4960 kPa | 719 psi
Joints:	W	**Internal Coating:**	U
Stress Level:	32 %	**Environment:**	
Original Permit Date:	August 10, 2022	**Construction Date:**	
Original License/Line No:	2027 - 182	**NEB Registration:**	
Last Occurrence Year:	2022	**Abacus No:**	N/A

Disposition Information

APPLICATION

ROE580 | RIGHT OF ENTRY AGREEMENT

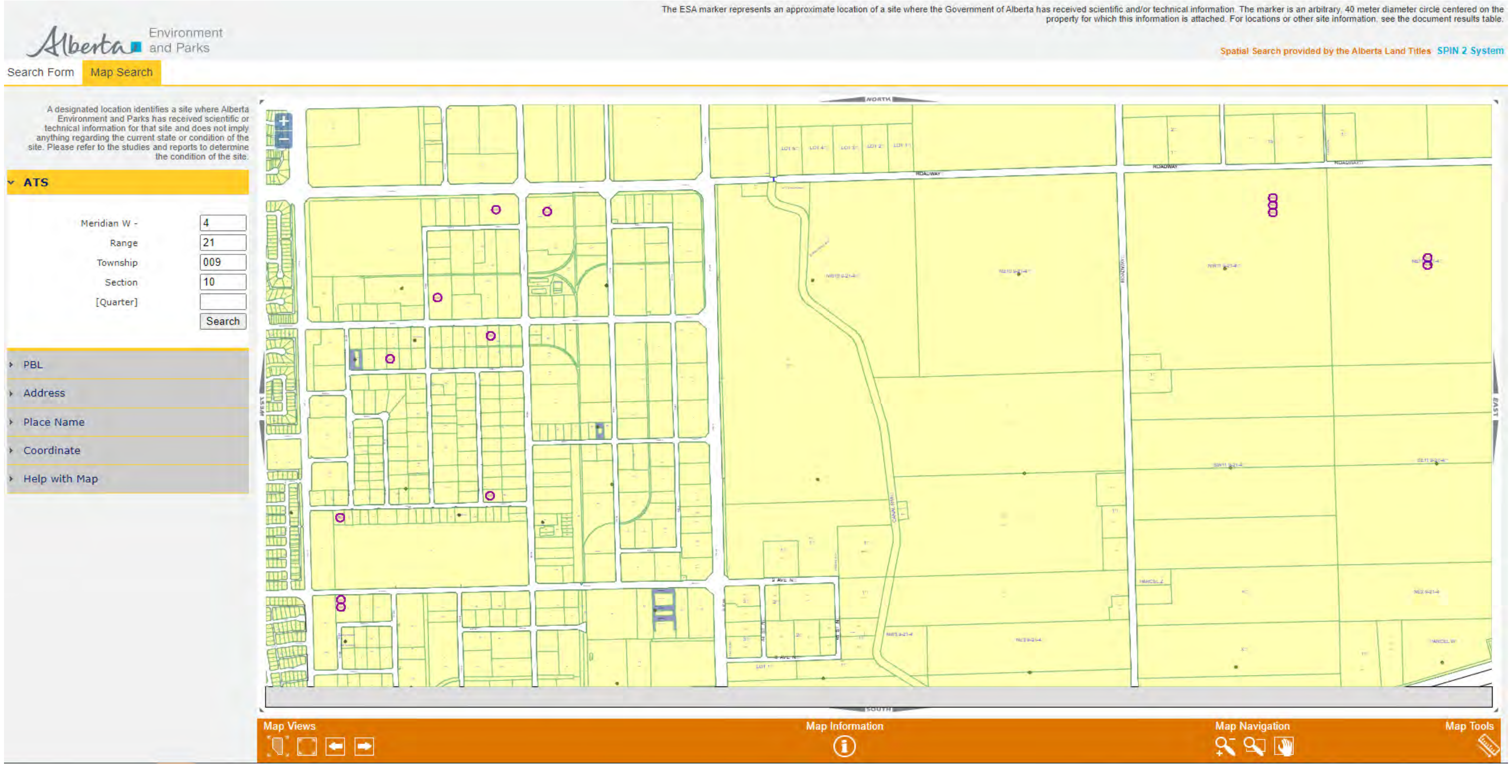
Client:	ATCO GAS AND PIPELINES LTD. (SOUTH)		
Source Document:	Survey	**Version Date:**	December 6, 1989
Discrepancies?	No	**Last Edit Date:**	February 18, 2009
Process Date:	February 2, 2023	**Application Date:**	March 3, 1952
Letter of Authority Date:		**Amendment to Letter of Authority Date:**	
Effective Date:	March 12, 1952	**Amendment Date:**	
Cancellation Date:		**Renewal Date:**	
Expiry Date:	December 31, 2999	**Reinstatement Date:**	
Plan Number:	15225P	**Near Water?**	No
Status:	ACTIVE/DISPOSED		
Purpose:	PIPELINE		
Dimensions:	P/L 16.5FT (W)		
Area (hectares):	0.40	**Area (acres):**	1.00
Restriction:			
Exceptions to Restriction:			

Low Pressure Pipeline Information

NATURAL GAS CO-OPERATIVE CONTACT INFORMATION

Data Current To December 20, 2022

Name:	ATCO Natural Gas Distribution Customer Correspondence		
Address:	PO Box 2409 Edmonton, T5J 2S3		
Phone #:	310-5678	**Alternate Phone #:**	
Website:	http://www.atcogas.com		



Alberta Environment and Parks

The ESA marker represents an approximate location of a site where the Government of Alberta has received scientific and/or technical information. The marker is an arbitrary, 40 meter diameter circle centered on the property for which this information is attached. For locations or other site information, see the document results table.

Spatial Search provided by the Alberta Land Titles SPIN 2 System

A designated location identifies a site where Alberta Environment and Parks has received scientific or technical information for that site and does not imply anything regarding the current state or condition of the site. Please refer to the studies and reports to determine the condition of the site.

ATS

Meridian W - 4
Range 21
Township 009
Section 10
[Quarter]

**Authorization Viewer -
Search Results**

For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

The Search Used the Following Values:

Legal Land Location:	10-009-21-W4
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

6 Result(s)

Document 00181809-00-00 LETHBRIDGE REGIONAL WATER SERVICES WATERWORKS SYSTEM is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act*. This Approval is currently issued as of Jun. 18, 2002 and does not expire.

Document 00181809-00-01 LETHBRIDGE REGIONAL WATER SERVICES WATERWORKS SYSTEM - LEGISLATIVE CHANGES is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act*. This Registration is currently renewed.

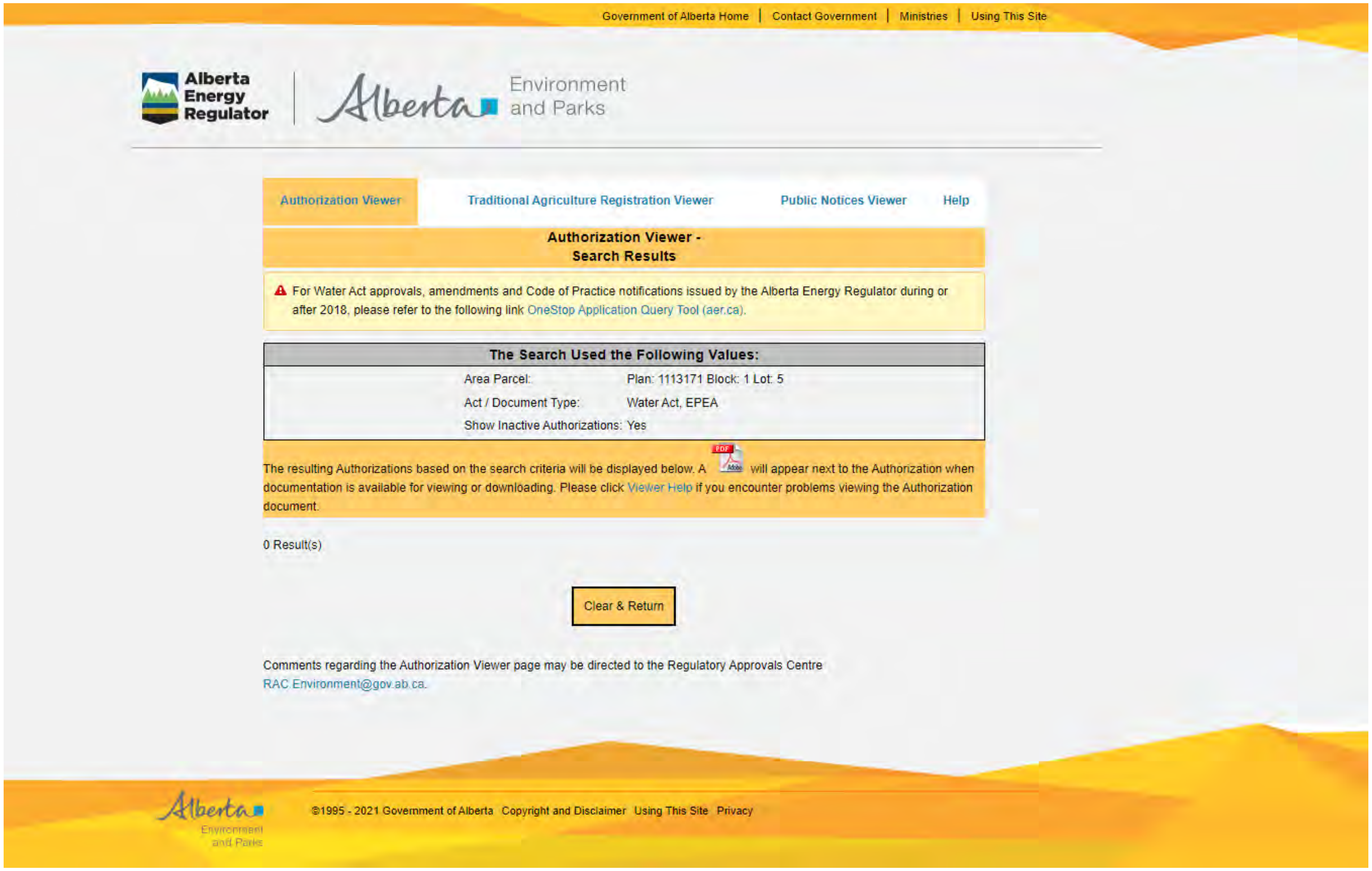
Document 00181809-01-00 LETHBRIDGE REGIONAL WATER DISTRIBUTION SYSTEM - CODE OF PRACTICE is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act*. This Registration is currently issued as of Apr. 01, 2005 and does not expire.

Document 00181809-01-01 LETHBRIDGE REGIONAL WATER DISTRIBUTION SYSTEM - REVISED LEAD MAC NOTICE is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act*. This Registration is currently issued as of Oct. 30, 2019 and does not expire.

Document 00335366-00-00 COALDALE/MANAGEMENT/LETHBRIDGE COUNTY - F00335366 is held by Lethbridge County, under the provisions of the *Water Act*. This Approval is currently issued as of Jun. 18, 2020 and expires on Jun. 17, 2045.

Document 00374661-00-00 RAVE INDUSTRIAL AREA STORM DRAINAGE SYSTEM is held by Lethbridge County, under the provisions of the *Environmental Protection & Enhancement Act*. This Registration is currently issued as of Jul. 24, 2020 and does not expire.

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.



Authorization Viewer - Search Results

For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

The Search Used the Following Values:

Area Parcel:	Plan: 1113171 Block: 1 Lot: 5
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

0 Result(s)

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.

Authorization Viewer - Search Results

⚠ For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

The Search Used the Following Values:

Area Parcel:	Plan: 0013201 Block: 1 Lot: 1
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

0 Result(s)

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.

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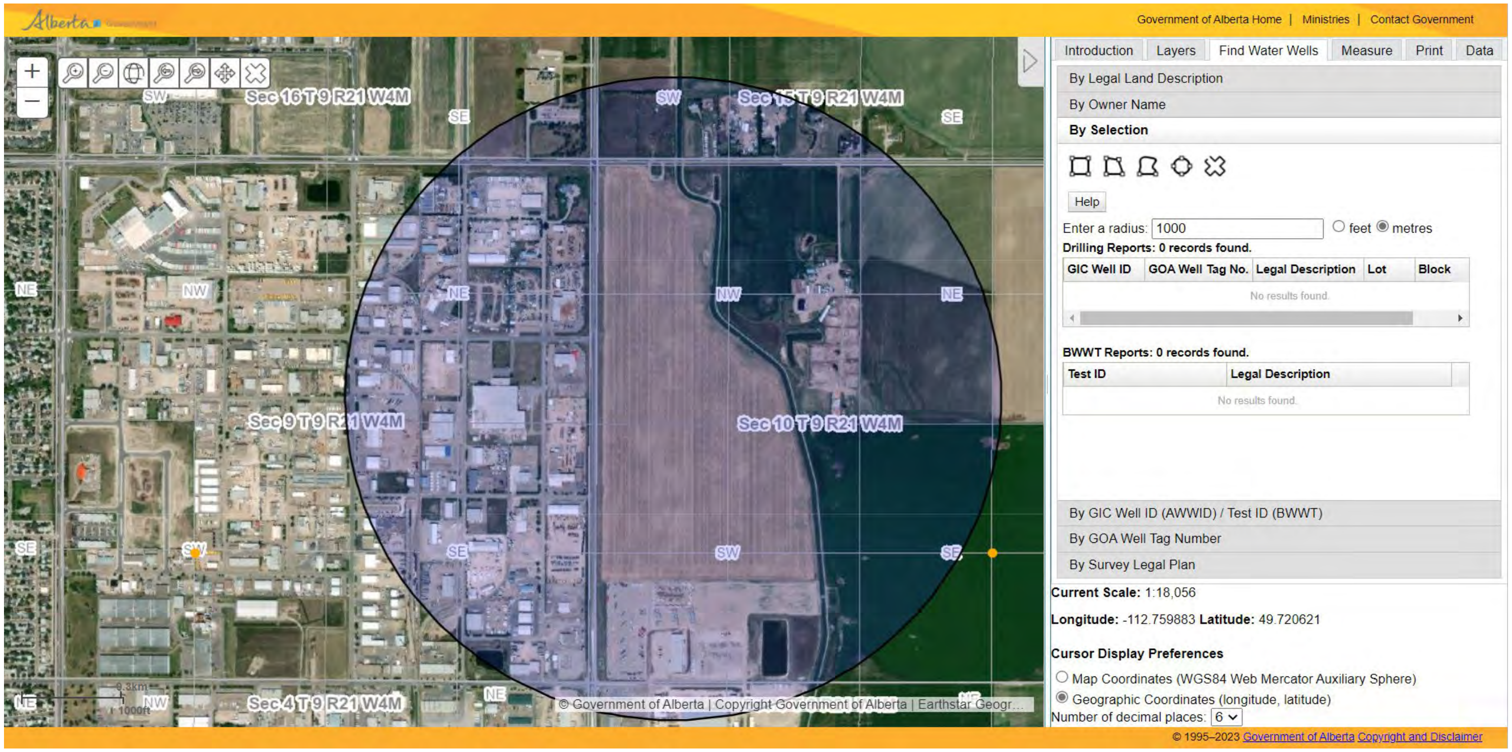


Enter a radius: 1000 ○ feet ● metres

Drilling Reports: 0 records found.

GIC Well ID	GOA Well Tag No.	Legal Description	Lot	Block
No results found.				

BWWT Reports: 0 records found.

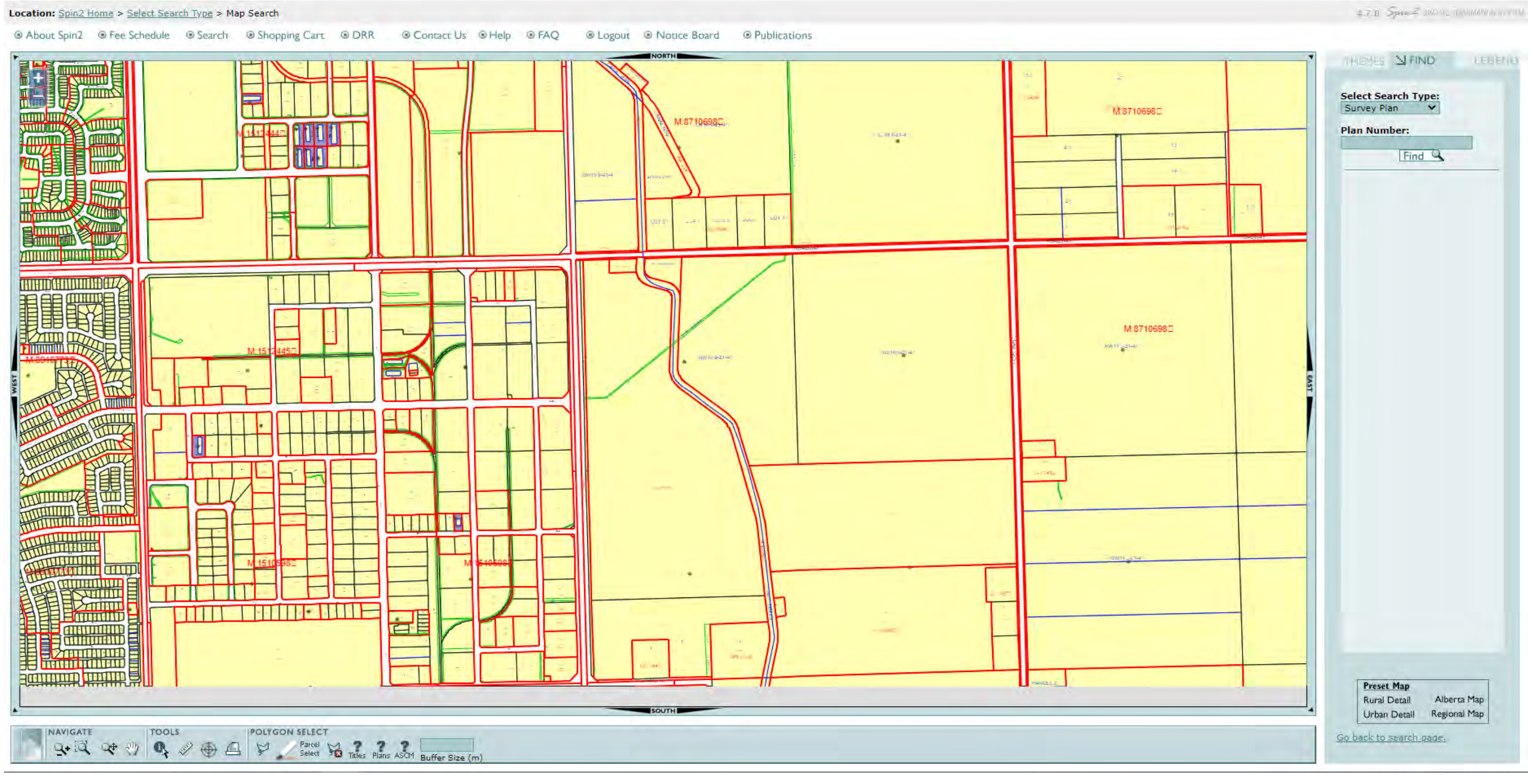
Test ID	Legal Description
No results found.	

Current Scale: 1:18,056

Longitude: -112.759883 **Latitude:** 49.720621

Cursor Display Preferences

○ Map Coordinates (WGS84 Web Mercator Auxiliary Sphere)
● Geographic Coordinates (longitude, latitude)
Number of decimal places: 6


Location: Spin2 Home > Select Search Type > Map Search
About Spin2
Fee Schedule
Search
Shopping Cart
DRR
Contact Us
Help
FAQ
Logout
Notice Board
Publications
NORTH
SOUTH
WEST
EAST
M 8710698
M 8710698
M 8710698
M 1512445
M 1510538
M 1510538
THEMES
FIND
LEGEND
Select Search Type:
Survey Plan
Plan Number:
Find
Preset Map
Rural Detail
Alberta Map
Urban Detail
Regional Map
Go back to search page.
NAVIGATE
TOOLS
POLYGON SELECT
Parcel Select
Titles
Plans
ASCM
Buffer Size (m)

LETHBRIDGE
COUNTY

#100, 905 - 4th Avenue South, Lethbridge, Alberta T1J 4E4

February 7, 2023

Tetra Tech Canada Inc.
Attn: Jaymes Going
442 – 10 Street N
Lethbridge, AB T1H 2C7

Re: Environmental Record Search: All properties on W1/2 10-9-21-W4M

The following properties were reviewed per your request:

- Plan 0013201; Block 1; Lot 1
- Plan 1113171; Block 1; Lot 4
- Plan 1113171; Block 1; Lot 5
- Plan 1710178; Block 1; Lot 6PUL
- Plan 1911847; Block 1; Lot 7

The following information is the County's response to your inquiry regarding the above-mentioned properties.

A review of the property file was completed and following can be reported:

- There were no environmental reports,
- There were no permits indicating approval for any fuel or chemical storage facilities,
- There was no record of any underground storage tanks,
- There was no record of any historic or potential landfills in the area, and
- There was no record of any spills and/or leaks on the properties or in the area.
    - You may wish to contact the Lethbridge Fire Department to see if they have any records of spills or leaks as this property is within their Fire / Emergency Response Area.
- There are some existing Development Permit approvals for the subject properties. They may be provided upon request.

If you have any other questions regarding this matter please contact Nathan Hill, Development Planner at 403-328-5525.

Regards,

Nate Hill

Nathan Hill
Development Planner

Tel: (403) 328-5525 E-Mail: mailbox@lethcounty.ca Fax: (403) 328-5602

APPENDIX D

SPECIAL ATTENTION ITEMS – BACKGROUND INFORMATION

D1 Asbestos

Construction materials used prior to the late 1970s were known to possibly contain asbestos (i.e., ceiling or floor tiles, drywall, and insulation for the walls, boiler, piping, and/or ducts). Asbestos is considered a health hazard if it is friable, airborne, and exposed to humans.

D2 Polychlorinated Biphenyls (PCBs)

The federal Environmental Contaminants Act (1976) has restricted the use and controlled the phase out of polychlorinated biphenyls (PCBs) in Canada. Additionally, the storage and disposal of PCBs is regulated. The Act prohibited the use of PCBs in electrical equipment installed after July 1, 1980. PCBs are commonly found in light ballasts, electrical transformers (pole or ground mounted) and various other types of electrical equipment (i.e., rectifiers) dating back to the early 1980s or earlier.

PCB containing light ballasts/electrical equipment should be disposed of appropriately at the end of their useful life.

D3 Ozone-Depleting Substances (ODS)

In December of 1998, The Government of Canada enacted the Ozone-depleting Substances (ODS) Regulations, which governs the use, handling and release of ODS. ODS may include, but are not limited to, chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl bromide. ODS are usually associated with operations such as: fire extinguishing systems; foam manufacturing; fumigant and pesticide application; prescription metered dose inhalers; refrigeration and air conditioning units; and solvent cleaning and degreasing facilities. ODS are not a health issue for people in the building but are more a maintenance issue to limit or prevent their release. This is accomplished by regular maintenance by trained personnel.

D4 Lead

Lead can be associated with paints, plumbing solder, pipes, and other products such as wall shielding in x-ray rooms. Lead-based paint was withdrawn from the market in the late 1970s. If present, lead-based paint is typically concealed beneath multiple layers of paint applied over the years during renovations. Lead-based paint and plumbing equipment are not a direct health risk when concealed (sealed behind layers of non-lead paint) and/or in good condition. It should, however, be considered when planning future renovations, when particles from lead-based paint could be released and/or ingested in the course of the work.

D5 Urea Formaldehyde Foam Insulation (UFFI)

Insulation materials used during the 1970s and 1980s were known to possibly contain urea formaldehyde foam insulation (UFFI). UFFI was banned in 1980 under the federal Hazardous Products Act.

D6 Radon

Radon gas is a product of the decay series that begins with uranium. Radon is produced directly from radium that is often found in bedrock that contains black shale and/or granite. The gas and its by-products occur naturally everywhere, in soil, water, and air, but usually in concentrations too low to pose a threat. Radon gas can migrate through the ground and enter buildings through porous concrete or fractures. Certain building materials including concrete, and gyprock can also release radon. The potential radon hazard in north-central, central, and southern Alberta is relatively high where it can accumulate in enclosed spaces. In outdoor air, radon gas concentrations are usually well below target limits set for Canada and are not a concern. Potential anthropogenic sources of radon gas should be considered.

D7 Methane

Methane gas is a product of anaerobic decomposition of organic material (e.g., buried fill high in organic material). Methane is also associated with natural gas deposits. Methane gas can migrate through the ground and enter buildings through porous concrete, joints or fractures. Methane presents a potential explosive hazard when it accumulates to concentrations greater than the lower explosive limit (LEL) in the presence of an ignition source.

CHINOOK INDUSTRIAL PARK
AREA STRUCTURE PLAN

March 2023

Prepared for:

Sumus

Prepared by:

Stantec Consulting Ltd.

Project Number:

116549063

TABLE OF CONTENTS

LIST OF MAPS

APPENDICIES

1. Introduction

1.1 PLAN AREA

The Chinook Industrial Area Structure Plan (ASP) consists of ±84.18 ha (±208.00 ac) of land (located within two quarter sections) in northeast Lethbridge County. The lands are bounded by 43 St N/City of Lethbridge boundary to the west, 9 Ave N to the south, the St. Mary River Irrigation District Canal to the east, and Township Road 92 to the north (herein referred to as the 'Plan Area'). There are undeveloped agricultural lands located to the east, some industrial development on the south and west sides, and a small pocket of residential lands on the north side, illustrated in Map 1.0.

1.2 HISTORY AND SURROUNDING CONTEXT

The existing Chinook Industrial ASP was approved by County Council in September 2018 (Bylaw 18-012). The previous iteration of the ASP detailed the two southernmost parcels as well as a portion of the south Stormpond area (Pond 100) on the east side. A business is existing in this area at the time of Plan creation.

Since the original adoption of this ASP the ownership of these lands has changed, and further detail is now needed to give direction on the Plan Area moving north. The ASP is also being fully reviewed and brought up to current planning and engineering standards as well as assessing the Plan against current market demands at the time of Plan adoption.

The amended ASP will provide a basis for evaluation of future applications for proposed Land Use Bylaw amendments (rezoning) and evaluation of subsequent subdivision applications.

The Chinook Industrial ASP consists of ±84.18 ha (±208.00 ac) of land (located within two quarter sections) in northeast Lethbridge County. The lands are bounded by 43rd St N/City of Lethbridge boundary to the west, 9th Ave N to the south, the St. Mary River Irrigation District Canal to the east, and Township Road 92 to the north. There are undeveloped agricultural lands located to the east, industrial development south and west, and a small pocket of residential lands on the north side, illustrated in Map 2.0.

This ASP describes the ultimate development of the Plan Area, which include portions of NW & SW Section 10, Township 9, Range 21, West of the 4th Meridian. The Plan Area is located adjacent to the northeast quadrant of the City of Lethbridge municipal boundary within Lethbridge County. These lands are Identified within the Industrial-Commercial Land Use Strategy and the Lethbridge County-City of Lethbridge Intermunicipal Development Plan as a growth area for commercial and industrial development as well as the MDP as a Potential Business Park Area or a growth area.

Lot 7, Block 1, Plan 1911847 and Lot 4 Block 1 Plan 1113171 totaling approximately ±22.26 hectares (±55.00 acres), have been partially developed as a gravel parking area with an accessory warehouse building. Lot 5 Block 1 Plan 1113171 which is in the northern portion of the Plan Area consists of ±59.56 hectares (±147.18 acres) of undeveloped land. The remaining portion of the Plan Area is Lot 6PUL, Block 1, Plan 1410178, a ±4.38 hectares (±10.82 acres) Lethbridge County Public Utility Lot which acts as a stormwater detention pond. The total development area is ±86.20 hectares (±213.00 acres) in size.

2. Planning Process

2.1 WHAT IS AN AREA STRUCTURE PLAN

An ASP is a statutory document approved by Council and adopted through a Bylaw. The Plan outlines a vision for the future physical development of an area with regard to such things as land use, transportation, protection of the natural environment, emergency services, general design, and utility service requirements.

An ASP provides Council with a ten to twenty year roadmap when considering land use changes, subdivision, and development. When making decisions regarding development in the Plan area, Council must consider the Plan and a wide range of other factors such as the economic goals of the County, County-wide growth, and the ability to provide servicing.

An ASP does not predict the rate of development within the Plan Area; ultimately growth is determined by market demand, which reflects the overall economic climate of the region.

Through the process of preparing an ASP, citizens are provided with opportunities, at various stages in the process, to have input into the development of policy. It is important that the vision, goals, and policies contained in the Plan address the interests of residents and stakeholders in the Plan area, as well as the interests of those in other parts of the County.

The Alberta Municipal Government Act states an ASP must describe:

- proposed land uses;
- density of population and sequence of development;
- general location of major transportation routes and public utilities; and
- any other matters Council considers necessary.

The policies in an ASP form a bridge between the general planning policies contained in the Municipal Development Plan (MDP) and the more detailed planning and design direction contained in a subdivision and development permit application. ASP policies must align with the MDP and all applicable County policies. The ASP must be based on sound planning principles and respond to the particular natural and built form of the Plan Area.

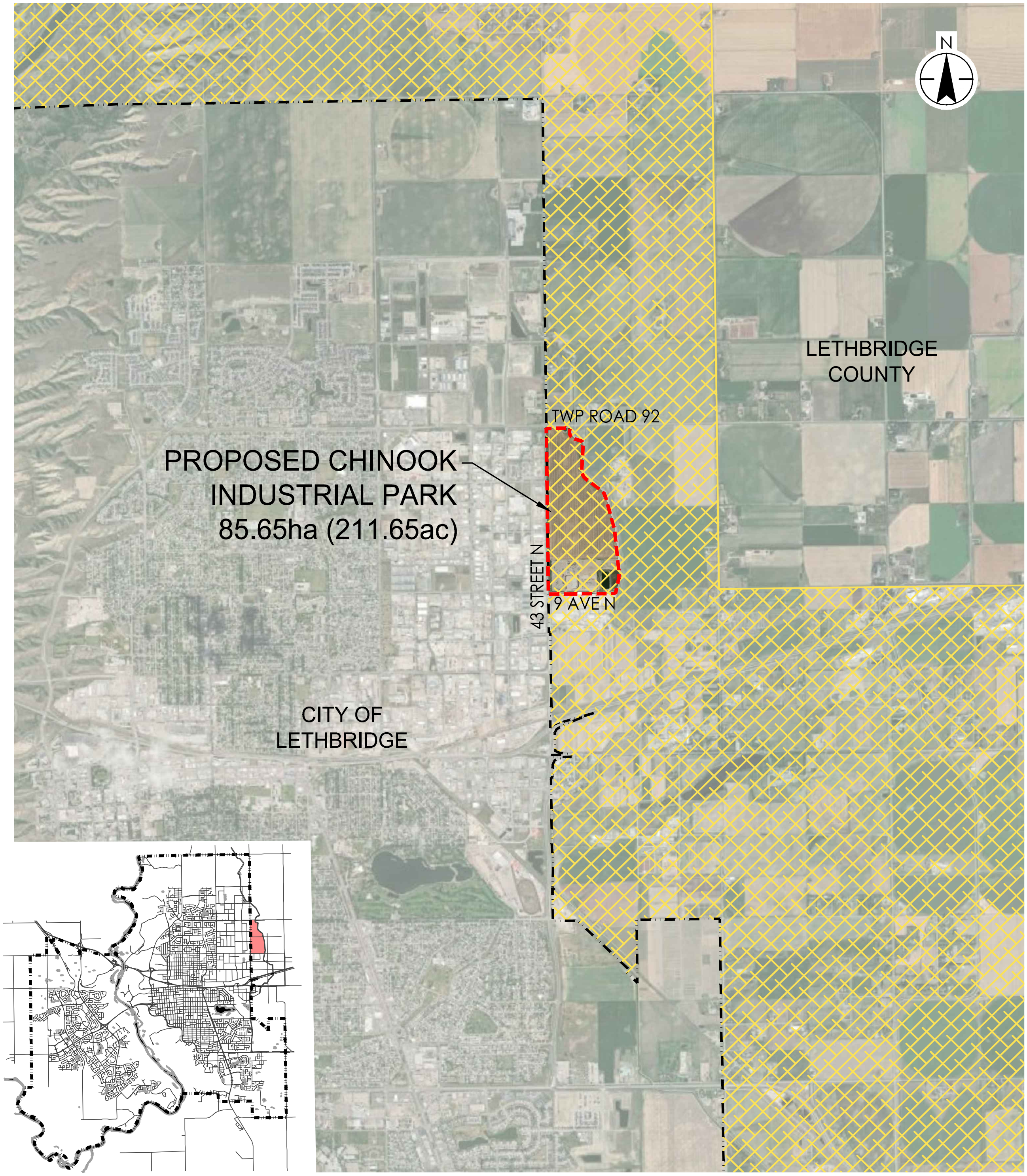
2.2 PLAN INTERPRETATION

Where “shall” is used in a policy, the policy is considered mandatory. Where “should” is used in a policy, it is intended to be complied with. However, the acceptable response to a policy may vary in a specific situation where the variance is necessary to address unique circumstances. Such a variance may be appropriate given special circumstances that would otherwise render compliance impractical or impossible. Where "may" is used in a policy it is a discretionary term, meaning the policy in question can be enforced by the County if it chooses to do so, dependent on the particular circumstances of the site and/or application.

~~This Area Structure Plan has been prepared by Stantec Consulting Ltd. on behalf of Ed Friesen and George Kirkham to describe the proposed development concept and municipal servicing strategy to be provided for the Chinook industrial/commercial business park. The Area Structure Plan describes the ultimate development of the subject lands, which include portions of NW & SW Section 10, Township 9, Range 21, West of the 4th Meridian.~~

~~Hasegawa respectfully submits this Area Structure Plan as support for the application to adopt the Plan as a By-Law of Lethbridge County. The Area Structure Plan will provide a basis for evaluation of future applications for a change in the proposed Land Use Designation of the parcels and evaluation of subsequent subdivision applications. The preliminary engineering and preparation of the area structure plan are parallel processes.~~

~~Two separate land owners are making the application for this development. George Kirkham (Kirkham Holdings Lethbridge Ltd.) owns Lot 4 Block 1 Plan 1113171 which is 20.24 hectares. This land has already been developed as a gravel parking area. 1000824 Alberta Ltd. owns Lot 5 Block 1 Plan 1113171 which is the large, undeveloped, northern portion of the development consisting of 59.56 hectares. The remaining portion of the development is Lot 6 Block 1 Plan 1410178, which is a 4.38-hectare Lethbridge County Public Utility Lot consisting of a stormwater detention pond. The total development area is 84.18 hectares (208.0 acres) located within Lethbridge County, directly adjacent to the City of Lethbridge (refer to Figures 2 and 3).~~



MAP 1.0 | CHINOOK INDUSTRIAL PARK ASP

LOCATION PLAN

▬ ▬ ▬	ASP BOUNDARY
▬ · · ▬ · · ▬	COUNTY/CITY BOUNDARY
▨	INTERMUNICIPAL DEVELOPMENT PLAN AREA

Stantec

116549063
December 7, 2022

PREPARED FOR: SUMUS

V:\1165\Active\116549063\drawings\figures\ASP Figures\49063_CIP_MAP 1.0-ASP Location Plan.dwg
2022/12/07 1:59 PM By: Wickend, Rynel

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

3. Vision

The Chinook Industrial Park (ASP) ~~Area Structure Plan~~ has been developed through rigorous planning and careful consideration of the needs of a diverse group of stakeholders. The focus in developing this plan was to put forward a development proposal which would minimize the impact on ~~area~~ infrastructure, ensure a good fit with adjacent land uses, protect and preserve the natural environment and ultimately provide Lethbridge County with a cost-effective model for future commercial/industrial development adjacent to the City of Lethbridge.

The Chinook Industrial Park is proposed to be a combination of Business Light Industrial and Rural General Industrial uses ~~sited~~ adjacent to 43rd Street between 9th Ave and 26th Ave. The goal of this development is to create an industrial center ~~in the County~~ adjacent to the City of Lethbridge that has excellent access to existing transportation networks and various services. ~~Good~~ With a limited supply of existing commercial and industrial lands with adequate servicing, the ~~is currently limited in the County.~~ key to achieving this goal is collaboration with the County, the City and the developer to establish the right balance of servicing level and cost.

Lethbridge and the surrounding community have deep agricultural roots and ~~there is~~ a strong culture ~~trend to~~ embracing rural and farm living. However, there is still a ~~strong~~ need for industrial development in the right locations. The Plan Area ~~land~~ is located adjacent to the Rave Industrial Park to the south and the Lethbridge Industrial Park to the west. This results in a perfect location for continued industrial growth ~~this use and has great~~ with direct access to 43rd Street, ~~which is~~ one of the major access points for ~~the~~ industrial uses in the area. ~~Since 43rd Street has been upgraded to 9th Avenue, this location also has great access for an industrial development~~. ~~Also~~ Additionally, the east boundary is bordered by the SMRID canal which provides a barrier between existing agricultural uses east of the development.

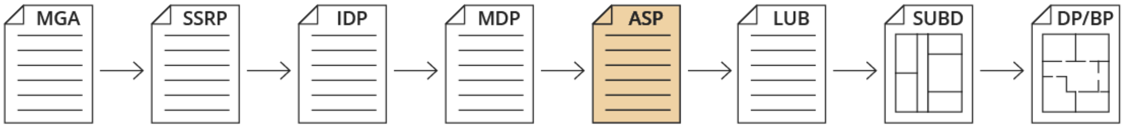
As with any development there are numerous challenges and opportunities. The opportunity is to provide a unique Commercial/Industrial development in a rural municipality ~~jurisdiction~~ with urban access and amenities. Key challenges to this development are identified and ultimately addressed in the remainder of this document.

Overall, the development concept acknowledges and seeks to positively integrate with the existing natural and built conditions in the area while successfully expanding the ~~adding to existing~~ commercial/industrial ~~land~~ uses adjacent to northeast Lethbridge. This ~~proposal and~~ plan has been designed to offer a new high-quality industrial and agribusiness development to Lethbridge County and create opportunities for new businesses ~~in the County and~~ while increasing the overall tax base.

4. Regulatory Compliance and Consultation

This ASP has been prepared in accordance with applicable legislative requirements outlined in the Municipal Government Act (MGA) and overarching County policies, such as the Lethbridge County Municipal Development Plan (MDP), as well as other applicable County policies and guiding documents.

In accordance with the MGA, all statutory plans passed by a municipality must be consistent with each other. Should a conflict or inconsistency arise between this ASP and the MDP, the MDP prevails to the extent of the conflict or inconsistency, unless otherwise noted. The diagram below illustrates the planning hierarchy in Alberta (generally), and where an ASP fits in with the process, with each heading highlighted in bold throughout the text below.



~~There are several documents that provide direction for the future development of Industrial/Commercial land in the Lethbridge Urban Fringe area. These documents include:~~

The Plan has been prepared to be consistent with, and to support the goals, of higher-level legislation and plans including:

- The MGA (RSA 2000, c M-26) and any associated regulations,
- The South Saskatchewan Regional Plan (SSRP), a southern Alberta regional plan based around the South Saskatchewan watershed,
- Lethbridge County and City of Lethbridge: Intermunicipal Development Plan (IDP) (Bylaw No. 6015 & 1478), ~~October~~ 2016, ~~(link to document)~~
- The Lethbridge County Municipal Development Plan ~~2010~~ (Bylaw No. 22-001), 2022,
- Lethbridge County Land Use Bylaw (LUB) (Bylaw No. 1404), 2013
- Lethbridge County: Industrial-Commercial Land Use Strategy, ~~October~~ 2016. ~~(link to document)~~

~~This document has been prepared taking these important documents into account. For example, according to the Industrial Commercial Land Use Strategy:~~

~~"The areas identified for future industrial-commercial growth as types of grouped or clustered land use developments consist primarily of expansions to existing industrial business parks, along with some new areas which are in close proximity to the existing parks." (refer to Section 5.6).~~

~~This development is essentially an extension of the Rave Industrial area. It is also intended to help improve the servicing level of that development. It is also adjacent to the City of Lethbridge Industrial Park to the East. As such, the IDP applies to this land and is specifically identified in Sections 3.4.4.12 for Policy Area 4 Subarea 1. Key to this expansion is improving the servicing and addressing issues such as storm drainage and sewage services. In addition, Section 4 of the IDP (Natural Environment, open spaces and water) have been observed.~~

In accordance with the IDP, the following agencies were consulted when preparing this document. Their comments and concerns are addressed throughout the remaining sections of the ASP.

- Lethbridge County
- Alberta Environment and Parks (AEP)
- St. Mary River Irrigation District (SMRID)
- City of Lethbridge

~~These plans have been prepared, taking into account feedback from each of these entities.~~

~~4. Plans and Drawings~~

~~To illustrate the location of the property, site drainage, and the proposed subdivision layout, numerous figures have been prepared. The figures are provided in Appendix A and are as follows:~~

1. ~~Location Plan~~
2. ~~Land Ownership Map and Shallow Utility Connection~~
3. ~~Existing Features and Topography~~
4. ~~Proposed Development & Phasing Plan~~
5. ~~Sections C-C & D-D~~
6. ~~Section E-E~~
7. ~~Details~~
8. ~~Pond Details~~

~~These maps are conceptual in nature and are to be used for planning purposes only. Upon ASP acceptance, detailed design drawings and plans will be prepared and submitted for review.~~

MAP 2.0 | CHINOOK INDUSTRIAL PARK ASP

TOPOGRAPHY MAP

ASP BOUNDARY

COUNTY/CITY BOUNDARY

Stantec

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January 31, 2023

PREPARED FOR: SUMUS

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Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

5. Land Use Concept

The land use areas of the Plan are intended to be flexible and evolve with potential market demand changes over time. Any refinements to the exact land use boundaries and districts may be made without an amendment to this ASP as long as the overall vision and core values of the Plan are maintained. Current and future land use areas with respect to location, size, and mix of commercial and industrial uses will be confirmed at land use, Subdivision, or Development Permit stage (whichever applies, under the discretion of the Development Authority), to provide flexibility and adaptability to market conditions. The objective of the Chinook Industrial Park is:

"To create a high-quality environment that will provide a location for the establishment and growth of businesses which provide service to the commercial and industrial base of the Lethbridge County."

5.1 EXISTING CONDITIONS and CURRENT LAND USE

Currently the land is used primarily for Agricultural purposes and is designated as ~~located within the~~ Lethbridge Urban Fringe (LUF) District ~~Zoning~~. The land is relatively flat with a natural drainage pattern flowing towards the southeast portion of the Plan Area. There is an existing break in topography located centrally within the Plan area where the natural drainage begins to flow in the northeast direction as shown in Map 2.0. ~~most of it draining to the southeast with the northern ¼ draining to the northeast.~~ ~~It is bounded by 43rd Street on the west, the SMRID canal on the north, 9th Avenue on the south and 26th Avenue on the north (refer to Figure 3). Cross- sections of existing site conditions can be seen in Figures 9-12. The~~

This ASP concept has been ~~is~~ designed with the existing conditions of the land in mind as well as any impacts to adjacent lands that could be caused through development to the area. This consideration includes the following: ~~The impact on adjacent landowners and residents was carefully considered in the preparation of the plan.~~

~~The northern portion lands within the boundaries of the proposed Area Structure Plan are currently used as cultivated land. The southern 20.2 hectares have been developed into a parking area for trucks. In addition, a drainage pond has been created on the southeast corner. Adjacent land owners include:~~

- ~~To the east~~ ~~Across the~~ East of the SMRID canal lie agricultural lands which include an agricultural cattle feeding area
- ~~To the north is~~ Agricultural lands located to the north
- Industrial business located to the west across 43rd Street ~~are Industrial businesses~~
- ~~To the south is~~ Rave Industrial Park located to the south

~~5.2 DEVELOPMENT OBJECTIVES~~

~~The objective of the Developers of the Chinook Industrial/Commercial Park is:~~

~~"To create a high-quality environment that will provide a location for the establishment and growth of businesses which provide service to the commercial and industrial base of the Lethbridge County."~~

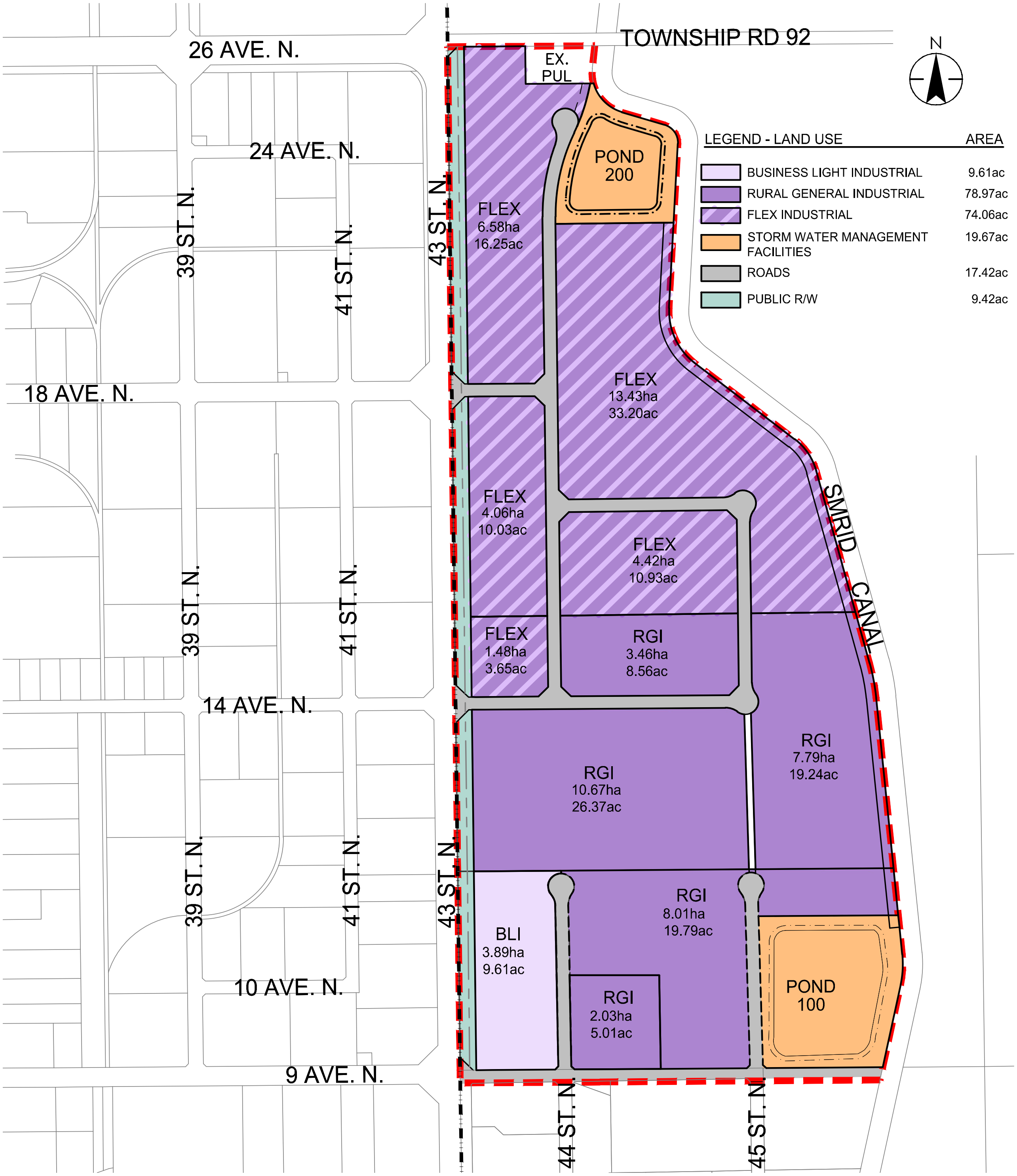
5.2 PREFERRED DEVELOPMENT CONCEPT

The proposed Land Use Plan ~~development and phasing plan~~ appears on ~~Figure~~ Map 3.0, with the ultimate development ~~will~~ consisting of approximately ±85.65 hectares (±211.65 acres) with ~~66.7~~ ±69.61 hectares (±172.01 acres) of developable area for primarily industrial business uses ~~properties~~. ~~The developer has proposed that the area will be developed in four phases.~~

The lands adjacent to 43rd Avenue have been identified as General Industrial or Flex lands to allow for commercial or industrial business development that would benefit from direct adjacency to the street. ~~The adjacent 43rd Avenue Business Light Industrial will be used to allow for businesses that will benefit from exposure to 43rd Street. The remainder of the development will be Rural General Industrial.~~ This is consistent ~~fits~~ with ~~current~~ existing developments located ~~ages~~ to the west and south of the Plan Area. Lots in Phase 1 are expected to ~~will~~ vary in size in order to accommodate a range of business exposure needs, however they are ~~Future lot sizes are~~ anticipated to range from approximately ±0.45 ha to ±2.3 ha (±1.0 ac to ±5.0 ac) in size. Larger lot sizes may be considered if the market permits. Lot sizes for Phases 2 and 3 expected to range from approximately ±1.77 ha to ±13.43 ha (±4.37 ac to ±33.19 ac) in size, however any minor adjustments to these areas shall not require an amendment to this plan. The Plan Area is proposed to be developed in 3 Phases, which is discussed in further detail in Section 11.

~~Phase 1 will be completed in two separate phases. They will consist of Lot 4. Block 1, Plan 111 3171 and PUL Lot 6, Block 1, Plan 141 0178 and a portion of Lot 5 Block 1 Plan 111 3171. It is proposed that Phase 1A include up to 13 lots to be serviced by the water supply currently servicing the Rave Industrial Park. Wastewater will flow to a storage tank to be pumped off peak to the City of Lethbridge sewer system. Phase 1B will be of similar size and have the same servicing concept. The existing overland drainage system will remain. Lot sizes in Phase 1 should range from ±0.45 to ±2.3 hectares (±1.00 to ±5.00 acres).~~

~~Phase 2A and 2B of the development will consist of Lot 5, Block 1, Plan 111 3171 and will have both commercial and industrial use properties. Phase 3, 4 and 5 will be constructed as economic conditions allow. It is proposed that complete underground water, sanitary, and storm services be installed in the new roadways which will also be constructed in Phase 2. Servicing concepts for these phases are further discussed in subsequent sections.~~



LEGEND - LAND USE	AREA
BUSINESS LIGHT INDUSTRIAL	9.61ac
RURAL GENERAL INDUSTRIAL	78.97ac
FLEX INDUSTRIAL	74.06ac
STORM WATER MANAGEMENT FACILITIES	19.67ac
ROADS	17.42ac
PUBLIC R/W	9.42ac

MAP 3.0 | CHINOOK INDUSTRIAL PARK ASP

PROPOSED LAND USE

ASP BOUNDARY
COUNTY/CITY BOUNDARY
POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED

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March 15, 2023

PREPARED FOR: SUMUS

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5.3 LAND USE CLASSIFICATION AND ANALYSIS

This section provides direction for the general land use areas shown on **Map 3.0**. A land use, Subdivision, and/or Development Permit application submitted for a site within the Plan Area shall demonstrate compliance with the policies of the land use area in the approximate area the site is located.

The proposed land use classification of the subdivision is Business Light Industrial (BLI) or Rural General Industrial (RGI) per the Lethbridge County Land Use Bylaw (No. 1404). ~~A figure depicting the anticipated land use designations within the Park is provided on Map 3.0.~~

Business Light Industrial (BLI)

The intent of the Business Light Industrial lands is to provide for a lower intensity business, such as light industrial or a use compatible to adjacent development in the area. These lands can be highly visible and accessible by both the travelling public and industrial users.

Rural General Industrial (RGI)

The intent of the Rural General Industrial lands is to provide for general industrial uses as well as rural or agricultural type uses.

Flex Industrial Area

The intent of the Flex Industrial Area is to provide flexible options for multiple forms of industrial related uses. Buildout of the Flex Industrial Area could take a variety of forms depending on market conditions and landowner requirements. Possible scenarios for buildout include, but are not limited to:

- 100% business light industrial uses,
- 100% rural general industrial uses,
- Mix or "checker" layout of industrial uses.

5.4 PROPOSED LAND USE AND STATISTICS

The distribution of land use within the proposed ASP is shown in **Table 1** below. The projected number of industrial lots will vary depending on economic conditions ~~the market~~. Lot locations and size will be established during subdivision.

Table 1. Land Use Statistics*

	Hectares (ac.)	Percent
Roads & Right-of-Ways	±7.05 (±17.42) ~~8.75 (21.62)~~	8% ~~10.7%~~
Rural General Industrial (RGI)	±32.57 (±80.49) ~~46.04 (113.78)~~	39% ~~56.3%~~
Business Light Industrial (BLI)	±4.64 (±11.47) ~~20.66 (51.06)~~	6% ~~25.2%~~
Flex Industrial**	±32.40 (±80.05)	38%
Public Utility Lots (Stormwater Management)	±7.96 (±19.67) ~~6.39 (15.79)~~	9% ~~7.8%~~
Parks/Green-Space/ER	0	0%
Gross Area	±84.62 (±209.10) ~~81.84 (202.25)~~	100%
Developable Area	±69.61 (±172.01) ~~81.84 (202.25)~~	

*Land Use Statistics are calculated at time of Plan preparation. Land within the plan area is to be redesignated over time and reflected in this table until the time of full build out.

**Flex Industrial lands represented on Map 3.0 shall be considered for Business Light Industrial or Rural General Industrial land use districts to be determined at time of application and reviewed by the Development Authority.

5.4 MUNICIPAL RESERVE

At this time, it is anticipated that at the time of subdivision, the municipal reserve requirements will be met by providing cash in lieu of land.

6. Servicing

To determine the viability of this development, preliminary evaluations have been performed with respect to servicing. Key service items include sewer, water, electricity, natural gas and telecommunications. ~~telephone, television, and electric~~. Additional information on key services is included in this section.

6.1 SANITARY SEWER SYSTEM

In initial meetings with County and City officials, it was determined that the current city sanitary infrastructure was not capable of accommodating the flows from the development. However, there were indications that temporary off-peak sewage flows could be routed through their system. As such, the primary sanitary servicing concept is to ultimately send the sewage to the County-managed system to the east. This servicing strategy has been completed for the Phase 1 Area along 9th Avenue N. This servicing strategy may be applied to the remainder of Phase 1 along 9th Avenue North in consultation with the City of Lethbridge.

Phases 2 and 3 will be serviced through septic fields or pump out tanks and no provision will be made in public roads for a municipal gravity system, nor any connection to municipal treatment facilities. As such, parcels will need to be a minimum of 0.81 ha (2.0 acres) in size, and high consumption water users producing large quantities of sewage effluent cannot be accommodated under this servicing strategy. Detailed evaluations, designs and regulatory approvals for onsite septic systems will be prepared by others during subdivision and permitting.

~~Alternate sewage servicing concepts have also been evaluated. A second concept is to create a private sewage treatment lagoon to the east. This would be funded and approved by the developer. A third option is to create a communal septic field system on the property. The final alternative to sewage treatment is to work with the City to allow for access to their sewage distribution infrastructure. Planning for a County-managed sewage system is currently underway. However, it is proposed that Phase 1 be serviced with a temporary system that utilizes off-peak discharge to the City sewage system.~~

In order to facilitate future design of sewage facilities for Phases 1A and 1B; preliminary design analysis has been conducted. This analysis uses the City of Lethbridge criteria for industrial discharge. It has been assumed that for the purposes of sewage disposal, businesses will comply with Business Light Industrial standards. Businesses that produce more waste will need to incorporate recycling and reuse of water into their building and site design. Sewage generation estimates are shown in the following Table 2. Sewage generation estimates are not being provided for Phases 2 and 3 where septic systems will be utilized as these statistics will have no relevance to future County conveyance and treatment systems.

Table 2. Sewage Generation Estimates

Phase	Area		Dry Weather flow	Peak Factor	Wet Weather Flow	Infiltration	Total	Flow
	Acres	Hectares	m^3/hectare/day		m^3/hectare/day	m^3/hectare/day		L/min
1A	22.6	9.2	20	NA	7.5	2.25	29.75	209.4
1B	16.6	6.7	20	NA	7.5	2.25	29.75	153.8
~~2A~~	~~17.9~~	~~7.2~~	~~20~~	~~NA~~	~~7.5~~	~~2.25~~	~~29.75~~	~~165.8~~
~~2B~~	~~21.6~~	~~8.7~~	~~20~~	~~NA~~	~~7.5~~	~~2.25~~	~~29.75~~	~~200.1~~
~~3~~	~~37.3~~	~~15.1~~	~~20~~	~~NA~~	~~7.5~~	~~2.25~~	~~29.75~~	~~345.6~~
~~4~~	~~35.3~~	~~14.3~~	~~20~~	~~NA~~	~~7.5~~	~~2.25~~	~~29.75~~	~~327.0~~
~~5~~	~~36.3~~	~~14.7~~	~~20~~	~~NA~~	~~7.5~~	~~2.25~~	~~29.75~~	~~337.2~~
Total	39.2	15.9						363.2

~~Phase 2-5 sanitary sewage will be handled through underground services to each lot from the sanitary mains located in the road. The sanitary sewage will be gravity fed away from the development to the south and into a lift station located offsite. This will ultimately flow into the County sewer system proposed for this phase. Plans for this system are underway. Alternative solutions are also under consideration as mentioned earlier in this document.~~

~~Piping sizes have been established using the calculations derived in Table 1. Due to the flat nature of the site, Phases 3-5 will require an additional sanitary lift station to convey sewage to the gravity system (refer to Figure 5).~~

6.2 WATER SYSTEM

It is proposed that each lot have a water service fed from a water main located in the adjacent roadways which will be fed by the existing water main currently servicing the Rave Industrial Park for Phases 1A and 1B. Phases 2 and 3 will be serviced from a connection to the City of Lethbridge Water System directly west of the Chinook Industrial Area as well as a connection to Township Road 92. ~~Water for firefighting purposes will be provided by the same infrastructure. This section covers how each of these water supply issues will be addressed.~~ The provision of potable water is contingent on the City of Lethbridge and Lethbridge County coming to a conveyance agreement.

6.2.1 POTABLE WATER AND FIRE PROTECTION

The proposed primary water source to this development will be through a connection ~~by connecting~~ to the distribution system servicing Rave Industrial park and City of Lethbridge. ~~This water is ultimately provided by the City of Lethbridge through metered connections.~~ A conceptual water system layout has been provided on Map 4.0. ~~Initial meetings with the City of Lethbridge infrastructure team gave indication that there is adequate supply of water in this area to service this development. The developers will formalize agreements with both the City and County to confirm access.~~ Water Conveyance agreements between the County and City will be required at the subdivision and permitting stage including payment of any connection and administrative fees by the developer. Each connection point to the City system shall have a meter chamber and premise/isolation backflow protection.

~~This water will be used for potable and fire protection purposes~~. Potable water will be used for human consumption and firefighting.

Fire Protection

Hydrant spacings shall meet the requirements of the jurisdiction providing the service at the time of construction. Currently, fire protection services are from the Town of Coaldale. ~~This will be the only source of potable water for this development. A preliminary design layout has been proposed in Figure 6~~. ~~This gives an indication of phasing as well. For Phase 1 there will be a single access point. Coincident with Phase 3, a second connection point will be added to the County line on the north edge of the property allowing for looping of the system.~~ All water mains are to be a minimum of 250 mm in diameter. Initial demand and flow analysis has been completed based on the developable area of Phases 2 and 3, (51.89Ha). A demand of 5m³/Ha/day was assumed, and fire flows has been assumed at 9,000 L/min. Table 3.0 shows the calculated demands. ~~Potential hydrant and valve locations are also shown in Figure 6~~. Water network and flow analysis will be conducted as part of the subdivision application.

Table 3. Water System Demands (Phase 2 and 3)

Average Day Demand (ADD)	259 m³/day
Maximum Day Demand (MDD)	518 m³/day
Maximum Day Demand (MDD) + Fire Flows	156 L/s
Peak Hour Demand (PHD)	12 L/s

6.2.2 NON-POTABLE WATER / INDUSTRIAL USE

~~In the event a business needs additional industrial water supply to accommodate a specialized or unique process, water may be available through the SMRID. The non-potable water system will distribute water from the SMRID canal to potential users. These users would need to be adjacent to the SMRID canal on the east side of the property. Each business owner would be responsible for providing their own infrastructure to support this use.~~ The use of non-potable water by future development is not anticipated at this time.

6.3 GAS

Natural gas distribution infrastructure in the area surrounding the site is operated by ATCO Gas. The developer will pay for the installation of natural gas distribution infrastructure to each lot. ATCO Gas will distribute natural gas within the development and lot purchasers will be able to select a retailer for natural gas supply. Future Developers will coordinate with ATCO to determine connection locations during the design phase. ~~The closest service connection point is shown on Figure 2.~~

6.4 ELECTRICAL POWER

Fortis will provide services to the proposed subdivision and underground services to each property line. Future Developers will coordinate with Fortis to determine connection locations during the design phase.

~~6.5 TELEPHONE~~

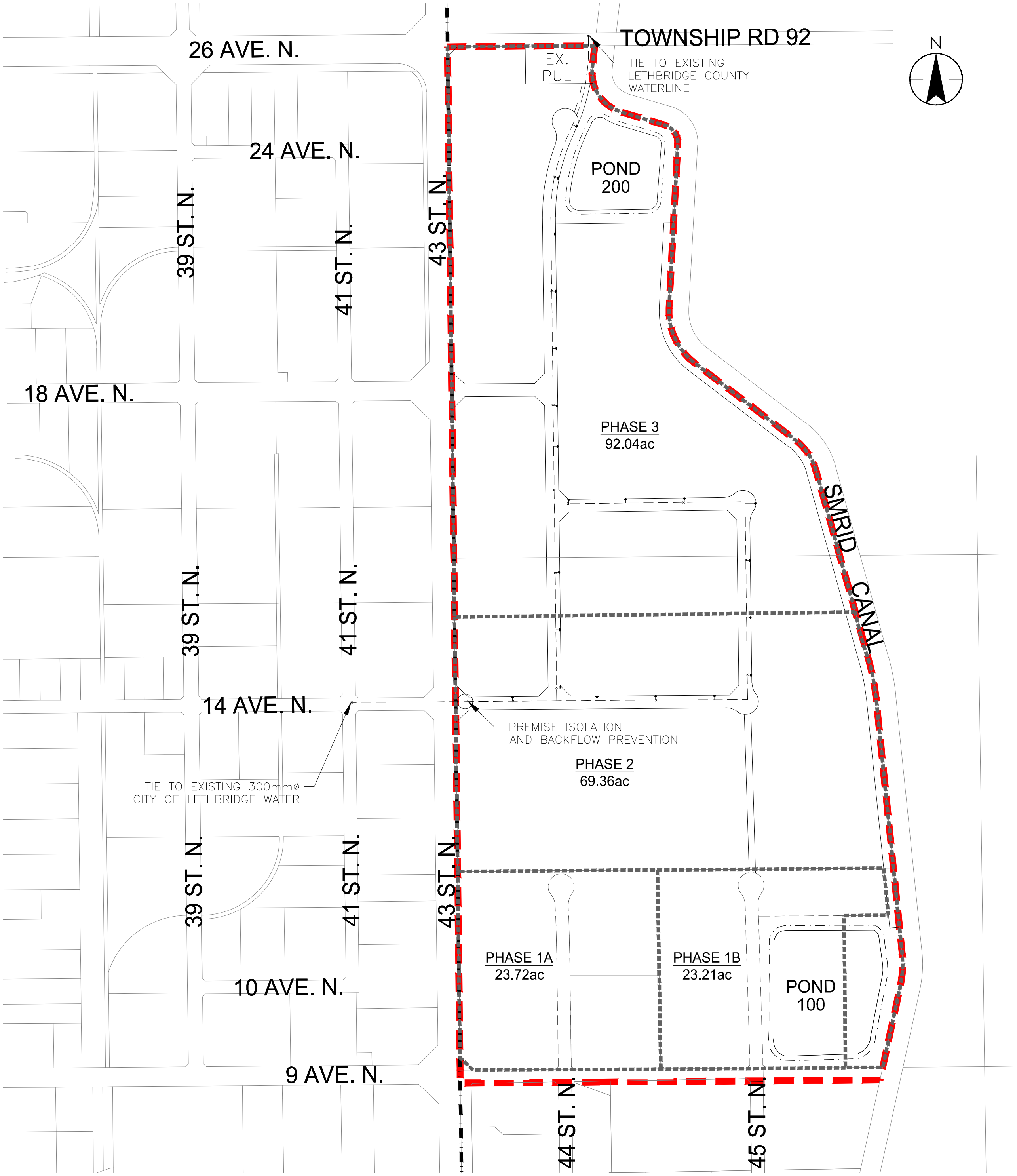
~~Telus will provide services to the lots, but each individual owner must apply for the service when building. The development will connect to an existing Telus pedestal at the corner of 9th Avenue North and 44th Street North. The service would require boring under 9th Avenue.~~

~~6.6 CABLE TELEVISION~~

~~There is no cable television available in the area, however, small satellite dishes may be installed by the lot owner.~~

6.5 TELECOMMUNICATIONS

During design development local service providers will be contacted for the provision of phone and internet services. These future systems may be incorporated in overall regional servicing or be completed by future parcel developers. Currently Telus and Satellite Service providers are the most viable options for these services.



MAP 4.0 | CHINOOK INDUSTRIAL PARK ASP

WATER SERVICING

PREPARED FOR: SUMUS

ASP BOUNDARY
PHASING BOUNDARY
COUNTY/CITY BOUNDARY
POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED
PROPOSED WATERMAIN

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February 1, 2023

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7. Roads

A layout of the streets and accesses is shown in Map 5.0. In general, roads within the subdivision will comply with City of Lethbridge and Lethbridge County engineering standards ~~for a 20m right-of-way industrial collector and industrial local road~~ throughout with no sidewalks.

Roads in the Phase 1 area will be reconstructed to an urban cross-section as identified with some provision for parking. Optional local access roads have been identified north of 9th Avenue. The completion of these roads, if required, will be determined at the subdivision stage.

Roads in the Phases 2 and 3 area will be constructed as identified with no provision for on street parking as industrial land uses in these phases will be required to accommodate all customer parking on site. Roadway widths in these phases will be 10 meters wide (two 5m driving lanes), and all internal intersections will be designed with two-centered curves to accommodate WB20 truck turning movements.

All Roads will be paved and will meet City of Lethbridge standards to allow for truck access ~~(refer to Figure 13)~~. The transportation improvements will be paid for by the developer.

There will ultimately be three access points to this development:

1. 9th Avenue North
2. 14th Avenue North
3. 18th Avenue North

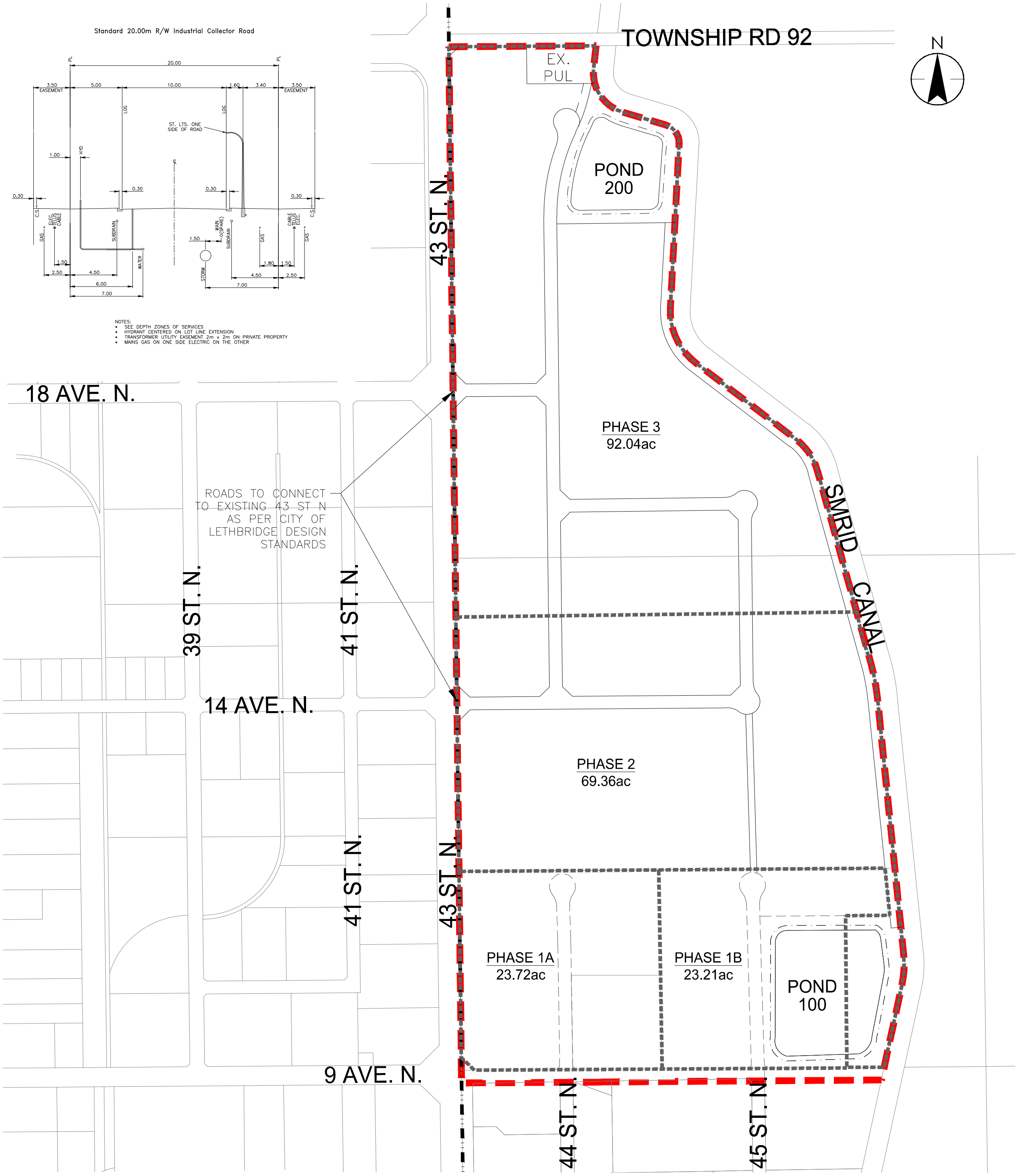
The access to Phase 1 will be via 9th Avenue North, which runs east to west along the south border of the development. ~~A portion of 44th Street North would be constructed from its intersection with 9th Avenue North to the north) to facilitate access to the proposed new building in Phase 1 and to the north for Phase 2 businesses.~~ Phase 2 will be accessed via a new intersection at 14th Avenue North. This intersection will be carried east and terminate at the 45th Street intersection. Portions of 44th Street and 45th Street will also be built to the northern limit of Phase 2. Phase 3 roads would include the rest of 44th Street North as well as 45th Street North, 16th Avenue North and ~~14~~18th Avenue North access. ~~Access to 18th Avenue and 43rd Street will be constructed as part of Phase 5. The north side of 9th Avenue will be upgraded to an industrial collector standard (City standard) by the developer.~~

A Traffic Impact Assessment ~~study~~ (TIA) has been completed for the proposed Chinook Industrial Park. The original traffic study was completed by EASL based on the projected land use and roadway layout at the time. ~~shown on Figure 4 Proposed Development & Phasing Plan (refer to Appendix C). The results of this study indicate that the existing infrastructure on 43rd Street North from 9th Avenue North to 26th Avenue North will accommodate this development.~~ The updated internal roadway network alters the way in which vehicles access the arterial roadway network from Phase 2 and Phase 3 developments. As such, new traffic analysis was undertaken and determined that the access points at 14th Avenue North and 18th Avenue North will accommodate post-development traffic volumes in Phases 2 and 3.

Although the TIA does indicate this development is feasible there are future improvements that are suggested for the ~~year 2022 (~~full build out horizon. ~~assumed).~~ These recommendations are as follows:

- Installation of westbound left turn only lane on 26th Avenue
- Traffic signals at 43rd Street and 14th Avenue
- Installation of a northbound left turn lane at 14 Avenue
- Traffic signals at 43rd Street and 18th Avenue
- Installation of a northbound left turn lane at 18 Avenue
- Installation of second eastbound left turn only lane at the intersection of 43rd Street and Highway 3.

For additional details and analysis refer to Appendix A.



MAP 5.0 | CHINOOK INDUSTRIAL PARK ASP

ROAD LAYOUT

🟥 ASP BOUNDARY
▨ PHASING BOUNDARY
-·- COUNTY/CITY BOUNDARY
– – POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED

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February 1, 2023

PREPARED FOR: SUMUS

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8. ~~Site Drainage and Grading~~ Stormwater Management

The Chinook Industrial Park Stormwater Management Systems are defined by existing topography and can be characterized into two distinct zones.

Zone 100 is comprised of existing development in the Rave Industrial Park south of our ASP, partially developed Phase 1A/1B, and future development in Phase 2.

Zone 200 is comprised of future Phase 3 development and the existing water filling station adjacent to Township Road 92.

All future drainage designs and construction shall meet the requirements Lethbridge County and the Province of Alberta. Documents referred to when completing this analysis included Alberta Environment and Parks Storm Water Management Guidelines (Current Edition). Unique to the stormwater management of the site is the requirement of a conveyance agreement between Lethbridge County and St. Mary River Irrigation District (SMRID). A current agreement exists for Pond 100 between the County and SMRID which requires the following before a pumped discharge of stormwater to the canal will be permitted.

1) Water must be sampled, tested and meet SMRID water quality standards.
2) Available conveyance capacity within the canal must be confirmed prior to operation of pump system.

Based on the above, Ponds will need to operate as "zero-release" facilities storing an entire 1:100 year rainfall event until such time as permission is granted by SMRID to discharge stormwater. Please refer to Section 8.3 for further discussion on the Major storm event conveyance and attenuation systems, and the Chinook Industrial Park Stormwater Management Plan report Appendix B. A hydrologic model was developed for the post-development condition using PCSWMM computer modelling software. Intensity-duration-frequency (IDF) storm data for the City of Lethbridge was used as the basis for the design storms used in the analysis.

8.1 PRE-DEVELOPMENT CONDITION

As can be seen in Map 2.0 of the ASP, existing lands generally flow from the west side along 43rd Street North to the east towards the existing SMRID irrigation canal. These general drainage patterns will be respected during the ultimate grading design of the site to minimize overall grading efforts during development.

Pond 100 is currently partially constructed and services portions of Phase 1 and the Rave Industrial area to the south. The completion of Phase 1 and Phase 2 will require the expansion of this facility and a review of the existing lift station pumping capacity to determine if upgrades are required.

8.2 POST DEVELOPMENT MINOR STORM SYSTEM

A minor storm sewer system is outlined on Map 6.0 and has been designed for a 1:5-year rainfall event using the following unit rates as outlined in City of Lethbridge Design Standards:

- Roadways 90L/s/Ha
- Private Parcels 40L/s/Ha (Restricted 1:5 Year Outflow)

Given the parcel coverage (by buildings) in general industrial areas is quite small, large parking and storage areas can be utilized to reduce outflow minimizing the size of downstream infrastructure. For private parcels, this will require that future parcel designs provide some stormwater attenuation and outflow control structure as part of permitting process. Sediment control through the implementation of sumps and or other control measures to collect pollutants should be reviewed at detailed design.

8.3 POST DEVELOPMENT MAJOR STORM SYSTEM

Major storm systems are outlined on Map 7.0 and must accommodate 1:100 year rainfall events. These systems include public roadways, swales, ditches and detention facilities. The pumped discharge of stormwater to the SMRID canal will be required at Pond 100 and Pond 200. Other options may be explored to eliminate the need for a second lift station; however, topography limitations and additional infrastructure costs will likely be prohibitive to try to combine both ponds to one pump station. If a second lift station is installed at Pond 200, a new conveyance agreement will be required between the County and SMRID.

In general, each private parcel within the study area will require some onsite storage and will have a restricted release rate. However, a few areas along the east edge of the study area boundary will not be restricted and will be serviced via swales, conveying runoff to the proposed ponds.

Future emergency overland drainage from private parcels will be directed to public ROW's and/or public conveyance systems. Detention storage on private parcels during the 1:100-year rainfall event will greatly reduce overland flows in roads and ditches thereby facilitating the achievement of safe flow depths and velocities as outlined by provincial guidelines. Private parcel drainage will not be permitted to pass through another private parcel unless covered under a drainage agreement.

For the purpose of preliminary pond sizing below, a 1:100-year rainfall for Lethbridge (109mm) is being utilized assuming a zero-release scenario during the storm event, due to conveyance agreement requirements with SMRID.

Stormwater Storage Requirements			
1:100 year rainfall amount (m)=			0.109
Zone	Area (Ha)	Required 1:100 year Storage (m^3)	% of Total Storage
Pond 100	5.27	5 744	7.0%
Phase 2	33.15	36 134	43.9%
Phase 1	15.36	16 742	20.3%
Rave	21.74	23 697	28.8%
Total	**75.52**	**82 317**	**100.0%**
Pond 200	3.00	3 270	9.5%
Phase 3	28.74	31 327	90.5%
Total	**31.74**	**34 597**	**100.0%**

~~All drainage onsite must conform to Lethbridge County and Alberta Environmental requirements. Documents referred to when completing this analysis included Alberta Environment and Parks Storm Water Management Guidelines (2013). This document also includes descriptions of Best Management Practices (BMPs) which are used to mitigate peak runoff values. These practices, combined with the storm ponds, will provide control and containment of storm runoff over the entire development.~~

~~As can be seen in Figure 3 of the ASP, drainage on the existing ground on Lot 5 to the north generally flows from the east side along 43rd Street North to the east towards the existing SMRID irrigation canal. Grading on Lot 4 where the gravel parking lot is located is to the south into the drainage ditch, which then directs the stormwater east into the storm pond. Lot drainage will be directed to the street. It will not cross the various lots.~~

~~1.1 SITE DRAINAGE~~

~~The proposed development will have two stormwater detention ponds. The ponds will receive storm water runoff from the subdivision by means of an overland drainage system constructed within the development area. The overland drainage system will consist of a curb and gutter system along the roads and lot line swales to collect storm water runoff from major events, and a storm drain system for minor events to convey the storm water to the ponds. The existing storm water management facility (SWMF) located at Lot 6 Block 1 Plan 141 0178 will remain and be extended both to the east and the north (refer to Figure 8). A second storm pond will be constructed at the north end of the development to provide additional storage for the northern lots. An additional lift station will need to be constructed at the north pond to pump effluent off- peak to the SMRID canal.~~

~~The south pond is currently released to the St Mary Reservoir Irrigation District (SMRID) main canal, which bounds the site to the east. There is an existing stormwater lift station that is used to pump storm water off-peak to the SMRID canal. This system would be capable of accommodating Phase 1A~~

~~but would need to be upsized with future developments to a final capacity of approximately 235 l/sec (3750 US gal/min) to achieve drain down times of about 3 days in this enlarged SWMF.~~

~~The new stormwater detention pond to the north and the expansion of the existing pond to the south will require approval from, and registration with Alberta Environment prior to construction.~~

~~Storm water runoff from the subject lands presently flows into the existing roadside ditches. The ditch system will be replaced with a full urban curb and gutter cross-section using a major and minor storm water system. Pre-development storm drainage patterns are described in greater detail in the Hydrogeological and Site Drainage Analysis completed for the site by Hasegawa Engineering and attached to this document as Appendix D.~~

~~1.2 POST-DEVELOPMENT~~

~~A detailed drainage analysis was performed for the site to compare pre-and post- development storm drainage patterns. A hydrologic model of the site was prepared using the PC SWMM hydrologic modeling software package. The hydrologic model was used to estimate the pre- development release rate for a 1:5 year, 4-hour storm event. The second hydrologic model of the post-development site was then analyzed using a 1:100-year 24-hour design storm event. This storm event is a synthetic Modified Chicago storm based on City of Lethbridge weather data. The storm water management facilities were sized based on the results of these models. Detailed methods and results of surface runoff analysis are provided in Appendix D. A summary of the findings of this report appears below.~~

~~Primary channels for storm drainage within the proposed development are provided within the internal road right-of-ways. A storm drain system is utilized to accommodate minor storms.~~

~~Storm water runoff will be detained in two storm water management facilities. The existing Storm Water Management Facility (SWMF) continues to receive drainage from the Southland International parking area and Rave Industrial area through existing drainage channels but the parking area will be further developed and generate additional runoff. According to the July 2013 storm water management report for this facility, excess capacity already exists in this facility and the excess volume generated after development is well under this excess capacity.~~

~~Table 3 below and the following paragraphs summarize performance of the storage areas in the 100-year design storm comparing predevelopment and post development conditions.~~

~~Table 3. Predevelopment vs Post Development Runoff / Retention Pond Capacity~~

	~~Predevelopment Inflow Vol/ Rate~~	~~Post-development Inflow Vol/Rate~~	~~Post-develop. Outflow~~	~~Retention Pond Maximums Volume/Depth/% Capacity~~ ~~[a]~~
~~North Storage~~	~~7055 m3~~ ~~0.882 m3/sec~~	~~10,464 m3~~ ~~2.893 m3/sec~~	~~Pumped - 0.04m3/sec assumed~~	~~8723 m3/1.3 m/58%~~
~~Existing South Storage~~ ~~[b]~~	~~34,016 m3 5.951 m3/sec~~	~~Not Applicable~~ *~~c~~*	~~Not Applicable~~	~~Not Applicable~~
~~Proposed South Storage~~ *~~b~~*	~~Not Applicable~~	~~76,718 m3~~ ~~8.226 m3/sec~~	~~0 (delayed release)~~	~~69,690 m3/2.87 m/ 78%~~

~~[a]~~ *~~Pond statistics for the north storage pond are based on assumed pumping rate of 40 l/sec into the outflow throughout the storm. Capacities shown include 0.6m freeboard.~~*

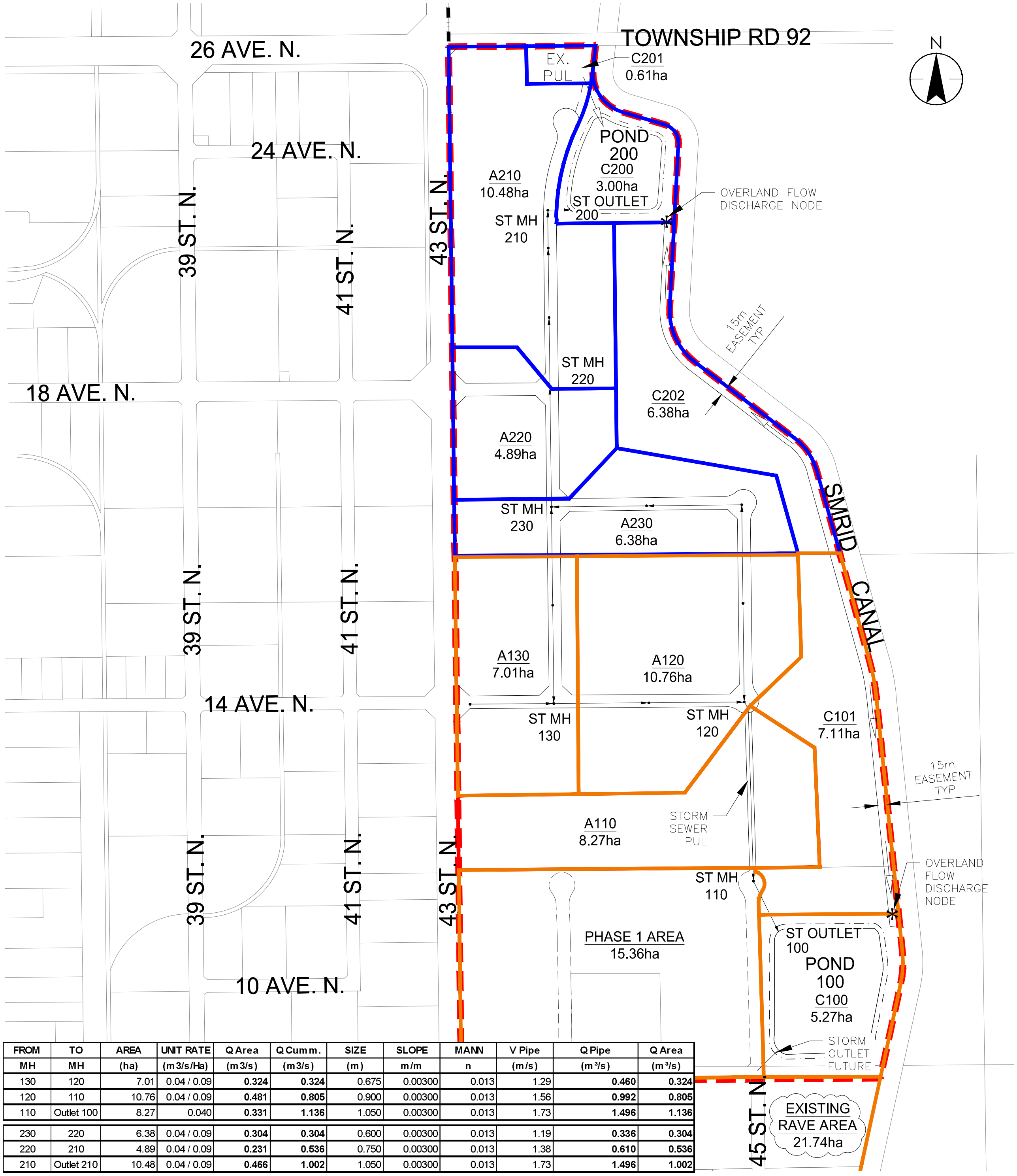
~~[b]~~ *~~The Rave Industrial Area Runoff model is not available – these volume figures include 17,000~~ ~~m^3~~ ~~to account for reported Rave volume but runoff rates do not include Rave contributions.~~*

~~[c]~~ *~~Post development runoff for the existing parking lot modeled separately for comparison to predevelopment column, shows a volume of 35,269~~ ~~m^3~~ ~~& a maximum inflow rate of 5.112~~ ~~m^3/sec.~~ ~~The area of new development contributing southbound runoff was also modeled separately for comparison although tributary areas are only approximate between pre- and post-development models - runoff volume increases from 12,163~~ ~~m^3~~ ~~in the predevelopment model to a post development volume of 32,186~~ ~~m^3~~ ~~while peak rates rise from 2.126~~ ~~m^3/sec~~ ~~to 6.62~~ ~~m^3/sec.~~*

~~The "new" runoff from the south portion of the development will be routed into the existing storm water management facility which will be enlarged to accommodate the increased volume. This will occur during Phase 3 of the development. This facility will store the storm runoff until permission is received to release it into the adjacent SMRID irrigation canal. Upgrading pump capacity may need to be considered to avoid the risk associated with extended retention times – this will probably also depend on re-negotiating release agreements with SMRID. Expanding the capacity of this SWMF will be accomplished by enlarging the top 2.9 metres of the existing pond east and north to about 5 metres from the lot line to create an upper bench continuous from the inlet ditch (refer to Figure 14 Appendix A). Lesser storm events are passed through to the deeper storage area and major storm events back up into the extended pond and drainage ditch along the east boundary. Runoff models indicate that the 100-year storm will generate about 76,718~~ ~~m^3~~ ~~of runoff routed to the south SWMF–~~

~~by utilizing the drainage ditch itself to augment storage, the existing SWMF needs to be enlarged to store 69,690 m^3 of this volume. Final design may adjust elevations and capacities of the ditch and SWMF extension.~~

~~A smaller area on the north of the proposed development will drain into a second retention area in the northeast corner. This runoff will also need to be pumped out, but the possibility exists for release into the ditch of a nearby Lethbridge County road during the storm. It is assumed that the limit for this release will be pump capacity rather than predevelopment runoff rates – assuming a constant pump outflow of 0.04 m^3/sec (600 US gal/min), modeling indicates that 8720 m^3 of storage is required at the north end and drain down times are about 3.5 days.~~



FROM	TO	AREA	UNIT RATE	Q Area	Q Cumm.	SIZE	SLOPE	MANN	V Pipe	Q Pipe	Q Area
MH	MH	(ha)	(m3/s/Ha)	(m3/s)	(m3/s)	(m)	m/m	n	(m/s)	(m³/s)	(m³/s)
130	120	7.01	0.04 / 0.09	**0.324**	**0.324**	0.675	0.00300	0.013	1.29	**0.460**	**0.324**
120	110	10.76	0.04 / 0.09	**0.481**	**0.805**	0.900	0.00300	0.013	1.56	**0.992**	**0.805**
110	Outlet 100	8.27	0.040	**0.331**	**1.136**	1.050	0.00300	0.013	1.73	**1.496**	**1.136**
230	220	6.38	0.04 / 0.09	**0.304**	**0.304**	0.600	0.00300	0.013	1.19	**0.336**	**0.304**
220	210	4.89	0.04 / 0.09	**0.231**	**0.536**	0.750	0.00300	0.013	1.38	**0.610**	**0.536**
210	Outlet 210	10.48	0.04 / 0.09	**0.466**	**1.002**	1.050	0.00300	0.013	1.73	**1.496**	**1.002**

MAP 6.0 | CHINOOK INDUSTRIAL PARK ASP

STORM DRAINAGE MINOR

PIPE SYSTEM

PREPARED FOR: SUMUS

🟥	ASP BOUNDARY
‒ · · ‒	COUNTY/CITY BOUNDARY
- - -	POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED

Stantec

116549063
December 7, 2022

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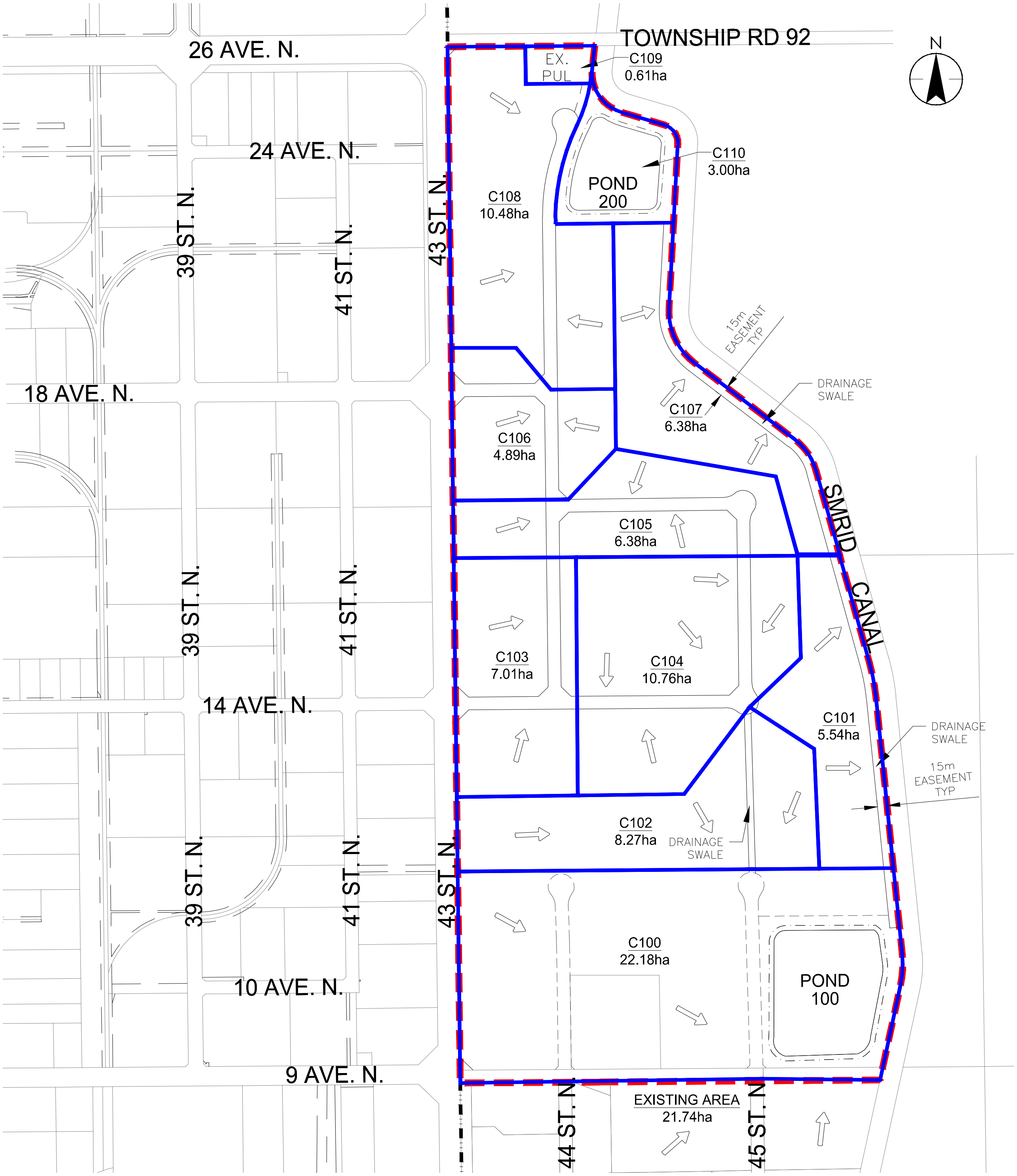

MAP 7.0 | CHINOOK INDUSTRIAL PARK ASP

STORM DRAINAGE MAJOR

OVERLAND SYSTEM

PREPARED FOR: SUMUS

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ASP BOUNDARY
COUNTY/CITY BOUNDARY
POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED

Stantec

116549063
December 7, 2022

9. Geotechnical

Two geotechnical reports were conducted for this project. One for the south parcel (Lot 4 Block 1 and Lot 6 Block 1) conducted in March of 2012 and one for the north parcel (SW¼ 10-9-21-W4M) conducted on May 2, 2017. As part of the ASP Amendment, a Geotechnical Report (March 2023) and Phase 1 Environmental Assessment (February 2023) was completed (W½ 10-9-21-W4M). All reports and detailed analysis are in Appendix D.

~~As part of the analysis on the Parcel 2 test pits and 4 boreholes were advanced to approximately 10 m depth. The overall lithology consisted of:~~

~~0.0 – 0.2 m~~	~~topsoil~~
~~0.2 – 1.5 m~~	~~clay~~
~~1.5 – 10 m~~	~~clay till~~

~~The groundwater was encountered between depths of 3.2 m and 9 m with the shallower water table being encountered closer to the SMRID canal.~~ Sieve analysis and Atterberg limits were conducted on site soils to evaluate grain size distribution and plastic and liquid limits. Recommendations were also given for site grading and future foundations. Overall the site soil conditions are amenable to site development and building construction. For additional details and analysis refer to Appendix D. This information will be used to facilitate design of grading, drainage and infrastructure. Additional geotechnical analysis will be required on each site to allow for proper foundation design.

10. Solid Waste Disposal

Lot purchasers shall be responsible to make arrangements for solid waste disposal. The City of Lethbridge Regional Solid Waste Facility is located approximately 23 km driving distance from the development. Alternatively, lot purchasers may contract with a private solid waste hauler.

11. ~~Architectural Controls~~ Phasing & Implementation

In accordance with the City of Lethbridge / Lethbridge County IDP Section 3.4.4.13, landscaping will follow standards with respect to shielding and buffering. The Highway Entranceways Design Guidelines, as specified in Appendix B of the IDP, will also be followed. Other internal parcel landscaping and building architecture will be at the discretion of the parcel developer and subject to Lethbridge County Land Use Bylaw and Permitting.

All construction will follow current Lethbridge County standards and development permit process. ~~The development of each lot will be considered on a case by case basis during the development permit process~~.

Phasing identifies the strategy for development of the Plan Area over time. The purpose of the phasing strategy is to provide for the logical and cost-effective progression of development. Phasing of development will be driven by the availability of servicing, transportation infrastructure, market demand, and landowner timing. Industrial uses should develop generally in accordance with the development staging sequence identified in Map 8.0. Industrial development proposing to proceed out of sequence may do so without requiring an amendment to this Plan; however, shall be required to provide rationale for the proposal in accordance with the provisions of this Plan and as required by the County.

Phase 1 will be completed in two separate phases, consisting of Lot 4 Block 1 Plan 1113171 and Lot 7 Block 1 Plan 1911847 and a portion of Lot 6PUL, Block 1, Plan 141 0178. It is proposed that both Phase 1A & 1B could include up to 13 lots each, and lot sizes may range from approximately ±0.45 ha to ±2.3 ha (±1.00 ac to ±5.00 ac).

Both Phases 2 & 3 will be subdivided out from Lot 5, Block 1, Plan 111 3171 for commercial and industrial uses as economic conditions allow. Each lot shall have a minimum lot size of ± 0.81 ha (±2.0 ac). The development of these phases over time requires critical infrastructure components in order to subdivide, service and market.

Phase 1A and 1B

These phases are currently serviced and operational from 9th Ave S. However, Pond 100 expansion will be required for any further onsite development as will the reconstruction of roads and storm systems in the Rave Subdivision.

Phase 2

The construction of Phase 2 requires the following for servicing:

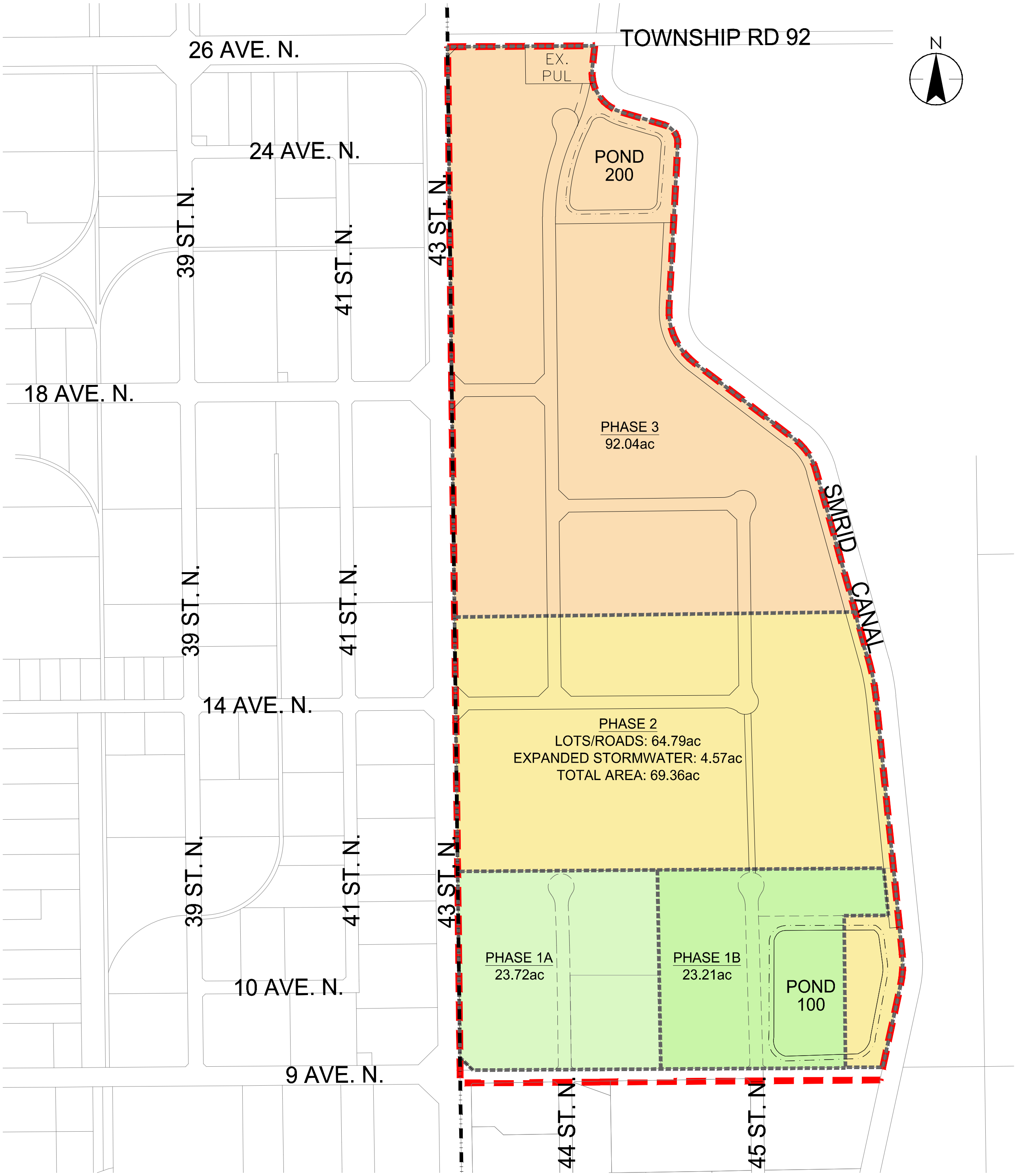
- Utility Crossing Agreement Approvals at 43rd Street
- Connection to the City of Lethbridge's Potable Water System

- Expansion of Pond 100 to accommodate additional stormwater run-off
- Lift Station Evaluation
- Extension of natural gas and power from 43rd Street

Phase 3

The construction of Phase 3 requires the following for servicing:

- Utility Crossing Agreement Approvals at 43rd Street
- Connection to Lethbridge County's Potable Water System (Township Road 92) and Phase 2 System
- Construction of Pond 200 and Lift Station to accommodate stormwater run-off and offsite conveyance
- Completion of Water Conveyance agreement between SMRID and Lethbridge County
- Stormwater Facility Registration with the province
- Extension of power, gas and telecommunications from Phase 2 and 43rd Street N (if required)



MAP 8.0 | CHINOOK INDUSTRIAL PARK ASP

PHASING PLAN

PREPARED FOR: SUMUS

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ASP BOUNDARY
PHASING BOUNDARY
COUNTY/CITY BOUNDARY
POTENTIAL PHASE 1 ROAD OPTIONS TO BE CONFIRMED

Stantec

116549063
December 7, 2022

APPENDICES

APPENDIX A

Traffic Impact Assessment

Chinook Industrial Park Area Structure Plan

February 2, 2023

Prepared for:

Sumus

Prepared by:

Stantec Consulting Ltd.
Unit 230, 704 4 Avenue South
Lethbridge AB T1J 0N8

TRAFFIC IMPACT ASSESSMENT

This document entitled Traffic Impact Assessment was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Sumus (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by: Angela Forsyth, P.Eng.

Reviewed by: Japji Chahal-Virk, P.Eng.

Corporate Authorization

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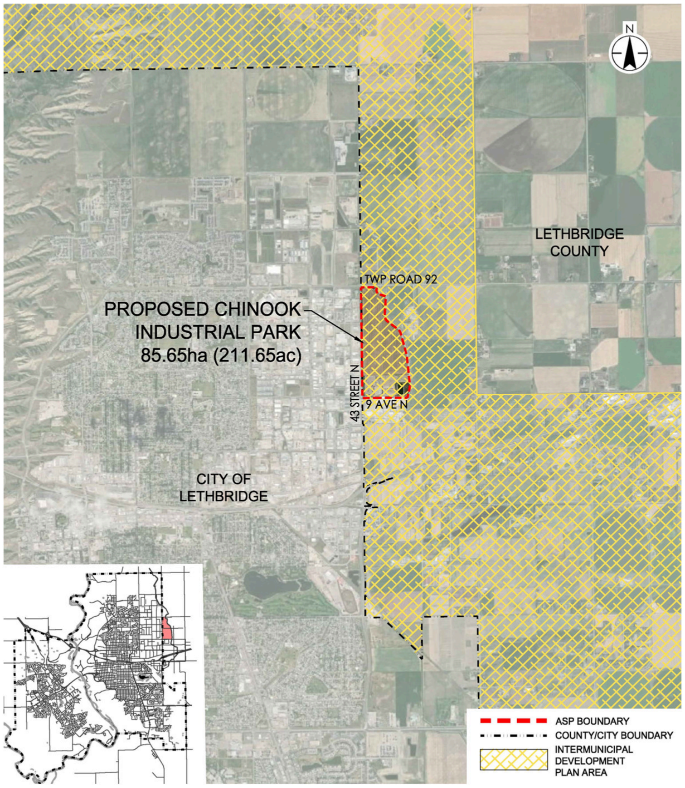
1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Sumus to complete a Traffic Impact Assessment (TIA) as part of the Chinook Industrial Park Area Structure Plan (ASP). This is an updated ASP to reflect the reconfigured land uses and access points in the area. Previously, there was an internal roadway network connecting the 9 Avenue N access point to the 14 Avenue N and 18 Avenue N access points via a north-south local roadway. This roadway has since been discontinued, leaving the two access points for the proposed remaining development. The current 9 Avenue N access remains to service the existing developed portion of the ASP area.

The development is located in Lethbridge County adjacent to the City of Lethbridge boundary. It is bounded by 43 Street N to the west, 9 Avenue N to the south, the SMRID canal to the east, and Township Road 92 to the north. Figure 1 illustrates the location of the site.

Figure 1: Site Location



1.1 OBJECTIVES

The objectives of this TIA are as follows:

- Collect the traffic data from the existing traffic impact assessment.
- Estimate the magnitude and characteristics of the peak hour traffic generated by the proposed development.
- Evaluate the impacts of vehicular traffic generated by the proposed development on the adjacent intersections on 43 Street N.
- Identify proposed roadway and intersection geometry for the planned new intersections.
- Identify and recommend appropriate traffic operation and/or infrastructure improvements necessary to accommodate the anticipated traffic.

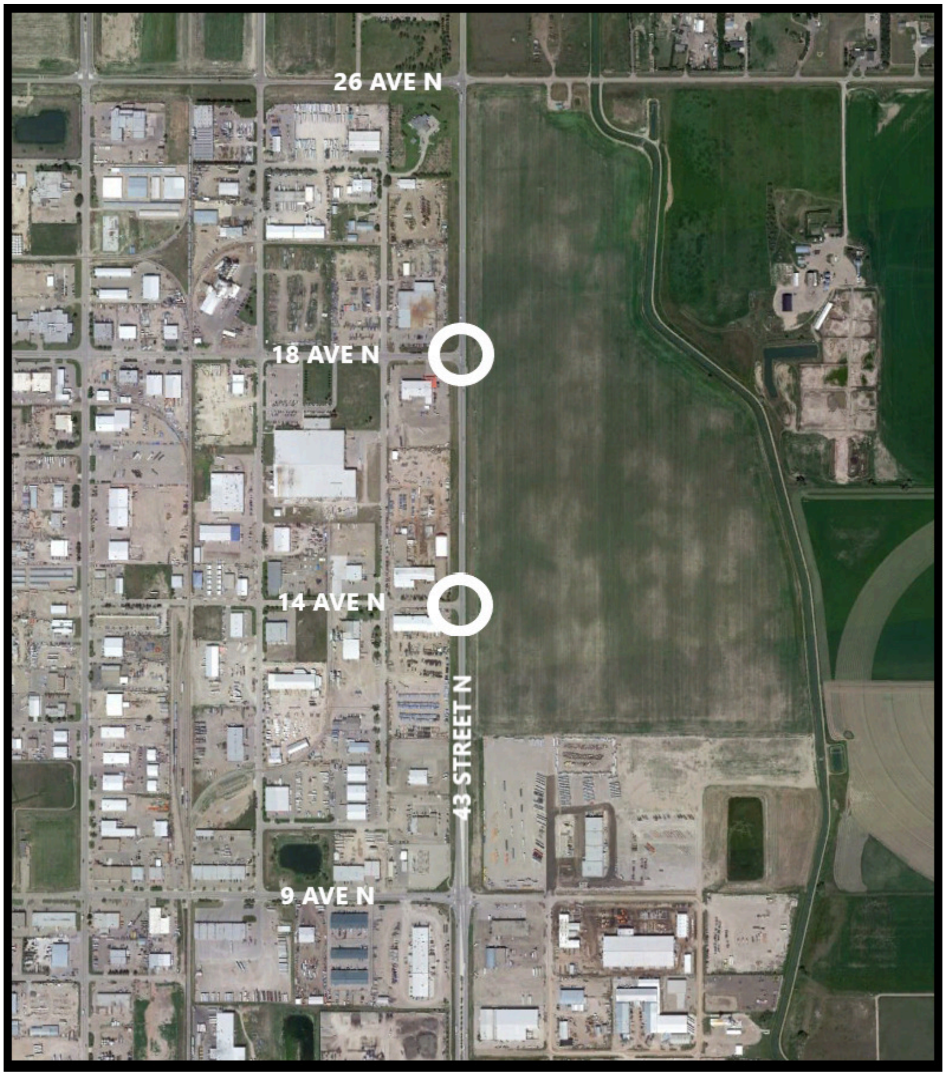
1.2 STUDY AREA

The study area includes the following intersections:

- 43 Street N and 18 Avenue N
- 43 Street N and 14 Avenue N

The study area is illustrated in Figure 2.

Figure 2: Study Intersections



2.0 EXISTING INFRASTRUCTURE

2.1 ROAD NETWORK

43 Street N is a two-lane urban and rural cross-section along the east limits of the City of Lethbridge. From Highway 3 to north of 9 Avenue N, the roadway is an urban 4-lane cross section with signalized intersections. Just north of 9 Avenue N, the road transitions from the 4-lane urban to a 2-lane rural cross section, and continues as such to the City of Lethbridge limits at 62 Avenue N.

14 Avenue N and 18 Avenue N are both urban industrial collector roads connecting the Churchill Industrial Park to the arterial road network. Both intersections with 43 Street N are three-leg unsignalized, rural type intersections, intersecting at 90 degrees. There is a stop condition on the minor approach in both locations. 43 Street N is posted at 60 kilometres per hour, and all other roadways are 50 kilometres per hour.

2.2 EXISTING GEOMETRY

43 Street N at the project location has two 3.75-metre-wide lanes with a 2.25 metre shoulder on each side. There are no horizontal curves, and the grade is relatively flat.

The three-leg intersection of 43 Street with 14 Avenue is at 90 degrees with little to no vertical curvature. Sight lines are excellent at this intersection. The cross section is transitioned from urban to rural at the edge of shoulder of 43 Street, where the curb terminates, and the shoulder is introduced. Two-centered curves are used on both radii.

Similarly, the three-leg intersection of 43 Street with 18 Avenue is at 90 degrees with little to no vertical curvature. Sight lines are excellent at this intersection. The cross section is transitioned from urban to rural at the edge of shoulder of 43 Street, where the curb terminates, and the shoulder is introduced. Two-centered curves are used on both radii.

2.3 LAND USE

The existing land is currently greenfield and zoned as Lethbridge Urban Fringe (LUF) by Lethbridge County. To the west, parcels are zoned as General Industrial (I-G) by the City of Lethbridge and the area is largely developed.

2.4 BACKGROUND TRAFFIC VOLUMES AND INTERSECTION ANALYSIS

The original TIA entitled *A Traffic Impact Assessment (TIA) Report* was completed in October 2018 by EASL Transportation Consultants Inc. This report was used for the background volumes for all scenarios, and analysis performed is still valid for the purposes of this TIA. The previous TIA and relevant background analysis can be found in Appendix A.

3.0 PROPOSED DEVELOPMENT

3.1 TRIP GENERATION

Proposed land uses for the ASP area are a mixture of Business Light Industrial (BLI) and Rural General Industrial (RGI). The proposed land use areas are outlined in Figure 3. Table 1 summarizes the development proposal for the ASP area.

Figure 3: Proposed Land Uses

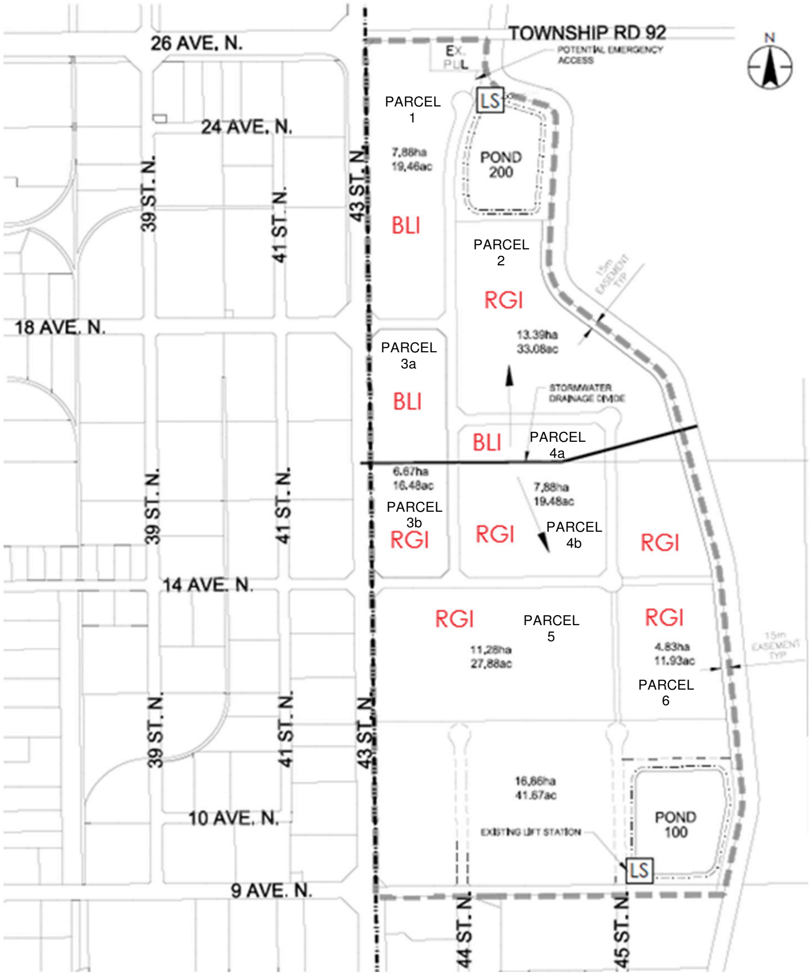


Table 1: Construction Site Traffic Projections

Parcel	Use	Gross Area
1	Business Light Industrial	19.46 ac
2	Rural General Industrial	33.08 ac
3a	Business Light Industrial	8.86 ac
3b	Rural General Industrial	7.62 ac
4a	Business Light Industrial	4.79 ac
4b	Rural General Industrial	14.69 ac
5	Rural General Industrial	27.88 ac
6	Rural General Industrial	11.93 ac

To estimate the peak hour traffic generated by the proposed development, the trip generation rates from Table 4 were applied. This includes a factor of 8,200 square feet of developed gross floor building area (GFA) per acre for the proposed development, as utilized in the pervious TIA (EASL Transportation Consultants Inc, 2018). The trip generation rates were taken from ITE's Trip Generation Web-based App, 11th Edition. Table 2 summarizes the site traffic generated by the proposed development for the weekday AM and PM peak hours.

Table 2: Site Generated Traffic Volumes

Parcel	Land Use	Area	ITE 11 Ed		Intensity	Weekday						Weekday					
						AM			PM			AM			PM		
			Land Use Code			Trip Rate	In %	Out %	Trip Rate	In %	Out %	Total Trips (vph)	In	Out	Total Trips (vph)	In	Out
1	BLI	19.46 ac	110	Light Industrial	159.572 x1000 sqft	0.74	88%	12%	0.65	14%	86%	118	104	14	104	15	89
2	RGI	33.08 ac	130	Industrial Park	271.256 x1000 sqft	0.34	81%	19%	0.34	22%	78%	92	75	18	92	20	72
3a	BLI	8.86 ac	110	Light Industrial	72.652 x1000 sqft	0.74	88%	12%	0.65	14%	86%	54	47	6	47	7	41
3b	RGI	7.62 ac	130	Industrial Park	62.484 x1000 sqft	0.34	81%	19%	0.34	22%	78%	21	17	4	21	5	17
4a	BLI	4.79 ac	110	Light Industrial	39.278 x1000 sqft	0.74	88%	12%	0.65	14%	86%	29	26	3	26	4	22
4b	RGI	14.69 ac	130	Industrial Park	120.458 x1000 sqft	0.34	81%	19%	0.34	22%	78%	41	33	8	41	9	32
5	RGI	27.88 ac	130	Industrial Park	228.616 x1000 sqft	0.34	81%	19%	0.34	22%	78%	78	63	15	78	17	61
6	RGI	11.93 ac	130	Industrial Park	97.826 x1000 sqft	0.34	81%	19%	0.34	22%	78%	33	27	6	33	7	26
											Total	**466**	**392**	**75**	**442**	**83**	**359**

3.1.1 Trip Distribution and Assignment

Estimated traffic volumes were distributed similarly to the previous TIA (EASL Transportation Consultants Inc, 2018). Percentage of vehicles arriving from and departing to the north, south and west were maintained for consistency in this analysis. There will be no change to the other intersections along 43 Street N corridor since there is no significant net volume change.

Traffic generated by the proposed development was assigned to the roadway network based on the trip distributions used in the previous TIA. The following trip distribution pattern was applied:

- To / from the north on 43 Street N: 11%
- To / from the south on 43 Street N: 83%
- To / from the west on 14 Avenue N: 1%
- To / from the west on 18 Avenue N: 5%

Peak hour development traffic volumes are shown in Figures 4 and 5, for the AM peak hour and PM peak hour, respectively.

Figure 4: AM Peak Hour Development Traffic

Figure 5: PM Peak Hour Development Traffic

4.0 2037 HORIZON ANAYLSIS

4.1 OPERATING CONDITIONS

The intersection analysis in this TIA was undertaken using the Synchro 11 software package, supporting the Highway Capacity Manual 6th Edition (HCM 6th).

The methodology considers the intersection geometry, traffic volumes, posted speed limit, and intersection control for unsignalized intersections. For signalized intersections, the intersection geometry, traffic volumes, posted speed limit, traffic signal phasing/timing plan and pedestrian volumes are all considered.

The average delay for each lane group, as well as the overall intersection; is calculated and computed into a level-of-service (LOS) category. The level-of-service criteria is tabulated below in Table 3 for both unsignalized and signalized intersections.

Table 3: Level of Service Criteria

Level of Service	Average Control Delay (seconds per vehicle)		Comment
	Signalized Intersection	Unsignalized Intersection	
A	10.0 or less	10.0 or less	Very good operation
B	10.1 to 20.0	10.1 to 15.0	Good operation
C	20.1 to 35.0	15.1 to 25.0	Acceptable operation
D	35.1 to 55.0	25.1 to 35.0	Congestion
E	55.1 to 80.0	35.1 to 50.0	Significant congestion
F	More than 80.0	More than 50.0	Unacceptable operation

The volume-to-capacity (v/c) ratio was also considered in the analyses. The v/c ratio represents the percentage of capacity the traffic volumes are consuming. If the v/c ratio is above 1.0, then the movement or intersection has exceeded capacity.

4.2 TRAFFIC VOLUMES

To obtain the total post development 2037 traffic volumes, the 2037 background volumes from the previous TIA (EASL Transportation Consultants Inc, 2018) were extracted from the report. The site generated traffic volumes were added to the 2037 background volumes to obtain the total post-development 2037 traffic volumes. Figure 6 and Figure 7 show the 2037 projected total peak hour traffic volumes in the AM peak hour and PM peak hour, respectively.

Figure 6: Projected Total 2037 AM Peak Hour Traffic Volumes

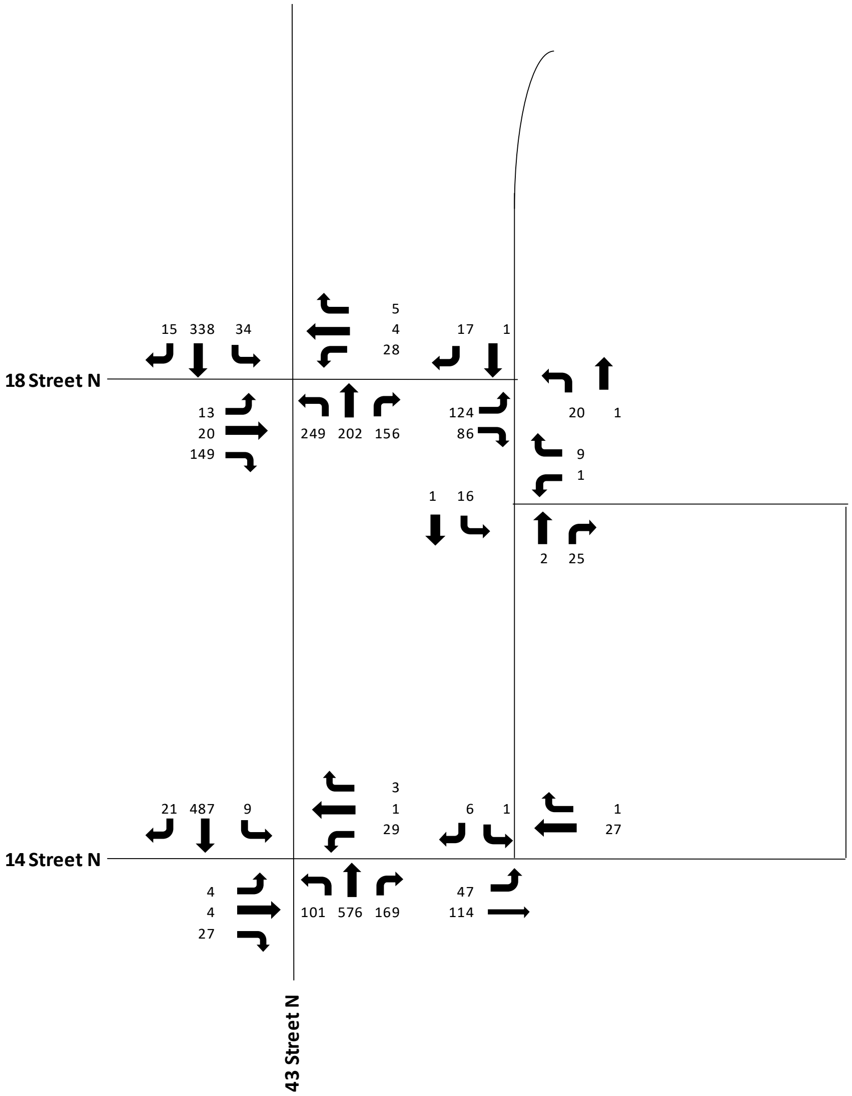
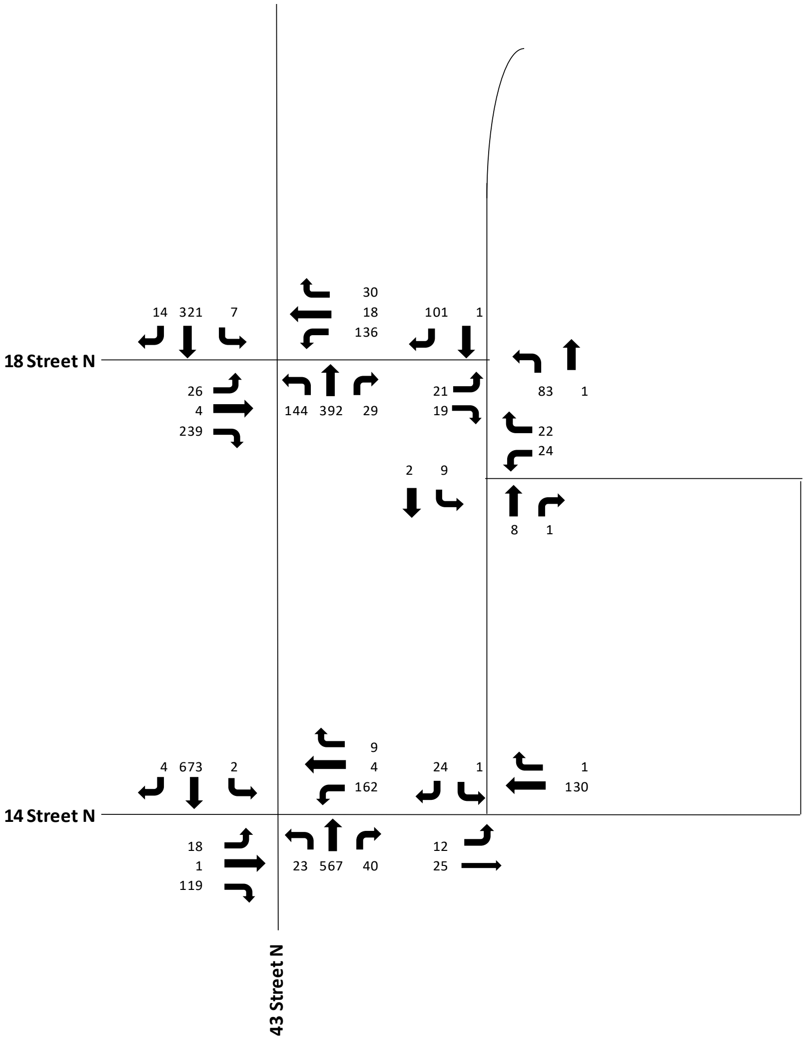


Figure 7: Projected Total 2037 PM Peak Hour Traffic Volumes



4.3 INTERSECTION CAPACITY ANALYSIS

The projected traffic volumes were applied to roadway network, and the intersections were reviewed for both the AM and PM peak hours, based on proposed geometrics, lane conditions and traffic control measures. Traffic signals were added to the intersections of 43 Street N with 18 Street N and 14 Street N based on the analysis of the existing TIA (EASL Transportation Consultants Inc, 2018).

The results of the Synchro analysis are summarized in Table 4 and Table 5 for the AM and PM peak hours, respectively.

Table 4: Analysis Results for 2037 AM Peak Hour Total Traffic Conditions

Intersection	Intersection Control	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
43 Street N / 18 Avenue N	Traffic Signals	Volumes (vph)	13	20	149	28	4	5	249	202	156	34	338	15	B
		Level of Service	B			D			C			A			
		V/C Ratio by Movement	0.59			0.33			0.89			0.42			
		95th Percentile Queue (m)	23.6			14.6			166.1			39.7			
43 Street N / 14 Avenue N	Traffic Signals	Volumes (vph)	4	4	27	29	1	3	101	576	169	9	487	21	B
		Level of Service	B			C			B			A			
		V/C Ratio by Movement	0.21			0.27			0.84			0.44			
		95th Percentile Queue (m)	9.7			9.6			210.7			42.3			
Internal Intersection 1	Stop Controlled	Volumes (vph)	124		86				20	1			1	17	A
		Level of Service	A						A			A			
		V/C Ratio by Movement	0.25						0.01			0.01			
		95th Percentile Queue (m)	7.4						0.3			0			
Internal Intersection 2	Stop Controlled	Volumes (vph)				1		9		2	25	16	1		A
		Level of Service				A			A			A			
		V/C Ratio by Movement				0.01			0.02			0.01			
		95th Percentile Queue (m)				0.2			0			0.3			
Internal Intersection 3	Stop Controlled	Volumes (vph)	47	114			27	1				1		6	A
		Level of Service	A			A						A			
		V/C Ratio by Movement	0.03			0.02						0.01			
		95th Percentile Queue (m)	0.8			0						0.2			

Table 5: Analysis Results for 2037 PM Peak Hour Total Traffic Conditions

Intersection	Intersection Control	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
43 Street N / 18 Avenue N	Traffic Signals	Volumes (vph)	26	4	239	136	18	30	144	392	29	7	321	14	C
		Level of Service	A			D			C			A			
		V/C Ratio by Movement	0.52			0.85			0.92			0.46			
		95th Percentile Queue (m)	19.3			56.8			121.7			38.7			
43 Street N / 14 Avenue N	Traffic Signals	Volumes (vph)	18	1	119	162	4	9	23	567	40	2	673	4	B
		Level of Service	A			C			B			B			
		V/C Ratio by Movement	0.32			0.64			0.73			0.76			
		95th Percentile Queue (m)	12.1			41.1			121.7			133.3			
Internal Intersection 1	Stop Controlled	Volumes (vph)	21		19				83	1			1	101	A
		Level of Service	A						A			A			
		V/C Ratio by Movement	0.06						0.07			0.07			
		95th Percentile Queue (m)	1.4						1.6			0			
Internal Intersection 2	Stop Controlled	Volumes (vph)				24		22		8	1	9	2		A
		Level of Service				A			A			A			
		V/C Ratio by Movement				0.05			0.01			0.01			
		95th Percentile Queue (m)				1.3			0			0.1			
Internal Intersection 3	Stop Controlled	Volumes (vph)	12	25			130	1				1		24	A
		Level of Service	A			A						A			
		V/C Ratio by Movement	0.01			0.09						0.03			
		95th Percentile Queue (m)	0.2			0						0.8			

From the analysis, it appears that the intersection will operate acceptably through the 2037 post-development conditions. Level of service is maintained at LOS D or better for any given movement, v/c ratios are for the most part well below 1.0. Scenarios approaching 1.0 include northbound movements at 43 Street N and 18 Avenue N in the AM and PM peak hours, as well as the westbound movement at that intersection in the PM peak hour. 95th percentiles queue lengths are lengthy for some movements, with the highest being 210 meters for the northbound movement at 43 Street N and 14 Avenue N.. All queue lengths are able to be contained in the respective blocks, with no queues extending to the adjacent intersection.

To reduce queue lengths, a northbound left turn lane was introduced at both 14 Avenue N and 18 Avenue N. These turn lanes were effective in reducing the longer queue lengths by more than 50% in some cases. The results of this Synchro analysis are summarized in Table 6 and Table 7 for the AM and PM peak hours, respectively.

Table 6: Analysis Results for 2037 AM Peak Hour Total Traffic Conditions (Adjusted Geometry)

Intersection	Intersection Control	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
43 Street N / 18 Avenue N	Traffic Signals	Volumes (vph)	13	20	149	28	4	5	249	202	156	34	338	15	A
		Level of Service	A			B			B	A		A			
		V/C Ratio by Movement	0.46			0.15			0.6	0.46		0.52			
		95th Percentile Queue (m)	15.9			9			33.1	26.2		37.6			
43 Street N / 14 Avenue N	Traffic Signals	Volumes (vph)	4	4	27	29	1	3	101	576	169	9	487	21	A
		Level of Service	B			C			A	A		A			
		V/C Ratio by Movement	0.14			0.16			0.19	0.67		0.46			
		95th Percentile Queue (m)	8.7			9.1			8.2	88.6		42.1			

Table 7:Analysis Results for 2037 PM Peak Hour Total Traffic Conditions (Adjusted Geometry)

Intersection	Intersection Control	Measure	Eastbound			Westbound			Northbound			Southbound			Level of Service
			Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
43 Street N / 18 Avenue N	Traffic Signals	Volumes (vph)	26	4	239	136	18	30	144	392	29	7	321	14	B
		Level of Service	A			C			B	B		B			
		V/C Ratio by Movement	0.51			0.69			0.41	0.64		0.53			
		95th Percentile Queue (m)	13.8			35.5			21.5	55.1		42			
43 Street N / 14 Avenue N	Traffic Signals	Volumes (vph)	18	1	119	162	4	9	23	567	40	2	673	4	B
		Level of Service	A			C			A	B		B			
		V/C Ratio by Movement	0.32			0.64			0.07	0.68		0.76			
		95th Percentile Queue (m)	12.1			41.1			4.2	110.9		133.3			

5.0 CONCLUSION

The proposed changes in the development's roadway network appear to have no detrimental effect on the operations at the 43 Street N access points. The recommendations from the previous TIA (EASL Transportation Consultants Inc, 2018) still allow both intersections to operate acceptably. Therefore, this analysis indicates that:

- The two access points at 14 Street N and 18 Street N continue to operate acceptably under the new internal roadway network.
- The two access points at 14 Street N and 18 Street N will require signalization to maintain acceptable operations.
- Both intersections should be monitored periodically for traffic operations. If traffic operations deteriorate, consideration should be given to installing a northbound left turn lane at one or both intersections.
- Internal roadways should operate as two-lane cross sections with a stop-condition on the "T" approach.
- Other recommendations from the previous TIA (EASL Transportation Consultants Inc, 2018) should be preserved:
    - 43 Street N & 26 Avenue N, to mitigate the 2037 background condition:
        - Installation of a traffic signal.
    - 43 Street and Highway 3, to mitigate the 2037 background condition:
        - Installation of a second westbound left turn lane.
        - Installation of a second eastbound left turn lane.
        - Installation of a third westbound through lane.
        - Installation of a third eastbound through lane.
        - Optimization of the traffic signal splits.

APPENDIX A

Synchro Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Volume (vph)	4	4	27	29	1	3	101	576	169	9	487	21
Future Volume (vph)	4	4	27	29	1	3	101	576	169	9	487	21
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.898			0.989			0.973			0.994	
Flt Protected		0.994			0.957			0.994			0.999	
Satd. Flow (prot)	0	1404	0	0	1489	0	0	1522	0	0	1562	0
Flt Permitted		0.953			0.720			0.868			0.985	
Satd. Flow (perm)	0	1346	0	0	1120	0	0	1329	0	0	1540	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			3			33			6	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		131.7			164.3			548.3			495.0	
Travel Time (s)		9.5			11.8			32.9			29.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	5	5	31	33	1	3	115	655	192	10	553	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	0	0	37	0	0	962	0	0	587	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

6: 43 St N & 14 Ave N

AM Peak

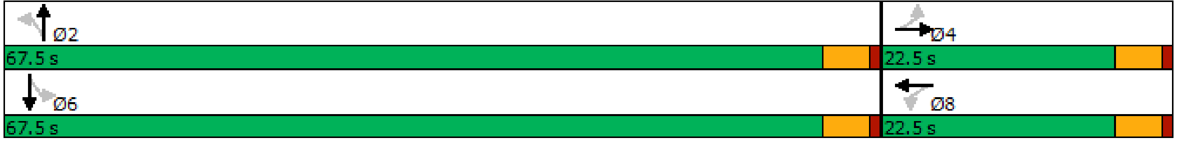
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.5	22.5		22.5	22.5		67.5	67.5		67.5	67.5	
Total Split (%)	25.0%	25.0%		25.0%	25.0%		75.0%	75.0%		75.0%	75.0%	
Maximum Green (s)	18.0	18.0		18.0	18.0		63.0	63.0		63.0	63.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.2			10.2			71.9			71.9	
Actuated g/C Ratio		0.12			0.12			0.86			0.86	
v/c Ratio		0.21			0.27			0.84			0.44	
Control Delay		18.5			34.0			15.8			3.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.5			34.0			15.8			3.9	
LOS		B			C			B			A	
Approach Delay		18.5			34.0			15.8			3.9	
Approach LOS		B			C			B			A	
Queue Length 50th (m)		1.5			5.2			91.2			25.6	
Queue Length 95th (m)		9.7			m9.6			#210.7			42.3	
Internal Link Dist (m)		107.7			140.3			524.3			471.0	
Turn Bay Length (m)												
Base Capacity (vph)		314			244			1150			1328	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.13			0.15			0.84			0.44	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 83.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 12.0 Intersection LOS: B
Intersection Capacity Utilization 99.8% ICU Level of Service F
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: 6: 43 St N & 14 Ave N



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	13	20	149	28	4	5	249	202	156	34	338	15
Future Volume (vph)	13	20	149	28	4	5	249	202	156	34	338	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.890			0.981			0.965			0.995	
Flt Protected		0.996			0.964			0.980			0.996	
Satd. Flow (prot)	0	1395	0	0	1488	0	0	1488	0	0	1559	0
Flt Permitted		0.977			0.541			0.688			0.917	
Satd. Flow (perm)	0	1368	0	0	835	0	0	1045	0	0	1435	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		169			6			46			5	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		143.5			159.4			495.0			516.3	
Travel Time (s)		10.3			11.5			29.7			31.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	15	23	169	32	5	6	283	230	177	39	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	207	0	0	43	0	0	690	0	0	440	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.6	22.6		22.6	22.6		67.4	67.4		67.4	67.4	
Total Split (%)	25.1%	25.1%		25.1%	25.1%		74.9%	74.9%		74.9%	74.9%	
Maximum Green (s)	18.1	18.1		18.1	18.1		62.9	62.9		62.9	62.9	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.6			11.6			55.2			55.2	
Actuated g/C Ratio		0.15			0.15			0.73			0.73	
v/c Ratio		0.59			0.33			0.89			0.42	
Control Delay		16.5			35.7			25.1			5.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		16.5			35.7			25.1			5.5	
LOS		B			D			C			A	
Approach Delay		16.5			35.7			25.1			5.5	
Approach LOS		B			D			C			A	
Queue Length 50th (m)		5.4			5.4			50.5			17.2	
Queue Length 95th (m)		23.6			14.6			#166.1			39.7	
Internal Link Dist (m)		119.5			135.4			471.0			492.3	
Turn Bay Length (m)												
Base Capacity (vph)		462			208			869			1184	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.45			0.21			0.79			0.37	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 76
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 17.9 Intersection LOS: B
Intersection Capacity Utilization 83.2% 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: 3: 43 St N & 18 Ave N

Intersection	
Int Delay, s/veh	9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↰	↱	
Traffic Vol, veh/h	124	86	20	1	1	17
Future Vol, veh/h	124	86	20	1	1	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	141	98	23	1	1	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	58	11	20	0	-	0
Stage 1	11	-	-	-	-	-
Stage 2	47	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	929	1047	1546	-	-	-
Stage 1	991	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	915	1047	1546	-	-	-
Mov Cap-2 Maneuver	915	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	955	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1546	-	965	-	-
HCM Lane V/C Ratio	0.015	-	0.247	-	-
HCM Control Delay (s)	7.4	0	10	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	1	-	-

Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	1	9	2	25	16	1
Future Vol, veh/h	1	9	2	25	16	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	1	10	2	28	18	1

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	53	16	0	0	30	0
Stage 1	16	-	-	-	-	-
Stage 2	37	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	936	1040	-	-	1533	-
Stage 1	986	-	-	-	-	-
Stage 2	965	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	925	1040	-	-	1533	-
Mov Cap-2 Maneuver	925	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	953	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	6.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1027	1533	-
HCM Lane V/C Ratio	-	-	0.011	0.012	-
HCM Control Delay (s)	-	-	8.5	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	47	114	27	1	1	6
Future Vol, veh/h	47	114	27	1	1	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	53	130	31	1	1	7

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	32	0	-	0	268	32
Stage 1	-	-	-	-	32	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	4.2	-	-	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	2.29	-	-	-	3.59	3.39
Pot Cap-1 Maneuver	1530	-	-	-	704	1019
Stage 1	-	-	-	-	970	-
Stage 2	-	-	-	-	785	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1530	-	-	-	678	1019
Mov Cap-2 Maneuver	-	-	-	-	678	-
Stage 1	-	-	-	-	934	-
Stage 2	-	-	-	-	785	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1530	-	-	-	951
HCM Lane V/C Ratio	0.035	-	-	-	0.008
HCM Control Delay (s)	7.4	0	-	-	8.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0

	⤴	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	18	1	119	162	4	9	23	567	40	2	673	4
Future Volume (vph)	18	1	119	162	4	9	23	567	40	2	673	4
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.883			0.993			0.992			0.999	
Flt Protected		0.994			0.956			0.998				
Satd. Flow (prot)	0	1381	0	0	1493	0	0	1558	0	0	1572	0
Flt Permitted		0.949			0.672			0.965			0.999	
Satd. Flow (perm)	0	1318	0	0	1050	0	0	1506	0	0	1570	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		135			5			9			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		131.7			164.3			548.3			495.0	
Travel Time (s)		9.5			11.8			32.9			29.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	20	1	135	184	5	10	26	644	45	2	765	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	0	0	199	0	0	715	0	0	772	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

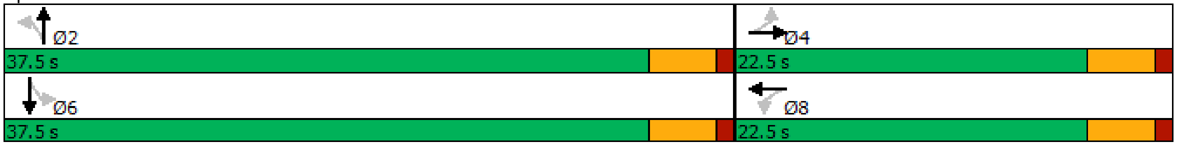
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.5	22.5		22.5	22.5		37.5	37.5		37.5	37.5	
Total Split (%)	37.5%	37.5%		37.5%	37.5%		62.5%	62.5%		62.5%	62.5%	
Maximum Green (s)	18.0	18.0		18.0	18.0		33.0	33.0		33.0	33.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		15.2			15.2			33.4			33.4	
Actuated g/C Ratio		0.29			0.29			0.65			0.65	
v/c Ratio		0.32			0.64			0.73			0.76	
Control Delay		7.0			29.0			17.0			18.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.0			29.0			17.0			18.3	
LOS		A			C			B			B	
Approach Delay		7.0			29.0			17.0			18.3	
Approach LOS		A			C			B			B	
Queue Length 50th (m)		1.6			18.1			54.7			62.0	
Queue Length 95th (m)		12.1			#41.1			#121.7			#133.3	
Internal Link Dist (m)		107.7			140.3			524.3			471.0	
Turn Bay Length (m)												
Base Capacity (vph)		579			397			1004			1044	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.27			0.50			0.71			0.74	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 51.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 78.6% 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: 6: 43 St N & 14 Ave N



Chinook Industrial TIA
3: 43 St N & 18 Ave N

2037 Post-Development
PM Peak

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (vph)	26	4	239	136	18	30	144	392	29	7	321	14
Future Volume (vph)	26	4	239	136	18	30	144	392	29	7	321	14
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.880			0.978			0.993			0.994	
Flt Protected		0.995			0.964			0.987			0.999	
Satd. Flow (prot)	0	1378	0	0	1483	0	0	1542	0	0	1562	0
Flt Permitted		0.956			0.512			0.812			0.989	
Satd. Flow (perm)	0	1324	0	0	788	0	0	1269	0	0	1547	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		272			15			7			6	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		143.5			159.4			495.0			516.3	
Travel Time (s)		10.3			11.5			29.7			31.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	30	5	272	155	20	34	164	445	33	8	365	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	307	0	0	209	0	0	642	0	0	389	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

Chinook Industrial TIA
3: 43 St N & 18 Ave N

2037 Post-Development
PM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	23.0	23.0		23.0	23.0		42.0	42.0		42.0	42.0	
Total Split (%)	35.4%	35.4%		35.4%	35.4%		64.6%	64.6%		64.6%	64.6%	
Maximum Green (s)	18.5	18.5		18.5	18.5		37.5	37.5		37.5	37.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		4.5			4.5			4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		18.2			18.2			33.4			33.4	
Actuated g/C Ratio		0.30			0.30			0.55			0.55	
v/c Ratio		0.52			0.85			0.92			0.46	
Control Delay		7.7			53.9			33.3			9.9	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		7.7			53.9			33.3			9.9	
LOS		A			D			C			A	
Approach Delay		7.7			53.9			33.3			9.9	
Approach LOS		A			D			C			A	
Queue Length 50th (m)		3.1			22.3			58.2			23.1	
Queue Length 95th (m)		19.3			#56.8			#121.7			38.7	
Internal Link Dist (m)		119.5			135.4			471.0			492.3	
Turn Bay Length (m)												
Base Capacity (vph)		597			254			798			973	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.51			0.82			0.80			0.40	

Intersection Summary

Area Type: Other
Cycle Length: 65
Actuated Cycle Length: 60.7
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 25.1 Intersection LOS: C
Intersection Capacity Utilization 96.7% ICU Level of Service F
Analysis Period (min) 15

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

Splits and Phases: 3: 43 St N & 18 Ave N

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↰	↱	
Traffic Vol, veh/h	21	19	83	1	1	101
Future Vol, veh/h	21	19	83	1	1	101
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	24	22	94	1	1	115

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	248	59	116	0	-	0
Stage 1	59	-	-	-	-	-
Stage 2	189	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	723	985	1424	-	-	-
Stage 1	944	-	-	-	-	-
Stage 2	824	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	675	985	1424	-	-	-
Mov Cap-2 Maneuver	675	-	-	-	-	-
Stage 1	882	-	-	-	-	-
Stage 2	824	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	9.8		7.6		0	
HCM LOS	A					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1424	-	794	-	-
HCM Lane V/C Ratio	0.066	-	0.057	-	-
HCM Control Delay (s)	7.7	0	9.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

Intersection	
Int Delay, s/veh	7.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↑↱			↰↑
Traffic Vol, veh/h	24	22	8	1	9	2
Future Vol, veh/h	24	22	8	1	9	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	27	25	9	1	10	2

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	32	10	0	0	10	0
Stage 1	10	-	-	-	-	-
Stage 2	22	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	962	1048	-	-	1559	-
Stage 1	993	-	-	-	-	-
Stage 2	980	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	956	1048	-	-	1559	-
Mov Cap-2 Maneuver	956	-	-	-	-	-
Stage 1	993	-	-	-	-	-
Stage 2	974	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	998	1559	-
HCM Lane V/C Ratio	-	-	0.052	0.007	-
HCM Control Delay (s)	-	-	8.8	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

8: 14 Ave N & 44 St N

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	12	25	130	1	1	24
Future Vol, veh/h	12	25	130	1	1	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	14	28	148	1	1	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	149	0	-	0	205	149
Stage 1	-	-	-	-	149	-
Stage 2	-	-	-	-	56	-
Critical Hdwy	4.2	-	-	-	6.5	6.3
Critical Hdwy Stg 1	-	-	-	-	5.5	-
Critical Hdwy Stg 2	-	-	-	-	5.5	-
Follow-up Hdwy	2.29	-	-	-	3.59	3.39
Pot Cap-1 Maneuver	1385	-	-	-	766	877
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	947	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1385	-	-	-	758	877
Mov Cap-2 Maneuver	-	-	-	-	758	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	947	-

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1385	-	-	-	872
HCM Lane V/C Ratio	0.01	-	-	-	0.033
HCM Control Delay (s)	7.6	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Traffic Volume (vph)	4	4	27	29	1	3	101	576	169	9	487	21
Future Volume (vph)	4	4	27	29	1	3	101	576	169	9	487	21
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.898			0.989			0.966			0.994	
Flt Protected		0.994			0.957		0.950				0.999	
Satd. Flow (prot)	0	1404	0	0	1489	0	1495	1520	0	0	1562	0
Flt Permitted		0.950			0.742		0.473				0.988	
Satd. Flow (perm)	0	1342	0	0	1154	0	744	1520	0	0	1545	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			3			39			6	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		131.7			164.3			548.3			495.0	
Travel Time (s)		9.5			11.8			32.9			29.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	5	5	31	33	1	3	115	655	192	10	553	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	0	0	37	0	115	847	0	0	587	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.5	22.5		22.5	22.5		57.5	57.5		57.5	57.5	
Total Split (%)	28.1%	28.1%		28.1%	28.1%		71.9%	71.9%		71.9%	71.9%	
Maximum Green (s)	18.0	18.0		18.0	18.0		53.0	53.0		53.0	53.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.7			10.7		45.8	45.8			45.8	
Actuated g/C Ratio		0.19			0.19		0.83	0.83			0.83	
v/c Ratio		0.14			0.16		0.19	0.67			0.46	
Control Delay		14.8			26.5		3.8	8.2			4.9	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		14.8			26.5		3.8	8.2			4.9	
LOS		B			C		A	A			A	
Approach Delay		14.8			26.5			7.7			4.9	
Approach LOS		B			C			A			A	
Queue Length 50th (m)		1.0			3.4		3.7	49.1			25.6	
Queue Length 95th (m)		8.7			m9.1		8.2	88.6			42.1	
Internal Link Dist (m)		107.7			140.3			524.3			471.0	
Turn Bay Length (m)							50.0					
Base Capacity (vph)		485			401		657	1347			1365	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.08			0.09		0.18	0.63			0.43	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 55.5
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.67
Intersection Signal Delay: 7.3 Intersection LOS: A
Intersection Capacity Utilization 88.4% ICU Level of Service E
Analysis Period (min) 15

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

Splits and Phases: 6: 43 St N & 14 Ave N

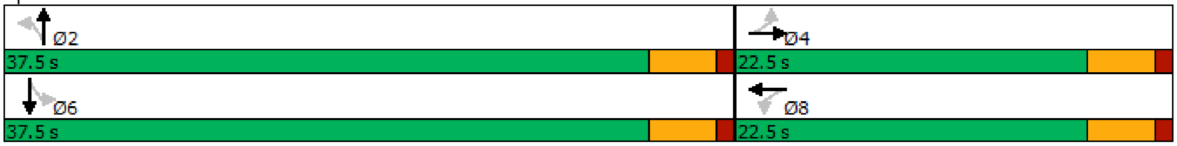
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Traffic Volume (vph)	13	20	149	28	4	5	249	202	156	34	338	15
Future Volume (vph)	13	20	149	28	4	5	249	202	156	34	338	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.890			0.981			0.935			0.995	
Flt Protected		0.996			0.964		0.950				0.996	
Satd. Flow (prot)	0	1395	0	0	1488	0	1495	1471	0	0	1559	0
Flt Permitted		0.979			0.806		0.527				0.947	
Satd. Flow (perm)	0	1371	0	0	1244	0	829	1471	0	0	1482	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		169			6			103			5	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		143.5			159.4			495.0			516.3	
Travel Time (s)		10.3			11.5			29.7			31.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	15	23	169	32	5	6	283	230	177	39	384	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	207	0	0	43	0	283	407	0	0	440	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.5	22.5		22.5	22.5		37.5	37.5		37.5	37.5	
Total Split (%)	37.5%	37.5%		37.5%	37.5%		62.5%	62.5%		62.5%	62.5%	
Maximum Green (s)	18.0	18.0		18.0	18.0		33.0	33.0		33.0	33.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.7			10.7		26.0	26.0			26.0	
Actuated g/C Ratio		0.23			0.23		0.57	0.57			0.57	
v/c Ratio		0.46			0.15		0.60	0.46			0.52	
Control Delay		8.7			14.7		13.3	6.3			8.9	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		8.7			14.7		13.3	6.3			8.9	
LOS		A			B		B	A			A	
Approach Delay		8.7			14.7			9.2			8.9	
Approach LOS		A			B			A			A	
Queue Length 50th (m)		1.9			1.9		11.8	10.6			17.0	
Queue Length 95th (m)		15.9			9.0		33.1	26.2			37.6	
Internal Link Dist (m)		119.5			135.4			471.0			492.3	
Turn Bay Length (m)							50.0					
Base Capacity (vph)		649			501		607	1106			1087	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.32			0.09		0.47	0.37			0.40	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 45.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 9.2 Intersection LOS: A
Intersection Capacity Utilization 68.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: 43 St N & 18 Ave N



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Traffic Volume (vph)	18	1	119	162	4	9	23	567	40	2	673	4
Future Volume (vph)	18	1	119	162	4	9	23	567	40	2	673	4
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.883			0.993			0.990			0.999	
Flt Protected		0.994			0.956		0.950					
Satd. Flow (prot)	0	1381	0	0	1493	0	1495	1558	0	0	1572	0
Flt Permitted		0.949			0.672		0.352				0.999	
Satd. Flow (perm)	0	1318	0	0	1050	0	554	1558	0	0	1570	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		135			5			9			1	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		131.7			164.3			548.3			495.0	
Travel Time (s)		9.5			11.8			32.9			29.7	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	20	1	135	184	5	10	26	644	45	2	765	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	0	0	199	0	26	689	0	0	772	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

6: 43 St N & 14 Ave N

PM Peak

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	22.5	22.5		22.5	22.5		37.5	37.5		37.5	37.5	
Total Split (%)	37.5%	37.5%		37.5%	37.5%		62.5%	62.5%		62.5%	62.5%	
Maximum Green (s)	18.0	18.0		18.0	18.0		33.0	33.0		33.0	33.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		15.2			15.2		33.4	33.4			33.4	
Actuated g/C Ratio		0.29			0.29		0.65	0.65			0.65	
v/c Ratio		0.32			0.64		0.07	0.68			0.76	
Control Delay		7.0			29.0		7.0	14.8			18.3	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		7.0			29.0		7.0	14.8			18.3	
LOS		A			C		A	B			B	
Approach Delay		7.0			29.0			14.5			18.3	
Approach LOS		A			C			B			B	
Queue Length 50th (m)		1.6			18.1		1.1	49.5			62.0	
Queue Length 95th (m)		12.1			#41.1		4.2	#110.9			#133.3	
Internal Link Dist (m)		107.7			140.3			524.3			471.0	
Turn Bay Length (m)							50.0					
Base Capacity (vph)		579			397		368	1038			1044	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.27			0.50		0.07	0.66			0.74	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 51.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.76

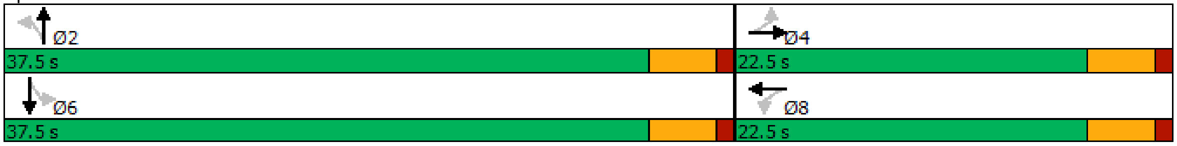
Intersection Signal Delay: 17.0 Intersection LOS: B

Intersection Capacity Utilization 65.2% 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: 6: 43 St N & 14 Ave N



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Traffic Volume (vph)	26	4	239	136	18	30	144	392	29	7	321	14
Future Volume (vph)	26	4	239	136	18	30	144	392	29	7	321	14
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Width (m)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Storage Length (m)	0.0		0.0	0.0		0.0	50.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.6			7.6			7.6			7.6		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.880			0.978			0.990			0.994	
Flt Protected		0.995			0.964		0.950				0.999	
Satd. Flow (prot)	0	1378	0	0	1483	0	1495	1558	0	0	1562	0
Flt Permitted		0.955			0.583		0.534				0.990	
Satd. Flow (perm)	0	1322	0	0	897	0	840	1558	0	0	1548	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		272			22			10			6	
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		143.5			159.4			495.0			516.3	
Travel Time (s)		10.3			11.5			29.7			31.0	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Adj. Flow (vph)	30	5	272	155	20	34	164	445	33	8	365	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	307	0	0	209	0	164	478	0	0	389	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.5			3.5	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.9			4.9			4.9			4.9	
Two way Left Turn Lane												
Headway Factor	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (m)	6.1	30.5		6.1	30.5		6.1	30.5		6.1	30.5	
Trailing Detector (m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Position(m)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Size(m)	6.1	1.8		6.1	1.8		6.1	1.8		6.1	1.8	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(m)		28.7			28.7			28.7			28.7	
Detector 2 Size(m)		1.8			1.8			1.8			1.8	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	

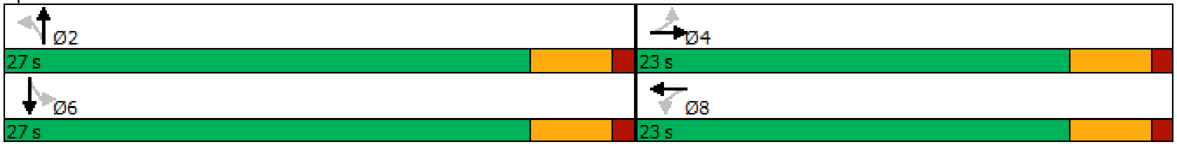
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		20.0	20.0		20.0	20.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		24.5	24.5		24.5	24.5	
Total Split (s)	23.0	23.0		23.0	23.0		27.0	27.0		27.0	27.0	
Total Split (%)	46.0%	46.0%		46.0%	46.0%		54.0%	54.0%		54.0%	54.0%	
Maximum Green (s)	18.5	18.5		18.5	18.5		22.5	22.5		22.5	22.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5			4.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		14.2			14.2		21.1	21.1			21.1	
Actuated g/C Ratio		0.32			0.32		0.48	0.48			0.48	
v/c Ratio		0.51			0.69		0.41	0.64			0.53	
Control Delay		6.0			25.9		12.8	14.6			12.2	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		6.0			25.9		12.8	14.6			12.2	
LOS		A			C		B	B			B	
Approach Delay		6.0			25.9			14.1			12.2	
Approach LOS		A			C			B			B	
Queue Length 50th (m)		1.8			11.5		7.4	24.4			18.5	
Queue Length 95th (m)		13.8			#35.5		21.5	55.1			42.0	
Internal Link Dist (m)		119.5			135.4			471.0			492.3	
Turn Bay Length (m)							50.0					
Base Capacity (vph)		714			390		430	803			796	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.43			0.54		0.38	0.60			0.49	

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 44.4
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 88.0% 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: 3: 43 St N & 18 Ave N



APPENDIX B

Existing TIA

A Traffic Impact Assessment (TIA) Report

For

CHINOOK INDUSTRIAL PARK AREA STRUCTURE PLAN DEVELOPMENT

Lethbridge, Alberta

Prepared for

Hasegawa Consulting Professional Engineers

November 3, 2017
1st Revision: April 9, 2018
2nd Revision: September 6, 2018
3rd Revision: October 10, 2018

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1.0 INTRODUCTION

1.1 General

Hasegawa Consulting Professional Engineers retained EASL Transportation Consultants, Inc. to undertake a traffic impact assessment (TIA) in support of the proposed Chinook Industrial Park Development to be located within Quarter Sections SW 1/4-10-9-21-4 and NW 1/4-10-9-21-4 in Lethbridge County, Alberta. This traffic impact assessment is being prepared to assess potential transportation impacts of the proposed development and to satisfy Lethbridge County's and City of Lethbridge's requirements for such a study as a result of the proposed development. **Figure 1a** presents a site map that shows the general location of the proposed development, and **Figure 1b** presents a local context aerial map. The proposed development is defined by the following boundaries:

- 43 Street N to the west;
- Greenfield to the east;
- Township Road 92 to the north; and
- 9 Avenue N to the south.

1.2 Existing Land Use

The southern portion of project area located at the northeastern corner of 43 Street / 9 Avenue N intersection is occupied by the currently operating Southland International Truck Facility. The remaining portion of the land to the north is a Greenfield unoccupied area.

1.3 Proposed Development Plan

The proposed Chinook Industrial Park Development site will consist of the following:

1. **Phase 1:** will be located within the existing Southland International Truck Facility and will include 18.56 acres of General Light Industrial land use and 18.62 acres of Business Park land use. Phase 1 will be completed after 2 years from today.
2. **Phases 2 to 5:** will be located within the Greenfield area north of the existing Southland International Truck Facility and will consist of 95.17 acres of General Light Industrial land use and 40.66 acres of Business Park land use. Phase 2 will be completed within 5 years from today.

The proposed project development site plan and internal roadway plan are included in **Appendix A** of this report.

1.4 Purpose of Study

The primary purposes of this traffic impact assessment study are:

- To evaluate the traffic operations and levels of service (LOS) at the following intersections:

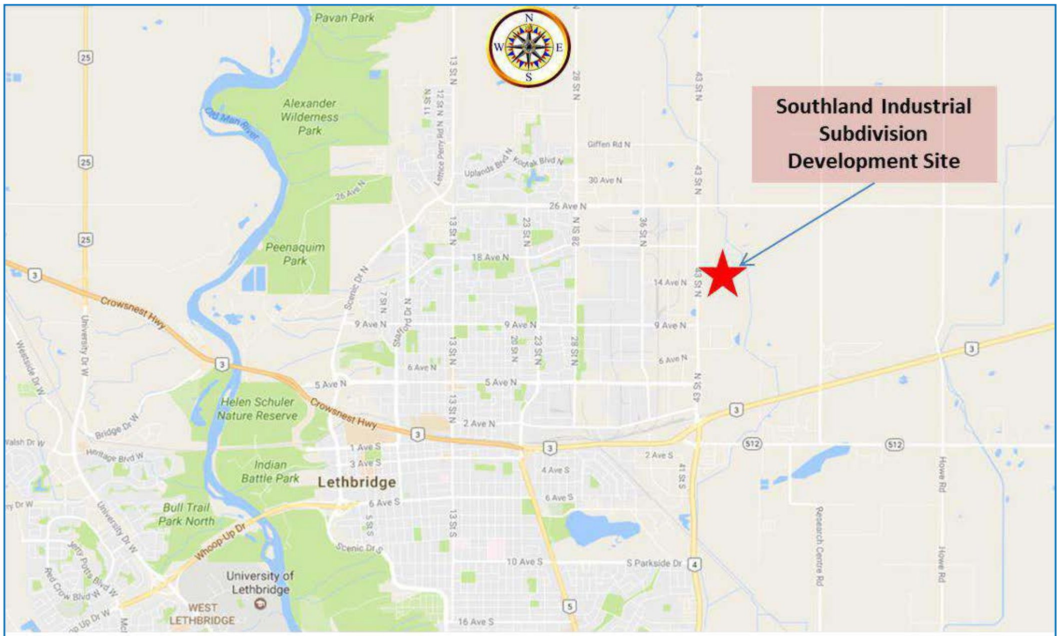

Figure 1a: Site Location Map

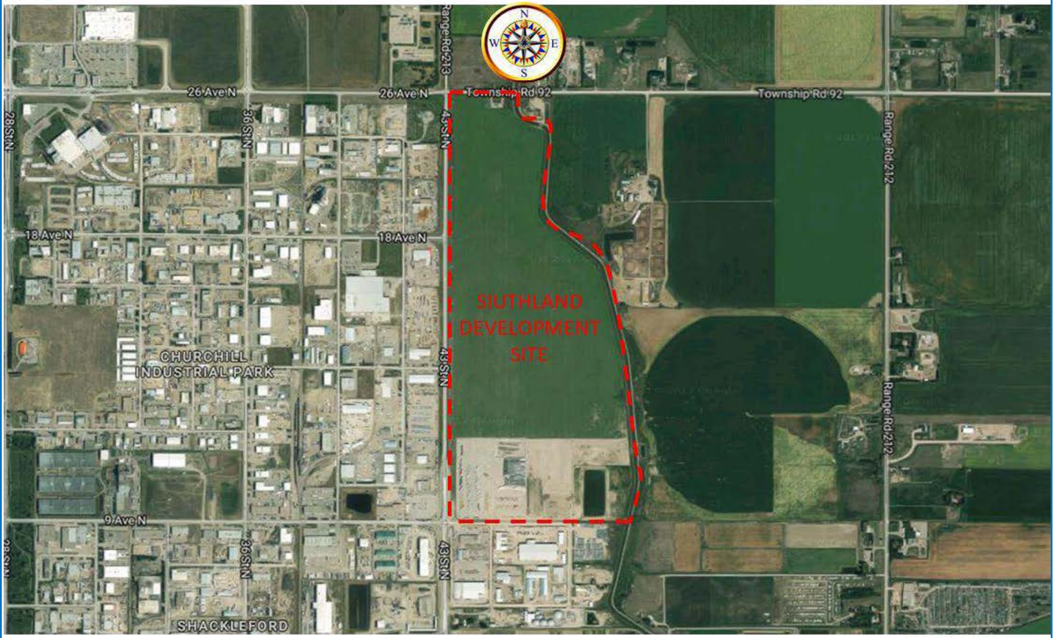

Figure 1b: Local Context Aerial Map

    - 43 Street North and 26 Avenue North intersection (Unsignalized);
    - 43 Street North and 18 Avenue North intersection (Unsignalized);
    - 43 Street North and 14 Avenue North intersection (Unsignalized);
    - 43 Street North and 9 Avenue North intersection (Signalized);
    - 43 Street North and 5 Avenue North intersection (Signalized); and
    - Highway 3 / Crowsnest Highway and 43 Street North intersection (signalized).

- To evaluate any potential project traffic impacts of the proposed development to the surrounding roadway network, and to determine if the roadways, site access and traffic circulations in the project vicinities would be suitable for the intended development and the amount of development traffic volumes anticipated.
- To identify suitable intersection control and geometric configurations that would be required to properly service the proposed development including conducting a signal warrant analyses for any of the study unsignalized intersections, as needed.
- Also, to identify any needed short-term and long-term roadway improvements in the areas to enable acceptable traffic operations that would satisfy both the Lethbridge County and the City of Lethbridge requirements.

1.5 Methodologies

This traffic impact assessment utilizes the following evaluation methodologies:

- Data collection including but not limited to existing roadway and intersection geometric characteristic, pavement markings, traffic control types, and intersection turning movement traffic counts.
- The forecast of background peak hour traffic volumes without the site traffic for the 2, 5 and 20-year horizons (2019, 2022 and 2037).
- Trip generation estimate for the proposed development based on appropriate ***Trip Generation*** land use categories and corresponding trip generation rates by the Institute of Transportation Engineers (ITE).
- Distribution of the site generated trips to/from the development site based on population, land uses, roadway network, and existing traffic patterns in the project vicinities.
- Assignment of the project trips to the adjacent roadways based on the proposed project site plan and the estimated roadway trip distribution characteristics.
- Existing, background, and future traffic capacity analysis for the study area intersections and roadways to identify possible capacity constraints and to assess overall traffic impacts of the proposed development, which is based on the ***latest Highway Capacity Manual (HCM)*** methodologies by the Transportation Research Board, the US National Academies of Sciences, Engineering and Medicine.

2.0 EXISTING CONDITIONS

2.1 Area Road Network

The existing transportation system within the vicinity of the proposed project site consists of the following roadways:

43 Street North is within the City of Lethbridge limits and represent the borderline between the City of Lethbridge and Lethbridge County. 43 Street N is a paved arterial two-lane two-way roadway north of 9 Avenue N and a divided 4-lane roadway with two lanes per direction south of 9 Avenue N. 43 Street North is classified as a dangerous goods route with a posted speed limit of 70 km/h. Based on the City of Lethbridge 2016 Traffic Flow Map, the daily traffic volumes on 43 Street N in the vicinity of 9 Avenue N is 8,300 vehicles per day and north of 26 Avenue N is 800 vehicles per day.

26 Avenue North / Township Road 92: 26 Avenue N, to the west of 43 Street N is within the City of Lethbridge limits and is a two-lane two-way paved roadway with a posted speed limit of 60km/h. The existing daily traffic volume on 26 Avenue North is 4,800 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map. This road’s name changes to Township Road 92 to the east of 43 Street N and becomes under the jurisdiction of Lethbridge County.

18 Avenue North is within the City of Lethbridge limits and is a two-lane two-way paved industrial collector road with a posted speed limit of 50km/h. The existing daily traffic volume on 18 Avenue N is 3.900 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map.

14 Avenue North is within the City of Lethbridge limits and is a two-lane two-way paved roadway paved industrial collector road with a posted speed limit of 50km/h. The existing daily traffic volumes on 14 Avenue North is 1,200 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map.

9 Avenue North west of 43 Street N is within the City of Lethbridge limits and is a paved two-lane two-way industrial collector roadway with allowed parallel parking on both sides of the road. However, 9 Avenue N east of 43 Street N is within the Lethbridge County limits and is a two-lane two-way gravel roadway. The posted speed limit is 50km/h. Access to the existing Southland International Truck Facility as well as the Phase 1 of the proposed development will be off 9 Avenue N at 44 Street North. The existing daily traffic volume on 9 Avenue N west of 43 Street N is 4,400 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map.

5 Avenue North is within the City of Lethbridge limits and is a paved four lane divided roadway with a posted speed limit of 60km/h. The existing daily traffic volume on 5 Avenue N just west of 43 Street N is 4,200 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map.

Highway 3 (Crowsnest Highway) is a provincial paved and divided four lane highway with a posted speed limit of 80 Km/h in the vicinity of 43 Street. The existing daily traffic volume on

Highway 3 west of 43 Street N is 25,100 vehicles per day based on the City of Lethbridge 2016 Traffic Flow Map.

2.2 Existing Intersection Conditions

All study area intersections are located along 43 Street North with the northern three intersections at 26 Avenue N, 18 Avenue N, and 14 Avenue N currently unsignalized and controlled by stop signs on the east/west intersecting roads. The remaining three study intersections located at 9 Avenue N, 5 Avenue N, and Highway 3 (Crowsnest Hwy) are signalized intersections. **Figure 2a** has been prepared to present the lane configurations, the channelized movements and the control types at each of the study area intersections.

2.3 Existing Traffic Volumes and Conditions

A field reconnaissance of the site and its surroundings was conducted to establish a database of the existing conditions. The peak period for the proposed Chinook Industrial Park Development would typically occur during the weekday morning and the late afternoon periods.

Turning movement traffic count data were collected by Hasegawa Engineering on March 14, 2017 and March 16, 2017 from 7:00 AM to 9:00 AM, and from 4:00 PM to 6:00 PM at the following four study intersections:

- 43 Street North and 18 Avenue North intersection
- 43 Street North and 14 Avenue North intersection
- 43 Street North and 9 Avenue North intersection
- 43 Street North and 5 Avenue North intersection

The City of Lethbridge's 2016 traffic counts were obtained for the intersection of:

- 43 Street North and 26 Avenue North

Also, Alberta Transportation's 2016 traffic count data has been utilized to represent the existing traffic volumes for the intersection of:

- Highway 3/Crowsnest Highway and 43 Street

Analysis of the 15-minute turning movement traffic count data at study intersections indicated that the AM peak hour of traffic occurs between 7:15 AM and 8:15 AM; and the PM peak hour of traffic occurs between 4:15 PM and 5:15 PM. The existing AM and PM peak-hour traffic volumes for all study intersections are illustrated on **Figure 2b**. Details of the collected traffic count data as well as the City of Lethbridge and Alberta Transportation 2016 traffic count data are contained in **Appendix B**.

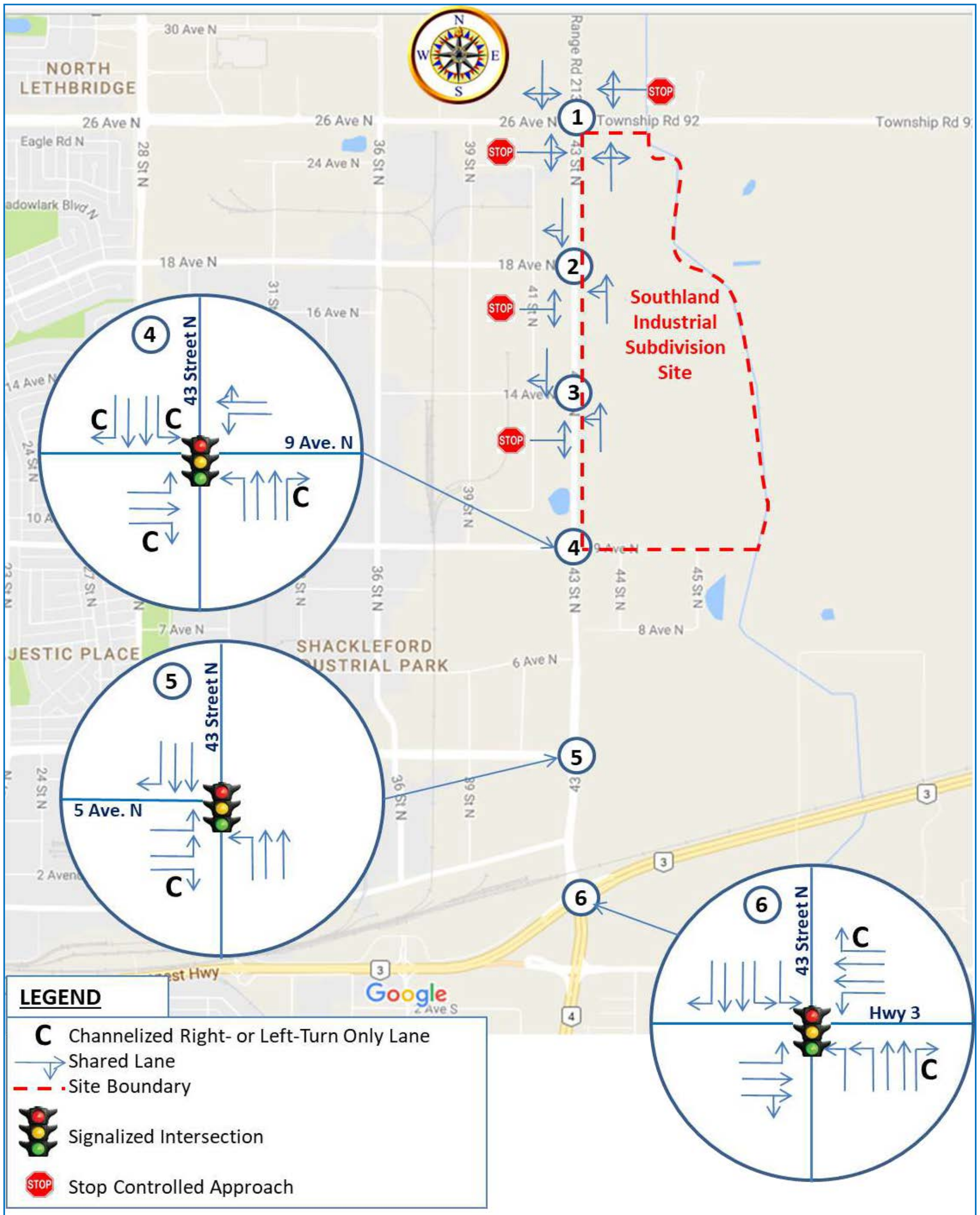

Figure 2a: Existing Study Area Intersection Lane Configuration and Control Types

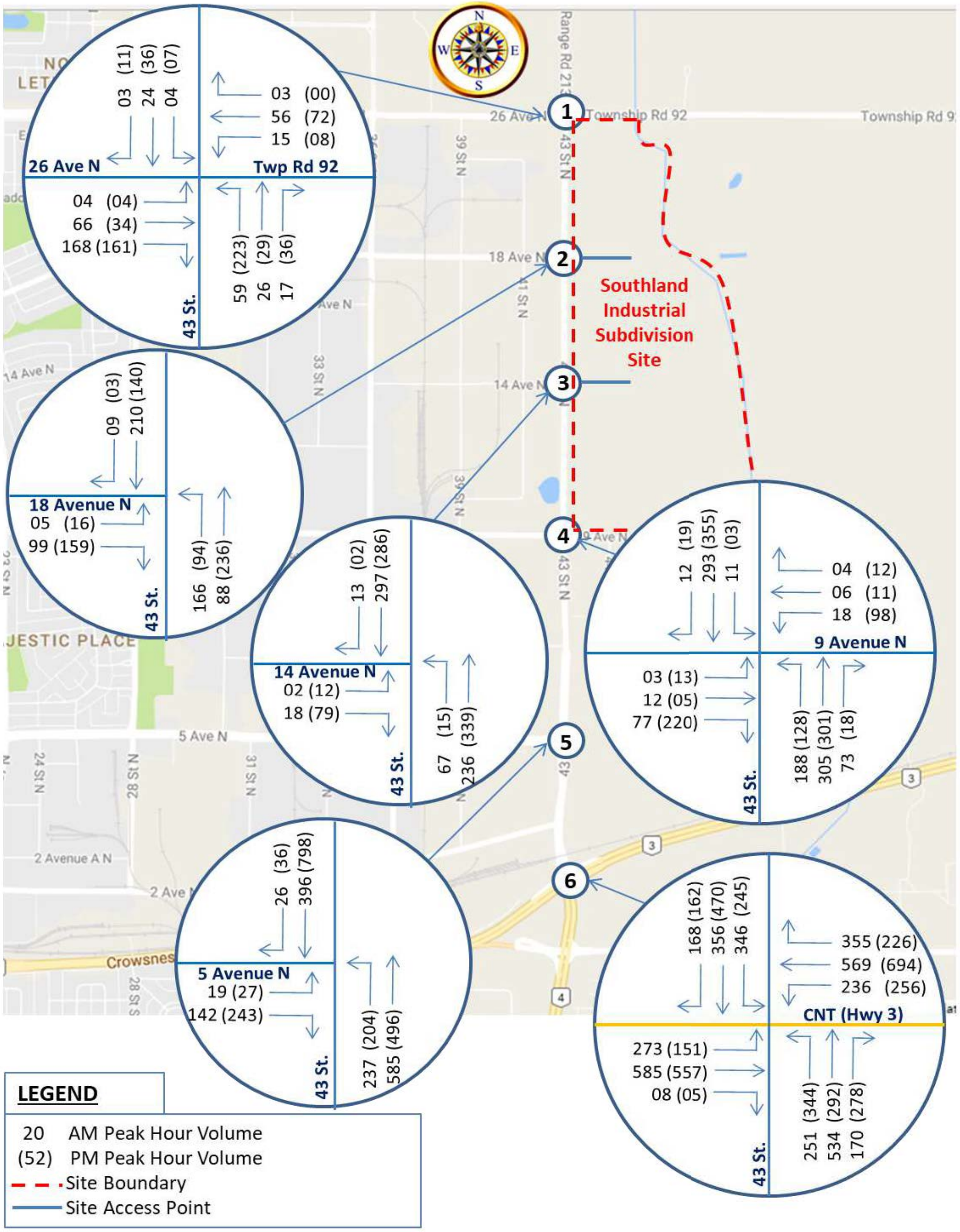

Figure 2b: Existing 2017 Peak Hour Traffic Volumes

2.4 Existing Heavy Vehicle Composition

The turning movement traffic count completed for the study intersections as well as the traffic count data obtained from the City of Lethbridge / Alberta Transportation were analyzed and the heavy vehicle percentages were determined at all study intersections. The AM peak hour and the PM peak hour heavy vehicle compositions were determined and are presented in Table 1. Note that heavy vehicle traffic volume considered included trucks, multi-axle vehicles, city buses and school buses.

Table 1: Adjacent Highway Heavy Vehicle Composition (in %)

Intersection Name	Peak Hour Period	2016 / 2017 Traffic Count Data			
		EB	WB	NB	SB
43 Street North and 26 Avenue	**AM and PM**	4%	4%	7%	16%
43 Street North and 18 Avenue North	**AM**	12%	-	10%	3%
	PM	9%	-	9%	8%
43 Street North and 14 Avenue North	**AM**	55%	-	10%	6%
	PM	3%	-	9%	10%
43 Street North and 9 Avenue North	**AM**	3%	36%	9%	9%
	PM	6%	2%	13%	7%
43 Street North and 5 Avenue North	**AM**	12%	-	6%	16%
	PM	7%	-	12%	6%
Highway 3 / Crowsnest Highway 43 Street North	**AM**	10.7%	8.7%	9.7%	14.8%
	PM	9.5%	6.3%	6.7%	11.2%

Based on the above results, the capacity analysis for study intersections utilized the observed heavy vehicle percentages as noted in Table 1. However, for new approaches, a heavy vehicle percentage of **10%** was utilized in the capacity analysis software for that approach as per the City of Lethbridge TIA standards.

2.5 Planned Roadway Improvements

City of Lethbridge has been contacted in order to find out if there are any plans for any roadway improvements within the study area in the near future. The City of Lethbridge development planning staff indicated that 43 Street N, north of 9 Avenue will be upgraded to 4-lane roadway in the future. However, the City of Lethbridge further confirmed that 43 Street N north of 9 Ave N is not anticipated to be twinned by 2037, which is the future horizon design year for this TIA. Therefore, existing layout will be considered in the analysis and needed improvements will be recommended. Additionally, the ***2006 Functional Planning Study completed by Stantec***(1) for Highways 3 & 4 in Lethbridge area proposes / recommends new alignments for these highways that would provide external links allowing external traffic to by-pass the City and hence reducing Crowsnest Highway traffic within Lethbridge.

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(1) http://www.transportation.alberta.ca/projects/assets/Area_8_South/Hwy%203%20Lethbridge/Executive_Summary.pdf

3.0 PROJECTED TRAFFIC VOLUMES

3.1 Trip Generation for Background Developments

Background traffic takes into account additional traffic on the roadway systems that will be generated by approved developments in the area that may be completed by the time of the site build-out. The current project is projected to be built-out in the near term. Based on EASL Transportation Consultants' discussion with the City of Lethbridge, there is one approved development, Cavendish Farms within the vicinity of the project site that must be considered. The AM and PM peak hour traffic volumes generated by this background development and would impact the current study area intersections were obtained from the City of Lethbridge and are presented on **Figure 3**. A copy of the original City of Lethbridge's traffic volumes generated by Cavendish Farms is contained in **Appendix B**.

3.2 Historical Traffic Growth Rate

To account for inherited growth in traffic and the traffic generated by other unknown developments that may occur at the build-out of the proposed project, a traffic growth factor was applied to the existing traffic volumes to forecast the future traffic conditions. A 2.5% annual growth rate was used to estimate traffic growth for the 2-year, 5-year and 20-year horizons. This 2.5% growth rate was applied to the 2017 existing traffic volumes to derive the 2019, 2022, and 2037 background growth traffic volumes to be used to estimate the total background traffic volumes. Note that the 2.5% annual growth rate is in accordance with the City of Lethbridge / Lethbridge County acceptable medium to long range growth standards. The background growth traffic volumes for the years 2019, 2022, and 2037 are illustrated on **Figures 4, 5,** and **6**, respectively.

3.3 Background Traffic

The Cavendish Farms Background traffic volumes presented on Figure 3 were added to the traffic growth due to unknown developments (Figures 4, 5 and 6) then added to the existing 2017 peak hour traffic volumes shown on Figure 2, creating the 2019, 2022 and 2037 background traffic scenario (without site volumes) as illustrated on **Figures 7, 8 and 9.**

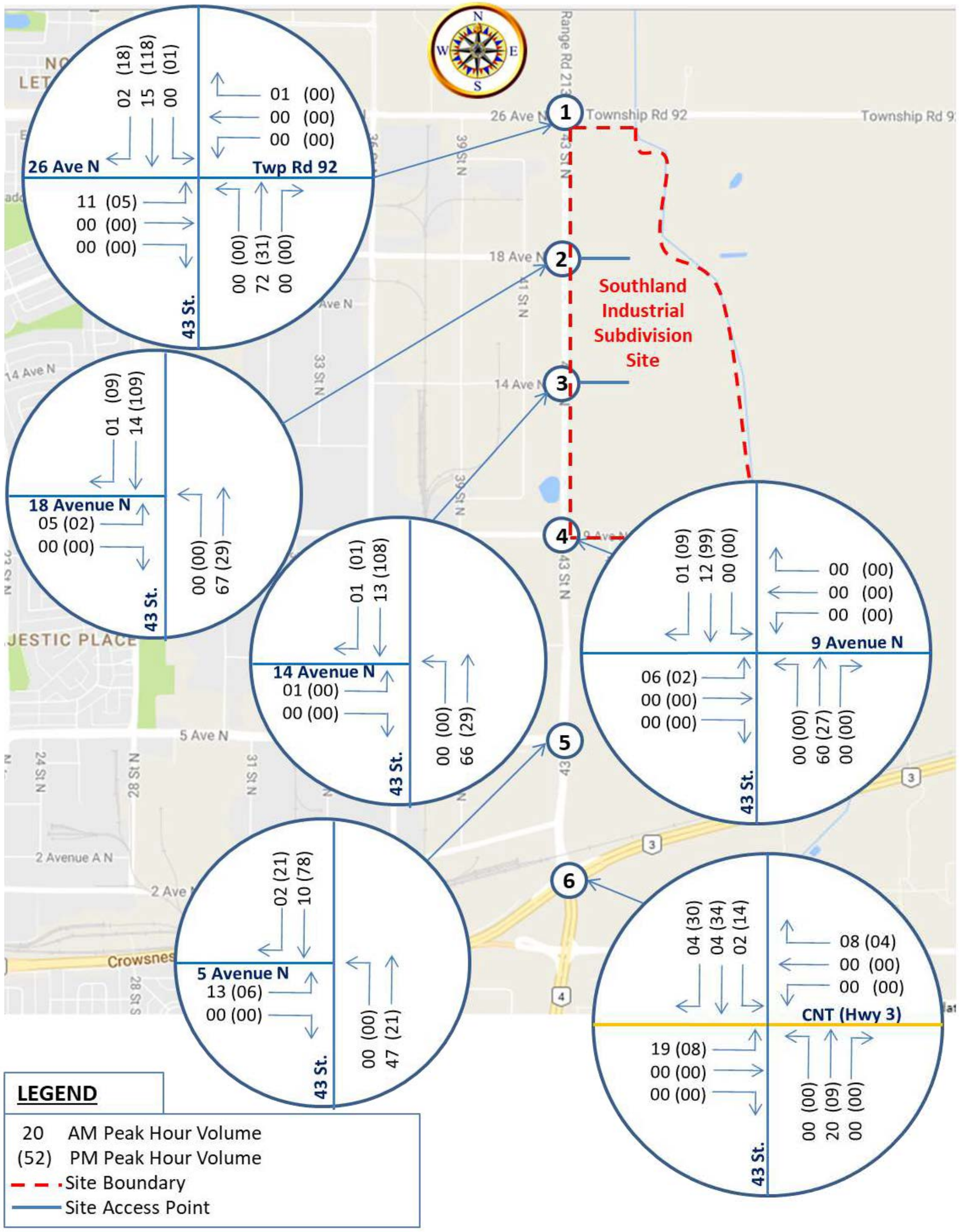


Figure 3: Known Background (Cavendish) Peak Hour Traffic Volumes

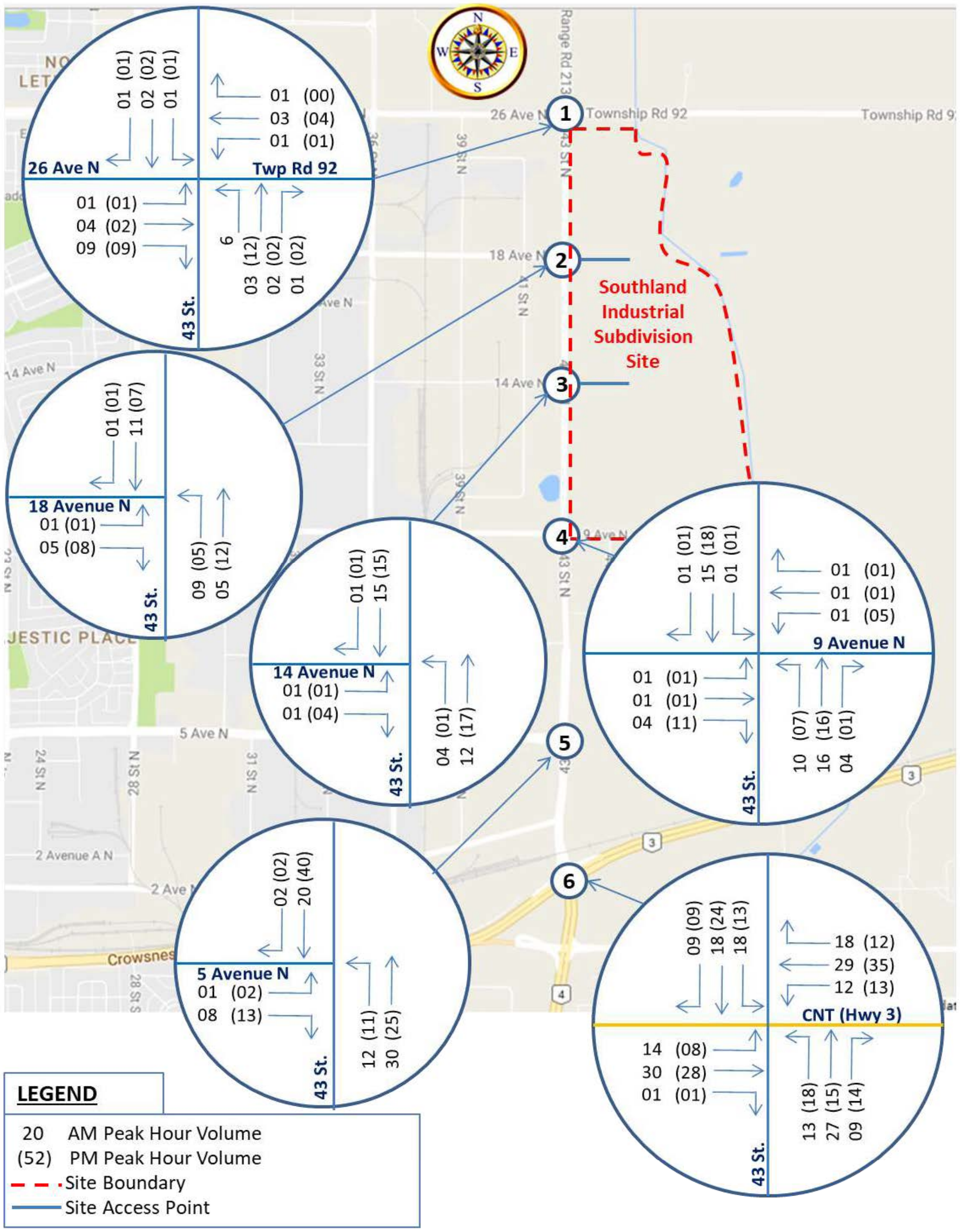


Figure 4: Background 2019 Growth Peak Hour Traffic Volumes
(2.5% Growth Rate Applied for 2 Years on Existing)

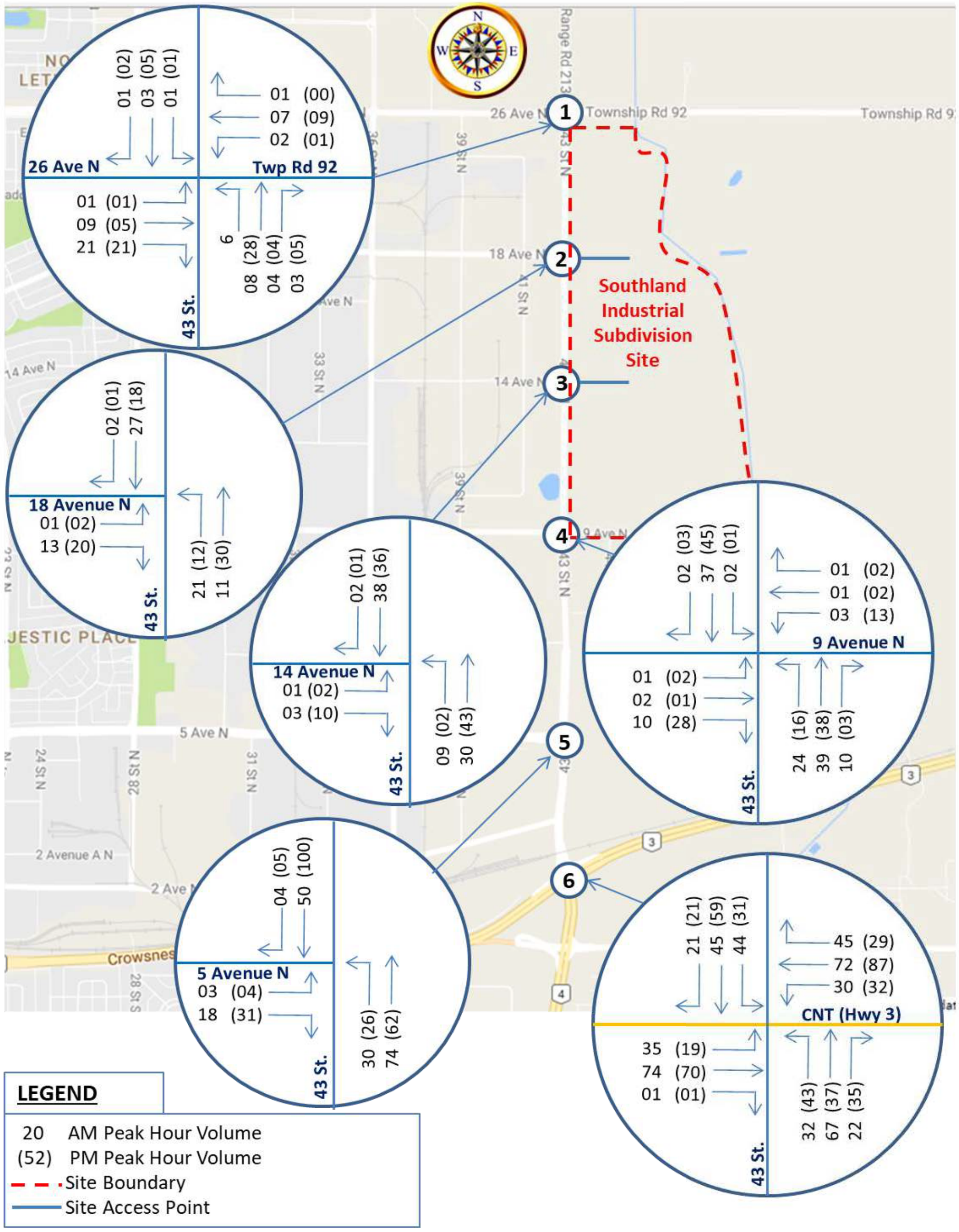


Figure 5: Background 2022 Growth Peak Hour Traffic Volumes
(2.5% Growth Rate Applied for 5 Years on Existing)

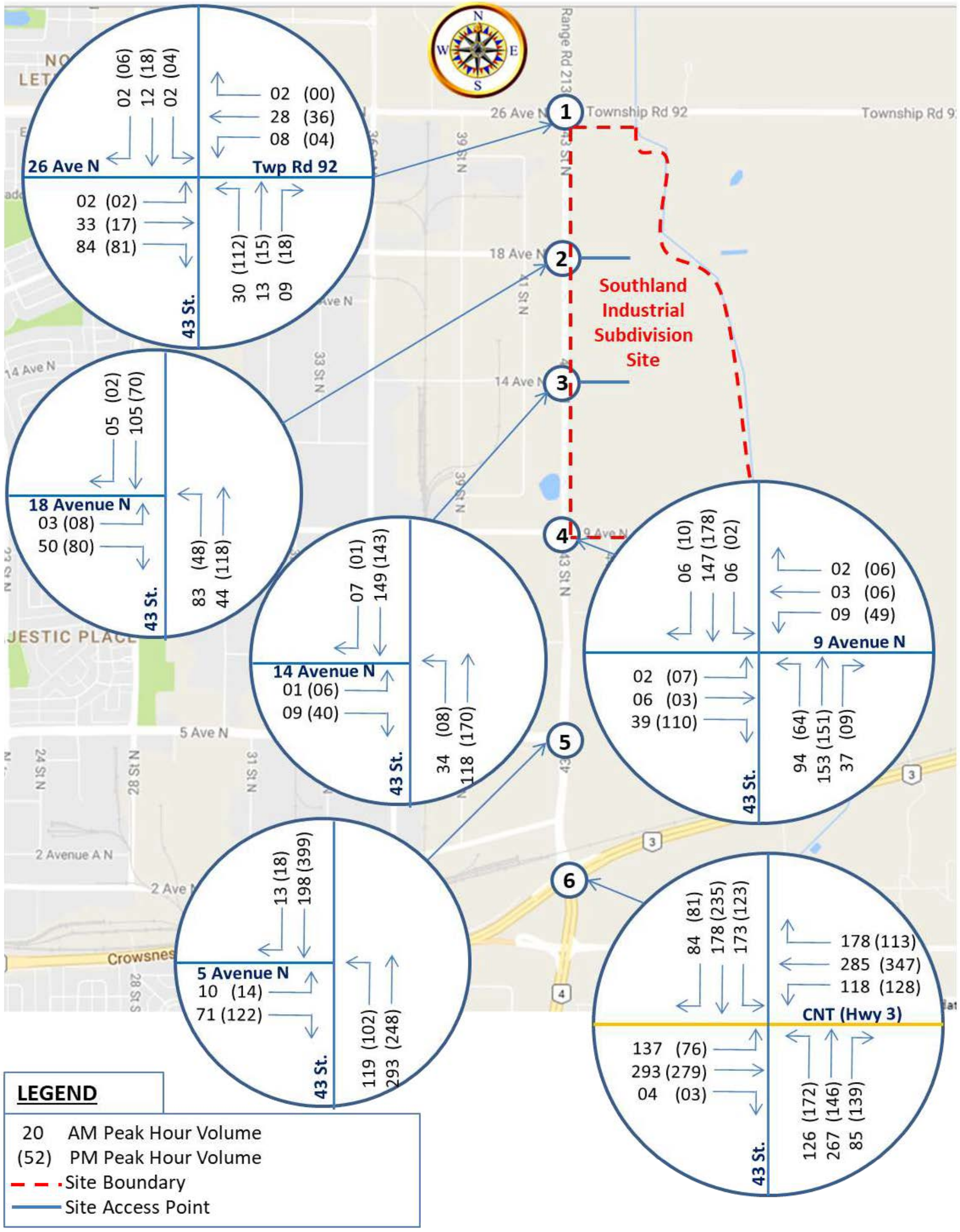


Figure 6: Background Growth Peak Hour Traffic Volumes
(2.5% Growth Rate Applied for 20 Years on Existing)

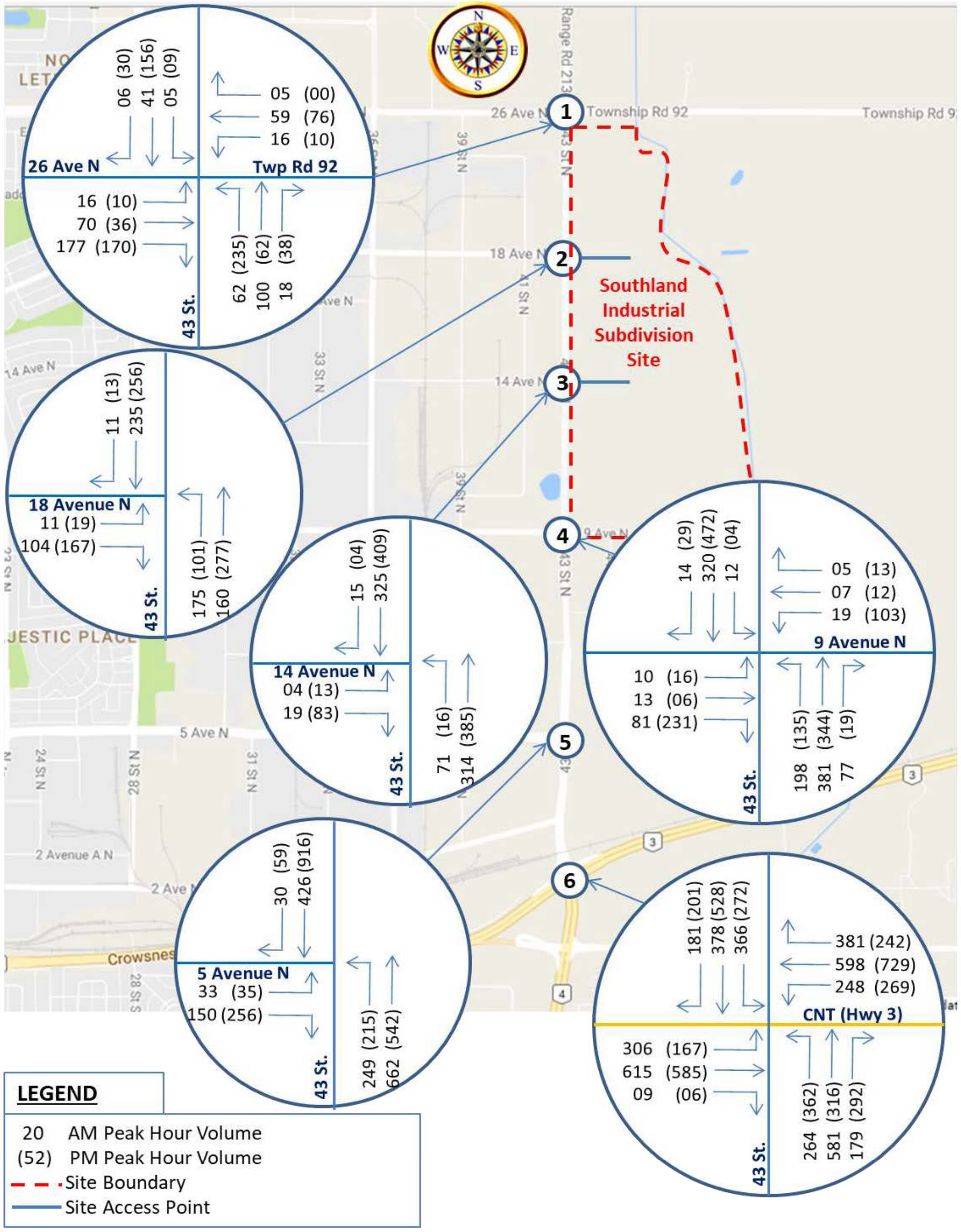


Figure 7: Total 2019 Background Peak Hour Traffic Volumes
(Existing + Known Background Development + 2019 Background Growth)

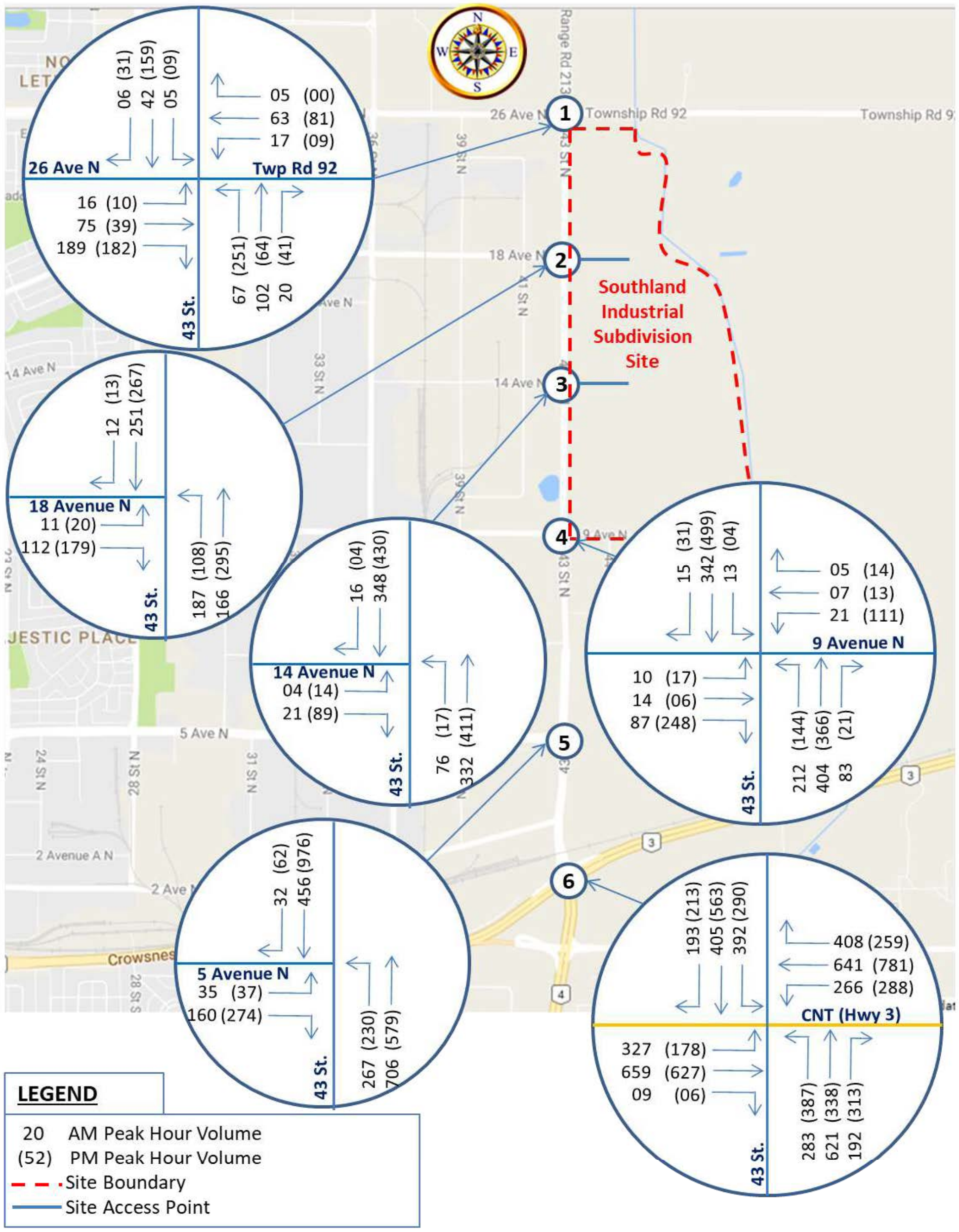


Figure 8: Total 2022 Background Peak Hour Traffic Volumes
(Existing + Known Background Development + 2022 Background Growth)

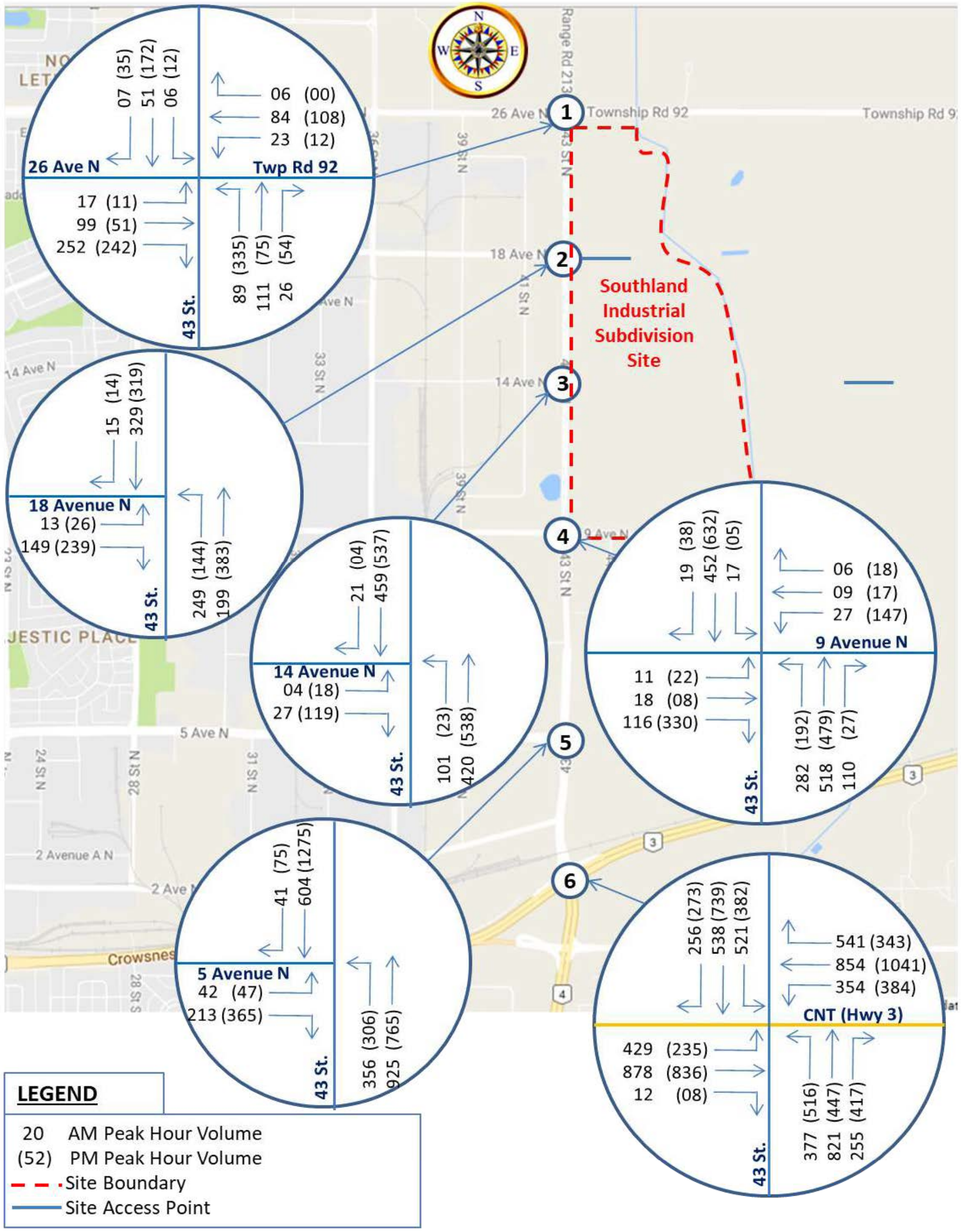


Figure 9: Total 2037 Background Peak Hour Traffic Volumes
(Existing + Known Background Development + 2037 Background Growth)

3.4 Site Generated Trips

To estimate the number of vehicle trips expected to be generated by a particular development, trip generation rates are applied based on the proposed land uses and intensity. The number of trips that would be generated by the proposed development was estimated based on the rates published in ***Trip Generation, 10th Edition*** by the Institute of Transportation Engineers (ITE). The trip generation rates along with the proposed land uses and the corresponding ITE land use codes are presented in **Table 2**. The projected Chinook Industrial Park development peak-hours and daily site-generated traffic volumes are presented in **Table 3**.

It should be noted that the proposed site development plan provides land use areas in acres and the ITE 10th Edition Trip Generation manual uses the gross floor area (GFA) as the independent variable. Based on reviewing several near-by, Lethbridge area existing industrial parks, building area ratios to the total acreage area ranged from 6,114 SF per acre to 11,155 SF per acre. We are selecting 8,200 SF per Acre for the proposed development as this is the average planned building areas. All proposed land use areas within each of the planned phases were converted to GFA based on this rate and are presented in the 4th column of **Table 3**.

Table 2: Trip Generation Rates (ITE Trip Generation Manual 10th Edition)

Land Use	ITE Code	Unit	AM Peak Hour			PM Peak Hour			Daily Trips
			in	out	total	in	out	total	
General Light Industrial	110	KSF	88%	12%	0.70	13%	87%	0.63	4.96
Business Park	770	KSF	61%	39%	0.40	46%	54%	0.42	12.44

Table 3: Projected Site-Generated Peak-Hour and Daily Traffic Volumes

Land Use		ITE Code	Intensity (KSF)	AM Peak Hour			PM Peak Hour			Daily Trips
				in	out	total	in	out	total	
Phase 1	G. Light Industrial	110	152.2	94	13	107	12	84	96	755
	Business Park	770	152.7	38	24	62	30	35	65	1,900
	Phase 1 Total			**132**	**37**	**169**	**42**	**119**	**161**	**2,655**
Phases 2 to 5	G. Light Industrial	110	780.4	481	66	547	64	428	492	3,871
	Business Park	770	333.4	82	52	134	65	76	141	4,148
	Phases 2 to 5 Total			563	118	681	129	504	633	8,019
Full Development Total Trips				**695**	**155**	**850**	**171**	**623**	**794**	**10,674**

3.4.1 Pass-by Trips

Pass-by trips are not new trips, but they are the trips that are attracted from the traffic passing the site on adjacent roadways. While pass-by trips are new trips at the access points to the site, they are not new trips on the adjacent roadway systems

3.4.2 Internal Trips

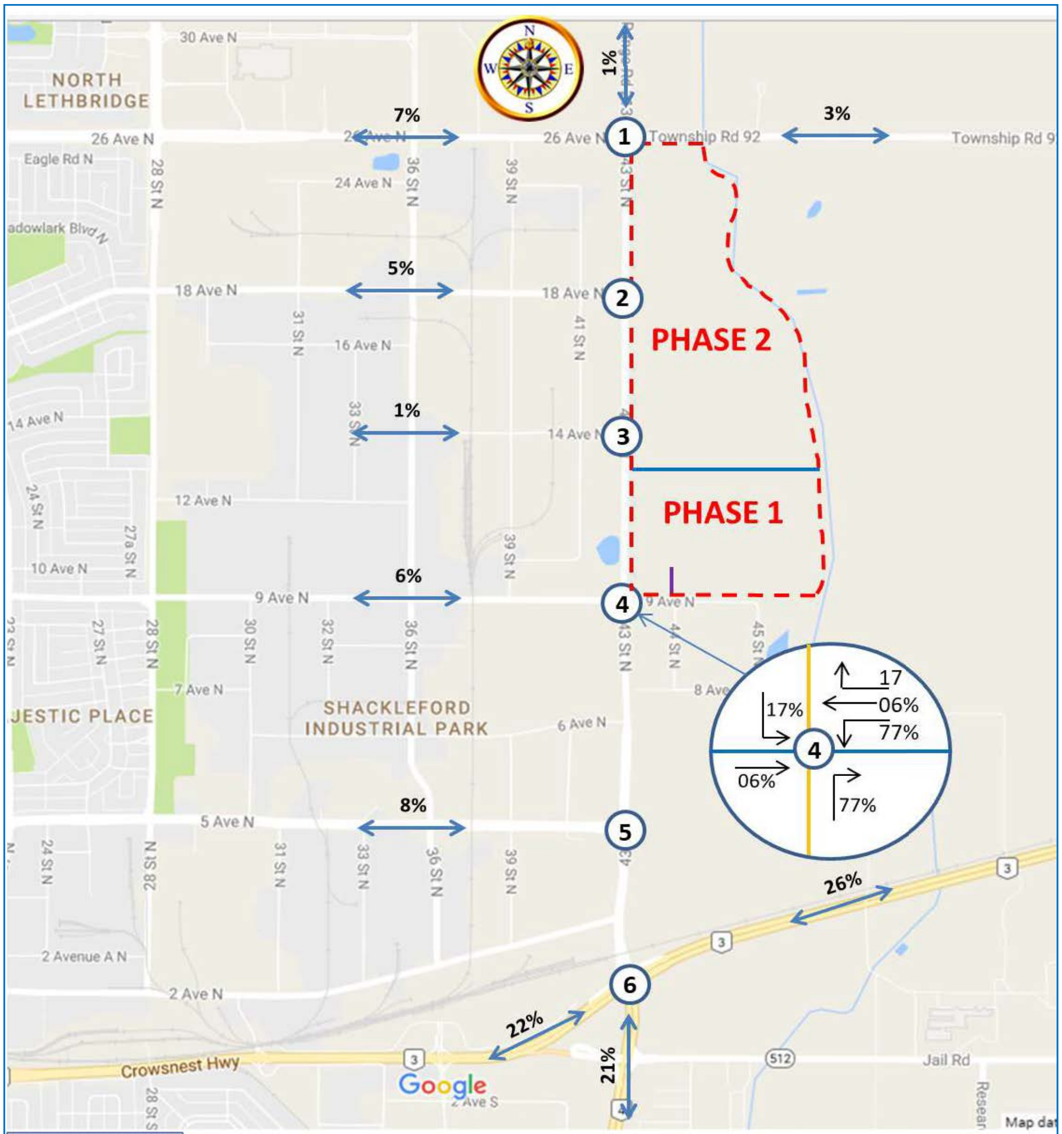
An internal trip is a trip that has both its origin and destination within a multi-use development area under investigation, which should be deducted from the total number of trips departing and entering the study site. The appropriate internal trip reduction rates are based on the characteristics of the mixed land uses. The proposed development has a potential for some internal trips but to be conservative in the analysis no internal trips were considered for this development.

3.5 Trip Distribution

The directions from which vehicles will approach and depart a site is a function of several variables, including the population and employment distribution within the development's area of influence, the operational characteristics of the road system, and the ease with which drivers can travel over various sections of the roadway network without encountering congestion. The directional distribution of new project trips by the Chinook Industrial Park development was estimated based on the consideration of all the pertinent factors above including existing traffic patterns. The resulting directional distributions are as follows:

- 22% of site generated trips will travel to and from the west on Highway 3;
- 21% of site generated trips will travel to and from the south on 43 Street S;
- 26% of site generated trips will travel to and from the east on Highway 3;
- 08% of site generated trips will travel to and from the west on 5 Avenue N;
- 06% of site generated trips will travel to and from the west on 9 Avenue N;
- 01% of site generated trips will travel to and from the west on 14 Avenue N;
- 05% of site generated trips will travel to and from the west on 18 Avenue N;
- 07% of site generated trips will travel to and from the west on 26 Avenue N;
- 01% of site generated trips will travel to and from the north on 43 Street N; and
- 03% of site generated trips will travel to and from the east on Township Road 92.

Site access distribution percentages were determined based on the above directional distributions coupled with the ability of traffic to perform the needed turns and in relation to the available site accesses during each development phase. The resulting final directions of approaches and site access traffic distributions for Phase 1 and Phase 2 are illustrated on **Figure 10a and Figure 10b,** respectively.



LEGEND

XX% External Roads Direction of Approach
XX% Site Access Distribution
🟥 Site Boundary
🟪 Site Access Point

Figure 10a: Direction of Approach and Site Access Distribution
(Phase 1 of Development – Interim 2019)

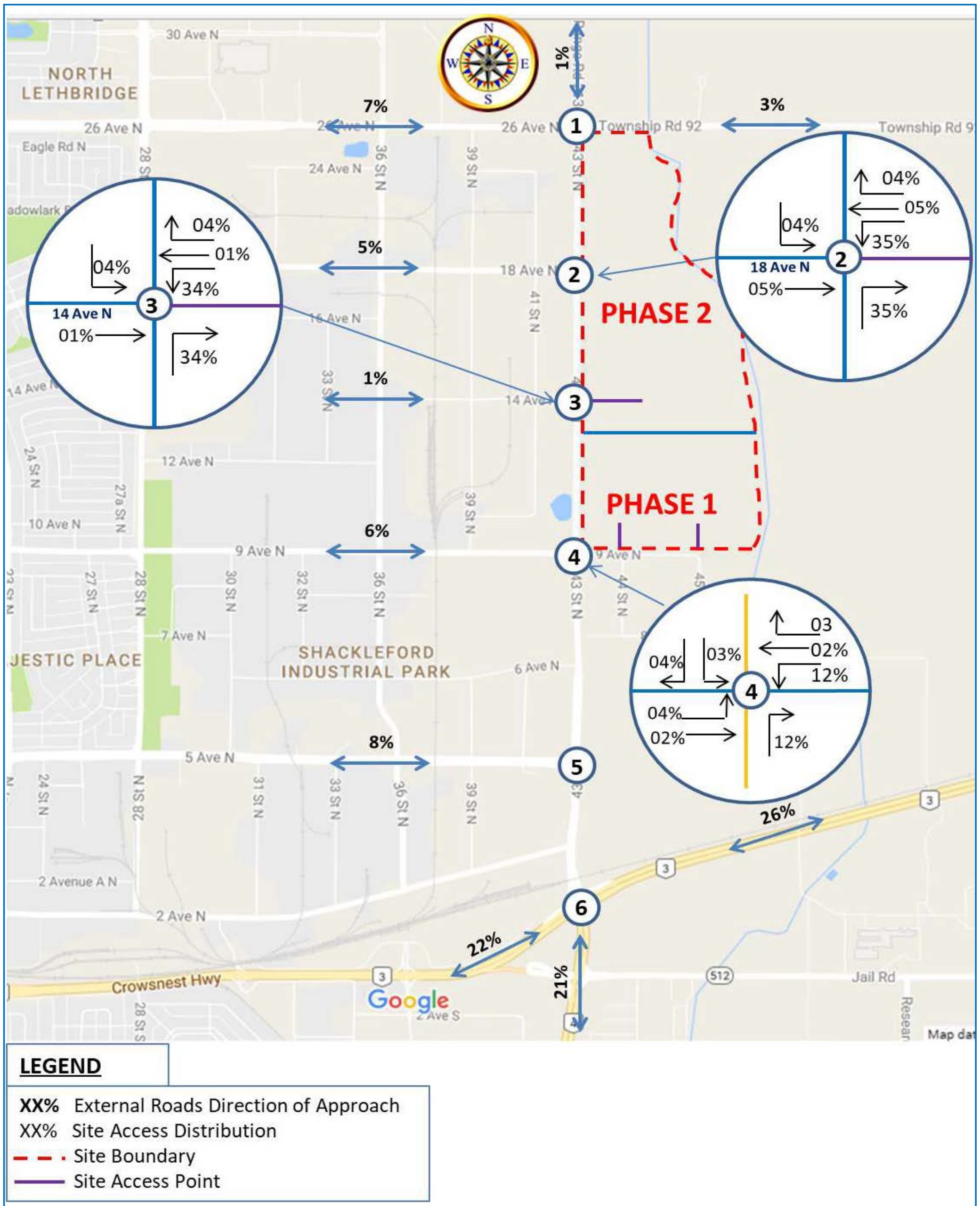


Figure 10b: Direction of Approach and Site Access Distribution
Phase 2: Full Development of Site(2022)

3.6 Trip Assignment

3.6.1 Project Built-Out (Opening Year – 2019) Volumes

The projected peak-hour traffic volumes for the Chinook Industrial Park Phase 1 of the development were assigned to the adjacent roadways based on the estimated directional distribution as shown on **Figure 10a**. The resulting site generated AM peak hour and PM peak hour trips are illustrated on **Figure 11.**

The project built-out year traffic volumes (opening year volumes) were prepared by adding the development's Phase 1 site-generated trips shown on Figure 11 to the Total 2019 Background traffic volumes shown on Figure 7. The resulting project built-out 2019 traffic volumes are presented on **Figure 13**.

3.6.2 Future Traffic Volumes

The projected full development (Phase 2) peak-hour traffic volumes for the Chinook Industrial Park were assigned to the adjacent roadways based on the estimated directional distribution as shown on **Figure 10b**. The resulting site generated AM peak hour and PM peak hour trips for the full development of the site are illustrated on **Figure 12.**

The development site-generated trips shown on **Figure 12** were then added to the 2022 and 2037 total background peak-hour traffic volumes shown on **Figure 8 and Figure 9** to arrive at the future 2022 and future 2037 peak-hour total traffic volumes, which are illustrated on **Figure 14 and Figure 15**.

3.6.3 Average Daily Traffic Volumes

The Future 2037 average daily traffic (ADT) volumes for the study area roadway links with the proposed Chinook Industrial Park traffic were estimated from the AM and PM peak hour volumes. As per the City of Lethbridge directions, the following formula was utilized to calculate the ADT volumes:

*ADT = (AM Peak Hour Volume + PM Peak Hour Volume) * 5.6*

The above formula was applied on the turning movement traffic volumes in order to estimate the roadway link ADT volumes. The resulting Future 2037 estimated ADT volumes are illustrated on **Figure 16**.

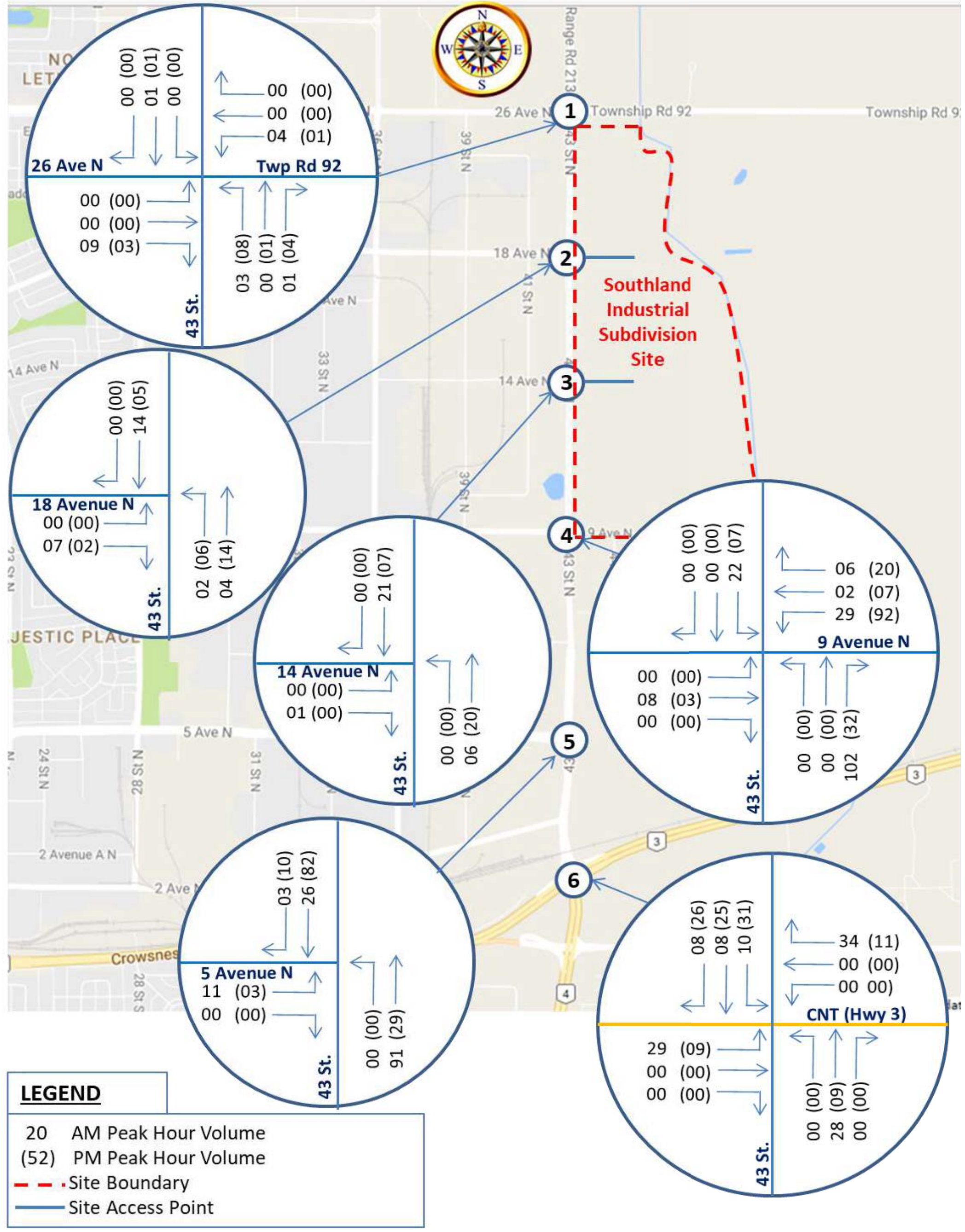


Figure 11: Phase 1 - Site Generated Peak Hour Traffic Volumes (2019)

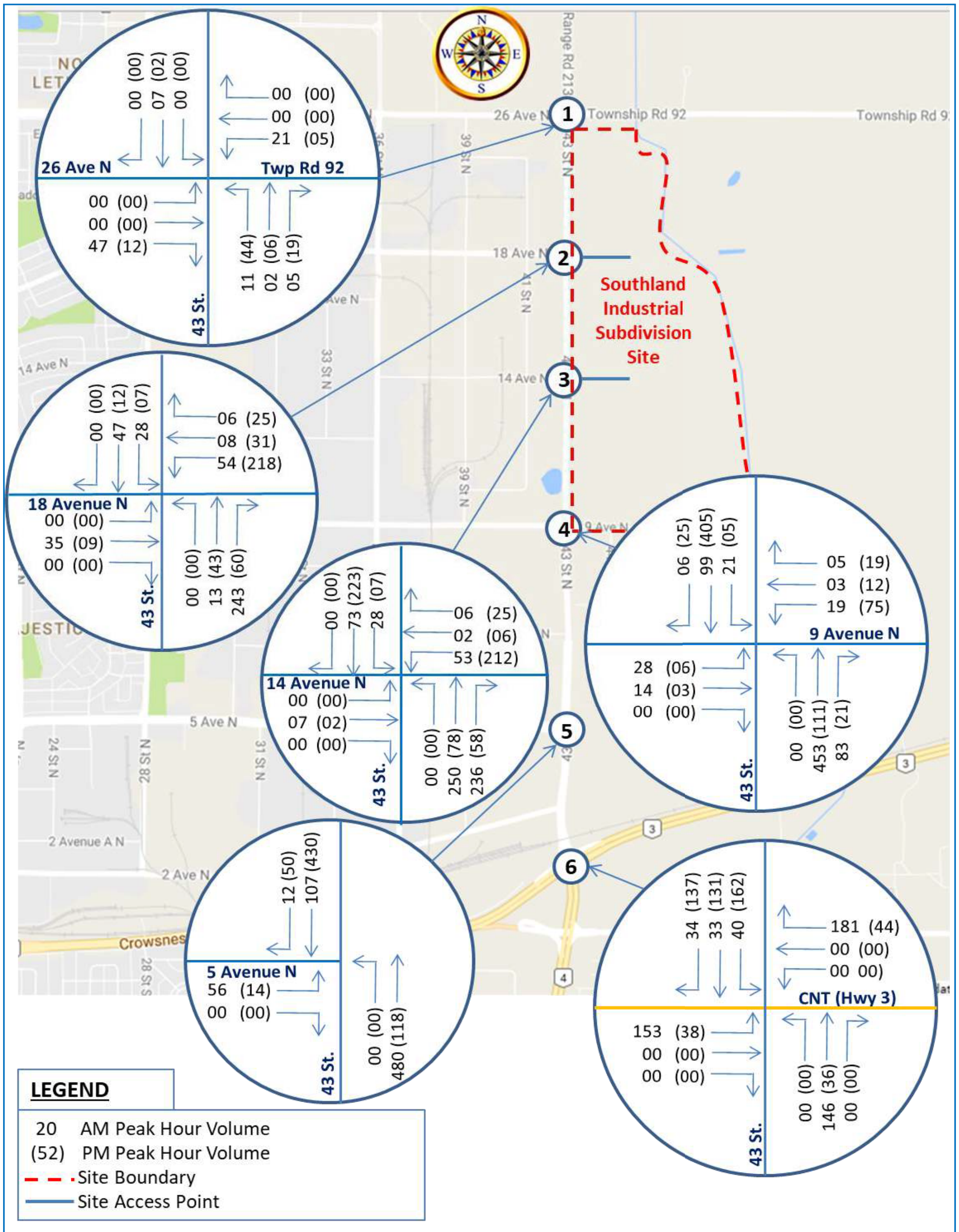


Figure 12: Site Generated Peak Hour Traffic Volumes (Full Development)

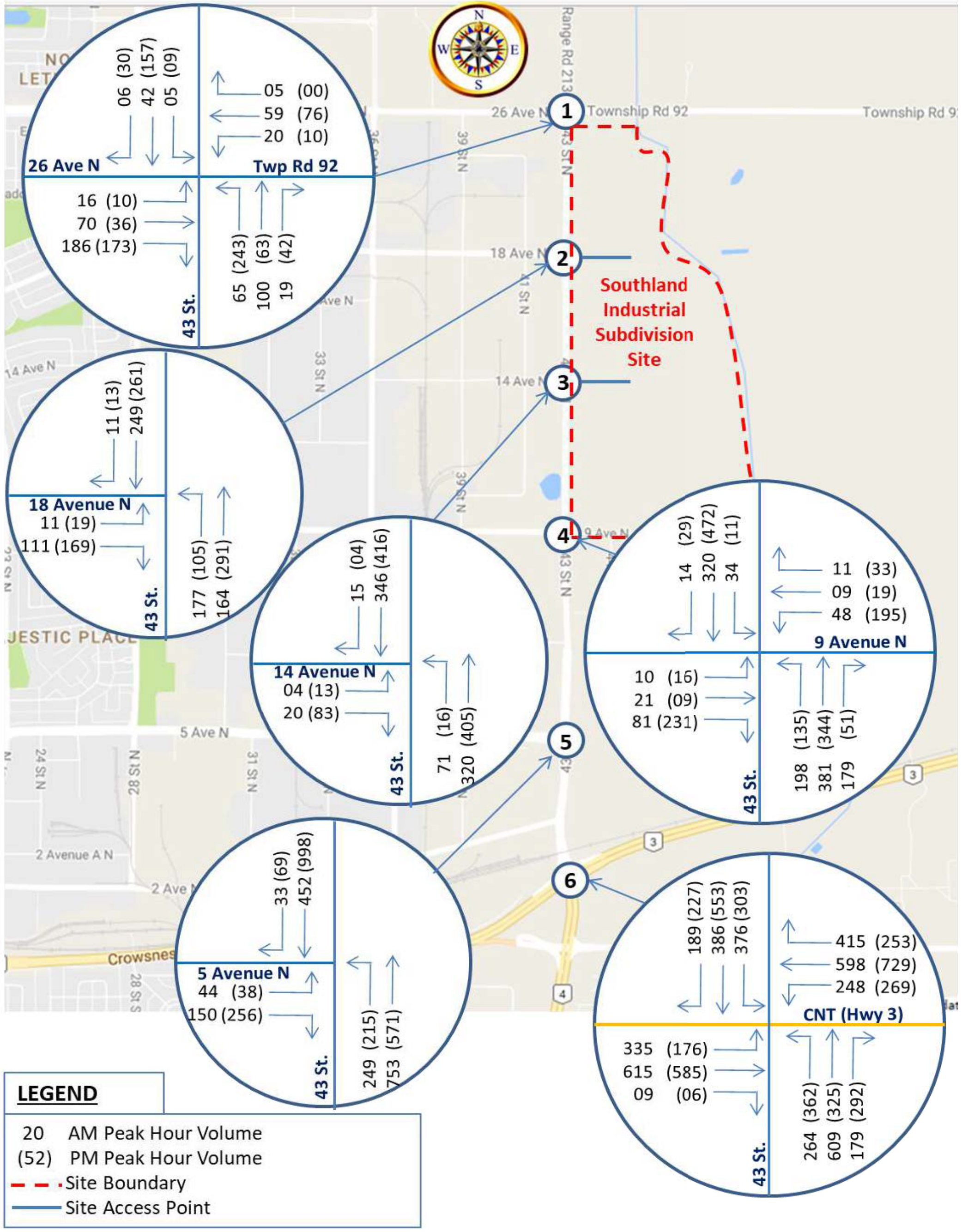


Figure 13: Total Future 2019 Peak Hour Traffic Volumes

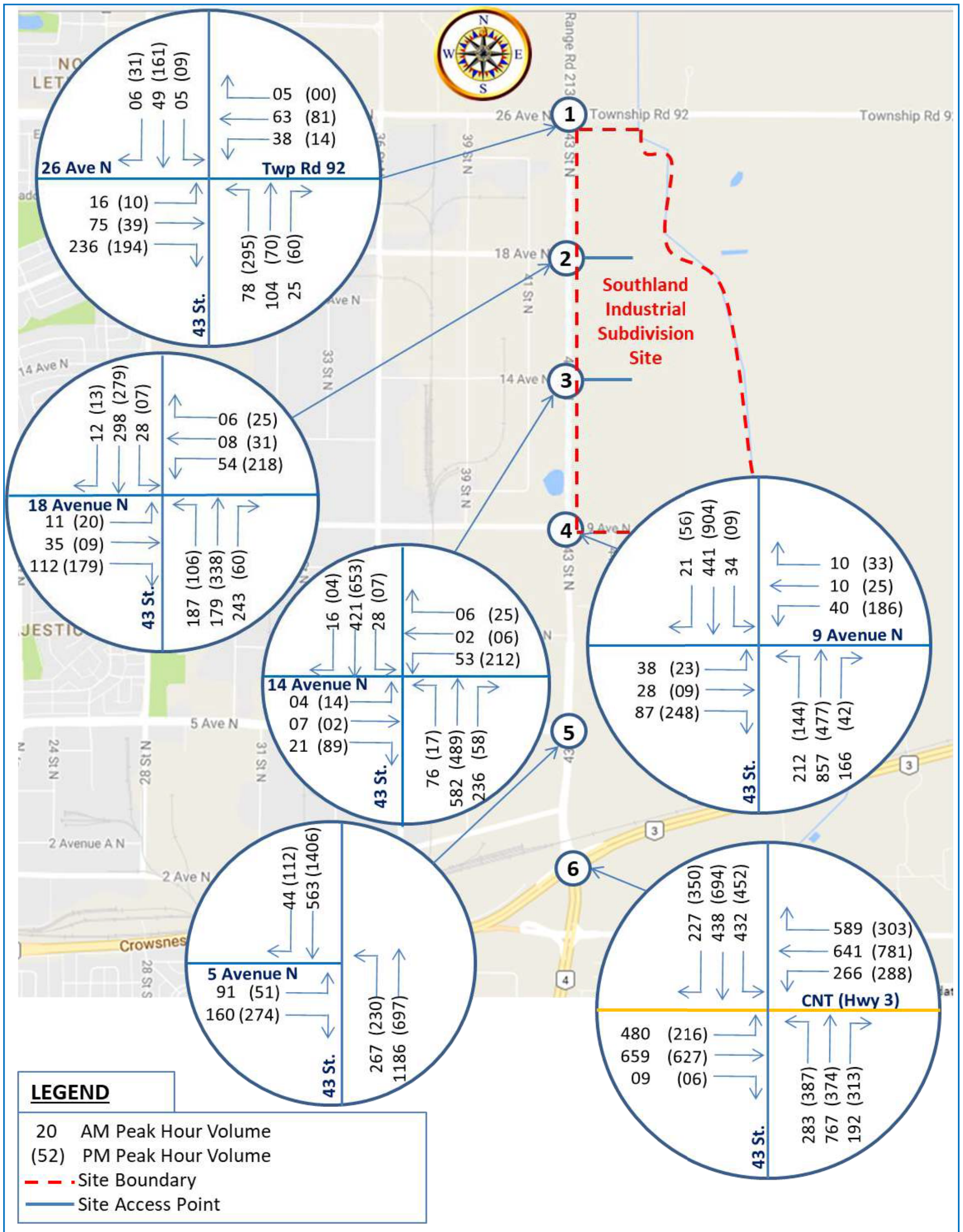


Figure 14: Total 2022 Future Peak Hour Traffic Volumes

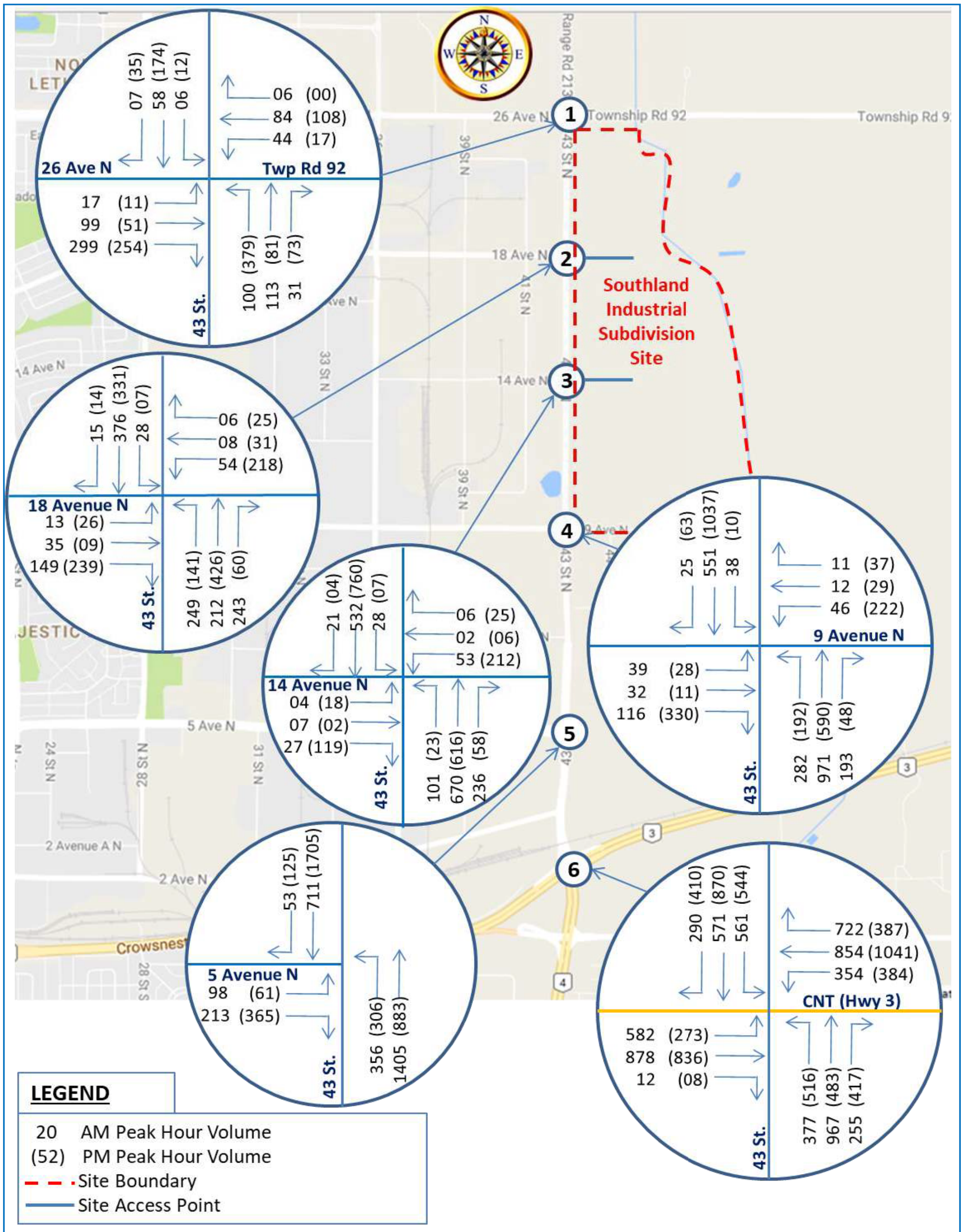


Figure 15: Total 2037 Future Peak Hour Traffic Volumes

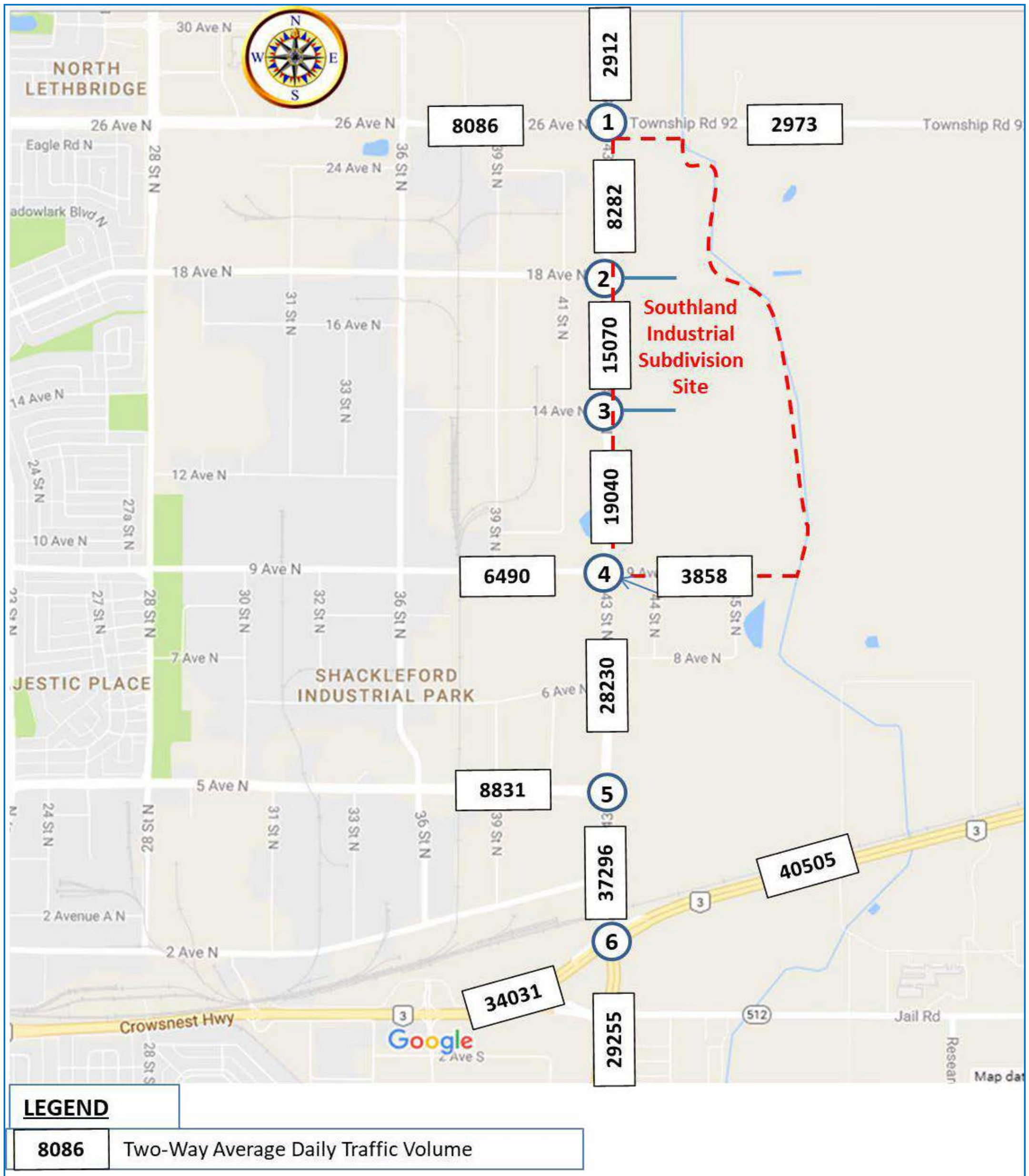


Figure 16: Future 2037 Average Daily Traffic (ADT) Volumes

4.0 EVALUATION AND RECOMMENDED IMPROVEMENTS

4.1 Level of Service Criteria for Intersections

The intersections identified for the study were analyzed according to the methodologies presented in the ***2010 Highway Capacity Manual***. The analysis determines the "Level of Service (LOS)" of unsignalized and signalized intersections considering the factors including but not limited to number and types of lanes, traffic volumes, heavy vehicle composition, peak hour factors, pedestrian activities, etc. Levels of service are expressed in a range from "A" through "F," with "A" being the highest level of service, and "F" representing the lowest level of service. **Table 4** shows the thresholds for Levels of Service "A" through "F" for unsignalized intersections and **Table 5** presents the LOS criteria for signalized intersections.

Table 4: Level of Service Criteria for Unsignalized Intersections *

Level of Service	Delay/Vehicle (seconds)	Description
A	≤ 10.0	Little or no delay, very low main street traffic.
B	10.1 to 15.0	Short traffic delays, many acceptable gaps.
C	15.1 to 25.0	Average traffic delays, frequent gaps still occur.
D	25.1 to 35.0	Long traffic delays, limited number of acceptable gaps.
E	35.1 to 50.0	Very long traffic delays, very small number of acceptable gaps.
F	> 50.0	Extreme traffic delays, virtually no acceptable gaps in traffic.

* Note: Capacity analysis for two-way stop-controlled intersection provides the LOS for the critical movements, not of the overall intersection.

Table 5: Level of Service Criteria for Signalized Intersections

Level of Service	Delay/Vehicle (seconds)	Description
A	≤ 10.0	Most vehicles do not stop at all.
B	10.1 to 20.0	Some vehicles stop.
C	20.1 to 35.0	The number of vehicles stopping is significant, although many pass through without stopping.
D	35.1 to 55.0	Many vehicles stop. Individual cycle failures are noticeable.
E	55.1 to 80.0	Considered to be the limit of acceptable delay. Individual cycle failures are frequent.
F	> 80.0	Unacceptable delay.

4.2 Capacity and Level of Service Analyses

Capacity and level of service analyses were conducted for the following conditions:

- Existing 2017 Conditions;
- Background 2019, 2022, and 2037 Conditions (without site traffic); and
- Future 2019, 2022 and 2037 Conditions (with the site traffic);

The software package Synchro 8 was utilized for the capacity analyses of all study intersections and site accesses. The Synchro software utilizes ***Highway Capacity Manual 2010*** methodologies for the evaluations.

Note that the observed heavy vehicle percentages and peak hour factors (PHF) were utilized in the Synchro software capacity analysis. For new approaches, a heavy vehicle percentage of 10% and a PHF of 0.92 were utilized for capacity analysis.

4.2.1 Existing 2017 Conditions

Existing capacity and level of service analysis results for the study intersections are presented in **Table 6**. These results were taken from the HCM 2010 Capacity Analyses Reports produced by Synchro software. Note that all capacity analysis results reported in all results tables that follow were also taken from the **HCM 2010**. The detailed capacity and LOS HCM 2010 analyses reports for all capacity analyses scenarios are contained in **Appendix C** of this report. The detailed capacity and LOS analyses reports, based on Synchro capacity analyses method, for all scenarios are contained in **Appendix D** for comparison purposes. The actual Synchro software capacity analyses files are contained in **Appendix E**.

A review of **Table 6** capacity analysis results indicates that all study area intersections, both signalized and unsignalized, are currently operating at acceptable levels of service during both the AM and the PM peak hours including the stop-controlled intersection approaches. Therefore, no mitigation is needed under existing traffic conditions.

A review of **Table 6** regarding the volume to capacity (V/C) ratios indicates that all existing intersections movements V/C have values below 0.80 except the northbound left-turn movements at the 43 Street N / 9 Avenue N intersection and 43 Street N / 5 Avenue N intersection that have values exceeding 0.80 and reaching 1.00. However, these reported V/C values in the results tables are based on the HCM 2010 analysis method. If these same values were compared with those produced based on the Synchro analysis method, the Synchro method estimated much lower values. For example, HCM estimated **1.00** V/C value for the NB left turn movement at the intersection of 43 Street N and 5 Avenue N; however, the Synchro method estimated **0.68** ratio for the same movement, this is significantly lower. Therefore, it is believed that the HCM analysis method, in general, estimates higher V/C ratios and therefore, these movements should be carefully reviewed before recommending improvements.

Table 6: HCM Capacity Analysis Results for Existing 2017 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.360	11.5	B	0.293	12.0	B
	WB	0.173	12.8	B	0.261	19.8	C
	NB	0.050	4.3	A	0.157	6.0	A
	SB	0.004	1.0	A	0.005	1.0	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.195	11.5	B	0.264	11.3	A
	WB	-	-	-	-	-	-
	NB	0.172	5.6	A	0.080	2.2	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.049	12.5	B	0.178	12.1	A
	WB	-	-	-	-	-	-
	NB	0.073	1.9	A	0.015	0.3	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**27.9**	**C**	**-**	**20.8**	**C**
	EB	0.10	43.4	D	0.08	40.9	D
	WB	0.15	44.3	D	0.54	44.4	D
	NB	0.98	37.9	D	0.85	22.0	C
	SB	0.18	9.4	A	0.23	10.5	B
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**22.7**	**C**	**-**	**16.9**	**B**
	EB	0.15	46.3	D	0.16	45.3	D
	NB	1.00	28.9	C	0.89	22.2	C
	SB	0.24	9.4	A	0.44	11.6	B
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**36.1**	**D**	**-**	**33.1**	**C**
	EB	0.75	36.1	D	0.59	33.4	C
	WB	0.67	34.7	C	0.67	29.8	C
	NB	0.78	40.2	D	0.60	31.6	C
	SB	0.64	33.9	C	0.73	37.4	D

(a) The V/C values presented are for the movements with highest V/C within that approach

4.2.2 Background 2019, 2022 and 2037 Conditions

LOS and capacity analyses results for the background 2019, 2022 and 2037 traffic conditions (without site development generated traffic) for all study area intersections are presented in **Table 7, Table 8 and Table 9,** respectively.

The Background 2037 Mitigated traffic conditions capacity analysis results are presented in **Table 10**.

Table 7: HCM Capacity Analysis Results for Background 2019 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.452	13.6	B	0.433	16.7	C
	WB	0.228	15.2	C	0.404	31.0	D
	NB	0.053	2.6	A	0.188	5.8	A
	SB	0.005	0.7	A	0.007	0.4	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.254	13.3	B	0.349	13.9	B
	WB	-	-	-	-	-	-
	NB	0.187	4.5	A	0.097	2.2	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.068	14.2	B	0.234	14.5	B
	WB	-	-	-	-	-	-
	NB	0.080	1.6	A	0.019	0.3	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**29.5**	**C**	**-**	**20.4**	**C**
	EB	0.10	43.0	D	0.10	40.4	D
	WB	0.15	43.7	D	0.55	44.0	D
	NB	1.03	39.4	D	0.86	21.7	C
	SB	0.20	9.9	A	0.31	11.8	B
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**25.2**	**C**	**-**	**18.3**	**B**
	EB	0.19	44.7	D	0.18	44.5	D
	NB	1.05	31.8	C	0.92	23.9	C
	SB	0.27	10.5	B	0.51	13.0	B
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**40.0**	**D**	**-**	**35.9**	**D**
	EB	0.83	40.8	D	0.64	37.2	D
	WB	0.71	38.4	D	0.73	33.5	C
	NB	0.86	45.2	D	0.65	32.5	C
	SB	0.71	35.8	D	0.78	39.7	D

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 7** indicates that all study intersections would continue to operate at acceptable levels during both AM peak hour and PM peak hour. Therefore, no mitigation would be needed for any of the study area intersections under background 2019 conditions.

Table 8: HCM Capacity Analysis Results for Background 2022 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.489	14.4	B	0.485	18.5	C
	WB	0.253	16.0	C	0.456	35.5	E
	NB	0.058	2.7	A	0.202	5.9	A
	SB	0.005	0.7	A	0.007	0.3	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.281	13.9	B	0.385	14.7	B
	WB	-	-	-	-	-	-
	NB	0.203	4.7	A	0.105	2.2	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.077	14.7	B	0.263	15.4	C
	WB	-	-	-	-	-	-
	NB	0.088	1.6	A	0.020	0..	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**18.4**	**B**	**-**	**19.0**	**B**
	EB	0.11	42.9	D	0.10	39.9	D
	WB	0.16	43.7	D	0.57	43.7	D
	NB	0.87	19.9	B	0.84	17.3	B
	SB	0.23	11.9	B	0.34	12.9	B
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**14.8**	**B**	**-**	**16.5**	**B**
	EB	0.19	44.5	D	0.18	44.4	D
	NB	0.87	14.5	B	0.88	17.2	B
	SB	0.31	13.2	B	0.57	15.0	B
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**44.8**	**D**	**-**	**39.3**	**D**
	EB	0.93	50.5	D	0.71	41.8	D
	WB	0.79	42.8	D	0.81	38.3	D
	NB	0.91	49.4	D	0.70	33.6	C
	SB	0.76	36.8	D	0.82	42.3	D

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 8** indicates that all study intersections would continue to operate at acceptable levels during both AM peak hour and PM peak hour under the 2022 background conditions. Therefore, no mitigation would be needed for any of the study area intersections under background 2022 conditions.

Table 9: HCM Capacity Analysis Results for Background 2037 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.697	21.4	C	0.901	59.8	F
	WB	0.438	23.9	C	0.985	139.5	F
	NB	0.077	3.0	A	0.274	6.3	A
	SB	0.006	0.7	A	0.009	0.4	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.472	20.3	C	0.604	22.3	C
	WB	-	-	-	-	-	-
	NB	0.296	5.4	A	0.148	2.4	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.125	18.4	C	0.445	22.3	C
	WB	-	-	-	-	-	-
	NB	0.132	1.8	A	0.031	0.4	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**20.6**	**C**	**-**	**22.6**	**C**
	EB	0.13	42.5	D	0.11	37.7	D
	WB	0.21	43.7	D	0.63	41.9	D
	NB	0.90	21.3	C	0.88	20.2	C
	SB	0.33	15.9	B	0.49	18.8	B
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**17.4**	**B**	**-**	**23.4**	**C**
	EB	0.21	44.0	D	0.21	43.7	D
	NB	0.90	15.8	B	0.92	20.7	C
	SB	0.47	18.9	B	0.82	24.8	C
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**114.5**	**F**	**-**	**80.2**	**F**
	EB	1.54	180.7	F	1.15	98.9	F
	WB	1.26	121.9	F	1.09	61.7	E
	NB	1.18	109.8	F	1.15	85.9	F
	SB	0.90	45.6	D	1.07	80.6	F

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 9** indicates that all study area intersections would continue to operate at acceptable levels during both AM peak hour and PM peak hour except for the following two intersections that would operate at unacceptable levels of service:

1. 43 Street N and 26 Avenue N / Township Road 92; and
2. Highway 3/Crowsnest Highway and 43 Street N.

Therefore, mitigations would be needed for these two intersections under the **background 2037 traffic conditions**. The proposed mitigations consist of the following:

<u>43 Street N and 26 Avenue N / Township Road 92 Intersection</u>

- Installation of a two-phase traffic signal

<u>Highway 3/Crowsnest Highway and 43 Street Intersection</u>

- Installation of a second westbound left-turn only lane;
- Installation of a second eastbound left-turn only lane;
- Installation of a third westbound through only lane;
- Installation of a third eastbound through only lane; and
- Optimization of the traffic signal splits.

The background 2037 Synchro traffic capacity analysis models were updated with the above suggested mitigations and the capacity analysis results of the mitigated traffic conditions are presented in **Table 10**.

Table 10: HCM Capacity Analysis Results for Background 2037 Mitigated Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C[a]	Delay "Sec"	LOS	V/C[a]	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Signalized)	**Overall**	**-**	**11.3**	**B**	**-**	**13.1**	**B**
	EB	0.64	10.9	B	0.66	18.0	B
	WB	0.19	7.8	A	0.23	14.2	B
	NB	0.54	13.8	B	0.68	12.0	B
	SB	0.16	11.3	B	0.29	8.2	A
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**47.3**	**D**	**-**	**43.1**	**D**
	EB	0.83	39.8	D	0.74	35.1	D
	WB	0.72	34.3	C	0.91	39.3	D
	NB	1.05	63.5	E	1.05	55.7	E
	SB	1.05	52.0	D	0.97	44.5	D

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 10** indicates that the operation at these two intersections would improve significantly with the suggested mitigations. The intersection of 43 Street and 26 Avenue N / Township Road 92 would operate at acceptable levels of service during the AM and PM peak hours with the two-phase signal. The intersection of Highway 3 / Crowsnest Highway and 43 Street would improve but the NB would continue to operate at LOS "E", which represents full capacity level of service. Any additional traffic would cause this intersection to perform at unacceptable levels of service and therefore, grade separation would be the most appropriate solution after 20 years.

Also, as discussed earlier, the ***2006 Functional Planning Study completed by Stantec***(1) for Highways 3 & 4 in Lethbridge area proposes / recommends new alignments for these highways that would provide external links allowing external traffic to by-pass the City and hence reducing Crowsnest Highway traffic within Lethbridge city. When these external links are built, significant reductions in traffic volumes would occur at the Crowsnest Highway / 43 Street intersection and operation would improve. Therefore, a reevaluation of this intersection operations at that time, should be performed to determine whether intersection improvements would actually be required.

4.2.3 Future 2019, 2022 and 2037 Conditions

LOS and capacity analyses results for the future 2019, 2022 and 2037 traffic conditions (with site development generated traffic) for all study area intersections are presented in **Table 11, Table 12 and Table 14,** respectively.

The capacity analysis results for the future 2022 mitigated conditions and future 2037 mitigated conditions are presented in **Table 13 and Table 15,** respectively.

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(1) http://www.transportation.alberta.ca/projects/assets/Area_8_South/Hwy%203%20Lethbridge/Executive_Summary.pdf

Table 11: HCM Capacity Analysis Results for Future 2019 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C[(a)]	Delay "Sec"	LOS	V/C[(a)]	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.468	13.9	B	0.446	17.2	C
	WB	0.252	16.1	C	0.420	32.7	D
	NB	0.056	2.7	A	0.195	5.8	A
	SB	0.005	0.7	A	0.007	0.3	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.274	13.7	B	0.359	14.2	B
	WB	-	-	-	-	-	-
	NB	0.192	4.5	A	0.102	2.2	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.073	14.6	B	0.239	14.8	B
	WB	-	-	-	-	-	-
	NB	0.082	1.6	A	0.019	0.3	A
	SB	-	0.0	A	-	0.0	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**19.2**	**B**	**-**	**22.9**	**C**
	EB	0.14	42.1	D	0.070	33.8	C
	WB	0.37	44.8	D	0.690	39.9	D
	NB	0.86	19.6	B	0.840	19.4	B
	SB	0.21	11.8	B	0.30	17.0	B
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**14.4**	**B**	**-**	**16.0**	**B**
	EB	0.21	43.9	D	0.19	44.3	D
	NB	0.87	13.8	B	0.87	16.6	B
	SB	0.31	13.0	B	0.57	14.5	B
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**42.2**	**D**	**-**	**36.9**	**D**
	EB	0.91	45.2	D	0.650	37.9	D
	WB	0.72	39.0	D	0.740	34.6	C
	NB	0.90	48.6	D	0.660	33.1	C
	SB	0.74	36.1	D	0.800	40.8	D

[(a)] The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 11** indicates that all study intersections would continue to operate at acceptable levels during both AM peak hour and PM peak hour under the future 2019 traffic conditions with site generated traffic. Therefore, no mitigations would be needed for any of the study area intersections under future 2019 traffic conditions.

Table 12: HCM Capacity Analysis Results for Future 2022 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.573	16.2	C	0.571	22.8	C
	WB	0.416	23.6	C	0.627	58.3	F
	NB	0.068	2.9	A	0.237	5.9	A
	SB	0.005	0.6	A	-	0.0	A
43 Street North and 18 Avenue North (Unsignalized)	EB	0.974	103.7	F	0.517	20.6	C
	WB	1.848	619.3	F	2.524	768.6	F
	NB	0.214	2.8	A	0.104	1.8	A
	SB	0.035	0.7	A	0.008	0.2	A
43 Street North and 14 Avenue North (Unsignalized)	EB	0.373	579	F	0.484	31.1	D
	WB	1.300	357.2	F	3.720	1345.6	F
	NB	0.095	0.8	A	0.026	0.3	A
	SB	0.052	0.6	A	0.008	0.1	A
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**16.9**	**B**	**-**	**23.9**	**C**
	EB	0.250	43.3	D	0.110	35.4	D
	WB	0.310	44.3	D	0.69	41.4	D
	NB	0.880	154	B	0.850	18.8	B
	SB	0.300	13.1	B	0.69	22.3	C
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**15.3**	**B**	**-**	**20.8**	**C**
	EB	0.350	43.1	D	0.220	43.5	D
	NB	0.880	13.5	B	0.89	17.3	B
	SB	0.410	15.6	B	0.83	22.1	C
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**85.0**	**F**	**-**	**50.0**	**D**
	EB	1.720	188.6	F	0.830	47.3	D
	WB	0.860	41.4	D	0.800	36.2	D
	NB	0.950	56.7	E	0.860	44.7	D
	SB	0.880	39.3	D	1.030	64.1	E

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 12** indicates that the following four intersections would operate at unacceptable levels of service and would require mitigations:

1. 43 Street North and 18 Avenue North (Unsignalized);
2. 43 Street North and 14 Avenue North (Unsignalized); and
3. Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)

The intersection of 43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized) would have the westbound approach, during the PM peak hour only, operate at LOS “F” with an average delay of 58.3 seconds per vehicle and a V/C ratio of 0.627. This amount of delay is usually considered acceptable by the drivers especially noting that the V/C ratio is relatively low. However, to ensure that no such delays are experienced by intersection users the following is recommended:

- Installation of a two-phase traffic signal under future 2022 traffic conditions.

The remaining two signalized intersections located at 9 Avenue North and at 5 Avenue North would continue to operate at acceptable levels of service during both AM peak hour and PM peak hour. Therefore, mitigations would only be needed for the three study intersections listed above under future 2022 conditions (with site traffic).

The proposed mitigations under the future 2022 conditions consist of the following:

43 Street N and 18 Avenue N / Site Access

- Installation of a two-phase traffic signal

43 Street N and 14 Avenue N / Site Access

- Installation of a two-phase traffic signal; and
- Installation of a northbound left-turn only lane.

Highway 3 / Crowsnest Highway and 43 Street Intersection

- Installation of a second eastbound left-turn only lane; and
- Optimization of the traffic signal splits.

The future 2022 Synchro traffic capacity analysis models were updated with the above suggested mitigations and the capacity analysis results for the mitigated traffic conditions are presented in **Table 13**.

Table 13: HCM Capacity Analysis Results for Future 2022 Mitigated Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C(a)	Delay "Sec"	LOS	V/C(a)	Delay "Sec"	LOS
43 Street North and 18 Avenue North (Signalized)	**Overall**	**-**	**32.7**	**C**	**-**	**26.3**	**C**
	EB	0.47	34.8	C	0.39	25.7	C
	WB	0.23	31.2	C	0.69	39.2	D
	NB	0.96	44.1	D	0.74	25.8	C
	SB	0.42	11.4	B	0.38	16.6	B
43 Street North and 14 Avenue North (Signalized)	**Overall**	**-**	**37.1**	**D**	**-**	**23.6**	**C**
	EB	0.14	32.2	C	0.24	28.0	C
	WB	0.18	32.4	C	0.62	38.8	D
	NB	0.95	34.1	C	0.66	17.8	B
	SB	0.93	43.6	D	0.78	22.8	C
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	Overall	-	47.4	D	-	46.2	D
	EB	0.89	53.4	D	0.70	43.8	D
	WB	0.86	42.1	D	0.82	38.8	D
	NB	0.93	53.8	D	0.83	42.1	D
	SB	0.88	39.4	D	0.97	54.9	D

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 13** results indicates that the three intersections that previously failed would operate at acceptable levels of service with the proposed mitigations. Therefore, no further mitigations to any of these intersections would be needed under the future 2022 traffic conditions.

Table 14: HCM Capacity Analysis Results for Future 2037 Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C[(a)]	Delay "Sec"	LOS	V/C[(a)]	Delay "Sec"	LOS
43 Street N and 26 Avenue N / Twp. Road 92 (Unsignalized)	EB	0.793	27.4	D	1.641	350.2	F
	WB	0.440	28.6	D	0.968	143.4	F
	NB	0.088	3.1	A	0.31	6.4	A
	SB	0.006	0.7	A	0.01	0.4	A
43 Street North and 18 Avenue North (Signalized)	**Overall**	**-**	**102.9**	**F**	**-**	**42.5**	**D**
	EB	0.55	35.4	D	0.63	38.2	D
	WB	0.24	30.4	C	1.11	129.5	F
	NB	1.32	180.8	F	0.82	25.8	C
	SB	0.51	14.0	B	0.39	12.3	B
43 Street North and 14 Avenue North (Signalized)	**Overall**	**-**	**122.3**	**F**	**-**	**25.5**	**c**
	EB	0.17	32.7	C	0.39	36.2	D
	WB	0.18	32.4	C	0.88	69.0	E
	NB	1.05	58.5	E	0.73	15.8	B
	SB	1.45	264.4	F	0.81	20.0	B
43 Street North and 9 Avenue North (Signalized)	**Overall**	**-**	**21.7**	**C**	**-**	**33.2**	**C**
	EB	0.26	43.4	D	0.11	33.2	C
	WB	0.36	44.9	D	0.74	42.2	D
	NB	0.98	21.8	C	0.89	23.0	C
	SB	0.40	16.2	B	0.92	38.4	D
43 Street North and 5 Avenue North (Signalized)	**Overall**	**-**	**18.9**	**B**	**-**	**54.0**	**D**
	EB	0.38	43.2	D	0.24	43.2	D
	NB	0.92	16.4	B	0.96	22.1	C
	SB	0.58	21.5	C	1.10	75.1	E
Highway 3 (Crowsnest Hwy) and 43 Street (Signalized)	**Overall**	**-**	**78.6**	**E**	**-**	**50.6**	**D**
	EB	1.15	77.1	E	0.76	50.3	D
	WB	0.67	36.5	D	0.86	48.6	D
	NB	1.26	138.9	F	0.91	43.7	D
	SB	1.05	59.0	E	0.99	56.2	E

[(a)] The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 14** results indicates that four intersections of the total six intersections would operate at unacceptable levels of service. Therefore, mitigations would be required under the future 2037 conditions at these intersections.

The proposed mitigations under the **future 2037** conditions consist of the following:

43 Street N and 26 Avenue N / Township Road 92 Intersection

- Installation of a two-phase traffic signal

43 Street N and 18 Avenue N / Site Access

- Installation of a northbound left-turn only lane; and
- Optimization of the traffic signal splits.

43 Street N and 14 Avenue N / Site Access

- Optimization of the traffic signal splits.

Highway 3 / Crowsnest Highway and 43 Street Intersection

- As mentioned earlier, the **2006 Functional Planning Study completed by Stantec**(1) for Highways 3 & 4 in Lethbridge area proposes / recommends new alignments for these two highways that would provide external links allowing external traffic to by-pass the City and hence reducing Crowsnest Highway traffic within Lethbridge city. When these external links are built, significant reductions in traffic volumes would occur at the Crowsnest Highway / 43 Street intersection and operation would improve. Therefore, a reevaluation of this intersection operations at that time, should be performed to determine whether intersection improvements would be required.

The future 2037 Synchro traffic capacity analysis models were updated with the above suggested mitigations (excluding Highway 3 / Crowsnest Highway and 43 Street Intersection) and the capacity analysis results for the mitigated traffic conditions are presented in **Table 15.**

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(1) http://www.transportation.alberta.ca/projects/assets/Area_8_South/Hwy%203%20Lethbridge/Executive_Summary.pdf

Table 15: HCM Capacity Analysis Results for Future 2037 Mitigated Traffic Conditions

Intersection	App.	AM Peak Hour			PM Peak Hour		
		V/C$^{(a)}$	Delay "Sec"	LOS	V/C$^{(a)}$	Delay "Sec"	LOS
43 Street North and 26 Avenue North / Township Road 92 (Signalized)	**Overall**	**-**	**19.1**	**B**	**-**	**17.8**	**B**
	EB	0..84	26.0	C	0.67	18.9	B
	WB	0.33	12.0	B	0.24	14.6	B
	NB	0.46	13.7	B	0.80	21.5	C
	SB	0.13	10.3	B	0.29	9.1	A
43 Street North and 18 Avenue North (Signalized)	**Overall**	**-**	**16.9**	**B**	**-**	**25.3**	**C**
	EB	0.78	48.4	D	0.48	24.3	C
	WB	0.40	38.6	D	0.74	37.3	D
	NB	0.54	11.5	B	0.69	24.3	C
	SB	0.44	8.4	A	0.47	19.3	B
43 Street North and 14 Avenue North/Site Access (Signalized)	**Overall**	**-**	**12.1**	**B**	**-**	**27.9**	**C**
	EB	0.42	47.9	D	0.32	29.0	C
	WB	0.40	47.0	D	0.70	37.00	D
	NB	0.84	12.4	B	0.80	22.4	C
	SB	0.58	6.0	A	0.89	30.0	C

(a) The V/C values presented are for the movements with highest V/C within that approach

A review of **Table 15** results indicates that the three mitigated intersections would operate at acceptable levels of service with the proposed mitigations. Therefore, no further mitigations would be needed under the future 2037 traffic conditions.

4.2.4 Highway 3 / Crowsnest Highway and 43 Street Intersection

The capacity analysis results for the at grade intersection of Highway 3 / Crowsnest Highway and 43 Street with traffic signal showed unacceptable operations under background 2037 traffic conditions (without proposed site traffic) as well as under future 2037 with proposed site traffic. Therefore, by the year 2037 significant improvements including considering an interchange would be required based on the above capacity analysis results. However, if the proposed / recommended Highway 3 & 4 external links were built, Highway 3 east-west traffic volumes would be reduced significantly. Therefore, a reevaluation of this intersection is recommended.

A review of this intersection's future 2037 AM and PM left turning movement traffic volumes shown on Figure 15 indicates that they range between 287 and 705 vehicles per hour. These amounts of hourly traffic volumes indicate that a single free-flow interchange lane for each left turn movement would be able to accommodate the expected volumes. Merge / diverge capacity analysis has not been performed since there is no information about the future interchange configuration if it were determined needed.

4.2.5 Average Daily Traffic Volume Review

Figure 16 presents the Future 2037 ADT volumes for the study area roadway links with the proposed Chinook Industrial Park traffic volumes included. Note that these ADT's were estimated from the AM and PM peak hour volumes based on the City of Lethbridge recommended procedure discussed previously in subsection 3.6.3.

A review of the 43 Street North ADT volumes shown on Figure 16 between 9 Avenue N and 26 Avenue N indicates that they range between 8282 and 19040 vehicles per day these volumes are higher than the acceptable two-lane two-way facilities capacity levels as the City of Lethbridge's roadway design standards indicate 4-lane cross sections are required for ADT volumes above 8,000 vehicles per day. Based on the above, the existing 43 Street North two-lane roadway section between 9 Avenue N and 26 Avenue N would not be able to accommodate the future 2037 estimated traffic volumes. Therefore, under 2037 traffic conditions this section of 43 Street must be upgraded to 4-lane cross section to allow it to accommodate the 2037 expected daily traffic volumes.

A review of the 43 Street and Crowsnest Highway ADT volumes shown on Figure 16 indicates that they range between 28230 and 40505 vehicles per day. These daily traffic volumes are well below the full capacity of a four-lane divide highway capacity. Therefore, the existing four-lane divided highways (43 Street south of 9 Avenue to Crowsnest Highway; and the Crowsnest Highway east and west of 43 Street) would be able to accommodate the estimated ADT through volumes with the proposed site traffic. Note however, that the intersection widening recommended based on the intersection capacity analysis would still be needed at Highway 3 and 43 Street signalized intersection.

4.3 Traffic Control Signal Warrants

Traffic signal installation warrants for the unsignalized study intersections were conducted for several traffic volume scenarios as shown in **Table 16**. The purposes of these analyses were to determine if the installation of traffic signal controls would be warranted and when would it be expected to become warranted. Signal warrant analysis was performed in accordance with Transportation Association of Canada (TAC) standards and utilizing TAC warrants table. The 6-hour traffic volumes for each analysis year scenario considered were estimated as follows:

- AM peak hour volumes presented on the corresponding scenario figure were used for the 2 AM hours in TAC warrants table.
- PM peak hour volumes presented on the corresponding scenario figure were used for the 2 PM hours in TAC warrants table.
- To estimate the 2 mid-day hours, 60% of the AM volumes were used for one hour and 60% of the PM volumes were used for the second hour.

Table 16 presents a summary of the signal warrant analyses results for the three currently unsignalized intersections. The worksheet results for the traffic signal warrant analysis are included in **Appendix F**.

Table 16: TAC - Traffic Signal Warrant Results

Intersection	Scenario / Analyses Year	Warranting Score	Traffic Signal, Warranted?
43 Street North and 26 Avenue North / Township Road 92	Future 2022	59	**No**
	Future 2037	89	**No**
43 Street North and 18 Avenue North / Site Access	Background 2037	61	**No**
	Future 2022	131	**Yes**
	Future 2037	182	**Yes**
43 Street North and 14 Avenue North / Site Access	Background 2037	34	**No**
	Future 2022	133	**Yes**
	Future 2037	174	**Yes**

A review of **Table 16** indicates that traffic signal installation would NOT be warranted at the intersection of 43 Street North and 26 Avenue North / Township Road 92 by the future 2022 or the future 2037 traffic conditions with proposed site traffic volumes. However, by the year 2037 the TAC warranting score is 89, which is very close to the traffic signal warranting score of 100 breaking point. Also, the high expected delays to be experienced by the eastbound and westbound traffic, indicates a traffic signal installation would probably be required by the future 2037.

Additionally, a review of **Table 16** regarding the following two study intersections:

- 43 Street North and 18 Avenue North / Site Access
- 43 Street North and 14 Avenue North / Site Access

indicates that a traffic signal installation would be warranted under the future 2022 traffic conditions as well as under the future 2037 traffic conditions (with the proposed site traffic).

5.0 BICYCLE ROUTE MAP, BUS ROUTES AND STOPS REVIEW

5.1 Bicycle Route Map

Per the discussion and consultation with the City of Lethbridge Transportation Department, a review of the Cycling Master Plan should be considered as part of this TIA. Figure 17 presents the city-wide cycling network and infrastructure plan. A review of the cycling infrastructure plan indicated that 43 Street corridor has an existing Multi-use Pathway between 2 Avenue North and just north of 9 Avenue North. Additionally, a proposed Multi-use Pathway is also planned to connect to the existing Pathway along 43 Street south of 2 Avenue N and will continue all the way to the southern border of the City. Similarly, another Multi-use Pathway is planned to connect to the existing one along 43 Street N just north of 9 Avenue N and will extend all the way to the northern border of the City.

In addition to the above, there are four Multi-use Pathways planned along 5 Avenue N, 9 Avenue N, 18 Avenue N, and 26 Avenue N that would connect 43 Street N with the City of Lethbridge internal areas west of 43 Street N. These proposed Multi-use Pathways would connect to the existing facilities along 26 Avenue N and 28 Street N creating an efficient cycling and pedestrian connectivity.

The existing as well as the proposed Multi-use Pathways would allow significant percentages of the proposed development generated trips / customers to utilize active modes to access the proposed development, which would reduce vehicle trips and reduce vehicle traffic congestions. Additionally, it should be noted that the proposed development is proposing to have internal pedestrian infrastructure including sidewalks and/or multi-use pathways that would connect to the external Multi-use Pathways and sidewalks to ensure smooth and easy pedestrian / cyclist movements and access to the proposed development.

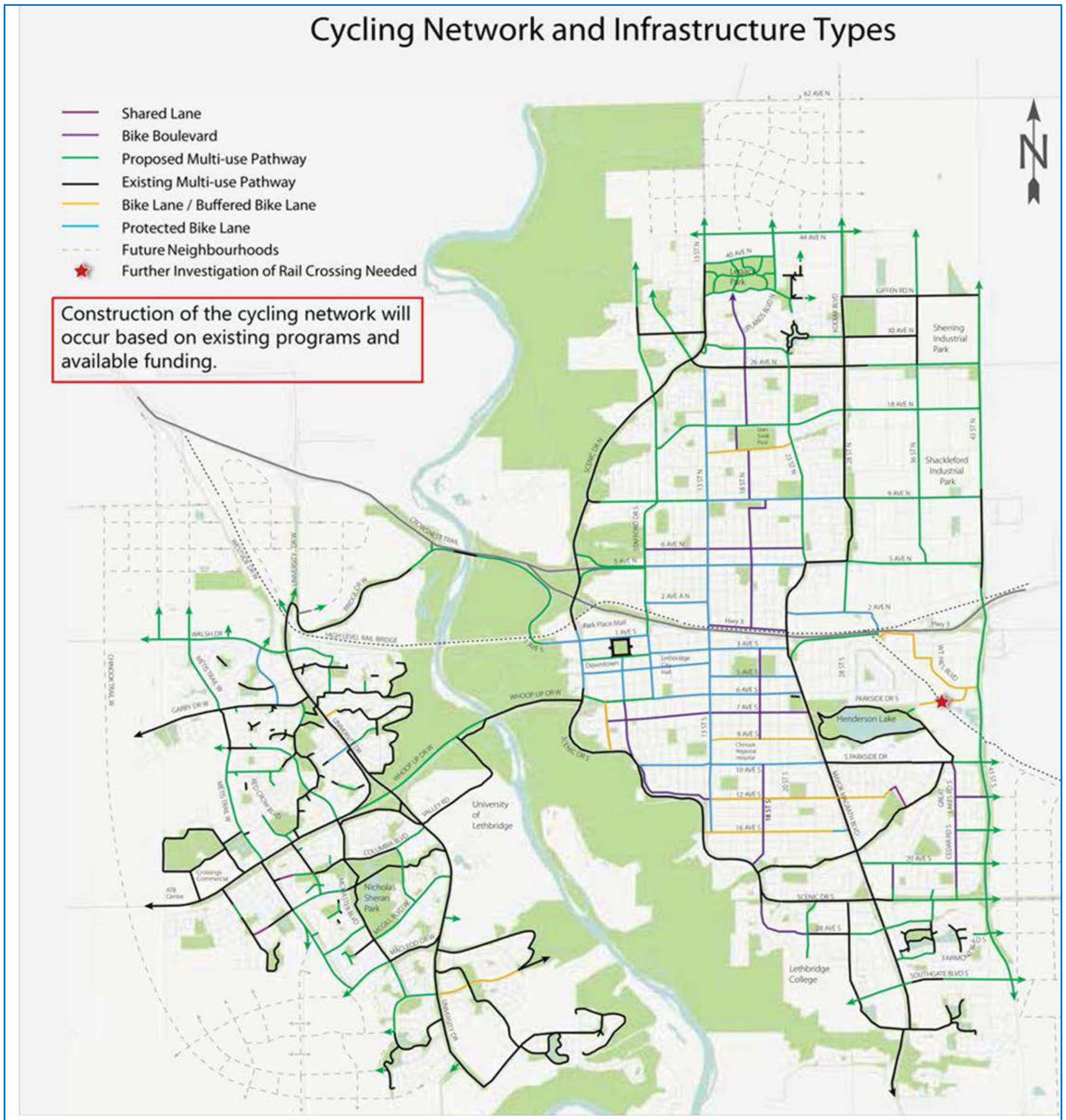

Figure 17: City of Lethbridge Cycling Master Plan

5.2 Bus Routes and Stops

As part of this TIA, a review of the Lethbridge Transit System and the available bus routes / stops to serve the project area is required. Figure 18 presents the Lethbridge Transit System Map with all available bus routes within the city shown. Figure 19 presents Route 21 Map as Route 21 with its varieties is the route that serves the vicinity of the proposed project area.

A review of Figure 18 indicates that there are a total of 18 routes, including their different service areas and service time varieties, available to serve the public within Lethbridge. There is a total of four transit terminals that provide connectivity of the service routes to allow full coverage of the city, these terminals are:

- University Terminal;
- North Terminal;
- College Terminal; and
- City Centre Terminal.

These terminals are placed at key locations within the City that allow smooth passenger transfers between the different routes in order to access different areas of the city. Reviewing Figure 18 closely indicates that Route “21S Day” is the route that directly serves the project vicinity as it passes through 43 Street N, north of Crowsnest Highway until it reaches 9 Avenue N where it turns left into the city.

A review of Figure 19 indicates that Route “21S Day” service is only available during the weekdays, Monday through Friday during daytime hours only. There is one bus stop along 9 Avenue N just west of 43 Street N that would be suitable to serve the proposed project site.

Consider modifying Route “21S Day” operation to also cover the weekends and the nights starting from year 2022, which is the opening year of Phase 2 of the proposed Chinook Industrial Park development. Also consider that the service coverage area of this route be modified to cover 43 Street N north of 9 Avenue N until 26 Avenue N and provision of two new bus stops in the vicinity of 14 Avenue and 18 Avenue to help Transit users access the proposed development since the site has an access point at each of these two roads.

Modifying the service area coverage and time / days coverage of Route “21S Day” would encourage reducing private vehicle trips and increasing the utilization of the transit, which in turn reduces traffic congestions.

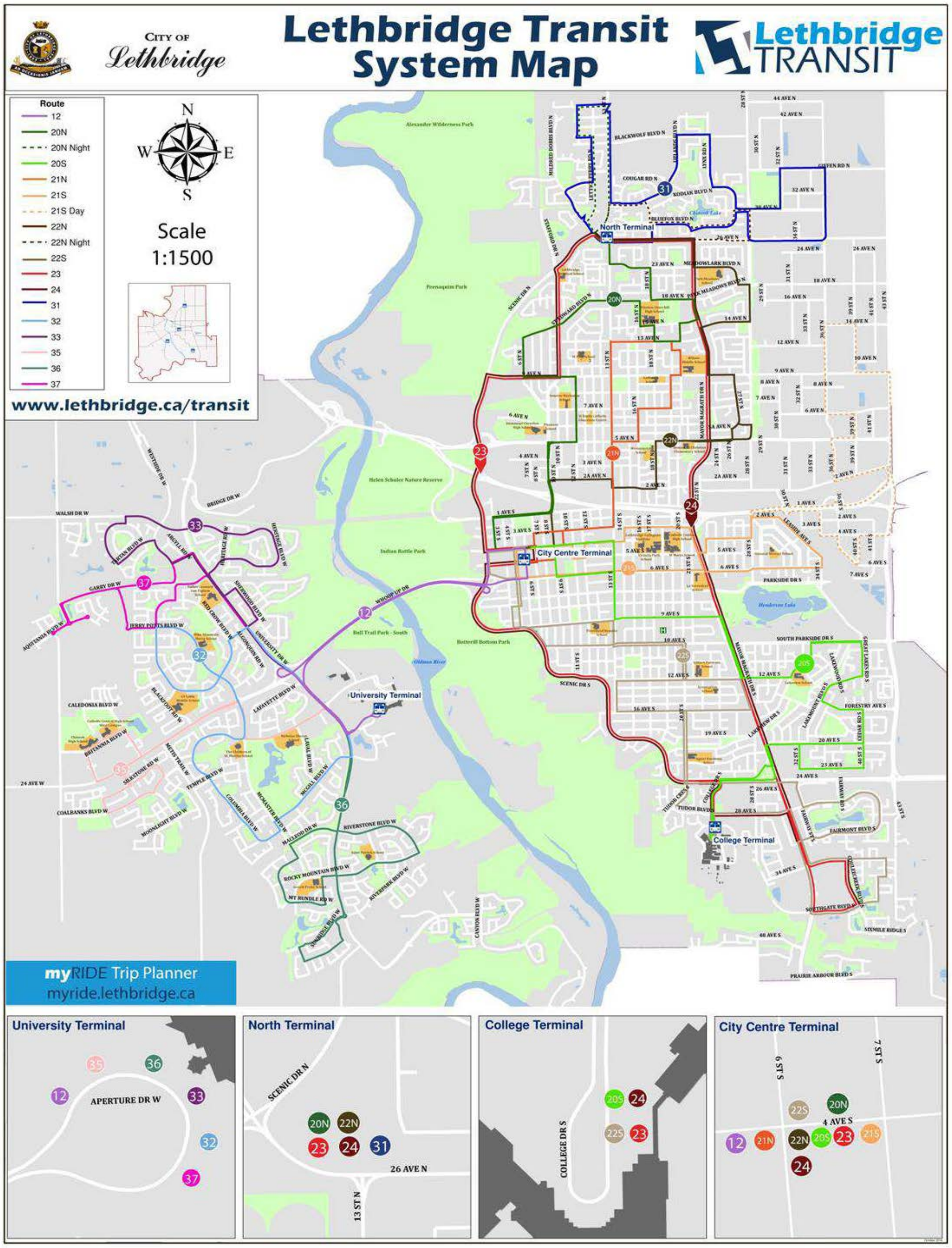

Figure 18: Lethbridge Transit System Map

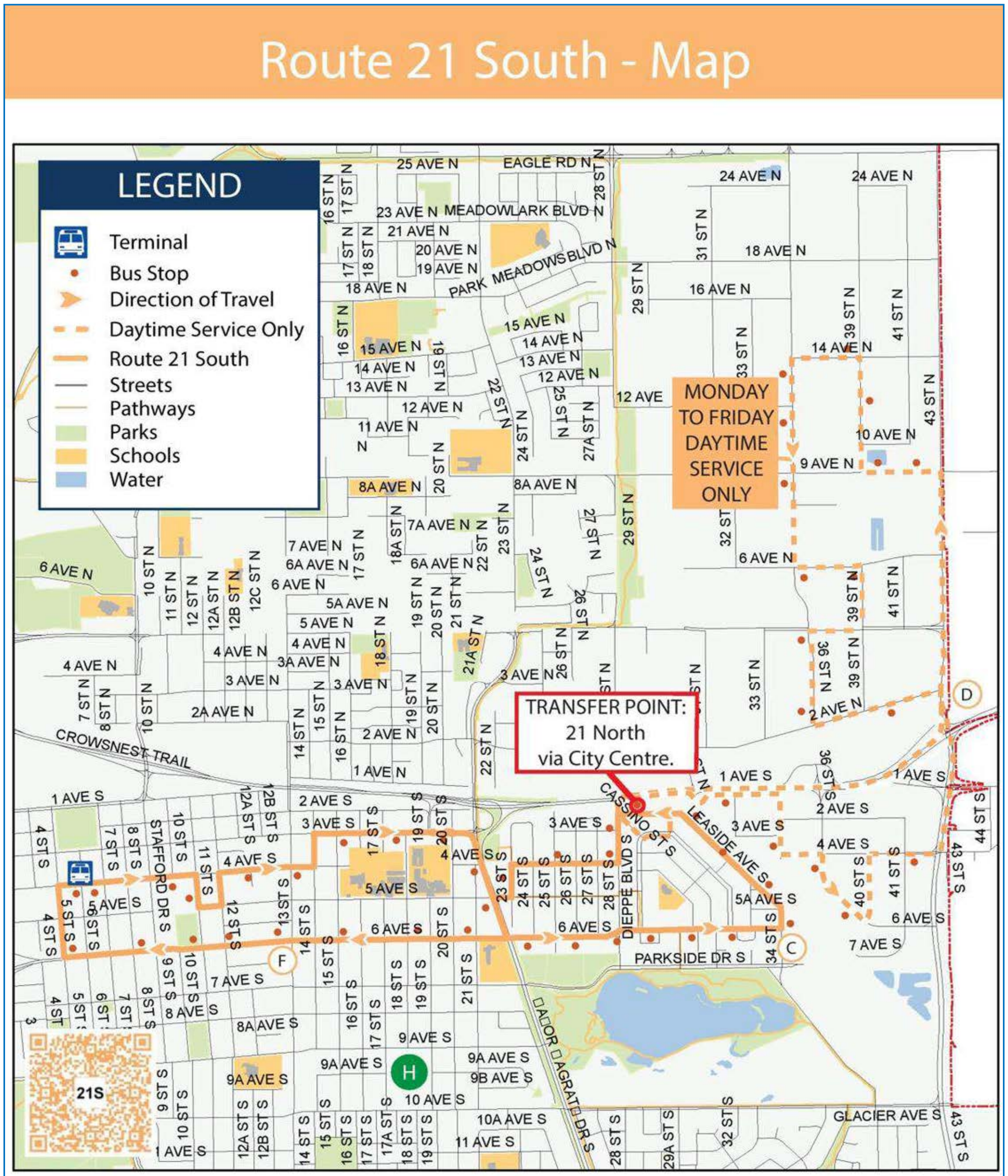

Figure 19: Lethbridge – Transit Route 21 Map

6.0 CONCLUSIONS AND RECOMMENDATIONS

This study analyzed the traffic impacts of the proposed Chinook Industrial Park Development project to be located in Lethbridge County, Alberta. The proposed development will have a total of five phases with Phase 1 including 18.56 acres of General Light Industrial land use and 18.62 acres of Business Park land use. Phase 1 will be completed after 2 years from today. Phases 2 to 5 will consist of 95.17 acres of General Light Industrial land use and 40.66 acres of Business Park land use. Phases 2 to 5 will be completed within 5 years from today. The estimated number of total site generated trips entering and exiting the development would be 10,674 trips daily, 850 trips during the AM peak, and 794 trips during the PM peak hour. The following conclusions have been reached by this traffic impact assessment study:

- LOS and capacity analyses indicated that under the **Existing 2017, Background 2019 and Background 2022** traffic conditions (without site traffic), all study area intersections operate at acceptable levels of service with no issues. Therefore, no intersection improvements required for any study intersection under these traffic conditions.

- **Background 2037** without the Project Site Traffic LOS analyses indicated that four study intersections would continue to operate at acceptable levels of service. However, the following two intersections would operate at unacceptable levels of service:

  a. 43 Street N and 26 Avenue N / Township Road 92; and
  b. Highway 3/Crowsnest Highway and 43 Street N.

  Therefore, mitigations would be needed for these two intersections under the background 2037 traffic conditions.

- The proposed mitigations under the Background 2037 conditions include:
  43 Street N and 26 Avenue N / Township Road 92 Intersection
    - Installation of a traffic signal

  Highway 3 / Crowsnest Highway and 43 Street Intersection
    - Installation of a second westbound left-turn only lane;
    - Installation of a second eastbound left-turn only lane;
    - Installation of a third westbound through only lane;
    - Installation of a third eastbound through only lane; and
    - Optimization of the traffic signal splits.

- The above mitigation would improve the operations at the above intersections. However, the intersection of Highway 3 / Crowsnest Highway and 43 Street would have the NB approach continue to operate at LOS “E”, which represents full capacity level of service.

- Any additional traffic would cause this intersection to perform at unacceptable levels of service and therefore, grade separation would be the most appropriate solution after 20 years from today.
- LOS and capacity analyses indicated that under the **Future 2019** traffic conditions (with site traffic), all study area intersections would operate at acceptable levels of service with no issues. Therefore, no intersection improvements would be required for any study intersection under future 2019 traffic conditions.
- **Future 2022** with the Project Site Traffic LOS analyses indicated that the three unsignalized study intersections and one of the signalized intersections would operate with unacceptable levels of service. The remaining two signalized intersections would continue to operate at acceptable levels of service. Therefore, mitigations would be needed for four of the study intersections under future 2022 conditions (with site traffic).
- The proposed mitigations under the future 2022 conditions consist of the following:
  <u>43 Street N and 26 Avenue N / Township Road 92 Intersection</u>
    - Installation of a two-phase traffic signal.

  <u>43 Street N and 18 Avenue N / Site Access</u>
    - Installation of a two-phase traffic signal

  <u>43 Street N and 14 Avenue N / Site Access</u>
    - Installation of a two-phase traffic signal; and
    - Installation of a northbound left-turn only lane.

  <u>Highway 3 / Crowsnest Highway and 43 Street Intersection</u>
    - Installation of a second eastbound left-turn only lane; and
    - Optimization of the traffic signal splits.
- The mitigated Future 2022 capacity analysis results indicate that the four intersections that previously failed would operate at acceptable levels of service with the proposed mitigations. Therefore, no further mitigations to any of these intersections would be needed under the future 2022 traffic conditions.
- **Future 2037** with the Project Site Traffic LOS analyses indicated that four intersections of the total six intersections would operate at unacceptable levels of service. Therefore, mitigations would be required under the Future 2037 conditions at these intersections.
- The proposed mitigations under the Future 2037 conditions consist of the following:
  <u>43 Street N and 26 Avenue N / Township Road 92 Intersection</u>
    - Installation of two-phase traffic signal.

43 Street N and 18 Avenue N / Site Access

  - Installation of a northbound left-turn only lane; and
  - Optimization of the traffic signal splits.

43 Street N and 14 Avenue N / Site Access

  - Optimization of the traffic signal splits.

Highway 3 / Crowsnest Highway and 43 Street Intersection

  - If the Stantec 2006 Functional Planning Study's proposed / recommended Highway 3 & 4 external links were built, Highway 3 east-west traffic volumes would be reduced significantly, and this intersection operation would improve. Therefore, a reevaluation of this intersection operation is recommended after the external highway links are built.

- Traffic signal control warrant analyses were performed for three stop-controlled intersections and the results indicated:
  - Traffic signal installation would NOT be warranted at the intersection of 43 Street North and 26 Avenue North / Township Road 92 by the future 2037 traffic conditions. **However, a traffic signal will be required to mitigate delays to traffic.** This is why it is recommended to monitor this intersection starting from year 2022 to determine when the installation of a traffic signal becomes warranted based on actual traffic count data.

- The traffic signal control warrant analyses further indicated that a traffic signal installation would be warranted under the future 2022 and future 2037 traffic conditions at the following two study intersections:
  - 43 Street North and 18 Avenue North / Site Access
  - 43 Street North and 14 Avenue North / Site Access

- A thorough review of the Cycling Master Plan / Infrastructure Plan has been completed and the results of the review indicated that the existing as well as the proposed Multi-use Pathways could allow significant percentages of the proposed development generated trips / customers to utilize active modes to access the proposed development, which would reduce vehicle trips and reduce vehicle traffic congestions.

- A review of the Lethbridge Transit System and the available bus routes / stops to serve the proposed project area was completed, the results indicated the following:

  - Route "21S Day" is the route that directly serves the project vicinity as it passes through 43 Street N, north of Crowsnest Highway until it reaches 9 Avenue N where it turns left into the city.

  - Route “21S Day” service is only available during the weekdays, Monday through Friday during daytime hours only. There is one bus stop along 9 Avenue N just west of 43 Street N that would be suitable to serve the proposed project site.

  - Consider modifying Route “21S Day” operation to also cover the weekends and the nights starting from year 2022, which is the opening year of Phase 2 of the proposed development.

  - It is also recommended to consider that the service coverage area of this route be modified to cover 43 Street N north of 9 Avenue N until 26 Avenue N and provision of two new bus stops in the vicinity of 14 Avenue and 18 Avenue to help Transit users access the proposed development since the site has access points at each of these two roads.

  - Modifying the service area coverage and time / days coverage of Route “21S Day” would encourage reducing private vehicle trips and increasing the utilization of the transit, which in turn reduces traffic congestions.

In summary, this traffic impact assessment concludes that the proposed Chinook Industrial Park Development will have impact on the traffic operations of both existing and future road network. However, this impact will be alleviated by implementing the improvements recommended above.

Yours truly,

EASL Transportation Consultants, Inc.

Prepared by:

EMAD M. ALSAIDI

Emad

PERMIT TO PRACTICE
EASL Transportation Consultants, Inc.
Signature: Emad
Date: **October 10, 2018**
Permit Number: 12960
The Association of Professional Engineers
and Geoscientists of Alberta

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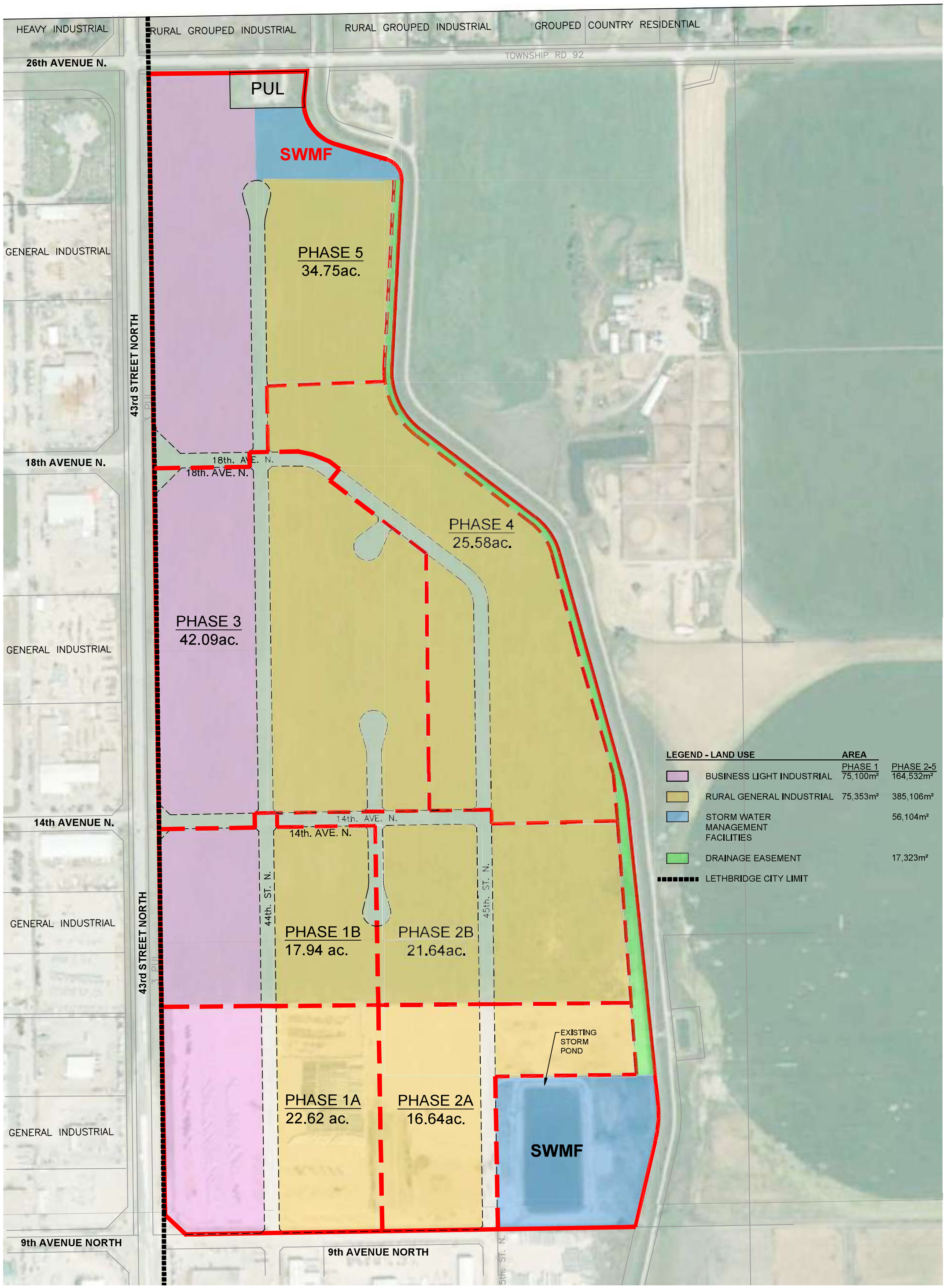
Appendix A

Proposed Development Site Plan



LEGEND - LAND USE		AREA PHASE 1	PHASE 2-5
🟪	BUSINESS LIGHT INDUSTRIAL	75,100m²	164,532m²
🟨	RURAL GENERAL INDUSTRIAL	75,353m²	385,106m²
🟦	STORM WATER MANAGEMENT FACILITIES		56,104m²
🟩	DRAINAGE EASEMENT		17,323m²
■■■■■■■■	LETHBRIDGE CITY LIMIT		

PROPOSED DEVELOPMENT & PHASING PLAN

N

0 50 100 150 200 250

SCALE=1:5,000

NOTES

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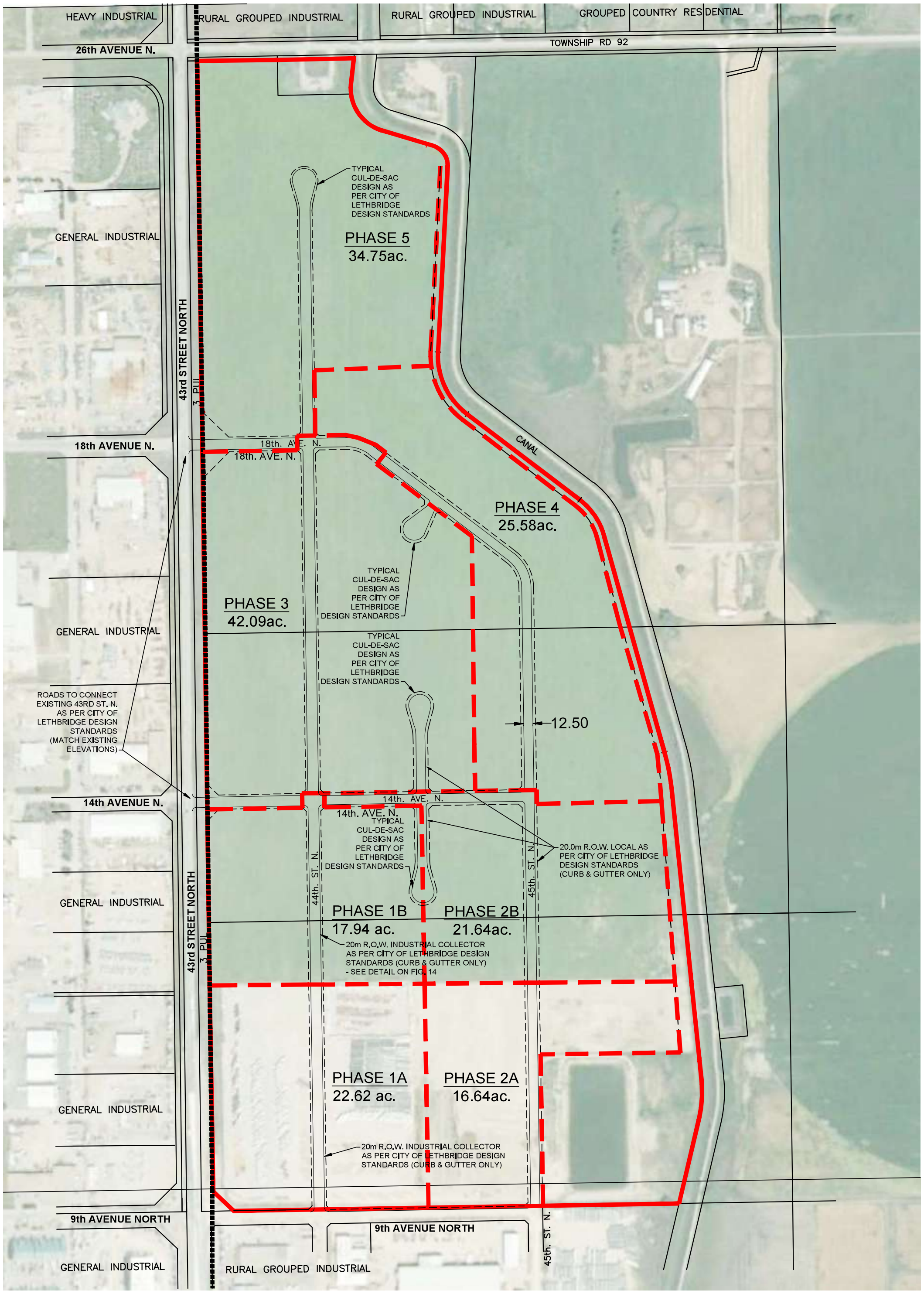
DRAWN: MDO
CHECKED: MAH
APPROVED: MAH
SCALE: AS SHOWN

DRAWING STATUS: PRELIMINARY

#	REVISION	DATE	BY

CLIENT: GEORGE KIRKHAM & ED FRIESEN
PROJECT TITLE: CHINOOK INDUSTRIAL PARK ASP
DRAWING TITLE: PROPOSED DEVELOPMENT & PHASING PLAN

PROJECT NUMBER: 17-006
VERSION NUMBER:
DATE DRAWN: Mar 26, 2018
SHEET NUMBER: FIG.4



PROPOSED ROADS LAYOUT

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DRAWN: MDO
CHECKED: MAH
APPROVED: MAH
SCALE: AS SHOWN

DRAWING STATUS: PRELIMINARY

#	REVISION	DATE	BY

CLIENT: GEORGE KIRKHAM & ED FRIESEN
PROJECT TITLE: CHINOOK INDUSTRIAL PARK ASP
DRAWING TITLE: PROPOSED ROADS LAYOUT

PROJECT NUMBER: 17-006
VERSION NUMBER:
DATE DRAWN: Mar 26, 2018
SHEET NUMBER: FIG.7

Appendix B

Intersection Turning Movement Traffic Counts

1. City of Lethbridge 2016 Traffic Count
2. Cavendish Farms Background Volumes
3. Alberta Transportation 2016 Traffic Count

City of Lethbridge: Intersection Summary

Northbound Street:	43 St N	RTOR	Y	Speed	70	Heavy Veh %	7	Next Signal		Median Wth		Bus Route	N
Eastbound Street:	26 Ave N	RTOR	Y	Speed	60	Heavy Veh %	4	Next Signal		Median Wth		Bus Route	N
Southbound Street:	43 St N	RTOR	Y	Speed	80	Heavy Veh %	16	Next Signal		Median Wth		Bus Route	N
Westbound Street:	Twp 92	RTOR	Y	Speed	50	Heavy Veh %	4	Next Signal		Median Wth		Bus Route	N

Weather: -16°C

Persons Challenged by Mobility Issues: N

Adjacent to Elementary School: N

Pathway for School: N

Date: Thu, Dec 15, 2016

Counted By: MioVision

Intersection: N-451

Senior Centre or Junior High: N

CBD: N

Notes: Site Code N-451

AM	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			Crosswalks					15 Minute Totals	60 Minute Totals	Peak Hour
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	North	South	East	West	Total			
7:00 - 7:15	10	5	1		2			8	37	3	8	1						75		
7:15 - 7:30	10	1			6		1	14	37	4	4							77		
7:30 - 7:45	11	8	2		8	1		14	48	2	9							103		
7:45 - 8:00	24	12	1	2	6		2	21	51	7	17	1						144	399	
8:00 - 8:15	17	4	8	1	4	1	1	15	45	1	13							110	434	
8:15 - 8:30	7	2	6	1	6	1	1	16	24	5	17	2						88	445	7:30-8:30
8:30 - 8:45	21	4	3		6	1		10	23	4	19	1						92	434	
8:45 - 9:00	17	7	4	1	3	1	1	6	21	3	6	2						72	362	
Peak Hour:	*59*	*26*	*17*	*4*	*24*	*3*	*4*	*66*	*168*	*15*	*56*	*3*							*PHF:*	*0.77*
PHF:	*0.61*	*0.54*	*0.53*	*0.50*	*0.75*	*0.75*	*0.50*	*0.79*	*0.82*	*0.54*	*0.82*	*0.38*								

MID	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			Crosswalks					15 Minute Totals	60 Minute Totals	Peak Hour
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	North	South	East	West	Total			
11:00 - 11:15	17	7	7		8	1	1	4	18	3	4							70		
11:15 - 11:30	18	2	7		5			7	29	6	11							85		
11:30 - 11:45	28	4	3		6	4	1	8	30	3	12							99		
11:45 - 12:00	35	3	3		3	2	4	5	27	7	10							99	353	
12:00 - 12:15	43	3	4	1	7			3	30	1	11							103	386	
12:15 - 12:30	46	1	4		11	3		10	36	2	6							119	420	
12:30 - 12:45	27	4	4	1	5	1		5	28	2	5							82	403	
12:45 - 13:00	33	9	2		4	1	1	7	50	2	7	1						117	421	12:00-13:00
Peak Hour:	*149*	*17*	*14*	*2*	*27*	*5*	*1*	*25*	*144*	*7*	*29*	*1*							*PHF:*	*0.88*
PHF:	*0.81*	*0.47*	*0.88*	*0.50*	*0.61*	*0.42*	*0.25*	*0.63*	*0.72*	*0.88*	*0.66*	*0.25*								

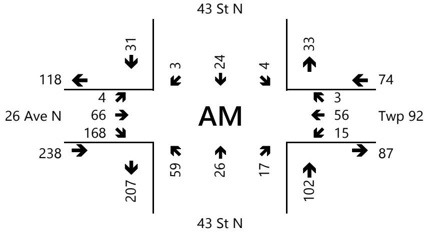
PM	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			Crosswalks					15 Minute Totals	60 Minute Totals	Peak Hour
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	North	South	East	West	Total			
15:00 - 15:15	32	2	7		8		4	10	31	3	4							101		
15:15 - 15:30	26	1	4		10	1	1	22	28	2	10	1						106		
15:30 - 15:45	47	4	10	3	32		1	17	26	1	15							156		
15:45 - 16:00	44	8	4	3	8			13	21	3	20							124	487	
16:00 - 16:15	41	8	5	1	10	2		11	35	1	12	1						127	513	
16:15 - 16:30	54	9	5	1	11	6	1	8	32	2	15							144	551	
16:30 - 16:45	66	6	4	4	11	1	1	10	45	2	17							167	562	
16:45 - 17:00	56	7	14		6	2	2	12	41	3	21							164	602	
17:00 - 17:15	47	7	13	2	8	2		4	43	1	19							146	621	16:15-17:15
17:15 - 17:30	40	7	14		6	2		10	28	1	16	1						125	602	
Peak Hour:	*223*	*29*	*36*	*7*	*36*	*11*	*4*	*34*	*161*	*8*	*72*								*PHF:*	*0.93*
PHF:	*0.84*	*0.81*	*0.64*	*0.44*	*0.82*	*0.46*	*0.50*	*0.71*	*0.89*	*0.67*	*0.86*									

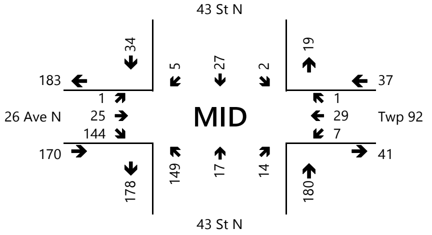
6 Hour Average	127	22	21	4	30	5	3	40	134	12	49	2				
Approach Lanes	0.5	1	0.5	0.5	1	0.5	0.5	1	0.5	0.5	1	0.5				
Departure Lanes	1			1			1			1						

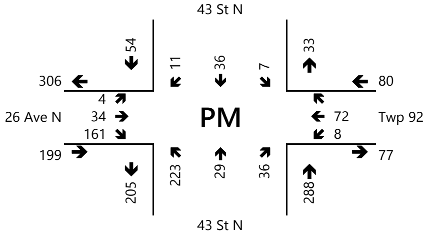
2 Hour PM Range Used for Vehicles: 15:30 to 17:30

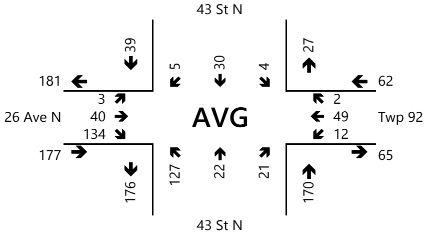
Not Warranted

Pedestrian Points:	0
Vehicle Points:	21
Total:	21









Intersection:	43 Street N and 18 Avenue N
Count Date:	14-Mar-17
Count Day:	Tuesday
Counted By:	Hasegawa Consulting Professional Engineers

ALL VEHICLES

AM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
AM	L	T	R	L	T	R	L	T	R	L	T	R			
7:00 - 7:15	0	0	25	0	0	0	25	10	0	0	44	0	104		
7:15 - 7:30	0	0	28	0	0	0	25	17	0	0	50	2	122		
7:30 - 7:45	1	0	17	0	0	0	49	18	0	0	58	0	143		
7:45 - 8:00	2	0	33	0	0	0	59	31	0	0	56	5	186	555	
8:00 - 8:15	2	0	21	0	0	0	33	22	0	0	46	2	126	**577**	**0.78**
8:15 - 8:30	1	0	28	0	0	0	25	22	0	0	29	2	107	562	
8:30 - 8:45	0	0	25	0	0	0	22	18	0	0	29	1	95	514	
8:45 - 9:00	3	0	18	0	0	0	24	29	0	0	44	2	120	448	
Peak Hour	**5**	**0**	**99**	**0**	**0**	**0**	**166**	**88**	**0**	**0**	**210**	**9**	**577**		
App Total	104			0			254			219			577		
HV %	**12%**			**#DIV/0!**			**10%**			**3%**			**7%**		

ALL VEHICLES

PM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
PM	L	T	R	L	T	R	L	T	R	L	T	R			
4:00 – 4:15	2	0	33	0	0	0	19	41	0	0	43	2	140		
4:15 – 4:30	1	0	26	0	0	0	24	55	0	0	29	3	138		
4:30 – 4:45	5	0	53	0	0	0	27	74	0	0	26	0	185		
4:45 – 5:00	5	0	32	0	0	0	25	42	0	0	32	0	136	599	
5:00 – 5:15	5	0	48	0	0	0	18	65	0	0	53	0	189	**648**	**0.86**
5:15 – 5:30	1	0	15	0	0	0	29	44	0	0	41	4	134	644	
5:30 – 5:45	1	0	23	0	0	0	16	54	0	0	31	2	127	586	
5:45 – 6:00	3	0	15	0	0	0	17	32	0	0	26	1	94	544	
Peak Hour	**16**	**0**	**159**	**0**	**0**	**0**	**94**	**236**	**0**	**0**	**140**	**3**	**648**		
App Total	175			0			330			143			648		
HV %	**9%**			**#DIV/0!**			**9%**			**8%**			**9%**		

Intersection: 43 Street N and 18 Avenue N
Count Date: 14-Mar-17
Count Day: Tuesday
Counted By: Hasegawa Consulting Professional Engineers

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

AM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	1	0	0	0	3	2	0	0	2	0	8
7:15 - 7:30	0	0	1	0	0	0	2	1	0	0	2	1	7
7:30 - 7:45	0	0	1	0	0	0	4	3	0	0	3	0	11
7:45 - 8:00	0	0	4	0	0	0	5	4	0	0	0	0	13
8:00 - 8:15	0	0	6	0	0	0	4	2	0	0	0	0	12
8:15 - 8:30	0	0	9	0	0	0	4	3	0	0	1	1	18
8:30 - 8:45	0	0	6	0	0	0	7	0	0	0	3	0	16
8:45 - 9:00	2	0	2	0	0	0	4	5	0	0	3	0	16
Peak Hour	**0**	**0**	**12**	**0**	**0**	**0**	**15**	**10**	**0**	**0**	**5**	**1**	**43**
App Total	**12**			**0**			**25**			**6**			**43**

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

PM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	0	0	3	0	0	0	2	2	0	0	3	0	10
4:15 – 4:30	0	0	4	0	0	0	4	3	0	0	6	0	17
4:30 – 4:45	0	0	2	0	0	0	4	7	0	0	1	0	14
4:45 – 5:00	0	0	5	0	0	0	7	1	0	0	0	0	13
5:00 – 5:15	0	0	4	0	0	0	2	3	0	0	4	0	13
5:15 – 5:30	0	0	0	0	0	0	2	0	0	0	1	1	4
5:30 – 5:45	0	0	2	0	0	0	2	1	0	0	0	0	5
5:45 – 6:00	0	0	0	0	0	0	1	0	0	0	0	0	1
Peak Hour	0	0	15	0	0	0	17	14	0	0	11	0	57
App Total	**15**			**0**			**31**			**11**			**57**

Intersection: 43 Street N and 18 Avenue N
Count Date: 14-Mar-17
Count Day: Tuesday
Counted By: Hasegawa Consulting Professional Engineers

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

AM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	24	0	0	0	22	8	0	0	42	0	96
7:15 - 7:30	0	0	27	0	0	0	23	16	0	0	48	1	115
7:30 - 7:45	1	0	16	0	0	0	45	15	0	0	55	0	132
7:45 - 8:00	2	0	29	0	0	0	54	27	0	0	56	5	173
8:00 - 8:15	2	0	15	0	0	0	29	20	0	0	46	2	114
8:15 - 8:30	1	0	19	0	0	0	21	19	0	0	28	1	89
8:30 - 8:45	0	0	19	0	0	0	15	18	0	0	26	1	79
8:45 - 9:00	1	0	16	0	0	0	20	24	0	0	41	2	104
Peak Hour	**5**	**0**	**87**	**0**	**0**	**0**	**151**	**78**	**0**	**0**	**205**	**8**	**534**
App Total	**92**			**0**			**229**			**213**			**534**

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

PM Peak Hour Traffic Count at 43 Street N and 18 Avenue N Intersection

Time Period	18 Avenue N Eastbound			18 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	2	0	30	0	0	0	17	39	0	0	40	2	130
4:15 – 4:30	1	0	22	0	0	0	20	52	0	0	23	3	121
4:30 – 4:45	5	0	51	0	0	0	23	67	0	0	25	0	171
4:45 – 5:00	5	0	27	0	0	0	18	41	0	0	32	0	123
5:00 – 5:15	5	0	44	0	0	0	16	62	0	0	49	0	176
5:15 – 5:30	1	0	15	0	0	0	27	44	0	0	40	3	130
5:30 – 5:45	1	0	21	0	0	0	14	53	0	0	31	2	122
5:45 – 6:00	3	0	15	0	0	0	16	32	0	0	26	1	93
Peak Hour	**16**	**0**	**144**	**0**	**0**	**0**	**77**	**222**	**0**	**0**	**129**	**3**	**591**
App Total	**160**			**0**			**299**			**132**			**591**

Intersection:	43 Street N and 14 Avenue N
Count Date:	14-Mar-17
Count Day:	Tuesday
Counted By:	Hasegawa Consulting Professional Engineers

ALL VEHICLES

AM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
AM	L	T	R	L	T	R	L	T	R	L	T	R			
7:00 - 7:15	0	0	0	0	0	0	10	32	0	0	60	1	103		
7:15 - 7:30	0	0	2	0	0	0	19	39	0	0	72	4	136		
7:30 - 7:45	0	0	5	0	0	0	22	62	0	0	76	2	167		
7:45 - 8:00	1	0	6	0	0	0	18	86	0	0	80	5	196	602	
8:00 - 8:15	1	0	5	0	0	0	8	49	0	0	69	2	134	633	**0.81**
8:15 - 8:30	0	0	4	0	0	0	10	51	0	0	60	1	126	623	
8:30 - 8:45	0	0	7	0	0	0	11	47	0	0	53	1	119	575	
8:45 - 9:00	1	0	5	0	0	0	10	49	0	0	53	3	121	500	
Peak Hour	**2**	**0**	**18**	**0**	**0**	**0**	**67**	**236**	**0**	**0**	**297**	**13**	**633**		
App Total	20			0			303			310			633		
HV %	**55%**			**#DIV/0!**			**10%**			**6%**			**10%**		

ALL VEHICLES

PM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
PM	L	T	R	L	T	R	L	T	R	L	T	R			
4:00 – 4:15	0	0	20	0	0	0	2	59	0	0	69	1	151		
4:15 – 4:30	3	0	9	0	0	0	4	89	0	0	62	1	168		
4:30 – 4:45	6	0	43	0	0	0	4	99	0	0	69	0	221		
4:45 – 5:00	0	0	17	0	0	0	3	68	0	0	62	0	150	690	
5:00 – 5:15	3	0	10	0	0	0	4	83	0	0	93	1	194	**733**	**0.83**
5:15 – 5:30	0	0	7	0	0	0	6	76	0	0	56	0	145	710	
5:30 – 5:45	1	0	5	0	0	0	3	74	0	0	52	0	135	624	
5:45 – 6:00	0	0	8	0	0	0	4	51	0	0	48	0	111	585	
Peak Hour	**12**	**0**	**79**	**0**	**0**	**0**	**15**	**339**	**0**	**0**	**286**	**2**	**733**		
App Total	91			0			354			288			733		
HV %	**3%**			**#DIV/0!**			**9%**			**10%**			**9%**		

Intersection:	43 Street N and 14 Avenue N
Count Date:	14-Mar-17
Count Day:	Tuesday
Counted By:	Hasegawa Consulting Professional Engineers

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

AM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	0	0	0	0	0	5	0	0	1	0	6
7:15 - 7:30	0	0	2	0	0	0	1	3	0	0	4	0	10
7:30 - 7:45	0	0	2	0	0	0	0	8	0	0	4	0	14
7:45 - 8:00	0	0	2	0	0	0	0	9	0	0	3	2	16
8:00 - 8:15	0	1	4	0	0	0	2	7	0	0	7	0	21
8:15 - 8:30	0	0	1	0	0	0	1	8	0	0	10	1	21
8:30 - 8:45	0	0	2	0	0	0	1	9	0	0	9	1	22
8:45 - 9:00	1	0	1	0	0	0	3	7	0	0	4	1	17
Peak Hour	**0**	**1**	**10**	**0**	**0**	**0**	**3**	**27**	**0**	**0**	**18**	**2**	**61**
App Total	**11**			**0**			**30**			**20**			**61**

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

PM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	0	0	2	0	0	0	0	4	0	0	7	0	13
4:15 – 4:30	0	0	0	0	0	0	1	8	0	0	11	1	21
4:30 – 4:45	0	0	2	0	0	0	0	10	0	0	3	0	15
4:45 – 5:00	0	0	0	0	0	0	1	8	0	0	5	0	14
5:00 – 5:15	1	0	0	0	0	0	0	4	0	0	7	1	13
5:15 – 5:30	0	0	0	0	0	0	2	3	0	0	1	0	6
5:30 – 5:45	0	0	1	0	0	0	1	4	0	0	1	0	7
5:45 – 6:00	0	0	0	0	0	0	1	1	0	0	1	0	3
Peak Hour	1	0	2	0	0	0	2	30	0	0	26	2	63
App Total	**3**			**0**			**32**			**28**			**63**

Intersection:	43 Street N and 14 Avenue N
Count Date:	14-Mar-17
Count Day:	Tuesday
Counted By:	Hasegawa Consulting Professional Engineers

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

AM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	0	0	0	0	10	27	0	0	59	1	97
7:15 - 7:30	0	0	0	0	0	0	18	36	0	0	68	4	126
7:30 - 7:45	0	0	3	0	0	0	22	54	0	0	72	2	153
7:45 - 8:00	1	0	4	0	0	0	18	77	0	0	77	3	180
8:00 - 8:15	0	0	1	0	0	0	6	42	0	0	62	2	113
8:15 - 8:30	0	0	3	0	0	0	9	43	0	0	50	0	105
8:30 - 8:45	0	0	5	0	0	0	10	38	0	0	44	0	97
8:45 - 9:00	0	0	4	0	0	0	7	42	0	0	49	2	104
Peak Hour	**1**	**0**	**8**	**0**	**0**	**0**	**64**	**209**	**0**	**0**	**279**	**11**	**572**
App Total	**9**			**0**			**273**			**290**			**572**

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

PM Peak Hour Traffic Count at 43 Street N and 14 Avenue N Intersection

Time Period	14 Avenue N Eastbound			14 Avenue N Westbaoun			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	0	0	18	0	0	0	2	55	0	0	62	1	138
4:15 – 4:30	3	0	9	0	0	0	3	81	0	0	51	0	147
4:30 – 4:45	6	0	41	0	0	0	4	89	0	0	66	0	206
4:45 – 5:00	0	0	17	0	0	0	2	60	0	0	57	0	136
5:00 – 5:15	2	0	10	0	0	0	4	79	0	0	86	0	181
5:15 – 5:30	0	0	7	0	0	0	4	73	0	0	55	0	139
5:30 – 5:45	1	0	4	0	0	0	2	70	0	0	51	0	128
5:45 – 6:00	0	0	8	0	0	0	3	50	0	0	47	0	108
Peak Hour	**11**	**0**	**77**	**0**	**0**	**0**	**13**	**309**	**0**	**0**	**260**	**0**	**670**
App Total	**88**			**0**			**322**			**260**			**670**

Intersection: 43 Street N and 9 Avenue N
Count Date: 14-Mar-17
Count Day: Tuesday
Counted By: Hasegawa Consulting Professional Engineers

ALL VEHICLES

AM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
AM	L	T	R	L	T	R	L	T	R	L	T	R			
7:00 - 7:15	0	4	9	2	0	0	24	36	24	5	52	2	158		
7:15 - 7:30	0	7	13	2	3	2	39	67	20	7	68	2	230		
7:30 - 7:45	1	3	18	8	3	1	35	88	16	2	71	1	247		
7:45 - 8:00	1	2	22	1	0	0	60	101	24	1	85	4	301	936	
8:00 - 8:15	1	0	24	7	0	1	54	49	13	1	69	5	224	**1002**	**0.83**
8:15 - 8:30	2	2	29	7	2	1	39	54	13	4	62	4	219	991	
8:30 - 8:45	3	4	25	7	1	1	33	58	14	1	55	1	203	947	
8:45 - 9:00	1	5	27	6	2	2	42	56	11	3	54	3	212	858	
Peak Hour	**3**	**12**	**77**	**18**	**6**	**4**	**188**	**305**	**73**	**11**	**293**	**12**	**1002**		
App Total	92			28			566			316			1002		
HV %	**3%**			**36%**			**9%**			**9%**			**9%**		

ALL VEHICLES

PM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
PM	L	T	R	L	T	R	L	T	R	L	T	R			
4:00 – 4:15	2	1	41	32	14	12	30	39	2	1	69	5	248		
4:15 – 4:30	1	4	46	13	4	2	38	71	3	1	59	5	247		
4:30 – 4:45	7	0	49	53	3	4	26	93	4	0	126	5	370		
4:45 – 5:00	1	1	42	15	1	2	32	63	7	2	67	6	239	1104	
5:00 – 5:15	4	0	83	17	3	4	32	74	4	0	103	3	327	**1183**	**0.80**
5:15 – 5:30	1	1	38	13	0	0	27	92	1	0	65	3	241	1177	
5:30 – 5:45	0	0	27	20	62	2	17	5	1	0	53	1	188	995	
5:45 – 6:00	0	0	21	5	0	1	14	51	2	0	54	1	149	905	
Peak Hour	**13**	**5**	**220**	**98**	**11**	**12**	**128**	**301**	**18**	**3**	**355**	**19**	**1183**		
App Total	238			121			447			377			1183		
HV %	**6%**			**2%**			**13%**			**7%**			**9%**		

Intersection: 43 Street N and 9 Avenue N
Count Date: 14-Mar-17
Count Day: Tuesday
Counted By: Hasegawa Consulting Professional Engineers

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

AM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	0	0	0	0	0	4	0	0	1	0	5
7:15 - 7:30	0	0	0	1	0	1	3	4	2	0	5	1	17
7:30 - 7:45	0	0	1	2	1	0	2	8	2	0	6	0	22
7:45 - 8:00	0	0	2	1	0	0	2	9	1	0	5	0	20
8:00 - 8:15	0	0	0	3	0	1	9	8	2	1	11	0	35
8:15 - 8:30	1	0	3	2	0	0	2	8	2	1	9	0	28
8:30 - 8:45	1	1	4	5	0	0	3	9	1	0	10	1	35
8:45 - 9:00	0	1	2	3	0	2	3	7	3	1	6	0	28
Peak Hour	**0**	**0**	**3**	**7**	**1**	**2**	**16**	**29**	**7**	**1**	**27**	**1**	**94**
App Total	**3**			**10**			**52**			**29**			**94**

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

PM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	1	0	2	1	1	0	3	3	0	0	9	1	21
4:15 – 4:30	0	2	4	0	0	0	5	8	0	1	10	0	30
4:30 – 4:45	0	0	4	1	0	0	6	11	0	0	3	1	26
4:45 – 5:00	0	0	0	0	1	0	6	9	2	1	5	0	24
5:00 – 5:15	0	0	5	0	1	0	4	4	1	0	7	0	22
5:15 – 5:30	0	0	3	0	0	0	5	5	1	0	1	0	15
5:30 – 5:45	0	0	5	2	0	0	2	4	0	0	2	0	15
5:45 – 6:00	0	0	5	0	0	0	2	3	1	0	1	0	12
Peak Hour	0	2	13	1	2	0	21	32	3	2	25	1	102
App Total	**15**			**3**			**56**			**28**			**102**

Intersection:	43 Street N and 9 Avenue N
Count Date:	14-Mar-17
Count Day:	Tuesday
Counted By:	Hasegawa Consulting Professional Engineers

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

AM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	4	9	2	0	0	24	32	24	5	51	2	153
7:15 - 7:30	0	7	13	1	3	1	36	63	18	7	63	1	213
7:30 - 7:45	1	3	17	6	2	1	33	80	14	2	65	1	225
7:45 - 8:00	1	2	20	0	0	0	58	92	23	1	80	4	281
8:00 - 8:15	1	0	24	4	0	0	45	41	11	0	58	5	189
8:15 - 8:30	1	2	26	5	2	1	37	46	11	3	53	4	191
8:30 - 8:45	2	3	21	2	1	1	30	49	13	1	45	0	168
8:45 - 9:00	1	4	25	3	2	0	39	49	8	2	48	3	184
Peak Hour	**3**	**12**	**74**	**11**	**5**	**2**	**172**	**276**	**66**	**10**	**266**	**11**	**908**
App Total		**89**			**18**			**514**			**287**		**908**

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

PM Peak Hour Traffic Count at 43 Street N and 9 Avenue N Intersection

Time Period	9 Avenue N Eastbound			9 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	1	1	39	31	13	12	27	36	2	1	60	4	227
4:15 – 4:30	1	2	42	13	4	2	33	63	3	0	49	5	217
4:30 – 4:45	7	0	45	52	3	4	20	82	4	0	123	4	344
4:45 – 5:00	1	1	42	15	0	2	26	54	5	1	62	6	215
5:00 – 5:15	4	0	78	17	2	4	28	70	3	0	96	3	305
5:15 – 5:30	1	1	35	13	0	0	22	87	0	0	64	3	226
5:30 – 5:45	0	0	22	18	62	2	15	1	1	0	51	1	173
5:45 – 6:00	0	0	16	5	0	1	12	48	1	0	53	1	137
Peak Hour	**13**	**3**	**207**	**97**	**9**	**12**	**107**	**269**	**15**	**1**	**330**	**18**	**1081**
App Total		**223**			**118**			**391**			**349**		**1081**

Intersection: 43 Street N and 5 Avenue N
Count Date: 16-Mar-17
Count Day: Thursday
Counted By: Hasegawa Consulting Professional Engineers

ALL VEHICLES

AM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
AM	L	T	R	L	T	R	L	T	R	L	T	R			
7:00 - 7:15	6	0	23	0	0	0	38	76	0	0	65	4	212		
7:15 - 7:30	5	0	35	0	0	0	64	116	0	0	79	3	302		
7:30 - 7:45	3	0	27	0	0	0	67	136	0	0	101	8	342		
7:45 - 8:00	8	0	44	0	0	0	57	168	0	0	119	10	406	1262	
8:00 - 8:15	3	0	36	0	0	0	49	165	0	0	97	5	355	**1405**	**0.87**
8:15 - 8:30	3	0	22	0	0	0	45	119	0	0	116	4	309	1412	
8:30 - 8:45	4	0	36	0	0	0	32	104	0	0	95	5	276	1346	
8:45 - 9:00	5	0	37	0	0	0	50	93	0	0	86	5	276	1216	
Peak Hour	**19**	**0**	**142**	**0**	**0**	**0**	**237**	**585**	**0**	**0**	**396**	**26**	**1405**		
App Total	161			0			822			422			1405		
HV %	**12%**			**#DIV/0!**			**6%**			**16%**			**10%**		

ALL VEHICLES

PM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum	4-P Total	PHF
PM	L	T	R	L	T	R	L	T	R	L	T	R			
4:00 – 4:15	8	0	45	0	0	0	60	105	0	0	162	4	384		
4:15 – 4:30	6	0	46	0	0	0	53	138	0	0	140	10	393		
4:30 – 4:45	9	0	58	0	0	0	57	128	0	0	235	12	499		
4:45 – 5:00	6	0	59	0	0	0	48	113	0	0	202	3	431	1707	
5:00 – 5:15	6	0	80	0	0	0	46	117	0	0	221	11	481	**1804**	**0.90**
5:15 – 5:30	3	0	41	0	0	0	37	106	0	0	172	3	362	1773	
5:30 – 5:45	1	0	41	0	0	0	35	74	0	0	103	5	259	1533	
5:45 – 6:00	1	0	40	0	0	0	24	57	0	0	102	5	229	1331	
Peak Hour	**27**	**0**	**243**	**0**	**0**	**0**	**204**	**496**	**0**	**0**	**798**	**36**	**1804**		
App Total	270			0			700			834			1804		
HV %	**7%**			**#DIV/0!**			**12%**			**6%**			**8%**		

Intersection:	43 Street N and 5 Avenue N
Count Date:	16-Mar-17
Count Day:	Thursday
Counted By:	Hasegawa Consulting Professional Engineers

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

AM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	0	6	0	0	0	3	3	0	0	17	1	30
7:15 - 7:30	0	0	6	0	0	0	2	8	0	0	9	0	25
7:30 - 7:45	0	0	2	0	0	0	3	7	0	0	11	3	26
7:45 - 8:00	2	0	5	0	0	0	0	11	0	0	18	2	38
8:00 - 8:15	0	0	4	0	0	0	3	14	0	0	24	2	47
8:15 - 8:30	1	0	5	0	0	0	4	7	0	0	19	0	36
8:30 - 8:45	0	0	6	0	0	0	8	16	0	0	26	1	57
8:45 - 9:00	0	0	7	0	0	0	4	13	0	0	16	1	41
Peak Hour	**2**	**0**	**17**	**0**	**0**	**0**	**8**	**40**	**0**	**0**	**62**	**7**	**136**
App Total	**19**			**0**			**48**			**69**			**136**

TRUCKS, MULTI-AXLE VEHICLE, CITY BUS OR SCHOOL BUS

PM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	1	0	5	0	0	0	13	10	0	0	6	0	35
4:15 – 4:30	1	0	5	0	0	0	15	15	0	0	9	5	50
4:30 – 4:45	1	0	4	0	0	0	9	11	0	0	13	1	39
4:45 – 5:00	4	0	2	0	0	0	7	13	0	0	6	0	32
5:00 – 5:15	0	0	2	0	0	0	5	6	0	0	9	3	25
5:15 – 5:30	1	0	2	0	0	0	3	7	0	0	14	0	27
5:30 – 5:45	1	0	2	0	0	0	11	12	0	0	7	1	34
5:45 – 6:00	0	0	2	0	0	0	2	5	0	0	4	1	14
Peak Hour	6	0	13	0	0	0	36	45	0	0	37	9	146
App Total	**19**			**0**			**81**			**46**			**146**

Intersection: 43 Street N and 5 Avenue N
Count Date: 16-Mar-17
Count Day: Thursday
Counted By: Hasegawa Consulting Professional Engineers

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

AM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
AM	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	6	0	17	0	0	0	35	73	0	0	48	3	182
7:15 - 7:30	5	0	29	0	0	0	62	108	0	0	70	3	277
7:30 - 7:45	3	0	25	0	0	0	64	129	0	0	90	5	316
7:45 - 8:00	6	0	39	0	0	0	57	157	0	0	101	8	368
8:00 - 8:15	3	0	32	0	0	0	46	151	0	0	73	3	308
8:15 - 8:30	2	0	17	0	0	0	41	112	0	0	97	4	273
8:30 - 8:45	4	0	30	0	0	0	24	88	0	0	69	4	219
8:45 - 9:00	5	0	30	0	0	0	46	80	0	0	70	4	235
Peak Hour	**17**	**0**	**125**	**0**	**0**	**0**	**229**	**545**	**0**	**0**	**334**	**19**	**1269**
App Total	**142**			**0**			**774**			**353**			**1269**

PASSENGER CARS, MINI-VANS, TWO AXLE TRUCKS, MOTOR CYCLES AND STATION WAGONS

PM Peak Hour Traffic Count at 43 Street N and 5 Avenue N Intersection

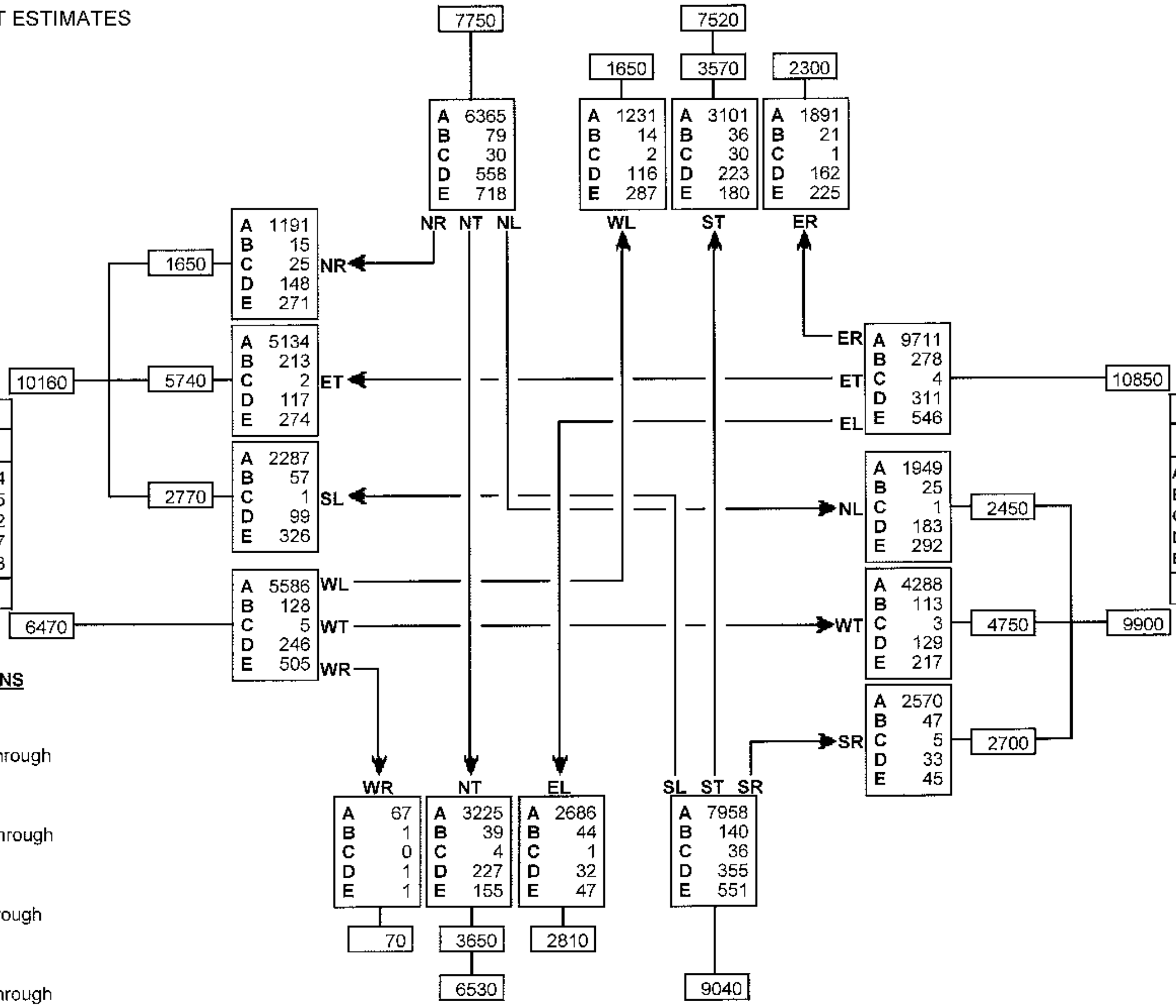
Time Period	5 Avenue N Eastbound			5 Avenue N Westbound			43 Street N Northbound			43 Street N Southbound			Sum
PM	L	T	R	L	T	R	L	T	R	L	T	R	
4:00 – 4:15	7	0	40	0	0	0	47	95	0	0	156	4	349
4:15 – 4:30	5	0	41	0	0	0	38	123	0	0	131	5	343
4:30 – 4:45	8	0	54	0	0	0	48	117	0	0	222	11	460
4:45 – 5:00	2	0	57	0	0	0	41	100	0	0	196	3	399
5:00 – 5:15	6	0	78	0	0	0	41	111	0	0	212	8	456
5:15 – 5:30	2	0	39	0	0	0	34	99	0	0	158	3	335
5:30 – 5:45	0	0	39	0	0	0	24	62	0	0	96	4	225
5:45 – 6:00	1	0	38	0	0	0	22	52	0	0	98	4	215
Peak Hour	**21**	**0**	**230**	**0**	**0**	**0**	**168**	**451**	**0**	**0**	**761**	**27**	**1658**
App Total	**251**			**0**			**619**			**788**			**1658**

Turning Movement Summary Diagram

Reference No.: 50000010
Intersection of:
3 & 4 & 843 IN LETHBRIDGE 4-29-21-400001320

2016 AADT / ASDT ESTIMATES

North On 843		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	12588	82.4
B: Recreational Vehicle	150	1.0
C: Bus	63	0.4
D: Single Unit Truck	1059	6.9
E: Tractor Trailer Unit	1410	9.2
ASDT 15820	**AADT** 15270	



West On 3		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	14198	85.4
B: Recreational Vehicle	413	2.5
C: Bus	33	0.2
D: Single Unit Truck	610	3.7
E: Tractor Trailer Unit	1376	8.3
ASDT 17390	**AADT** 16630	

East On 3		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	18518	89.2
B: Recreational Vehicle	463	2.2
C: Bus	13	0.1
D: Single Unit Truck	656	3.2
E: Tractor Trailer Unit	1100	5.3
ASDT 21490	**AADT** 20750	

South On 4		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	13936	89.5
B: Recreational Vehicle	224	1.4
C: Bus	41	0.3
D: Single Unit Truck	615	3.9
E: Tractor Trailer Unit	754	4.8
ASDT 16150	**AADT** 15570	

TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

TURNING MOVEMENT ABBREVIATIONS

AADT: Average Annual Daily Traffic
Average daily traffic expressed as vehicles per day fo period of January 1 to December 31 (365 days)

ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day fo period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 50000010

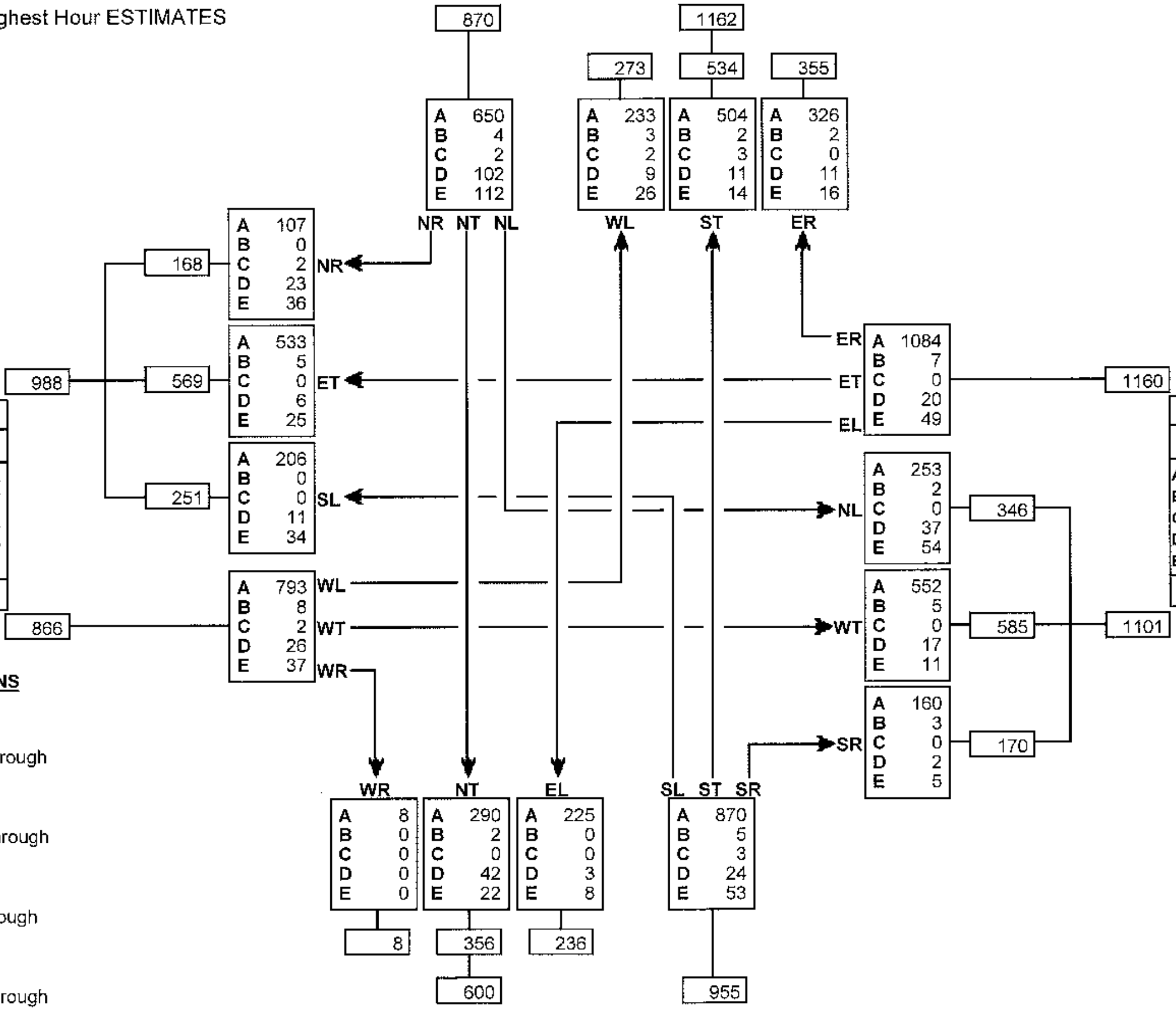
Intersection of:

3 & 4 & 843 IN LETHBRIDGE 4-29-21-400001320

2016 a.m. 100th Highest Hour ESTIMATES

North On 843		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1713	84.3
B: Recreational Vehicle	11	0.5
C: Bus	7	0.3
D: Single Unit Truck	133	6.5
E: Tractor Trailer Unit	168	8.3
Total	2032	

West On 3		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1639	88.4
B: Recreational Vehicle	13	0.7
C: Bus	4	0.2
D: Single Unit Truck	66	3.6
E: Tractor Trailer Unit	132	7.1
Total	1854	



East On 3		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	2049	90.6
B: Recreational Vehicle	17	0.8
C: Bus	0	0.0
D: Single Unit Truck	76	3.4
E: Tractor Trailer Unit	119	5.3
Total	2261	

TURNING MOVEMENT ABBREVIATIONS

NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

South On 4		
Vehicle Type	**Vol**	**%**
A: Passenger Vehicle	1393	89.6
B: Recreational Vehicle	7	0.5
C: Bus	3	0.2
D: Single Unit Truck	69	4.4
E: Tractor Trailer Unit	83	5.3
Total	1555	

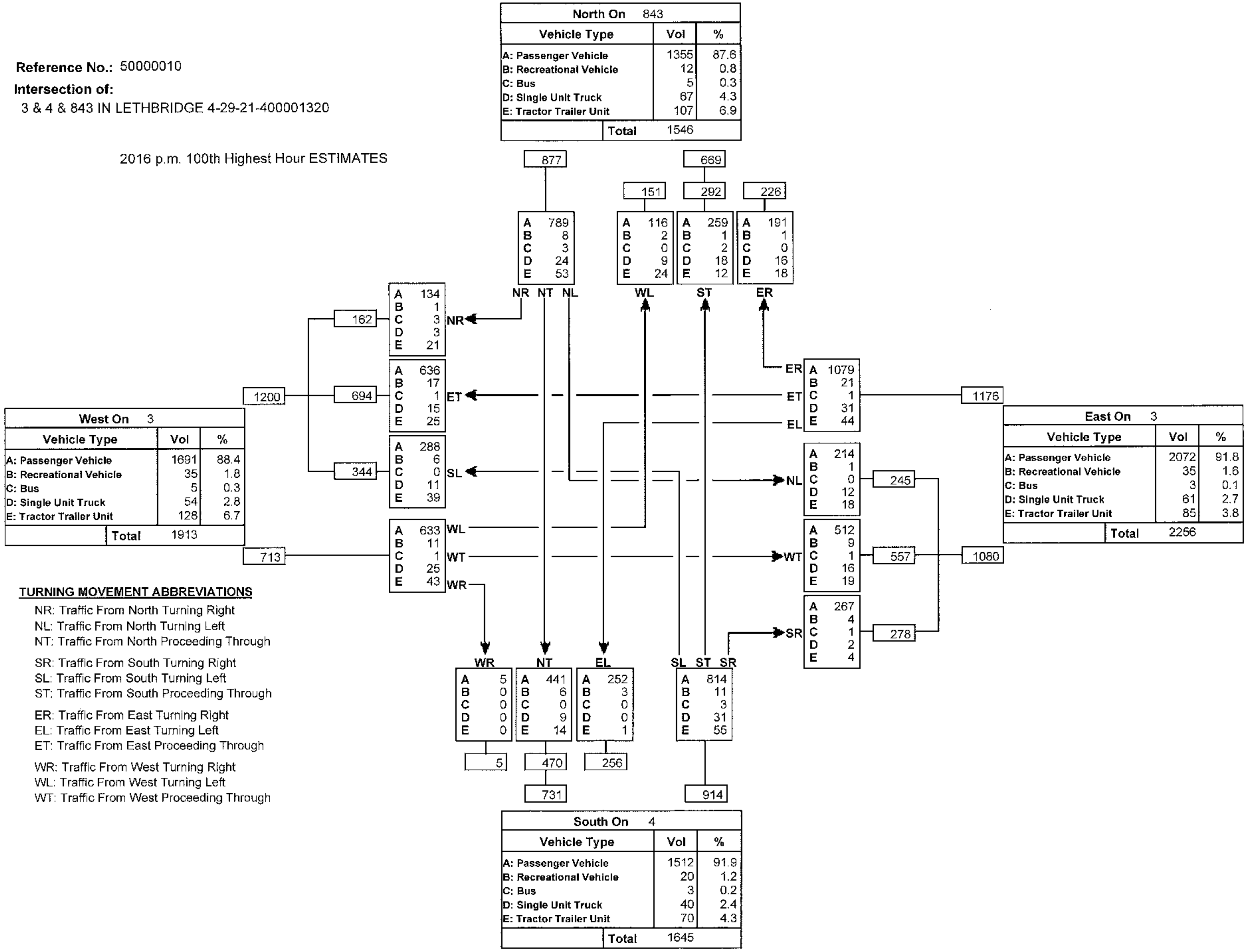
Reference No.: 50000010

Intersection of:

3 & 4 & 843 IN LETHBRIDGE 4-29-21-400001320

2016 p.m. 100th Highest Hour ESTIMATES

Turning Movement Summary Diagram



North On 843		
Vehicle Type	Vol	%
A: Passenger Vehicle	1355	87.6
B: Recreational Vehicle	12	0.8
C: Bus	5	0.3
D: Single Unit Truck	67	4.3
E: Tractor Trailer Unit	107	6.9
Total	1546	

West On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	1691	88.4
B: Recreational Vehicle	35	1.8
C: Bus	5	0.3
D: Single Unit Truck	54	2.8
E: Tractor Trailer Unit	128	6.7
Total	1913	

East On 3		
Vehicle Type	Vol	%
A: Passenger Vehicle	2072	91.8
B: Recreational Vehicle	35	1.6
C: Bus	3	0.1
D: Single Unit Truck	61	2.7
E: Tractor Trailer Unit	85	3.8
Total	2256	

South On 4		
Vehicle Type	Vol	%
A: Passenger Vehicle	1512	91.9
B: Recreational Vehicle	20	1.2
C: Bus	3	0.2
D: Single Unit Truck	40	2.4
E: Tractor Trailer Unit	70	4.3
Total	1645	

TURNING MOVEMENT ABBREVIATIONS

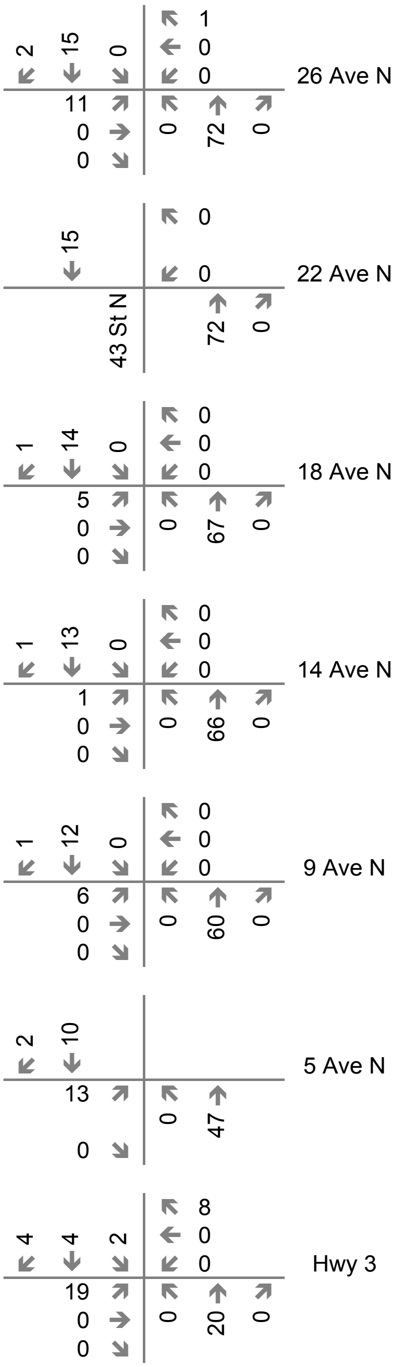
NR: Traffic From North Turning Right
NL: Traffic From North Turning Left
NT: Traffic From North Proceeding Through

SR: Traffic From South Turning Right
SL: Traffic From South Turning Left
ST: Traffic From South Proceeding Through

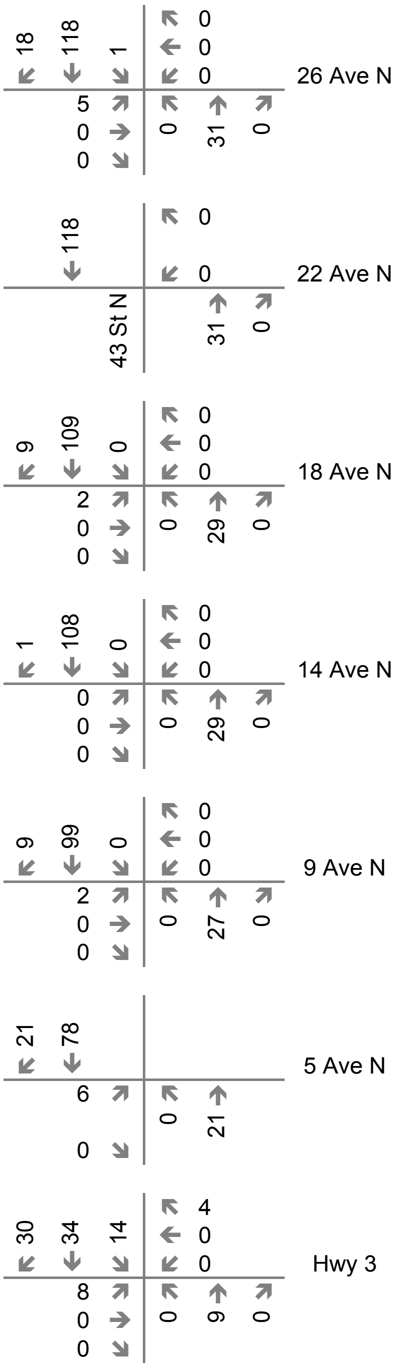
ER: Traffic From East Turning Right
EL: Traffic From East Turning Left
ET: Traffic From East Proceeding Through

WR: Traffic From West Turning Right
WL: Traffic From West Turning Left
WT: Traffic From West Proceeding Through

AM Peak Hour



PM Peak Hour



Appendix C

HCM Capacity Analysis Results Reports

4: 43 Street N & 9 Ave N

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	3	12	77	18	6	4	188	305	73	11	293	12
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	4	14	0	22	7	5	227	367	0	13	353	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	166	141	120	145	58	41	232	2628	1176	634	1966	879
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.08	0.14	0.79	0.00	0.59	0.59	0.00
Sat Flow, veh/h	1383	1845	1568	1046	759	542	1660	3312	1482	946	3312	1482
Grp Volume(v), veh/h	4	14	0	22	0	12	227	367	0	13	353	0
Grp Sat Flow(s),veh/h/ln	1383	1845	1568	1046	0	1301	1660	1656	1482	946	1656	1482
Q Serve(g_s), s	0.3	0.7	0.0	2.0	0.0	0.9	13.6	2.6	0.0	0.6	4.8	0.0
Cycle Q Clear(g_c), s	1.1	0.7	0.0	2.7	0.0	0.9	13.6	2.6	0.0	0.6	4.8	0.0
Prop In Lane	1.00		1.00	1.00		0.42	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	166	141	120	145	0	99	232	2628	1176	634	1966	879
V/C Ratio(X)	0.02	0.10	0.00	0.15	0.00	0.12	0.98	0.14	0.00	0.02	0.18	0.00
Avail Cap(c_a), veh/h	427	489	416	342	0	345	232	2628	1176	634	1966	879
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.6	43.0	0.0	44.2	0.0	43.0	42.8	2.4	0.0	8.4	9.2	0.0
Incr Delay (d2), s/veh	0.1	0.3	0.0	0.5	0.0	0.5	52.3	0.1	0.0	0.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.4	0.0	0.6	0.0	0.3	9.6	1.2	0.0	0.2	2.3	0.0
LnGrp Delay(d),s/veh	43.6	43.3	0.0	44.7	0.0	43.6	95.1	2.5	0.0	8.4	9.4	0.0
LnGrp LOS	D	D		D		D	F	A		A	A	
Approach Vol, veh/h		18			34			594			366	
Approach Delay, s/veh		43.4			44.3			37.9			9.4	
Approach LOS		D			D			D			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		85.9		14.1	20.0	65.9		14.1
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	14.0	40.5		26.5
Max Q Clear Time (g_c+I1), s		4.6		3.1	15.6	6.8		4.7
Green Ext Time (p_c), s		6.6		0.2	0.0	6.3		0.2

Intersection Summary			
HCM 2010 Ctrl Delay			27.9
HCM 2010 LOS			C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	19	142	237	585	396	26
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	22	0	272	672	455	30
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	143	66	273	2807	1881	841
Arrive On Green	0.05	0.00	0.16	0.82	0.60	0.60
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	22	0	272	672	455	30
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	0.7	0.0	15.9	4.3	6.8	0.9
Cycle Q Clear(g_c), s	0.7	0.0	15.9	4.3	6.8	0.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	143	66	273	2807	1881	841
V/C Ratio(X)	0.15	0.00	1.00	0.24	0.24	0.04
Avail Cap(c_a), veh/h	580	267	273	2807	1881	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	45.9	0.0	42.0	1.9	9.2	8.0
Incr Delay (d2), s/veh	0.5	0.0	53.2	0.2	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	11.5	2.0	3.0	0.4
LnGrp Delay(d),s/veh	46.3	0.0	95.2	2.1	9.5	8.1
LnGrp LOS	D		F	A	A	A
Approach Vol, veh/h	22			944	485	
Approach Delay, s/veh	46.3			28.9	9.4	
Approach LOS	D			C	A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		88.9		11.1	22.0	66.9		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		68.5		18.5	16.0	46.5		
Max Q Clear Time (g_c+I1), s		6.3		2.7	17.9	8.8		
Green Ext Time (p_c), s		12.3		0.0	0.0	11.3		

Intersection Summary			
HCM 2010 Ctrl Delay			22.7
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: EX-AM
Exisiting AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	273	585	8	236	569	355	251	534	170	346	356	168
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	297	636	9	257	618	0	273	580	0	376	387	183
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	398	1022	14	383	971	434	649	741	332	585	804	360
Arrive On Green	0.15	0.31	0.31	0.13	0.29	0.00	0.09	0.23	0.00	0.12	0.26	0.26
Sat Flow, veh/h	1630	3283	46	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	297	315	330	257	618	0	273	580	0	376	387	183
Grp Sat Flow(s),veh/h/ln	1630	1626	1704	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	14.1	18.6	18.6	11.9	18.3	0.0	7.2	18.7	0.0	10.3	11.8	12.5
Cycle Q Clear(g_c), s	14.1	18.6	18.6	11.9	18.3	0.0	7.2	18.7	0.0	10.3	11.8	12.5
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	398	506	530	383	971	434	649	741	332	585	804	360
V/C Ratio(X)	0.75	0.62	0.62	0.67	0.64	0.00	0.42	0.78	0.00	0.64	0.48	0.51
Avail Cap(c_a), veh/h	436	506	530	451	971	434	1065	846	378	891	809	362
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.1	33.1	33.1	24.2	34.6	0.0	29.1	41.0	0.0	29.2	35.5	35.8
Incr Delay (d2), s/veh	6.3	5.7	5.4	3.1	3.2	0.0	0.4	4.3	0.0	1.2	0.4	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.0	9.1	9.6	5.7	8.8	0.0	3.2	8.9	0.0	4.4	5.2	5.0
LnGrp Delay(d),s/veh	30.4	38.8	38.5	27.3	37.8	0.0	29.5	45.2	0.0	30.4	36.0	37.0
LnGrp LOS	C	D	D	C	D		C	D		C	D	D
Approach Vol, veh/h		942			875			853			946	
Approach Delay, s/veh		36.1			34.7			40.2			33.9	
Approach LOS		D			C			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.4	42.0	18.7	31.4	22.4	40.0	15.3	34.8
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	13.9	20.6	12.3	20.7	16.1	20.3	9.2	14.5
Green Ext Time (p_c), s	0.5	6.9	1.5	4.7	0.4	7.1	1.1	6.9

Intersection Summary	
HCM 2010 Ctrl Delay	36.1
HCM 2010 LOS	D

HCM 2010 TWSC
1: 43 Street N & 26 Ave N/Twp Rd 92

Timing Plan: EX-AM
Exisiting AM Peak Hour

Intersection	
Int Delay, s/veh	9.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	66	168	15	56	3	59	26	17	4	24	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	5	86	218	19	73	4	77	34	22	5	31	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	280	253	33	393	243	45	35	0	0	56	0	0
Stage 1	44	44	-	198	198	-	-	-	-	-	-	-
Stage 2	236	209	-	195	45	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	668	647	1035	563	655	1019	1544	-	-	1464	-	-
Stage 1	965	854	-	799	733	-	-	-	-	-	-	-
Stage 2	763	725	-	802	853	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	581	612	1035	380	619	1019	1544	-	-	1464	-	-
Mov Cap-2 Maneuver	581	612	-	380	619	-	-	-	-	-	-	-
Stage 1	915	851	-	757	695	-	-	-	-	-	-	-
Stage 2	645	687	-	567	850	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	12.8	4.3	1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1544	-	-	859	557	1464	-	-
HCM Lane V/C Ratio	0.05	-	-	0.36	0.173	0.004	-	-
HCM Control Delay (s)	7.5	0	-	11.5	12.8	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.6	0.6	0	-	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	5	99	166	88	210	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	12	12	10	10	3	3
Mvmt Flow	6	127	213	113	269	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	813	275	281	0	-	0
Stage 1	275	-	-	-	-	-
Stage 2	538	-	-	-	-	-
Critical Hdwy	6.52	6.32	4.2	-	-	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.52	-	-	-	-	-
Follow-up Hdwy	3.608	3.408	2.29	-	-	-
Pot Cap-1 Maneuver	335	740	1237	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	566	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	273	740	1237	-	-	-
Mov Cap-2 Maneuver	273	-	-	-	-	-
Stage 1	749	-	-	-	-	-
Stage 2	462	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	5.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1237	-	684	-	-
HCM Lane V/C Ratio	0.172	-	0.195	-	-
HCM Control Delay (s)	8.5	0	11.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.6	-	0.7	-	-

HCM 2010 TWSC
3: 43 Street N & 14 Ave N

Timing Plan: EX-AM
Exisiting AM Peak Hour

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	2	18	67	236	297	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	55	55	10	10	6	6
Mvmt Flow	2	22	83	291	367	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	832	375	383	0	-	0
Stage 1	375	-	-	-	-	-
Stage 2	457	-	-	-	-	-
Critical Hdwy	6.95	6.75	4.2	-	-	-
Critical Hdwy Stg 1	5.95	-	-	-	-	-
Critical Hdwy Stg 2	5.95	-	-	-	-	-
Follow-up Hdwy	3.995	3.795	2.29	-	-	-
Pot Cap-1 Maneuver	277	569	1133	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	540	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	253	569	1133	-	-	-
Mov Cap-2 Maneuver	253	-	-	-	-	-
Stage 1	593	-	-	-	-	-
Stage 2	493	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1133	-	506	-	-
HCM Lane V/C Ratio	0.073	-	0.049	-	-
HCM Control Delay (s)	8.4	0	12.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: EX-PM
Exisiting PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	13	5	220	98	11	12	128	301	18	3	355	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	16	6	0	122	14	15	160	376	0	4	444	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	201	203	172	227	93	100	188	2418	1082	626	1954	874
Arrive On Green	0.11	0.11	0.00	0.11	0.11	0.11	0.12	0.76	0.00	0.58	0.58	0.00
Sat Flow, veh/h	1323	1792	1524	1404	824	883	1601	3195	1429	956	3374	1509
Grp Volume(v), veh/h	16	6	0	122	0	29	160	376	0	4	444	0
Grp Sat Flow(s),veh/h/ln	1323	1792	1524	1404	0	1707	1601	1597	1429	956	1687	1509
Q Serve(g_s), s	1.1	0.3	0.0	8.5	0.0	1.5	9.8	3.2	0.0	0.2	6.4	0.0
Cycle Q Clear(g_c), s	2.6	0.3	0.0	8.8	0.0	1.5	9.8	3.2	0.0	0.2	6.4	0.0
Prop In Lane	1.00		1.00	1.00		0.52	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	201	203	172	227	0	193	188	2418	1082	626	1954	874
V/C Ratio(X)	0.08	0.03	0.00	0.54	0.00	0.15	0.85	0.16	0.00	0.01	0.23	0.00
Avail Cap(c_a), veh/h	402	475	404	440	0	452	224	2418	1082	626	1954	874
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	41.2	39.5	0.0	43.4	0.0	40.0	43.2	3.3	0.0	8.9	10.2	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.0	2.0	0.0	0.4	22.3	0.1	0.0	0.0	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.1	0.0	3.4	0.0	0.7	5.5	1.5	0.0	0.0	3.0	0.0
LnGrp Delay(d),s/veh	41.4	39.5	0.0	45.3	0.0	40.4	65.5	3.5	0.0	8.9	10.5	0.0
LnGrp LOS	D	D		D		D	E	A		A	B	
Approach Vol, veh/h		22			151			536			448	
Approach Delay, s/veh		40.9			44.4			22.0			10.5	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		82.2		17.8	17.8	64.4		17.8
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	14.0	40.5		26.5
Max Q Clear Time (g_c+I1), s		5.2		4.6	11.8	8.4		10.8
Green Ext Time (p_c), s		7.7		0.7	0.1	7.1		0.6

Intersection Summary			
HCM 2010 Ctrl Delay			20.8
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Timing Plan: EX-PM
Exisiting PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	27	243	204	496	798	36
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	30	0	227	551	887	40
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	185	85	255	2622	2029	908
Arrive On Green	0.06	0.00	0.16	0.81	0.60	0.60
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	30	0	227	551	887	40
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	0.9	0.0	13.8	3.8	14.2	1.1
Cycle Q Clear(g_c), s	0.9	0.0	13.8	3.8	14.2	1.1
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	185	85	255	2622	2029	908
V/C Ratio(X)	0.16	0.00	0.89	0.21	0.44	0.04
Avail Cap(c_a), veh/h	607	279	259	2622	2029	908
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.9	0.0	41.3	2.1	11.0	8.4
Incr Delay (d2), s/veh	0.4	0.0	29.3	0.2	0.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	8.2	1.8	6.8	0.5
LnGrp Delay(d),s/veh	45.3	0.0	70.6	2.3	11.7	8.5
LnGrp LOS	D		E	A	B	A
Approach Vol, veh/h	30			778	927	
Approach Delay, s/veh	45.3			22.2	11.6	
Approach LOS	D			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		87.8		12.2	21.8	66.1		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		68.5		18.5	16.0	46.5		
Max Q Clear Time (g_c+I1), s		5.8		2.9	15.8	16.2		
Green Ext Time (p_c), s		18.3		0.1	0.0	14.3		

Intersection Summary			
HCM 2010 Ctrl Delay			16.9
HCM 2010 LOS			B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	151	557	5	256	694	226	344	292	278	245	470	162
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	164	605	5	278	754	0	374	317	0	266	511	176
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	327	1032	9	413	1178	527	619	807	361	734	696	311
Arrive On Green	0.09	0.31	0.31	0.13	0.35	0.00	0.12	0.24	0.00	0.09	0.21	0.21
Sat Flow, veh/h	1645	3336	28	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	164	298	312	278	754	0	374	317	0	266	511	176
Grp Sat Flow(s),veh/h/ln	1645	1641	1722	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	7.1	16.3	16.3	11.7	20.0	0.0	9.2	8.4	0.0	6.8	15.6	11.5
Cycle Q Clear(g_c), s	7.1	16.3	16.3	11.7	20.0	0.0	9.2	8.4	0.0	6.8	15.6	11.5
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	327	507	533	413	1178	527	619	807	361	734	696	311
V/C Ratio(X)	0.50	0.59	0.59	0.67	0.64	0.00	0.60	0.39	0.00	0.36	0.73	0.57
Avail Cap(c_a), veh/h	466	507	533	489	1178	527	997	917	410	1178	884	395
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.7	31.1	31.1	21.7	29.1	0.0	28.4	34.1	0.0	28.1	39.1	37.5
Incr Delay (d2), s/veh	1.2	4.9	4.7	2.9	2.7	0.0	1.0	0.3	0.0	0.3	2.4	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	8.0	8.4	5.7	9.8	0.0	4.2	4.0	0.0	3.0	7.3	4.8
LnGrp Delay(d),s/veh	23.9	36.0	35.8	24.6	31.8	0.0	29.3	34.4	0.0	28.4	41.5	39.1
LnGrp LOS	C	D	D	C	C		C	C		C	D	D
Approach Vol, veh/h		774			1032			691			953	
Approach Delay, s/veh		33.4			29.8			31.6			37.4	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.2	40.0	15.0	31.5	15.9	44.3	17.7	28.8
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	13.7	18.3	8.8	10.4	9.1	22.0	11.2	17.6
Green Ext Time (p_c), s	0.5	8.4	1.1	6.8	0.4	6.9	1.5	5.2

Intersection Summary	
HCM 2010 Ctrl Delay	33.1
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	9.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	34	161	8	72	0	223	29	36	7	36	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	4	37	173	9	77	0	240	31	39	8	39	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	629	609	45	695	596	51	51	0	0	70	0	0
Stage 1	60	60	-	530	530	-	-	-	-	-	-	-
Stage 2	569	549	-	165	66	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	392	407	1019	354	414	1011	1524	-	-	1446	-	-
Stage 1	946	841	-	529	523	-	-	-	-	-	-	-
Stage 2	504	513	-	832	836	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	283	338	1019	235	344	1011	1524	-	-	1446	-	-
Mov Cap-2 Maneuver	283	338	-	235	344	-	-	-	-	-	-	-
Stage 1	790	836	-	442	437	-	-	-	-	-	-	-
Stage 2	346	428	-	656	831	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12	19.8	6	1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1524	-	-	730	329	1446	-	-
HCM Lane V/C Ratio	0.157	-	-	0.293	0.261	0.005	-	-
HCM Control Delay (s)	7.8	0	-	12	19.8	7.5	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.6	-	-	1.2	1	0	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	16	159	94	236	140	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	9	8	8
Mvmt Flow	19	185	109	274	163	3

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	658	165	166	0	-	0
Stage 1	165	-	-	-	-	-
Stage 2	493	-	-	-	-	-
Critical Hdwy	6.49	6.29	4.19	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	2.281	-	-	-
Pot Cap-1 Maneuver	418	862	1371	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	379	862	1371	-	-	-
Mov Cap-2 Maneuver	379	-	-	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	544	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.3	2.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1371	-	772	-	-
HCM Lane V/C Ratio	0.08	-	0.264	-	-
HCM Control Delay (s)	7.9	0	11.3	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1.1	-	-

3: 43 Street N & 14 Ave N

Exisiting PM Peak Hour

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	12	79	15	339	286	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	3	3	9	9	10	10
Mvmt Flow	14	95	18	408	345	2

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	791	346	347	0	-	0
Stage 1	346	-	-	-	-	-
Stage 2	445	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.19	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.281	-	-	-
Pot Cap-1 Maneuver	357	695	1174	-	-	-
Stage 1	714	-	-	-	-	-
Stage 2	644	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	350	695	1174	-	-	-
Mov Cap-2 Maneuver	350	-	-	-	-	-
Stage 1	714	-	-	-	-	-
Stage 2	631	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.1	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1174	-	615	-	-
HCM Lane V/C Ratio	0.015	-	0.178	-	-
HCM Control Delay (s)	8.1	0	12.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	10	13	81	19	7	5	198	381	77	12	320	14
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	12	16	0	23	8	6	239	459	0	14	386	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	174	154	131	151	62	47	232	2605	1165	582	1942	869
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.08	0.14	0.79	0.00	0.59	0.59	0.00
Sat Flow, veh/h	1380	1845	1568	1044	742	557	1660	3312	1482	869	3312	1482
Grp Volume(v), veh/h	12	16	0	23	0	14	239	459	0	14	386	0
Grp Sat Flow(s),veh/h/ln	1380	1845	1568	1044	0	1299	1660	1656	1482	869	1656	1482
Q Serve(g_s), s	0.8	0.8	0.0	2.1	0.0	1.0	14.0	3.4	0.0	0.7	5.5	0.0
Cycle Q Clear(g_c), s	1.8	0.8	0.0	2.9	0.0	1.0	14.0	3.4	0.0	0.7	5.5	0.0
Prop In Lane	1.00		1.00	1.00		0.43	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	174	154	131	151	0	109	232	2605	1165	582	1942	869
V/C Ratio(X)	0.07	0.10	0.00	0.15	0.00	0.13	1.03	0.18	0.00	0.02	0.20	0.00
Avail Cap(c_a), veh/h	424	489	416	340	0	344	232	2605	1165	582	1942	869
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.3	42.4	0.0	43.7	0.0	42.5	43.0	2.6	0.0	8.7	9.7	0.0
Incr Delay (d2), s/veh	0.2	0.3	0.0	0.5	0.0	0.5	66.6	0.1	0.0	0.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.4	0.0	0.6	0.0	0.4	10.7	1.6	0.0	0.2	2.5	0.0
LnGrp Delay(d),s/veh	43.5	42.7	0.0	44.2	0.0	43.0	109.7	2.8	0.0	8.8	9.9	0.0
LnGrp LOS	D	D		D		D	F	A		A	A	
Approach Vol, veh/h		28			37			698			400	
Approach Delay, s/veh		43.0			43.7			39.4			9.9	
Approach LOS		D			D			D			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		85.1		14.9	20.0	65.1		14.9
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	14.0	40.5		26.5
Max Q Clear Time (g_c+I1), s		5.4		3.8	16.0	7.5		4.9
Green Ext Time (p_c), s		8.1		0.3	0.0	7.6		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	29.5
HCM 2010 LOS	C

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	33	150	249	662	426	30
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	38	0	286	761	490	34
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	204	94	273	2741	1820	814
Arrive On Green	0.07	0.00	0.16	0.80	0.58	0.58
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	38	0	286	761	490	34
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	1.1	0.0	16.0	5.6	7.8	1.0
Cycle Q Clear(g_c), s	1.1	0.0	16.0	5.6	7.8	1.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	204	94	273	2741	1820	814
V/C Ratio(X)	0.19	0.00	1.05	0.28	0.27	0.04
Avail Cap(c_a), veh/h	580	267	273	2741	1820	814
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.2	0.0	42.0	2.5	10.2	8.8
Incr Delay (d2), s/veh	0.4	0.0	67.3	0.3	0.4	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	12.6	2.6	3.4	0.4
LnGrp Delay(d),s/veh	44.7	0.0	109.3	2.7	10.6	8.9
LnGrp LOS	D		F	A	B	A
Approach Vol, veh/h	38			1047	524	
Approach Delay, s/veh	44.7			31.8	10.5	
Approach LOS	D			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		87.0		13.0	22.0	65.0		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		68.5		18.5	16.0	46.5		
Max Q Clear Time (g_c+I1), s		7.6		3.1	18.0	9.8		
Green Ext Time (p_c), s		14.4		0.1	0.0	12.9		

Intersection Summary			
HCM 2010 Ctrl Delay			25.2
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: BG2019-AM
Background 2019 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	306	615	9	248	598	381	264	581	179	366	378	181
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	333	668	10	270	650	0	287	632	0	398	411	197
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	400	1015	15	378	937	419	635	737	330	563	806	361
Arrive On Green	0.16	0.31	0.31	0.13	0.28	0.00	0.09	0.22	0.00	0.13	0.26	0.26
Sat Flow, veh/h	1630	3280	49	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	333	331	347	270	650	0	287	632	0	398	411	197
Grp Sat Flow(s),veh/h/ln	1630	1626	1703	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	16.7	20.6	20.6	13.2	20.4	0.0	7.9	21.6	0.0	11.2	13.1	14.2
Cycle Q Clear(g_c), s	16.7	20.6	20.6	13.2	20.4	0.0	7.9	21.6	0.0	11.2	13.1	14.2
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	400	503	527	378	937	419	635	737	330	563	806	361
V/C Ratio(X)	0.83	0.66	0.66	0.71	0.69	0.00	0.45	0.86	0.00	0.71	0.51	0.55
Avail Cap(c_a), veh/h	404	503	527	426	937	419	1018	816	365	831	806	361
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.9	34.9	34.9	25.8	37.3	0.0	30.2	43.4	0.0	30.5	37.1	37.5
Incr Delay (d2), s/veh	13.6	6.6	6.3	4.9	4.2	0.0	0.5	8.4	0.0	1.6	0.5	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	10.1	10.6	6.5	9.9	0.0	3.5	10.6	0.0	4.8	5.7	5.6
LnGrp Delay(d),s/veh	39.6	41.5	41.3	30.7	41.6	0.0	30.7	51.8	0.0	32.1	37.6	39.2
LnGrp LOS	D	D	D	C	D		C	D		C	D	D
Approach Vol, veh/h		1011			920			919			1006	
Approach Delay, s/veh		40.8			38.4			45.2			35.8	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	21.6	43.1	19.7	32.2	24.7	40.0	16.0	36.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	15.2	22.6	13.2	23.6	18.7	22.4	9.9	16.2
Green Ext Time (p_c), s	0.4	6.4	1.5	2.6	0.1	6.5	1.2	6.9

Intersection Summary			
HCM 2010 Ctrl Delay			40.0
HCM 2010 LOS			D

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	70	177	16	59	5	62	100	18	5	41	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	21	91	230	21	77	6	81	130	23	6	53	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	414	384	57	534	377	142	61	0	0	153	0	0
Stage 1	70	70	-	303	303	-	-	-	-	-	-	-
Stage 2	344	314	-	231	74	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	545	546	1004	454	551	900	1511	-	-	1346	-	-
Stage 1	935	833	-	702	660	-	-	-	-	-	-	-
Stage 2	667	653	-	767	829	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	457	511	1004	288	516	900	1511	-	-	1346	-	-
Mov Cap-2 Maneuver	457	511	-	288	516	-	-	-	-	-	-	-
Stage 1	880	829	-	661	621	-	-	-	-	-	-	-
Stage 2	546	614	-	524	825	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	15.2	2.6	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1511	-	-	755	456	1346	-	-
HCM Lane V/C Ratio	0.053	-	-	0.452	0.228	0.005	-	-
HCM Control Delay (s)	7.5	0	-	13.6	15.2	7.7	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2.4	0.9	0	-	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	11	104	175	160	235	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	12	12	10	10	3	3
Mvmt Flow	14	133	224	205	301	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	962	308	315	0	-	0
Stage 1	308	-	-	-	-	-
Stage 2	654	-	-	-	-	-
Critical Hdwy	6.52	6.32	4.2	-	-	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.52	-	-	-	-	-
Follow-up Hdwy	3.608	3.408	2.29	-	-	-
Pot Cap-1 Maneuver	272	709	1201	-	-	-
Stage 1	723	-	-	-	-	-
Stage 2	499	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	215	709	1201	-	-	-
Mov Cap-2 Maneuver	215	-	-	-	-	-
Stage 1	723	-	-	-	-	-
Stage 2	394	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.3	4.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1201	-	581	-	-
HCM Lane V/C Ratio	0.187	-	0.254	-	-
HCM Control Delay (s)	8.7	0	13.3	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.7	-	1	-	-

HCM 2010 TWSC
3: 43 Street N & 14 Ave N

Timing Plan: BG2019-AM
Background 2019 AM Peak Hour

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	19	71	314	325	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	55	55	10	10	6	6
Mvmt Flow	5	23	88	388	401	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	973	410	420	0	-	0
Stage 1	410	-	-	-	-	-
Stage 2	563	-	-	-	-	-
Critical Hdwy	6.95	6.75	4.2	-	-	-
Critical Hdwy Stg 1	5.95	-	-	-	-	-
Critical Hdwy Stg 2	5.95	-	-	-	-	-
Follow-up Hdwy	3.995	3.795	2.29	-	-	-
Pot Cap-1 Maneuver	225	542	1097	-	-	-
Stage 1	570	-	-	-	-	-
Stage 2	478	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	202	542	1097	-	-	-
Mov Cap-2 Maneuver	202	-	-	-	-	-
Stage 1	570	-	-	-	-	-
Stage 2	429	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.2	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1097	-	419	-	-
HCM Lane V/C Ratio	0.08	-	0.068	-	-
HCM Control Delay (s)	8.6	0	14.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	16	6	231	103	12	13	135	344	19	4	472	29
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	20	8	0	129	15	16	169	430	0	5	590	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	209	215	183	234	99	106	197	2396	1072	588	1912	856
Arrive On Green	0.12	0.12	0.00	0.12	0.12	0.12	0.12	0.75	0.00	0.57	0.57	0.00
Sat Flow, veh/h	1321	1792	1524	1402	826	881	1601	3195	1429	909	3374	1509
Grp Volume(v), veh/h	20	8	0	129	0	31	169	430	0	5	590	0
Grp Sat Flow(s),veh/h/ln	1321	1792	1524	1402	0	1707	1601	1597	1429	909	1687	1509
Q Serve(g_s), s	1.4	0.4	0.0	9.0	0.0	1.6	10.3	3.9	0.0	0.2	9.2	0.0
Cycle Q Clear(g_c), s	3.0	0.4	0.0	9.4	0.0	1.6	10.3	3.9	0.0	0.2	9.2	0.0
Prop In Lane	1.00		1.00	1.00		0.52	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	209	215	183	234	0	205	197	2396	1072	588	1912	856
V/C Ratio(X)	0.10	0.04	0.00	0.55	0.00	0.15	0.86	0.18	0.00	0.01	0.31	0.00
Avail Cap(c_a), veh/h	401	475	404	438	0	452	224	2396	1072	588	1912	856
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	40.8	38.9	0.0	43.0	0.0	39.4	43.0	3.6	0.0	9.4	11.4	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.0	2.0	0.0	0.3	24.3	0.2	0.0	0.0	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.2	0.0	3.6	0.0	0.8	5.9	1.7	0.0	0.1	4.4	0.0
LnGrp Delay(d),s/veh	41.0	39.0	0.0	45.0	0.0	39.8	67.2	3.8	0.0	9.5	11.8	0.0
LnGrp LOS	D	D		D		D	E	A		A	B	
Approach Vol, veh/h		28			160			599			595	
Approach Delay, s/veh		40.4			44.0			21.7			11.8	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		81.5		18.5	18.3	63.2		18.5
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	14.0	40.5		26.5
Max Q Clear Time (g_c+I1), s		5.9		5.0	12.3	11.2		11.4
Green Ext Time (p_c), s		10.3		0.8	0.1	9.1		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			20.4
HCM 2010 LOS			C

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	35	256	215	542	916	59
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	39	0	239	602	1018	66
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	217	100	259	2591	1988	890
Arrive On Green	0.07	0.00	0.16	0.80	0.58	0.58
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	39	0	239	602	1018	66
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.1	0.0	14.6	4.5	17.7	1.9
Cycle Q Clear(g_c), s	1.1	0.0	14.6	4.5	17.7	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	217	100	259	2591	1988	890
V/C Ratio(X)	0.18	0.00	0.92	0.23	0.51	0.07
Avail Cap(c_a), veh/h	607	279	259	2591	1988	890
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.1	0.0	41.4	2.4	12.4	9.1
Incr Delay (d2), s/veh	0.4	0.0	36.3	0.2	0.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	9.1	2.0	8.6	0.8
LnGrp Delay(d),s/veh	44.5	0.0	77.7	2.6	13.3	9.2
LnGrp LOS	D		E	A	B	A
Approach Vol, veh/h	39			841	1084	
Approach Delay, s/veh	44.5			23.9	13.0	
Approach LOS	D			C	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.9		13.1	22.0	64.9		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		68.5		18.5	16.0	46.5		
Max Q Clear Time (g_c+I1), s		6.5		3.1	16.6	19.7		
Green Ext Time (p_c), s		22.7		0.1	0.0	15.5		

Intersection Summary			
HCM 2010 Ctrl Delay			18.3
HCM 2010 LOS			B

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: BG2019-PM
Background 2019 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	167	585	6	269	729	242	362	316	292	272	528	201
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	182	636	7	292	792	0	393	343	0	296	574	218
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	310	989	11	397	1144	512	604	841	376	744	737	330
Arrive On Green	0.10	0.30	0.30	0.14	0.34	0.00	0.12	0.25	0.00	0.10	0.23	0.23
Sat Flow, veh/h	1645	3325	37	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	182	314	329	292	792	0	393	343	0	296	574	218
Grp Sat Flow(s),veh/h/ln	1645	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	8.4	18.4	18.5	12.9	22.5	0.0	9.9	9.4	0.0	7.7	18.4	15.1
Cycle Q Clear(g_c), s	8.4	18.4	18.5	12.9	22.5	0.0	9.9	9.4	0.0	7.7	18.4	15.1
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	310	488	512	397	1144	512	604	841	376	744	737	330
V/C Ratio(X)	0.59	0.64	0.64	0.73	0.69	0.00	0.65	0.41	0.00	0.40	0.78	0.66
Avail Cap(c_a), veh/h	433	488	512	452	1144	512	946	881	394	1145	850	380
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	33.9	33.9	23.6	31.7	0.0	29.0	34.8	0.0	28.1	40.3	39.0
Incr Delay (d2), s/veh	1.8	6.4	6.1	5.3	3.5	0.0	1.2	0.3	0.0	0.3	4.1	3.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.9	9.2	9.6	6.6	11.0	0.0	4.5	4.4	0.0	3.4	8.7	6.4
LnGrp Delay(d),s/veh	26.7	40.3	40.0	28.9	35.1	0.0	30.2	35.1	0.0	28.5	44.4	42.5
LnGrp LOS	C	D	D	C	D		C	D		C	D	D
Approach Vol, veh/h		825			1084			736			1088	
Approach Delay, s/veh		37.2			33.5			32.5			39.7	
Approach LOS		D			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	21.4	40.0	15.9	33.7	16.7	44.6	18.4	31.2
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	14.9	20.5	9.7	11.4	10.4	24.5	11.9	20.4
Green Ext Time (p_c), s	0.5	7.9	1.2	7.5	0.4	5.8	1.6	4.8

Intersection Summary		
HCM 2010 Ctrl Delay		35.9
HCM 2010 LOS		D

Intersection	
Int Delay, s/veh	10

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	36	170	10	76	0	235	62	38	9	156	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	11	39	183	11	82	0	253	67	41	10	168	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	836	816	184	906	811	87	200	0	0	108	0	0
Stage 1	203	203	-	592	592	-	-	-	-	-	-	-
Stage 2	633	613	-	314	219	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	284	309	853	255	311	966	1343	-	-	1400	-	-
Stage 1	794	730	-	489	491	-	-	-	-	-	-	-
Stage 2	464	480	-	693	718	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	179	245	853	149	247	966	1343	-	-	1400	-	-
Mov Cap-2 Maneuver	179	245	-	149	247	-	-	-	-	-	-	-
Stage 1	634	724	-	391	392	-	-	-	-	-	-	-
Stage 2	293	384	-	511	712	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.7	31	5.8	0.4
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1343	-	-	537	229	1400	-	-
HCM Lane V/C Ratio	0.188	-	-	0.433	0.404	0.007	-	-
HCM Control Delay (s)	8.3	0	-	16.7	31	7.6	0	-
HCM Lane LOS	A	A	-	C	D	A	A	-
HCM 95th %tile Q(veh)	0.7	-	-	2.2	1.8	0	-	-

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	19	167	101	277	256	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	9	8	8
Mvmt Flow	22	194	117	322	298	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	862	305	313	0	-	0
Stage 1	305	-	-	-	-	-
Stage 2	557	-	-	-	-	-
Critical Hdwy	6.49	6.29	4.19	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	2.281	-	-	-
Pot Cap-1 Maneuver	317	719	1209	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	560	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	280	719	1209	-	-	-
Mov Cap-2 Maneuver	280	-	-	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	494	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	2.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1209	-	620	-	-
HCM Lane V/C Ratio	0.097	-	0.349	-	-
HCM Control Delay (s)	8.3	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1.6	-	-

HCM 2010 TWSC
3: 43 Street N & 14 Ave N

Timing Plan: BG2019-PM
Background 2019 PM Peak Hour

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	13	83	16	385	409	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	3	3	9	9	10	10
Mvmt Flow	16	100	19	464	493	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	997	495	498	0	-	0
Stage 1	495	-	-	-	-	-
Stage 2	502	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.19	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.281	-	-	-
Pot Cap-1 Maneuver	269	573	1031	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	606	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	262	573	1031	-	-	-
Mov Cap-2 Maneuver	262	-	-	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	591	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	14.5		0.3		0	
HCM LOS	B					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1031	-	494	-	-
HCM Lane V/C Ratio	0.019	-	0.234	-	-
HCM Control Delay (s)	8.6	0	14.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.9	-	-

4: 43 Street N & 9 Ave N

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	10	14	87	21	7	5	212	404	83	13	342	15
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	12	17	0	25	8	6	255	487	0	16	412	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	175	157	133	152	63	47	293	2600	1163	537	1818	813
Arrive On Green	0.08	0.08	0.00	0.08	0.08	0.08	0.18	0.79	0.00	0.55	0.55	0.00
Sat Flow, veh/h	1380	1845	1568	1043	742	557	1660	3312	1482	847	3312	1482
Grp Volume(v), veh/h	12	17	0	25	0	14	255	487	0	16	412	0
Grp Sat Flow(s),veh/h/ln	1380	1845	1568	1043	0	1299	1660	1656	1482	847	1656	1482
Q Serve(g_s), s	0.8	0.9	0.0	2.3	0.0	1.0	15.0	3.7	0.0	0.9	6.4	0.0
Cycle Q Clear(g_c), s	1.8	0.9	0.0	3.1	0.0	1.0	15.0	3.7	0.0	0.9	6.4	0.0
Prop In Lane	1.00		1.00	1.00		0.43	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	175	157	133	152	0	110	293	2600	1163	537	1818	813
V/C Ratio(X)	0.07	0.11	0.00	0.16	0.00	0.13	0.87	0.19	0.00	0.03	0.23	0.00
Avail Cap(c_a), veh/h	424	489	416	339	0	344	432	2600	1163	537	1818	813
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.2	42.3	0.0	43.7	0.0	42.3	40.1	2.7	0.0	10.4	11.6	0.0
Incr Delay (d2), s/veh	0.2	0.3	0.0	0.5	0.0	0.5	12.3	0.2	0.0	0.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.4	0.0	0.7	0.0	0.4	7.9	1.7	0.0	0.2	3.0	0.0
LnGrp Delay(d),s/veh	43.3	42.6	0.0	44.2	0.0	42.8	52.4	2.9	0.0	10.5	11.9	0.0
LnGrp LOS	D	D		D		D	D	A		B	B	
Approach Vol, veh/h		29			39			742			428	
Approach Delay, s/veh		42.9			43.7			19.9			11.9	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		85.0		15.0	23.6	61.4		15.0
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	26.0	28.5		26.5
Max Q Clear Time (g_c+I1), s		5.7		3.8	17.0	8.4		5.1
Green Ext Time (p_c), s		8.8		0.3	0.7	6.9		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	18.4
HCM 2010 LOS	B

5: 43 Street N & 5 Ave N

Background 2022 AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	35	160	267	706	456	32
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	40	0	307	811	524	37
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	210	97	352	2734	1671	748
Arrive On Green	0.07	0.00	0.21	0.80	0.54	0.54
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	40	0	307	811	524	37
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	1.2	0.0	17.4	6.2	9.4	1.3
Cycle Q Clear(g_c), s	1.2	0.0	17.4	6.2	9.4	1.3
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	210	97	352	2734	1671	748
V/C Ratio(X)	0.19	0.00	0.87	0.30	0.31	0.05
Avail Cap(c_a), veh/h	360	166	615	2734	1671	748
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.1	0.0	38.4	2.5	12.9	11.0
Incr Delay (d2), s/veh	0.4	0.0	6.8	0.3	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	8.9	2.9	4.1	0.5
LnGrp Delay(d),s/veh	44.5	0.0	45.3	2.8	13.4	11.1
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	40			1118	561	
Approach Delay, s/veh	44.5			14.5	13.2	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.8		13.2	26.6	60.2		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		75.5		11.5	36.0	33.5		
Max Q Clear Time (g_c+I1), s		8.2		3.2	19.4	11.4		
Green Ext Time (p_c), s		16.2		0.1	1.2	11.1		

Intersection Summary	
HCM 2010 Ctrl Delay	14.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	327	659	9	266	641	408	283	621	192	392	405	193
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	355	716	10	289	697	0	308	675	0	426	440	210
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	380	973	14	364	921	412	634	746	334	561	818	366
Arrive On Green	0.16	0.30	0.30	0.14	0.28	0.00	0.10	0.23	0.00	0.13	0.26	0.26
Sat Flow, veh/h	1630	3284	46	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	355	354	372	289	697	0	308	675	0	426	440	210
Grp Sat Flow(s),veh/h/ln	1630	1626	1704	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	18.6	23.3	23.3	14.5	22.8	0.0	8.5	23.8	0.0	12.2	14.3	15.4
Cycle Q Clear(g_c), s	18.6	23.3	23.3	14.5	22.8	0.0	8.5	23.8	0.0	12.2	14.3	15.4
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	380	482	505	364	921	412	634	746	334	561	818	366
V/C Ratio(X)	0.93	0.74	0.74	0.79	0.76	0.00	0.49	0.91	0.00	0.76	0.54	0.57
Avail Cap(c_a), veh/h	380	482	505	394	921	412	989	802	359	800	818	366
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.7	37.6	37.6	27.4	39.2	0.0	30.4	44.6	0.0	30.7	37.7	38.2
Incr Delay (d2), s/veh	29.9	9.6	9.2	10.0	5.8	0.0	0.6	13.2	0.0	2.6	0.7	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.3	11.7	12.2	7.6	11.2	0.0	3.8	12.2	0.0	5.2	6.3	6.2
LnGrp Delay(d),s/veh	57.6	47.2	46.8	37.4	45.0	0.0	31.0	57.9	0.0	33.4	38.4	40.3
LnGrp LOS	E	D	D	D	D		C	E		C	D	D
Approach Vol, veh/h		1081			986			983			1076	
Approach Delay, s/veh		50.5			42.8			49.4			36.8	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.8	42.2	20.7	33.0	25.0	40.0	16.8	36.9
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	16.5	25.3	14.2	25.8	20.6	24.8	10.5	17.4
Green Ext Time (p_c), s	0.3	5.3	1.6	1.2	0.0	5.6	1.2	6.8

Intersection Summary	
HCM 2010 Ctrl Delay	44.8
HCM 2010 LOS	D

1: 43 Street N & 26 Ave N/Twp Rd 92

Background 2022 AM Peak Hour

Intersection	
Int Delay, s/veh	9.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	75	189	17	63	5	67	102	20	5	42	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	21	97	245	22	82	6	87	132	26	6	55	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	435	403	58	562	394	145	62	0	0	158	0	0
Stage 1	71	71	-	319	319	-	-	-	-	-	-	-
Stage 2	364	332	-	243	75	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	528	533	1002	435	539	897	1510	-	-	1341	-	-
Stage 1	934	832	-	688	649	-	-	-	-	-	-	-
Stage 2	651	641	-	756	829	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	436	497	1002	265	503	897	1510	-	-	1341	-	-
Mov Cap-2 Maneuver	436	497	-	265	503	-	-	-	-	-	-	-
Stage 1	875	828	-	645	608	-	-	-	-	-	-	-
Stage 2	524	601	-	501	825	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.4	16	2.7	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1510	-	-	744	436	1341	-	-
HCM Lane V/C Ratio	0.058	-	-	0.489	0.253	0.005	-	-
HCM Control Delay (s)	7.5	0	-	14.4	16	7.7	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2.7	1	0	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	11	112	187	166	251	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	12	12	10	10	3	3
Mvmt Flow	14	144	240	213	322	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1021	329	337	0	-	0
Stage 1	329	-	-	-	-	-
Stage 2	692	-	-	-	-	-
Critical Hdwy	6.52	6.32	4.2	-	-	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.52	-	-	-	-	-
Follow-up Hdwy	3.608	3.408	2.29	-	-	-
Pot Cap-1 Maneuver	251	690	1179	-	-	-
Stage 1	707	-	-	-	-	-
Stage 2	479	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	193	690	1179	-	-	-
Mov Cap-2 Maneuver	193	-	-	-	-	-
Stage 1	707	-	-	-	-	-
Stage 2	368	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	4.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1179	-	561	-	-
HCM Lane V/C Ratio	0.203	-	0.281	-	-
HCM Control Delay (s)	8.8	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.8	-	1.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	21	76	332	348	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	55	55	10	10	6	6
Mvmt Flow	5	26	94	410	430	20

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1038	440	449	0	-	0
Stage 1	440	-	-	-	-	-
Stage 2	598	-	-	-	-	-
Critical Hdwy	6.95	6.75	4.2	-	-	-
Critical Hdwy Stg 1	5.95	-	-	-	-	-
Critical Hdwy Stg 2	5.95	-	-	-	-	-
Follow-up Hdwy	3.995	3.795	2.29	-	-	-
Pot Cap-1 Maneuver	205	520	1070	-	-	-
Stage 1	550	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	182	520	1070	-	-	-
Mov Cap-2 Maneuver	182	-	-	-	-	-
Stage 1	550	-	-	-	-	-
Stage 2	407	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1070	-	401	-	-
HCM Lane V/C Ratio	0.088	-	0.077	-	-
HCM Control Delay (s)	8.7	0	14.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	17	6	248	111	13	14	144	366	21	4	499	31
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	21	8	0	139	16	18	180	458	0	5	624	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	216	227	193	244	102	114	214	2374	1062	559	1855	830
Arrive On Green	0.13	0.13	0.00	0.13	0.13	0.13	0.13	0.74	0.00	0.55	0.55	0.00
Sat Flow, veh/h	1317	1792	1524	1402	802	902	1601	3195	1429	886	3374	1509
Grp Volume(v), veh/h	21	8	0	139	0	34	180	458	0	5	624	0
Grp Sat Flow(s),veh/h/ln	1317	1792	1524	1402	0	1704	1601	1597	1429	886	1687	1509
Q Serve(g_s), s	1.4	0.4	0.0	9.7	0.0	1.8	11.0	4.3	0.0	0.3	10.2	0.0
Cycle Q Clear(g_c), s	3.2	0.4	0.0	10.0	0.0	1.8	11.0	4.3	0.0	0.3	10.2	0.0
Prop In Lane	1.00		1.00	1.00		0.53	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	216	227	193	244	0	216	214	2374	1062	559	1855	830
V/C Ratio(X)	0.10	0.04	0.00	0.57	0.00	0.16	0.84	0.19	0.00	0.01	0.34	0.00
Avail Cap(c_a), veh/h	371	439	373	410	0	417	368	2374	1062	559	1855	830
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	40.3	38.3	0.0	42.7	0.0	38.9	42.3	3.9	0.0	10.2	12.4	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.0	2.1	0.0	0.3	8.7	0.2	0.0	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.2	0.0	3.9	0.0	0.9	5.4	1.9	0.0	0.1	4.9	0.0
LnGrp Delay(d),s/veh	40.5	38.3	0.0	44.8	0.0	39.2	51.0	4.0	0.0	10.2	12.9	0.0
LnGrp LOS	D	D		D		D	D	A		B	B	
Approach Vol, veh/h		29			173			638			629	
Approach Delay, s/veh		39.9			43.7			17.3			12.9	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		80.8		19.2	19.3	61.5		19.2
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		62.5		24.5	23.0	33.5		24.5
Max Q Clear Time (g_c+I1), s		6.3		5.2	13.0	12.2		12.0
Green Ext Time (p_c), s		11.3		0.8	0.5	8.6		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	19.0
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Timing Plan: BG2022-PM
Background 2022 PM Peak Hour

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	37	274	230	579	976	62
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	41	0	256	643	1084	69
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	223	103	292	2585	1912	855
Arrive On Green	0.07	0.00	0.18	0.80	0.56	0.56
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	41	0	256	643	1084	69
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.2	0.0	15.4	4.9	20.5	2.1
Cycle Q Clear(g_c), s	1.2	0.0	15.4	4.9	20.5	2.1
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	223	103	292	2585	1912	855
V/C Ratio(X)	0.18	0.00	0.88	0.25	0.57	0.08
Avail Cap(c_a), veh/h	328	151	420	2585	1912	855
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	44.0	0.0	39.9	2.4	14.1	10.1
Incr Delay (d2), s/veh	0.4	0.0	13.6	0.2	1.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	8.0	2.2	9.8	0.9
LnGrp Delay(d),s/veh	44.4	0.0	53.5	2.7	15.3	10.3
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	41			899	1153	
Approach Delay, s/veh	44.4			17.2	15.0	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.7		13.3	24.1	62.6		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	26.0	45.0		
Max Q Clear Time (g_c+I1), s		6.9		3.2	17.4	22.5		
Green Ext Time (p_c), s		26.2		0.0	0.7	14.8		

Intersection Summary			
HCM 2010 Ctrl Delay			16.5
HCM 2010 LOS			B

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: BG2022-PM
Background 2022 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	178	627	6	288	781	259	387	338	313	290	563	213
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	193	682	7	313	849	0	421	367	0	315	612	232
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	295	957	10	385	1120	501	603	859	384	744	749	335
Arrive On Green	0.10	0.29	0.29	0.15	0.33	0.00	0.13	0.25	0.00	0.10	0.23	0.23
Sat Flow, veh/h	1645	3328	34	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	193	336	353	313	849	0	421	367	0	315	612	232
Grp Sat Flow(s),veh/h/ln	1645	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	9.3	21.1	21.1	14.5	25.8	0.0	10.9	10.4	0.0	8.5	20.5	16.8
Cycle Q Clear(g_c), s	9.3	21.1	21.1	14.5	25.8	0.0	10.9	10.4	0.0	8.5	20.5	16.8
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	295	472	495	385	1120	501	603	859	384	744	749	335
V/C Ratio(X)	0.65	0.71	0.71	0.81	0.76	0.00	0.70	0.43	0.00	0.42	0.82	0.69
Avail Cap(c_a), veh/h	399	472	495	417	1120	501	902	859	384	1109	822	368
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.0	36.7	36.7	25.4	34.2	0.0	29.8	35.8	0.0	28.7	41.9	40.5
Incr Delay (d2), s/veh	2.5	8.9	8.5	11.0	4.8	0.0	1.5	0.3	0.0	0.4	6.0	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	10.7	11.2	7.9	12.8	0.0	5.0	4.9	0.0	3.7	9.8	7.2
LnGrp Delay(d),s/veh	29.4	45.5	45.1	36.4	39.0	0.0	31.3	36.1	0.0	29.1	47.9	45.4
LnGrp LOS	C	D	D	D	D		C	D		C	D	D
Approach Vol, veh/h		882			1162			788			1159	
Approach Delay, s/veh		41.8			38.3			33.6			42.3	
Approach LOS		D			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.8	40.0	16.7	35.2	17.7	45.1	19.5	32.4
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	16.5	23.1	10.5	12.4	11.3	27.8	12.9	22.5
Green Ext Time (p_c), s	0.3	6.9	1.3	7.8	0.4	4.0	1.7	4.0

Intersection Summary			
HCM 2010 Ctrl Delay			39.3
HCM 2010 LOS			D

1: 43 Street N & 26 Ave N/Twp Rd 92

Background 2022 PM Peak Hour

Intersection	
Int Delay, s/veh	11

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	39	182	9	81	0	251	64	41	9	159	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	11	42	196	10	87	0	270	69	44	10	171	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	881	860	188	957	855	91	204	0	0	113	0	0
Stage 1	207	207	-	631	631	-	-	-	-	-	-	-
Stage 2	674	653	-	326	224	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	265	291	849	235	293	961	1338	-	-	1394	-	-
Stage 1	790	727	-	466	471	-	-	-	-	-	-	-
Stage 2	441	461	-	682	715	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	156	226	849	129	228	961	1338	-	-	1394	-	-
Mov Cap-2 Maneuver	156	226	-	129	228	-	-	-	-	-	-	-
Stage 1	619	721	-	365	369	-	-	-	-	-	-	-
Stage 2	264	361	-	490	709	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.5	35.5	5.9	0.3
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1338	-	-	512	212	1394	-	-
HCM Lane V/C Ratio	0.202	-	-	0.485	0.456	0.007	-	-
HCM Control Delay (s)	8.4	0	-	18.5	35.5	7.6	0	-
HCM Lane LOS	A	A	-	C	E	A	A	-
HCM 95th %tile Q(veh)	0.8	-	-	2.6	2.2	0	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	179	108	295	267	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	9	8	8
Mvmt Flow	23	208	126	343	310	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	912	318	326	0	-	0
Stage 1	318	-	-	-	-	-
Stage 2	594	-	-	-	-	-
Critical Hdwy	6.49	6.29	4.19	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	2.281	-	-	-
Pot Cap-1 Maneuver	295	707	1195	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	538	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	257	707	1195	-	-	-
Mov Cap-2 Maneuver	257	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	468	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.7	2.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1195	-	601	-	-
HCM Lane V/C Ratio	0.105	-	0.385	-	-
HCM Control Delay (s)	8.4	0	14.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.4	-	1.8	-	-

3: 43 Street N & 14 Ave N

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	14	89	17	411	430	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	3	3	9	9	10	10
Mvmt Flow	17	107	20	495	518	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1056	520	523	0	-	0
Stage 1	520	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.19	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.281	-	-	-
Pot Cap-1 Maneuver	248	554	1009	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	585	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	241	554	1009	-	-	-
Mov Cap-2 Maneuver	241	-	-	-	-	-
Stage 1	595	-	-	-	-	-
Stage 2	569	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.4	0.3	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1009	-	471	-	-
HCM Lane V/C Ratio	0.02	-	0.263	-	-
HCM Control Delay (s)	8.6	0	15.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1	-	-

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: BG2037-AM
Background 2037 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↳		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	11	18	116	27	9	6	282	518	110	17	452	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	13	22	0	33	11	7	340	624	0	20	545	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	179	168	142	155	73	46	378	2581	1154	439	1628	728
Arrive On Green	0.09	0.09	0.00	0.09	0.09	0.09	0.23	0.78	0.00	0.49	0.49	0.00
Sat Flow, veh/h	1376	1845	1568	1038	799	508	1660	3312	1482	746	3312	1482
Grp Volume(v), veh/h	13	22	0	33	0	18	340	624	0	20	545	0
Grp Sat Flow(s),veh/h/ln	1376	1845	1568	1038	0	1307	1660	1656	1482	746	1656	1482
Q Serve(g_s), s	0.9	1.1	0.0	3.0	0.0	1.3	19.9	5.1	0.0	1.4	10.0	0.0
Cycle Q Clear(g_c), s	2.1	1.1	0.0	4.1	0.0	1.3	19.9	5.1	0.0	1.4	10.0	0.0
Prop In Lane	1.00		1.00	1.00		0.39	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	179	168	142	155	0	119	378	2581	1154	439	1628	728
V/C Ratio(X)	0.07	0.13	0.00	0.21	0.00	0.15	0.90	0.24	0.00	0.05	0.33	0.00
Avail Cap(c_a), veh/h	412	480	408	330	0	340	481	2581	1154	439	1628	728
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.9	41.8	0.0	43.7	0.0	41.9	37.5	3.0	0.0	13.3	15.5	0.0
Incr Delay (d2), s/veh	0.2	0.4	0.0	0.7	0.0	0.6	16.9	0.2	0.0	0.2	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.6	0.0	0.9	0.0	0.5	10.8	2.3	0.0	0.3	4.7	0.0
LnGrp Delay(d),s/veh	43.1	42.2	0.0	44.4	0.0	42.5	54.4	3.2	0.0	13.5	16.0	0.0
LnGrp LOS	D	D		D		D	D	A		B	B	
Approach Vol, veh/h		35			51			964			565	
Approach Delay, s/veh		42.5			43.7			21.3			15.9	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		84.4		15.6	28.7	55.7		15.6
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	29.0	26.0		26.0
Max Q Clear Time (g_c+I1), s		7.1		4.1	21.9	12.0		6.1
Green Ext Time (p_c), s		12.8		0.4	0.9	7.4		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	20.6
HCM 2010 LOS	C

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	42	213	356	925	604	41
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	48	0	409	1063	694	47
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	231	106	454	2712	1464	655
Arrive On Green	0.07	0.00	0.27	0.80	0.47	0.47
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	48	0	409	1063	694	47
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	1.4	0.0	23.1	9.2	15.2	1.9
Cycle Q Clear(g_c), s	1.4	0.0	23.1	9.2	15.2	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	231	106	454	2712	1464	655
V/C Ratio(X)	0.21	0.00	0.90	0.39	0.47	0.07
Avail Cap(c_a), veh/h	313	144	632	2712	1464	655
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.6	0.0	35.4	3.0	18.0	14.5
Incr Delay (d2), s/veh	0.4	0.0	12.6	0.4	1.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	12.5	4.4	6.7	0.7
LnGrp Delay(d),s/veh	44.0	0.0	48.0	3.4	19.2	14.7
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	48			1472	741	
Approach Delay, s/veh	44.0			15.8	18.9	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.1		13.9	32.6	53.5		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	37.0	34.0		
Max Q Clear Time (g_c+I1), s		11.2		3.4	25.1	17.2		
Green Ext Time (p_c), s		26.0		0.1	1.5	12.0		

Intersection Summary			
HCM 2010 Ctrl Delay			17.4
HCM 2010 LOS			B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	429	878	12	354	854	541	377	821	255	521	538	256
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	466	954	13	385	928	0	410	892	0	566	585	278
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	302	858	12	306	865	387	633	753	337	631	865	387
Arrive On Green	0.15	0.26	0.26	0.15	0.26	0.00	0.12	0.23	0.00	0.17	0.28	0.28
Sat Flow, veh/h	1630	3285	45	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	466	472	495	385	928	0	410	892	0	566	585	278
Grp Sat Flow(s),veh/h/ln	1630	1626	1704	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	19.0	33.0	33.0	19.0	33.0	0.0	12.1	29.0	0.0	18.1	21.0	22.6
Cycle Q Clear(g_c), s	19.0	33.0	33.0	19.0	33.0	0.0	12.1	29.0	0.0	18.1	21.0	22.6
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	302	425	445	306	865	387	633	753	337	631	865	387
V/C Ratio(X)	1.54	1.11	1.11	1.26	1.07	0.00	0.65	1.18	0.00	0.90	0.68	0.72
Avail Cap(c_a), veh/h	302	425	445	306	865	387	871	753	337	718	865	387
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.9	46.7	46.7	38.1	46.7	0.0	31.8	48.7	0.0	34.4	40.8	41.4
Incr Delay (d2), s/veh	260.3	77.8	76.9	139.1	52.2	0.0	1.1	96.4	0.0	13.0	2.1	6.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	32.3	23.9	24.9	22.5	21.3	0.0	5.3	23.1	0.0	10.7	9.4	9.4
LnGrp Delay(d),s/veh	298.2	124.5	123.6	177.3	99.0	0.0	32.9	145.1	0.0	47.4	42.9	47.7
LnGrp LOS	F	F	F	F	F		C	F		D	D	D
Approach Vol, veh/h		1433			1313			1302			1429	
Approach Delay, s/veh		180.7			121.9			109.8			45.6	
Approach LOS		F			F			F			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	25.0	40.0	26.4	35.0	25.0	40.0	20.6	40.8
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	21.0	35.0	20.1	31.0	21.0	35.0	14.1	24.6
Green Ext Time (p_c), s	0.0	0.0	1.3	0.0	0.0	0.0	1.5	3.6

Intersection Summary			
HCM 2010 Ctrl Delay			114.5
HCM 2010 LOS			F

HCM 2010 TWSC
1: 43 Street N & 26 Ave N/Twp Rd 92

Intersection	
Int Delay, s/veh	14.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	17	99	252	23	84	6	89	111	26	6	51	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	22	129	327	30	109	8	116	144	34	8	66	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	537	495	71	706	483	161	75	0	0	178	0	0
Stage 1	86	86	-	392	392	-	-	-	-	-	-	-
Stage 2	451	409	-	314	91	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	452	473	986	348	480	879	1493	-	-	1318	-	-
Stage 1	917	820	-	629	603	-	-	-	-	-	-	-
Stage 2	584	593	-	693	816	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	337	429	986	167	436	879	1493	-	-	1318	-	-
Mov Cap-2 Maneuver	337	429	-	167	436	-	-	-	-	-	-	-
Stage 1	837	815	-	574	551	-	-	-	-	-	-	-
Stage 2	424	541	-	388	811	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.4	23.9	3	0.7
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1493	-	-	686	335	1318	-	-
HCM Lane V/C Ratio	0.077	-	-	0.697	0.438	0.006	-	-
HCM Control Delay (s)	7.6	0	-	21.4	23.9	7.7	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	5.7	2.1	0	-	-

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	13	149	249	199	329	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	12	12	10	10	3	3
Mvmt Flow	17	191	319	255	422	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1325	431	441	0	-	0
Stage 1	431	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Critical Hdwy	6.52	6.32	4.2	-	-	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.52	-	-	-	-	-
Follow-up Hdwy	3.608	3.408	2.29	-	-	-
Pot Cap-1 Maneuver	164	604	1078	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	384	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	107	604	1078	-	-	-
Mov Cap-2 Maneuver	107	-	-	-	-	-
Stage 1	635	-	-	-	-	-
Stage 2	252	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.3	5.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1078	-	440	-	-
HCM Lane V/C Ratio	0.296	-	0.472	-	-
HCM Control Delay (s)	9.7	0	20.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	1.2	-	2.5	-	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	27	101	420	459	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	55	55	10	10	6	6
Mvmt Flow	5	33	125	519	567	26

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1348	580	593	0	-	0
Stage 1	580	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Critical Hdwy	6.95	6.75	4.2	-	-	-
Critical Hdwy Stg 1	5.95	-	-	-	-	-
Critical Hdwy Stg 2	5.95	-	-	-	-	-
Follow-up Hdwy	3.995	3.795	2.29	-	-	-
Pot Cap-1 Maneuver	129	427	945	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	105	427	945	-	-	-
Mov Cap-2 Maneuver	105	-	-	-	-	-
Stage 1	469	-	-	-	-	-
Stage 2	306	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.4	1.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	945	-	306	-	-
HCM Lane V/C Ratio	0.132	-	0.125	-	-
HCM Control Delay (s)	9.4	0	18.4	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	0.4	-	-

HCM 2010 Signalized Intersection Summary
1: 43 Street N & 26 Ave N/Twp Rd 92

Timing Plan: BG2037-AM-Mit
Background 2037 AM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	17	99	252	23	84	6	89	111	26	6	51	7
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1776	1900	1900	1638	1900
Adj Flow Rate, veh/h	22	129	327	30	109	8	116	144	34	8	66	9
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Percent Heavy Veh, %	4	4	4	4	4	4	7	7	7	16	16	16
Cap, veh/h	107	193	446	187	566	37	258	238	48	114	366	46
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	31	480	1106	194	1406	92	486	880	179	53	1355	171
Grp Volume(v), veh/h	478	0	0	147	0	0	294	0	0	83	0	0
Grp Sat Flow(s),veh/h/ln	1617	0	0	1693	0	0	1544	0	0	1579	0	0
Q Serve(g_s), s	0.6	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.9	0.0	0.0	2.1	0.0	0.0	6.7	0.0	0.0	1.6	0.0	0.0
Prop In Lane	0.05		0.68	0.20		0.05	0.39		0.12	0.10		0.11
Lane Grp Cap(c), veh/h	746	0	0	791	0	0	543	0	0	526	0	0
V/C Ratio(X)	0.64	0.00	0.00	0.19	0.00	0.00	0.54	0.00	0.00	0.16	0.00	0.00
Avail Cap(c_a), veh/h	1129	0	0	1151	0	0	951	0	0	940	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.0	0.0	0.0	7.7	0.0	0.0	12.9	0.0	0.0	11.2	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.1	0.0	0.0	0.8	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	0.0	1.0	0.0	0.0	3.0	0.0	0.0	0.7	0.0	0.0
LnGrp Delay(d),s/veh	10.9	0.0	0.0	7.8	0.0	0.0	13.8	0.0	0.0	11.3	0.0	0.0
LnGrp LOS	B			A			B			B		
Approach Vol, veh/h		478			147			294			83	
Approach Delay, s/veh		10.9			7.8			13.8			11.3	
Approach LOS		B			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		17.2		22.5		17.2		22.5
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		21.5		25.5		21.5		25.5
Max Q Clear Time (g_c+I1), s		8.7		11.9		3.6		4.1
Green Ext Time (p_c), s		2.0		4.2		2.4		5.1

Intersection Summary	
HCM 2010 Ctrl Delay	11.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	429	878	12	354	854	541	377	821	255	521	538	256
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	466	954	13	385	928	0	410	892	0	566	585	278
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	560	1283	17	557	1285	400	627	853	382	541	879	393
Arrive On Green	0.10	0.27	0.27	0.10	0.27	0.00	0.11	0.26	0.00	0.13	0.28	0.28
Sat Flow, veh/h	3163	4751	65	3221	4759	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	466	625	342	385	928	0	410	892	0	566	585	278
Grp Sat Flow(s),veh/h/ln	1581	1558	1700	1610	1586	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	10.0	18.3	18.4	8.6	17.7	0.0	9.3	26.0	0.0	13.0	16.5	17.8
Cycle Q Clear(g_c), s	10.0	18.3	18.4	8.6	17.7	0.0	9.3	26.0	0.0	13.0	16.5	17.8
Prop In Lane	1.00		0.04	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	560	841	459	557	1285	400	627	853	382	541	879	393
V/C Ratio(X)	0.83	0.74	0.74	0.69	0.72	0.00	0.65	1.05	0.00	1.05	0.67	0.71
Avail Cap(c_a), veh/h	560	841	459	557	1285	400	627	853	382	541	879	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.3	33.3	33.3	25.2	33.1	0.0	24.4	37.0	0.0	26.2	31.9	32.3
Incr Delay (d2), s/veh	10.3	5.9	10.5	3.6	3.5	0.0	2.4	43.3	0.0	51.4	1.9	5.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	8.6	10.0	4.0	8.2	0.0	4.3	16.9	0.0	9.3	7.4	7.5
LnGrp Delay(d),s/veh	37.6	39.2	43.8	28.8	36.6	0.0	26.8	80.3	0.0	77.6	33.8	38.0
LnGrp LOS	D	D	D	C	D		C	F		F	C	D
Approach Vol, veh/h		1433			1313			1302			1429	
Approach Delay, s/veh		39.8			34.3			63.5			52.0	
Approach LOS		D			C			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.0	34.0	18.0	32.0	16.0	34.0	16.0	34.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	27.0	13.0	26.0	10.0	27.0	11.0	28.0
Max Q Clear Time (g_c+I1), s	10.6	20.4	15.0	28.0	12.0	19.7	11.3	19.8
Green Ext Time (p_c), s	0.0	5.6	0.0	0.0	0.0	6.1	0.0	6.4

Intersection Summary	
HCM 2010 Ctrl Delay	47.3
HCM 2010 LOS	D

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: BG2037-PM
Background 2037 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	22	8	330	147	17	18	192	479	27	5	632	38
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	28	10	0	184	21	22	240	599	0	6	790	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	254	289	246	291	135	141	274	2264	1013	444	1612	721
Arrive On Green	0.16	0.16	0.00	0.16	0.16	0.16	0.17	0.71	0.00	0.48	0.48	0.00
Sat Flow, veh/h	1307	1792	1524	1399	834	874	1601	3195	1429	778	3374	1509
Grp Volume(v), veh/h	28	10	0	184	0	43	240	599	0	6	790	0
Grp Sat Flow(s),veh/h/ln	1307	1792	1524	1399	0	1708	1601	1597	1429	778	1687	1509
Q Serve(g_s), s	1.9	0.5	0.0	12.8	0.0	2.2	14.6	6.7	0.0	0.4	16.0	0.0
Cycle Q Clear(g_c), s	4.0	0.5	0.0	13.2	0.0	2.2	14.6	6.7	0.0	0.4	16.0	0.0
Prop In Lane	1.00		1.00	1.00		0.51	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	254	289	246	291	0	275	274	2264	1013	444	1612	721
V/C Ratio(X)	0.11	0.03	0.00	0.63	0.00	0.16	0.88	0.26	0.00	0.01	0.49	0.00
Avail Cap(c_a), veh/h	383	466	396	429	0	444	368	2264	1013	444	1612	721
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	37.8	35.4	0.0	41.0	0.0	36.1	40.4	5.2	0.0	13.7	17.8	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	2.3	0.0	0.3	16.4	0.3	0.0	0.1	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.2	0.0	5.1	0.0	1.0	7.7	3.0	0.0	0.1	7.6	0.0
LnGrp Delay(d),s/veh	38.0	35.4	0.0	43.2	0.0	36.3	56.8	5.5	0.0	13.8	18.9	0.0
LnGrp LOS	D	D		D		D	E	A		B	B	
Approach Vol, veh/h		38			227			839			796	
Approach Delay, s/veh		37.3			41.9			20.2			18.8	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		77.4		22.6	23.1	54.3		22.6
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	23.0	32.0		26.0
Max Q Clear Time (g_c+I1), s		8.7		6.0	16.6	18.0		15.2
Green Ext Time (p_c), s		16.2		1.2	0.5	8.6		0.9

Intersection Summary	
HCM 2010 Ctrl Delay	22.6
HCM 2010 LOS	C

HCM 2010 Signalized Intersection Summary

5: 43 Street N & 5 Ave N

Timing Plan: BG2037-PM

Background 2037 PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	47	365	306	765	1275	75
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	52	0	340	850	1417	83
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	251	115	368	2558	1722	770
Arrive On Green	0.08	0.00	0.23	0.79	0.51	0.51
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	52	0	340	850	1417	83
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.5	0.0	20.6	7.4	35.2	2.8
Cycle Q Clear(g_c), s	1.5	0.0	20.6	7.4	35.2	2.8
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	251	115	368	2558	1722	770
V/C Ratio(X)	0.21	0.00	0.92	0.33	0.82	0.11
Avail Cap(c_a), veh/h	328	151	388	2558	1722	770
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.3	0.0	37.7	2.9	20.9	12.9
Incr Delay (d2), s/veh	0.4	0.0	26.7	0.3	4.6	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	11.9	3.3	17.6	1.3
LnGrp Delay(d),s/veh	43.7	0.0	64.4	3.2	25.5	13.2
LnGrp LOS	D		E	A	C	B
Approach Vol, veh/h	52			1190	1500	
Approach Delay, s/veh	43.7			20.7	24.8	
Approach LOS	D			C	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.9		14.1	28.8	57.1		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	24.0	47.0		
Max Q Clear Time (g_c+I1), s		9.4		3.5	22.6	37.2		
Green Ext Time (p_c), s		41.1		0.1	0.2	8.8		

Intersection Summary			
HCM 2010 Ctrl Delay			23.4
HCM 2010 LOS			C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	235	836	8	384	1041	343	516	447	417	382	739	273
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	255	909	9	417	1132	0	561	486	0	415	803	297
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	221	922	9	384	1324	592	489	908	406	590	751	336
Arrive On Green	0.08	0.28	0.28	0.19	0.39	0.00	0.12	0.27	0.00	0.08	0.23	0.23
Sat Flow, veh/h	1645	3329	33	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	255	448	470	417	1132	0	561	486	0	415	803	297
Grp Sat Flow(s),veh/h/ln	1645	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	10.0	35.3	35.3	25.0	39.9	0.0	15.0	16.0	0.0	10.0	30.0	25.6
Cycle Q Clear(g_c), s	10.0	35.3	35.3	25.0	39.9	0.0	15.0	16.0	0.0	10.0	30.0	25.6
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	221	454	477	384	1324	592	489	908	406	590	751	336
V/C Ratio(X)	1.15	0.99	0.99	1.09	0.86	0.00	1.15	0.54	0.00	0.70	1.07	0.88
Avail Cap(c_a), veh/h	221	454	477	384	1324	592	489	908	406	590	751	336
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.6	46.7	46.7	40.4	36.1	0.0	37.0	40.6	0.0	39.6	50.0	48.3
Incr Delay (d2), s/veh	108.0	38.9	37.9	71.2	7.2	0.0	87.6	0.6	0.0	3.8	53.2	23.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	20.8	21.7	21.3	19.9	0.0	14.7	7.5	0.0	6.0	19.0	12.5
LnGrp Delay(d),s/veh	148.5	85.6	84.6	111.6	43.4	0.0	124.6	41.2	0.0	43.4	103.2	71.6
LnGrp LOS	F	F	F	F	D		F	D		D	F	E
Approach Vol, veh/h		1173			1549			1047			1515	
Approach Delay, s/veh		98.9			61.7			85.9			80.6	
Approach LOS		F			E			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	31.0	43.0	15.0	41.0	16.0	58.0	20.0	36.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	25.0	36.0	10.0	35.0	10.0	51.0	15.0	30.0
Max Q Clear Time (g_c+I1), s	27.0	37.3	12.0	18.0	12.0	41.9	17.0	32.0
Green Ext Time (p_c), s	0.0	0.0	0.0	10.3	0.0	7.7	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	80.2
HCM 2010 LOS	F

Intersection	
Int Delay, s/veh	34.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	11	51	242	12	108	0	335	75	54	12	172	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	12	55	260	13	116	0	360	81	58	13	185	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1118	1089	204	1217	1078	110	223	0	0	139	0	0
Stage 1	230	230	-	830	830	-	-	-	-	-	-	-
Stage 2	888	859	-	387	248	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	183	214	832	156	217	938	1317	-	-	1363	-	-
Stage 1	768	710	-	361	382	-	-	-	-	-	-	-
Stage 2	336	370	-	633	698	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	54	149	832	60	151	938	1317	-	-	1363	-	-
Mov Cap-2 Maneuver	54	149	-	60	151	-	-	-	-	-	-	-
Stage 1	539	702	-	253	268	-	-	-	-	-	-	-
Stage 2	134	260	-	397	690	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	59.8	139.5	6.3	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1317	-	-	363	131	1363	-	-
HCM Lane V/C Ratio	0.274	-	-	0.901	0.985	0.009	-	-
HCM Control Delay (s)	8.8	0	-	59.8	139.5	7.7	0	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	1.1	-	-	9	6.8	0	-	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	26	239	144	383	319	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	9	8	8
Mvmt Flow	30	278	167	445	371	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1159	379	387	0	-	0
Stage 1	379	-	-	-	-	-
Stage 2	780	-	-	-	-	-
Critical Hdwy	6.49	6.29	4.19	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	2.281	-	-	-
Pot Cap-1 Maneuver	210	653	1134	-	-	-
Stage 1	677	-	-	-	-	-
Stage 2	440	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	169	653	1134	-	-	-
Mov Cap-2 Maneuver	169	-	-	-	-	-
Stage 1	677	-	-	-	-	-
Stage 2	354	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.3	2.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1134	-	510	-	-
HCM Lane V/C Ratio	0.148	-	0.604	-	-
HCM Control Delay (s)	8.7	0	22.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.5	-	4	-	-

HCM 2010 TWSC
3: 43 Street N & 14 Ave N

Timing Plan: BG2037-PM
Background 2037 PM Peak Hour

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	18	119	23	538	537	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	3	3	9	9	10	10
Mvmt Flow	22	143	28	648	647	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1353	649	652	0	-	0
Stage 1	649	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.19	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.281	-	-	-
Pot Cap-1 Maneuver	164	468	902	-	-	-
Stage 1	518	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	156	468	902	-	-	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	518	-	-	-	-	-
Stage 2	465	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.3	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	902	-	371	-	-
HCM Lane V/C Ratio	0.031	-	0.445	-	-
HCM Control Delay (s)	9.1	0	22.3	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0.1	-	2.2	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	11	51	242	12	108	0	335	75	54	12	172	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1776	1900	1900	1638	1900
Adj Flow Rate, veh/h	12	55	260	13	116	0	360	81	58	13	185	38
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	4	4	4	7	7	7	16	16	16
Cap, veh/h	84	80	333	102	452	0	556	103	70	93	603	118
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.00	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	23	303	1266	71	1718	0	917	222	150	29	1298	255
Grp Volume(v), veh/h	327	0	0	129	0	0	499	0	0	236	0	0
Grp Sat Flow(s),veh/h/ln	1593	0	0	1790	0	0	1289	0	0	1582	0	0
Q Serve(g_s), s	1.5	0.0	0.0	0.0	0.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.0	0.0	0.0	2.7	0.0	0.0	15.5	0.0	0.0	4.4	0.0	0.0
Prop In Lane	0.04		0.80	0.10		0.00	0.72		0.12	0.06		0.16
Lane Grp Cap(c), veh/h	497	0	0	554	0	0	729	0	0	814	0	0
V/C Ratio(X)	0.66	0.00	0.00	0.23	0.00	0.00	0.68	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	628	0	0	694	0	0	940	0	0	1085	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.3	0.0	0.0	13.9	0.0	0.0	10.6	0.0	0.0	8.0	0.0	0.0
Incr Delay (d2), s/veh	1.7	0.0	0.0	0.2	0.0	0.0	1.4	0.0	0.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	0.0	0.0	1.4	0.0	0.0	5.8	0.0	0.0	1.9	0.0	0.0
LnGrp Delay(d),s/veh	18.0	0.0	0.0	14.2	0.0	0.0	12.0	0.0	0.0	8.2	0.0	0.0
LnGrp LOS	B			B			B			A		
Approach Vol, veh/h		327			129			499			236	
Approach Delay, s/veh		18.0			14.2			12.0			8.2	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		28.7		19.1		28.7		19.1
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		30.5		16.5		30.5		16.5
Max Q Clear Time (g_c+I1), s		17.5		11.0		6.4		4.7
Green Ext Time (p_c), s		4.7		1.5		6.2		2.6

Intersection Summary			
HCM 2010 Ctrl Delay			13.1
HCM 2010 LOS			B

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: BG2037-PM-Mit
Background 2037 PM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	235	836	8	384	1041	343	516	447	417	382	739	273
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	255	909	9	417	1132	0	561	486	0	415	803	297
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	540	1230	12	617	1240	386	535	862	386	722	831	372
Arrive On Green	0.11	0.26	0.26	0.11	0.26	0.00	0.11	0.26	0.00	0.11	0.26	0.26
Sat Flow, veh/h	3191	4815	48	3281	4848	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	255	593	325	417	1132	0	561	486	0	415	803	297
Grp Sat Flow(s),veh/h/ln	1596	1572	1719	1640	1616	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	5.0	15.6	15.6	8.3	20.4	0.0	10.0	11.3	0.0	8.6	22.0	17.2
Cycle Q Clear(g_c), s	5.0	15.6	15.6	8.3	20.4	0.0	10.0	11.3	0.0	8.6	22.0	17.2
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	540	803	439	617	1240	386	535	862	386	722	831	372
V/C Ratio(X)	0.47	0.74	0.74	0.68	0.91	0.00	1.05	0.56	0.00	0.57	0.97	0.80
Avail Cap(c_a), veh/h	540	803	439	617	1240	386	535	862	386	722	831	372
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.4	30.7	30.7	22.8	32.5	0.0	25.9	29.1	0.0	21.7	33.1	31.3
Incr Delay (d2), s/veh	0.6	6.0	10.6	2.9	11.7	0.0	52.0	0.8	0.0	1.1	23.2	11.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	7.4	8.7	4.0	10.5	0.0	3.9	5.4	0.0	3.8	12.5	8.1
LnGrp Delay(d),s/veh	23.1	36.8	41.4	25.7	44.3	0.0	77.9	30.0	0.0	22.8	56.3	43.0
LnGrp LOS	C	D	D	C	D		F	C		C	E	D
Approach Vol, veh/h		1173			1549			1047			1515	
Approach Delay, s/veh		35.1			39.3			55.7			44.5	
Approach LOS		D			D			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	16.0	30.0	15.0	29.0	16.0	30.0	15.0	29.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	10.0	23.0	10.0	23.0	10.0	23.0	10.0	23.0
Max Q Clear Time (g_c+I1), s	10.3	17.6	10.6	13.3	7.0	22.4	12.0	24.0
Green Ext Time (p_c), s	0.0	4.8	0.0	6.8	0.3	0.6	0.0	0.0

Intersection Summary			
HCM 2010 Ctrl Delay			43.1
HCM 2010 LOS			D

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	10	21	81	48	9	11	198	381	179	34	320	14
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	12	25	0	58	11	13	239	459	0	41	386	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	180	178	151	159	56	67	277	2562	1146	548	1812	811
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.17	0.77	0.00	0.55	0.55	0.00
Sat Flow, veh/h	1368	1845	1568	1035	584	691	1660	3312	1482	869	3312	1482
Grp Volume(v), veh/h	12	25	0	58	0	24	239	459	0	41	386	0
Grp Sat Flow(s),veh/h/ln	1368	1845	1568	1035	0	1275	1660	1656	1482	869	1656	1482
Q Serve(g_s), s	0.8	1.2	0.0	5.4	0.0	1.7	14.0	3.6	0.0	2.2	6.0	0.0
Cycle Q Clear(g_c), s	2.5	1.2	0.0	6.7	0.0	1.7	14.0	3.6	0.0	2.2	6.0	0.0
Prop In Lane	1.00		1.00	1.00		0.54	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	180	178	151	159	0	123	277	2562	1146	548	1812	811
V/C Ratio(X)	0.07	0.14	0.00	0.37	0.00	0.20	0.86	0.18	0.00	0.07	0.21	0.00
Avail Cap(c_a), veh/h	411	489	416	333	0	338	432	2562	1146	548	1812	811
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.8	41.4	0.0	44.5	0.0	41.6	40.6	3.0	0.0	10.8	11.6	0.0
Incr Delay (d2), s/veh	0.2	0.4	0.0	1.4	0.0	0.8	10.6	0.2	0.0	0.3	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.6	0.0	1.6	0.0	0.6	7.3	1.7	0.0	0.6	2.8	0.0
LnGrp Delay(d),s/veh	42.9	41.7	0.0	45.9	0.0	42.4	51.2	3.1	0.0	11.0	11.9	0.0
LnGrp LOS	D	D		D		D	D	A		B	B	
Approach Vol, veh/h		37			82			698			427	
Approach Delay, s/veh		42.1			44.8			19.6			11.8	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		83.9		16.1	22.7	61.2		16.1
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5	26.0	28.5		26.5
Max Q Clear Time (g_c+I1), s		5.6		4.5	16.0	8.0		8.7
Green Ext Time (p_c), s		8.4		0.6	0.7	6.7		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	19.2
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	44	150	249	753	452	33
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	51	0	286	866	520	38
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	237	109	330	2705	1684	753
Arrive On Green	0.08	0.00	0.19	0.79	0.54	0.54
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	51	0	286	866	520	38
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	1.5	0.0	16.2	7.0	9.2	1.3
Cycle Q Clear(g_c), s	1.5	0.0	16.2	7.0	9.2	1.3
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	237	109	330	2705	1684	753
V/C Ratio(X)	0.21	0.00	0.87	0.32	0.31	0.05
Avail Cap(c_a), veh/h	360	166	597	2705	1684	753
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.4	0.0	39.1	2.8	12.6	10.8
Incr Delay (d2), s/veh	0.4	0.0	6.9	0.3	0.5	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	8.3	3.4	4.0	0.5
LnGrp Delay(d),s/veh	43.9	0.0	46.0	3.2	13.1	11.0
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	51			1152	558	
Approach Delay, s/veh	43.9			13.8	13.0	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.9		14.1	25.3	60.6		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		75.5		11.5	35.0	34.5		
Max Q Clear Time (g_c+I1), s		9.0		3.5	18.2	11.2		
Green Ext Time (p_c), s		17.3		0.1	1.1	12.0		

Intersection Summary	
HCM 2010 Ctrl Delay	14.4
HCM 2010 LOS	B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	335	615	9	248	598	415	264	609	179	376	386	189
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	364	668	10	270	650	0	287	662	0	409	420	205
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	400	1011	15	377	929	416	631	739	330	554	815	365
Arrive On Green	0.16	0.31	0.31	0.13	0.28	0.00	0.09	0.23	0.00	0.13	0.26	0.26
Sat Flow, veh/h	1630	3280	49	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	364	331	347	270	650	0	287	662	0	409	420	205
Grp Sat Flow(s),veh/h/ln	1630	1626	1703	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	18.9	20.8	20.8	13.4	20.7	0.0	7.9	23.0	0.0	11.6	13.4	14.9
Cycle Q Clear(g_c), s	18.9	20.8	20.8	13.4	20.7	0.0	7.9	23.0	0.0	11.6	13.4	14.9
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	400	501	525	377	929	416	631	739	330	554	815	365
V/C Ratio(X)	0.91	0.66	0.66	0.72	0.70	0.00	0.45	0.90	0.00	0.74	0.52	0.56
Avail Cap(c_a), veh/h	400	501	525	423	929	416	1009	809	362	810	815	365
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	26.9	35.3	35.3	26.2	37.9	0.0	30.4	44.2	0.0	30.6	37.2	37.7
Incr Delay (d2), s/veh	24.5	6.7	6.4	5.0	4.4	0.0	0.5	12.0	0.0	2.0	0.6	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.0	10.2	10.7	6.6	10.0	0.0	3.5	11.6	0.0	5.0	5.9	6.0
LnGrp Delay(d),s/veh	51.4	42.0	41.7	31.2	42.2	0.0	30.9	56.2	0.0	32.6	37.8	39.7
LnGrp LOS	D	D	D	C	D		C	E		C	D	D
Approach Vol, veh/h		1042			920			949			1034	
Approach Delay, s/veh		45.2			39.0			48.6			36.1	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	21.7	43.3	20.1	32.5	25.0	40.0	16.1	36.5
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	15.4	22.8	13.6	25.0	20.9	22.7	9.9	16.9
Green Ext Time (p_c), s	0.4	6.3	1.5	1.4	0.0	6.4	1.2	6.8

Intersection Summary			
HCM 2010 Ctrl Delay			42.2
HCM 2010 LOS			D

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	70	186	20	59	5	65	100	19	5	42	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	21	91	242	26	77	6	84	130	25	6	55	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	424	394	58	549	386	142	62	0	0	155	0	0
Stage 1	71	71	-	311	311	-	-	-	-	-	-	-
Stage 2	353	323	-	238	75	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	537	539	1002	443	545	900	1510	-	-	1344	-	-
Stage 1	934	832	-	695	655	-	-	-	-	-	-	-
Stage 2	660	647	-	761	829	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	448	504	1002	276	509	900	1510	-	-	1344	-	-
Mov Cap-2 Maneuver	448	504	-	276	509	-	-	-	-	-	-	-
Stage 1	877	828	-	653	615	-	-	-	-	-	-	-
Stage 2	539	608	-	512	825	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.9	16.1	2.7	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1510	-	-	755	433	1344	-	-
HCM Lane V/C Ratio	0.056	-	-	0.468	0.252	0.005	-	-
HCM Control Delay (s)	7.5	0	-	13.9	16.1	7.7	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	2.5	1	0	-	-

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	11	111	177	164	249	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	12	12	10	10	3	3
Mvmt Flow	14	142	227	210	319	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	990	326	333	0	-	0
Stage 1	326	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Critical Hdwy	6.52	6.32	4.2	-	-	-
Critical Hdwy Stg 1	5.52	-	-	-	-	-
Critical Hdwy Stg 2	5.52	-	-	-	-	-
Follow-up Hdwy	3.608	3.408	2.29	-	-	-
Pot Cap-1 Maneuver	262	693	1183	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	494	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	205	693	1183	-	-	-
Mov Cap-2 Maneuver	205	-	-	-	-	-
Stage 1	710	-	-	-	-	-
Stage 2	387	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.7	4.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1183	-	571	-	-
HCM Lane V/C Ratio	0.192	-	0.274	-	-
HCM Control Delay (s)	8.8	0	13.7	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.7	-	1.1	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	4	20	71	320	346	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	55	55	10	10	6	6
Mvmt Flow	5	25	88	395	427	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1006	436	446	0	-	0
Stage 1	436	-	-	-	-	-
Stage 2	570	-	-	-	-	-
Critical Hdwy	6.95	6.75	4.2	-	-	-
Critical Hdwy Stg 1	5.95	-	-	-	-	-
Critical Hdwy Stg 2	5.95	-	-	-	-	-
Follow-up Hdwy	3.995	3.795	2.29	-	-	-
Pot Cap-1 Maneuver	214	522	1073	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	474	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	192	522	1073	-	-	-
Mov Cap-2 Maneuver	192	-	-	-	-	-
Stage 1	553	-	-	-	-	-
Stage 2	424	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.6	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1073	-	406	-	-
HCM Lane V/C Ratio	0.082	-	0.073	-	-
HCM Control Delay (s)	8.7	0	14.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.2	-	-

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2019-PM
Future 2019 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	16	9	231	195	19	33	135	344	51	11	472	29
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	20	11	0	244	24	41	169	430	0	14	590	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	294	368	313	352	127	217	201	2124	950	508	1616	723
Arrive On Green	0.21	0.21	0.00	0.21	0.21	0.21	0.13	0.66	0.00	0.48	0.48	0.00
Sat Flow, veh/h	1281	1792	1524	1398	619	1057	1601	3195	1429	909	3374	1509
Grp Volume(v), veh/h	20	11	0	244	0	65	169	430	0	14	590	0
Grp Sat Flow(s),veh/h/ln	1281	1792	1524	1398	0	1676	1601	1597	1429	909	1687	1509
Q Serve(g_s), s	1.3	0.5	0.0	16.9	0.0	3.2	10.3	5.2	0.0	0.8	11.0	0.0
Cycle Q Clear(g_c), s	4.5	0.5	0.0	17.4	0.0	3.2	10.3	5.2	0.0	0.8	11.0	0.0
Prop In Lane	1.00		1.00	1.00		0.63	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	294	368	313	352	0	344	201	2124	950	508	1616	723
V/C Ratio(X)	0.07	0.03	0.00	0.69	0.00	0.19	0.84	0.20	0.00	0.03	0.37	0.00
Avail Cap(c_a), veh/h	396	511	434	464	0	478	336	2124	950	508	1616	723
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	34.7	31.8	0.0	38.7	0.0	32.9	42.7	6.5	0.0	13.8	16.4	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.0	2.9	0.0	0.3	9.1	0.2	0.0	0.1	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.2	0.0	6.8	0.0	1.5	5.1	2.3	0.0	0.2	5.2	0.0
LnGrp Delay(d),s/veh	34.8	31.8	0.0	41.7	0.0	33.1	51.8	6.7	0.0	13.9	17.1	0.0
LnGrp LOS	C	C		D		C	D	A		B	B	
Approach Vol, veh/h		31			309			599			604	
Approach Delay, s/veh		33.8			39.9			19.4			17.0	
Approach LOS		C			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		73.0		27.0	18.6	54.4		27.0
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		58.5		28.5	21.0	31.5		28.5
Max Q Clear Time (g_c+I1), s		7.2		6.5	12.3	13.0		19.4
Green Ext Time (p_c), s		10.4		1.7	0.4	7.5		1.1

Intersection Summary	
HCM 2010 Ctrl Delay	22.9
HCM 2010 LOS	C

HCM 2010 Signalized Intersection Summary

5: 43 Street N & 5 Ave N

Timing Plan: FU2019-PM

Future 2019 PM Peak Hour

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	38	256	215	571	998	69
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	42	0	239	634	1109	77
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	226	104	275	2582	1945	870
Arrive On Green	0.07	0.00	0.17	0.80	0.57	0.57
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	42	0	239	634	1109	77
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.2	0.0	14.4	4.9	20.7	2.3
Cycle Q Clear(g_c), s	1.2	0.0	14.4	4.9	20.7	2.3
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	226	104	275	2582	1945	870
V/C Ratio(X)	0.19	0.00	0.87	0.25	0.57	0.09
Avail Cap(c_a), veh/h	328	151	404	2582	1945	870
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.9	0.0	40.4	2.5	13.6	9.7
Incr Delay (d2), s/veh	0.4	0.0	13.0	0.2	1.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	7.4	2.2	10.0	1.0
LnGrp Delay(d),s/veh	44.3	0.0	53.4	2.7	14.9	9.9
LnGrp LOS	D		D	A	B	A
Approach Vol, veh/h	42			873	1186	
Approach Delay, s/veh	44.3			16.6	14.5	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		86.6		13.4	23.0	63.6		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	25.0	46.0		
Max Q Clear Time (g_c+I1), s		6.9		3.2	16.4	22.7		
Green Ext Time (p_c), s		26.9		0.0	0.6	15.4		

Intersection Summary			
HCM 2010 Ctrl Delay			16.0
HCM 2010 LOS			B

6: 43 Street S/43 Street N & Hwy 3

Future 2019 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	176	585	6	269	729	253	362	325	292	303	553	227
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	191	636	7	292	792	0	393	353	0	329	601	247
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	311	979	11	395	1123	502	592	828	371	753	754	337
Arrive On Green	0.10	0.29	0.29	0.14	0.33	0.00	0.12	0.25	0.00	0.11	0.23	0.23
Sat Flow, veh/h	1645	3325	37	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	191	314	329	292	792	0	393	353	0	329	601	247
Grp Sat Flow(s),veh/h/ln	1645	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	8.9	18.7	18.7	13.2	22.9	0.0	9.9	9.9	0.0	8.6	19.5	17.6
Cycle Q Clear(g_c), s	8.9	18.7	18.7	13.2	22.9	0.0	9.9	9.9	0.0	8.6	19.5	17.6
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	311	483	507	395	1123	502	592	828	371	753	754	337
V/C Ratio(X)	0.61	0.65	0.65	0.74	0.71	0.00	0.66	0.43	0.00	0.44	0.80	0.73
Avail Cap(c_a), veh/h	424	483	507	446	1123	502	929	873	391	1121	842	376
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.4	34.5	34.5	24.2	32.6	0.0	29.2	35.6	0.0	27.8	40.6	39.8
Incr Delay (d2), s/veh	2.0	6.6	6.3	5.6	3.7	0.0	1.3	0.3	0.0	0.4	4.9	6.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	9.3	9.8	6.7	11.3	0.0	4.5	4.6	0.0	3.7	9.3	7.7
LnGrp Delay(d),s/veh	27.4	41.1	40.8	29.8	36.3	0.0	30.5	36.0	0.0	28.2	45.5	46.2
LnGrp LOS	C	D	D	C	D		C	D		C	D	D
Approach Vol, veh/h		834			1084			746			1177	
Approach Delay, s/veh		37.9			34.6			33.1			40.8	
Approach LOS		D			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	21.6	40.0	16.9	33.5	17.3	44.3	18.5	32.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	19.0	33.0	25.0	29.0	19.0	33.0	25.0	29.0
Max Q Clear Time (g_c+I1), s	15.2	20.7	10.6	11.9	10.9	24.9	11.9	21.5
Green Ext Time (p_c), s	0.4	7.8	1.3	7.8	0.4	5.6	1.6	4.5

Intersection Summary			
HCM 2010 Ctrl Delay			36.9
HCM 2010 LOS			D

Intersection	
Int Delay, s/veh	10.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	36	173	10	76	0	243	63	42	9	157	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	11	39	186	11	82	0	261	68	45	10	169	32

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	858	839	185	930	833	90	201	0	0	113	0	0
Stage 1	204	204	-	613	613	-	-	-	-	-	-	-
Stage 2	654	635	-	317	220	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	275	300	852	246	302	962	1342	-	-	1394	-	-
Stage 1	793	729	-	476	480	-	-	-	-	-	-	-
Stage 2	452	469	-	690	717	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	170	235	852	141	237	962	1342	-	-	1394	-	-
Mov Cap-2 Maneuver	170	235	-	141	237	-	-	-	-	-	-	-
Stage 1	627	723	-	377	380	-	-	-	-	-	-	-
Stage 2	281	371	-	506	711	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.2	32.7	5.8	0.3
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1342	-	-	528	220	1394	-	-
HCM Lane V/C Ratio	0.195	-	-	0.446	0.42	0.007	-	-
HCM Control Delay (s)	8.3	0	-	17.2	32.7	7.6	0	-
HCM Lane LOS	A	A	-	C	D	A	A	-
HCM 95th %tile Q(veh)	0.7	-	-	2.3	1.9	0	-	-

2: 43 Street N & 18 Ave N

Future 2019 PM Peak Hour

Intersection	
Int Delay, s/veh	4.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	19	169	105	291	261	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	9	8	8
Mvmt Flow	22	197	122	338	303	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	894	311	319	0	-	0
Stage 1	311	-	-	-	-	-
Stage 2	583	-	-	-	-	-
Critical Hdwy	6.49	6.29	4.19	-	-	-
Critical Hdwy Stg 1	5.49	-	-	-	-	-
Critical Hdwy Stg 2	5.49	-	-	-	-	-
Follow-up Hdwy	3.581	3.381	2.281	-	-	-
Pot Cap-1 Maneuver	303	713	1202	-	-	-
Stage 1	727	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	265	713	1202	-	-	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	727	-	-	-	-	-
Stage 2	477	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.2	2.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1202	-	609	-	-
HCM Lane V/C Ratio	0.102	-	0.359	-	-
HCM Control Delay (s)	8.3	0	14.2	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.3	-	1.6	-	-

HCM 2010 TWSC
3: 43 Street N & 14 Ave N

Timing Plan: FU2019-PM
Future 2019 PM Peak Hour

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	13	83	16	405	416	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	3	3	9	9	10	10
Mvmt Flow	16	100	19	488	501	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1031	504	506	0	-	0
Stage 1	504	-	-	-	-	-
Stage 2	527	-	-	-	-	-
Critical Hdwy	6.43	6.23	4.19	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.281	-	-	-
Pot Cap-1 Maneuver	257	566	1024	-	-	-
Stage 1	605	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	251	566	1024	-	-	-
Mov Cap-2 Maneuver	251	-	-	-	-	-
Stage 1	605	-	-	-	-	-
Stage 2	575	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.8	0.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1024	-	484	-	-
HCM Lane V/C Ratio	0.019	-	0.239	-	-
HCM Control Delay (s)	8.6	0	14.8	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.9	-	-

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2022-AM
Future 2022 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	38	28	87	40	10	10	212	857	166	34	441	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	46	34	0	48	12	12	255	1033	0	41	531	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	183	182	154	156	63	63	288	2555	1143	346	1781	797
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.17	0.77	0.00	0.54	0.54	0.00
Sat Flow, veh/h	1368	1845	1568	1027	642	642	1660	3312	1482	509	3312	1482
Grp Volume(v), veh/h	46	34	0	48	0	24	255	1033	0	41	531	0
Grp Sat Flow(s),veh/h/ln	1368	1845	1568	1027	0	1284	1660	1656	1482	509	1656	1482
Q Serve(g_s), s	3.2	1.7	0.0	4.5	0.0	1.7	15.0	10.4	0.0	4.0	8.8	0.0
Cycle Q Clear(g_c), s	4.9	1.7	0.0	6.2	0.0	1.7	15.0	10.4	0.0	4.0	8.8	0.0
Prop In Lane	1.00		1.00	1.00		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	183	182	154	156	0	126	288	2555	1143	346	1781	797
V/C Ratio(X)	0.25	0.19	0.00	0.31	0.00	0.19	0.88	0.40	0.00	0.12	0.30	0.00
Avail Cap(c_a), veh/h	404	480	408	322	0	334	349	2555	1143	346	1781	797
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.7	41.4	0.0	44.2	0.0	41.4	40.3	3.8	0.0	11.6	12.7	0.0
Incr Delay (d2), s/veh	0.7	0.5	0.0	1.1	0.0	0.7	20.0	0.5	0.0	0.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.9	0.0	1.3	0.0	0.6	8.5	4.8	0.0	0.6	4.1	0.0
LnGrp Delay(d),s/veh	44.4	41.9	0.0	45.3	0.0	42.1	60.4	4.3	0.0	12.3	13.1	0.0
LnGrp LOS	D	D		D		D	E	A		B	B	
Approach Vol, veh/h		80			72			1288			572	
Approach Delay, s/veh		43.3			44.3			15.4			13.1	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		83.6		16.4	23.4	60.3		16.4
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	21.0	34.0		26.0
Max Q Clear Time (g_c+I1), s		12.4		6.9	17.0	10.8		8.2
Green Ext Time (p_c), s		20.4		0.7	0.4	14.0		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			16.9
HCM 2010 LOS			B

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Timing Plan: FU2022-AM
Future 2022 AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	91	160	267	1186	563	44
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	105	0	307	1363	647	51
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	296	136	348	2641	1593	713
Arrive On Green	0.09	0.00	0.20	0.78	0.51	0.51
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	105	0	307	1363	647	51
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	3.1	0.0	17.5	15.0	12.8	1.9
Cycle Q Clear(g_c), s	3.1	0.0	17.5	15.0	12.8	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	296	136	348	2641	1593	713
V/C Ratio(X)	0.35	0.00	0.88	0.52	0.41	0.07
Avail Cap(c_a), veh/h	313	144	495	2641	1593	713
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	0.0	38.7	4.2	15.0	12.4
Incr Delay (d2), s/veh	0.7	0.0	12.7	0.7	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	9.4	7.1	5.7	0.7
LnGrp Delay(d),s/veh	43.1	0.0	51.4	4.9	15.8	12.6
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	105			1670	698	
Approach Delay, s/veh	43.1			13.5	15.6	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		84.0		16.0	26.4	57.7		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	29.0	42.0		
Max Q Clear Time (g_c+I1), s		17.0		5.1	19.5	14.8		
Green Ext Time (p_c), s		32.0		0.1	0.9	19.5		

Intersection Summary	
HCM 2010 Ctrl Delay	15.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	480	659	9	266	641	589	283	750	192	432	438	227
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	522	716	10	289	697	0	308	815	0	470	476	247
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	304	934	13	337	1099	492	614	855	383	533	982	439
Arrive On Green	0.09	0.28	0.28	0.13	0.33	0.00	0.08	0.26	0.00	0.13	0.31	0.31
Sat Flow, veh/h	1630	3284	46	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	522	354	372	289	697	0	308	815	0	470	476	247
Grp Sat Flow(s),veh/h/ln	1630	1626	1704	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	11.0	25.3	25.3	15.1	22.5	0.0	8.9	30.9	0.0	13.6	15.6	18.6
Cycle Q Clear(g_c), s	11.0	25.3	25.3	15.1	22.5	0.0	8.9	30.9	0.0	13.6	15.6	18.6
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	304	462	484	337	1099	492	614	855	383	533	982	439
V/C Ratio(X)	1.72	0.77	0.77	0.86	0.63	0.00	0.50	0.95	0.00	0.88	0.48	0.56
Avail Cap(c_a), veh/h	304	462	484	337	1099	492	614	855	383	615	1066	477
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	40.6	41.5	41.5	29.1	35.8	0.0	31.0	46.0	0.0	31.1	35.2	36.3
Incr Delay (d2), s/veh	337.0	11.5	11.1	19.1	2.8	0.0	0.6	20.2	0.0	12.8	0.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	28.4	12.8	13.4	8.6	10.7	0.0	3.9	16.4	0.0	6.6	6.8	7.4
LnGrp Delay(d),s/veh	377.5	53.0	52.5	48.2	38.6	0.0	31.6	66.2	0.0	43.9	35.6	37.6
LnGrp LOS	F	D	D	D	D		C	E		D	D	D
Approach Vol, veh/h		1248			986			1123			1193	
Approach Delay, s/veh		188.6			41.4			56.7			39.3	
Approach LOS		F			D			E			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.0	43.0	21.6	39.0	17.0	49.0	15.0	45.6
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	17.0	36.0	20.0	33.0	11.0	42.0	10.0	43.0
Max Q Clear Time (g_c+I1), s	17.1	27.3	15.6	32.9	13.0	24.5	10.9	20.6
Green Ext Time (p_c), s	0.0	5.9	1.0	0.1	0.0	9.7	0.0	12.0

Intersection Summary	
HCM 2010 Ctrl Delay	85.0
HCM 2010 LOS	F

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	75	236	38	63	5	78	104	25	5	49	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	21	97	306	49	82	6	101	135	32	6	64	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	479	451	68	636	438	151	71	0	0	168	0	0
Stage 1	81	81	-	354	354	-	-	-	-	-	-	-
Stage 2	398	370	-	282	84	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	494	501	990	388	509	890	1498	-	-	1329	-	-
Stage 1	922	824	-	659	627	-	-	-	-	-	-	-
Stage 2	624	617	-	721	821	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	399	461	990	211	468	890	1498	-	-	1329	-	-
Mov Cap-2 Maneuver	399	461	-	211	468	-	-	-	-	-	-	-
Stage 1	853	820	-	610	580	-	-	-	-	-	-	-
Stage 2	492	571	-	436	817	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.2	23.4	2.9	0.6
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1498	-	-	741	331	1329	-	-
HCM Lane V/C Ratio	0.068	-	-	0.573	0.416	0.005	-	-
HCM Control Delay (s)	7.6	0	-	16.2	23.4	7.7	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	3.7	2	0	-	-

2: 43 Street N & 18 Ave N

Intersection	
Int Delay, s/veh	46.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	11	35	112	54	8	6	187	179	243	28	298	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	92	92	92	78	78	78	78	78	78
Heavy Vehicles, %	12	12	12	10	10	10	10	10	10	3	3	3
Mvmt Flow	14	45	144	59	9	7	240	229	312	36	382	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1334	1483	390	1421	1334	385	397	0	0	541	0	0
Stage 1	462	462	-	865	865	-	-	-	-	-	-	-
Stage 2	872	1021	-	556	469	-	-	-	-	-	-	-
Critical Hdwy	7.22	6.62	6.32	7.2	6.6	6.3	4.2	-	-	4.13	-	-
Critical Hdwy Stg 1	6.22	5.62	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.22	5.62	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.608	4.108	3.408	3.59	4.09	3.39	2.29	-	-	2.227	-	-
Pot Cap-1 Maneuver	125	119	637	109	148	645	1119	-	-	1023	-	-
Stage 1	561	548	-	337	360	-	-	-	-	-	-	-
Stage 2	332	301	-	501	547	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	84	77	637	~ 34	96	645	1119	-	-	1023	-	-
Mov Cap-2 Maneuver	84	77	-	~ 34	96	-	-	-	-	-	-	-
Stage 1	380	523	-	228	244	-	-	-	-	-	-	-
Stage 2	215	204	-	339	522	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	103.7	$ 619.3	2.8	0.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1119	-	-	208	40	1023	-	-
HCM Lane V/C Ratio	0.214	-	-	0.974	1.848	0.035	-	-
HCM Control Delay (s)	9.1	0	-	103.7	$ 619.3	8.6	0	-
HCM Lane LOS	A	A	-	F	F	A	A	-
HCM 95th %tile Q(veh)	0.8	-	-	8.4	7.8	0.1	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection	
Int Delay, s/veh	15.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	4	7	21	53	2	6	76	582	236	28	421	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	92	92	92	81	81	81	81	81	81
Heavy Vehicles, %	55	55	55	10	10	10	10	10	10	6	6	6
Mvmt Flow	5	9	26	58	2	7	94	719	291	35	520	20

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1655	1797	530	1668	1661	864	540	0	0	1010	0	0
Stage 1	599	599	-	1052	1052	-	-	-	-	-	-	-
Stage 2	1056	1198	-	616	609	-	-	-	-	-	-	-
Critical Hdwy	7.65	7.05	6.75	7.2	6.6	6.3	4.2	-	-	4.16	-	-
Critical Hdwy Stg 1	6.65	6.05	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.65	6.05	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.995	4.495	3.795	3.59	4.09	3.39	2.29	-	-	2.254	-	-
Pot Cap-1 Maneuver	58	60	458	73	93	342	989	-	-	671	-	-
Stage 1	408	416	-	265	294	-	-	-	-	-	-	-
Stage 2	218	206	-	465	473	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	43	43	458	~ 46	66	342	989	-	-	671	-	-
Mov Cap-2 Maneuver	43	43	-	~ 46	66	-	-	-	-	-	-	-
Stage 1	313	385	-	203	225	-	-	-	-	-	-	-
Stage 2	162	158	-	397	438	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	57.9	$ 357.2	0.8	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	989	-	-	106	51	671	-	-
HCM Lane V/C Ratio	0.095	-	-	0.373	1.3	0.052	-	-
HCM Control Delay (s)	9	0	-	57.9	$ 357.2	10.7	0	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.3	-	-	1.5	6	0.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	11	35	112	54	8	6	187	179	243	28	298	12
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1696	1900	1900	1727	1900	1900	1727	1900	1900	1845	1900
Adj Flow Rate, veh/h	14	45	144	59	9	7	240	229	312	36	382	15
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	12	12	12	10	10	10	10	10	10	3	3	3
Cap, veh/h	51	103	281	265	39	25	275	232	306	91	913	35
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.61	0.61	0.61	0.61	0.61	0.61
Sat Flow, veh/h	46	388	1060	758	147	93	376	384	505	86	1509	57
Grp Volume(v), veh/h	203	0	0	75	0	0	781	0	0	433	0	0
Grp Sat Flow(s),veh/h/ln	1494	0	0	999	0	0	1265	0	0	1652	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	48.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	11.4	0.0	0.0	7.8	0.0	0.0	60.5	0.0	0.0	12.2	0.0	0.0
Prop In Lane	0.07		0.71	0.79		0.09	0.31		0.40	0.08		0.03
Lane Grp Cap(c), veh/h	434	0	0	329	0	0	812	0	0	1039	0	0
V/C Ratio(X)	0.47	0.00	0.00	0.23	0.00	0.00	0.96	0.00	0.00	0.42	0.00	0.00
Avail Cap(c_a), veh/h	434	0	0	329	0	0	812	0	0	1039	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	31.2	0.0	0.0	29.6	0.0	0.0	20.7	0.0	0.0	10.2	0.0	0.0
Incr Delay (d2), s/veh	3.6	0.0	0.0	1.6	0.0	0.0	23.5	0.0	0.0	1.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	0.0	0.0	1.8	0.0	0.0	26.8	0.0	0.0	6.5	0.0	0.0
LnGrp Delay(d),s/veh	34.8	0.0	0.0	31.2	0.0	0.0	44.1	0.0	0.0	11.4	0.0	0.0
LnGrp LOS	C			C			D			B		
Approach Vol, veh/h		203			75			781			433	
Approach Delay, s/veh		34.8			31.2			44.1			11.4	
Approach LOS		C			C			D			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		67.0		33.0		67.0		33.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		60.5		26.5		60.5		26.5
Max Q Clear Time (g_c+I1), s		62.5		13.4		14.2		9.8
Green Ext Time (p_c), s		0.0		1.6		15.6		1.8

Intersection Summary		
HCM 2010 Ctrl Delay		32.7
HCM 2010 LOS		C

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Volume (veh/h)	4	7	21	53	2	6	76	582	236	28	421	16
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1226	1900	1900	1727	1900	1727	1727	1900	1900	1792	1900
Adj Flow Rate, veh/h	5	9	26	58	2	7	94	719	291	35	520	20
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	55	55	55	10	10	10	10	10	10	6	6	6
Cap, veh/h	56	70	158	324	14	32	172	755	305	46	554	20
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	68	309	702	1143	60	140	799	1170	474	12	859	31
Grp Volume(v), veh/h	40	0	0	67	0	0	94	0	1010	575	0	0
Grp Sat Flow(s),veh/h/ln	1079	0	0	1344	0	0	799	0	1644	902	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	56.6	7.9	0.0	0.0
Cycle Q Clear(g_c), s	2.9	0.0	0.0	3.4	0.0	0.0	54.1	0.0	56.6	64.5	0.0	0.0
Prop In Lane	0.12		0.65	0.87		0.10	1.00		0.29	0.06		0.03
Lane Grp Cap(c), veh/h	283	0	0	370	0	0	172	0	1060	620	0	0
V/C Ratio(X)	0.14	0.00	0.00	0.18	0.00	0.00	0.55	0.00	0.95	0.93	0.00	0.00
Avail Cap(c_a), veh/h	283	0	0	370	0	0	172	0	1060	620	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	31.2	0.0	0.0	31.3	0.0	0.0	15.9	0.0	16.3	21.4	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.0	1.1	0.0	0.0	11.8	0.0	18.4	22.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.0	1.6	0.0	0.0	2.9	0.0	30.7	14.6	0.0	0.0
LnGrp Delay(d),s/veh	32.2	0.0	0.0	32.4	0.0	0.0	27.7	0.0	34.7	43.6	0.0	0.0
LnGrp LOS	C			C			C		C	D		
Approach Vol, veh/h		40			67			1104			575	
Approach Delay, s/veh		32.2			32.4			34.1			43.6	
Approach LOS		C			C			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		71.0		29.0		71.0		29.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		64.5		22.5		64.5		22.5
Max Q Clear Time (g_c+I1), s		58.6		4.9		66.5		5.4
Green Ext Time (p_c), s		5.0		0.5		0.0		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	37.1
HCM 2010 LOS	D

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2022-AM-Mit
Future 2022 AM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↳		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	38	28	87	40	10	10	212	857	166	34	441	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	46	34	0	48	12	12	255	1033	0	41	531	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	183	182	154	156	63	63	292	2555	1143	345	1774	794
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.18	0.77	0.00	0.54	0.54	0.00
Sat Flow, veh/h	1368	1845	1568	1027	642	642	1660	3312	1482	509	3312	1482
Grp Volume(v), veh/h	46	34	0	48	0	24	255	1033	0	41	531	0
Grp Sat Flow(s),veh/h/ln	1368	1845	1568	1027	0	1284	1660	1656	1482	509	1656	1482
Q Serve(g_s), s	3.2	1.7	0.0	4.5	0.0	1.7	15.0	10.4	0.0	4.1	8.9	0.0
Cycle Q Clear(g_c), s	4.9	1.7	0.0	6.2	0.0	1.7	15.0	10.4	0.0	4.1	8.9	0.0
Prop In Lane	1.00		1.00	1.00		0.50	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	183	182	154	156	0	126	292	2555	1143	345	1774	794
V/C Ratio(X)	0.25	0.19	0.00	0.31	0.00	0.19	0.87	0.40	0.00	0.12	0.30	0.00
Avail Cap(c_a), veh/h	404	480	408	322	0	334	415	2555	1143	345	1774	794
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.7	41.4	0.0	44.2	0.0	41.4	40.1	3.8	0.0	11.7	12.8	0.0
Incr Delay (d2), s/veh	0.7	0.5	0.0	1.1	0.0	0.7	13.6	0.5	0.0	0.7	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.9	0.0	1.3	0.0	0.6	8.0	4.8	0.0	0.6	4.2	0.0
LnGrp Delay(d),s/veh	44.4	41.9	0.0	45.3	0.0	42.1	53.8	4.3	0.0	12.4	13.3	0.0
LnGrp LOS	D	D		D		D	D	A		B	B	
Approach Vol, veh/h		80			72			1288			572	
Approach Delay, s/veh		43.3			44.3			14.1			13.2	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		83.6		16.4	23.6	60.1		16.4
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	25.0	30.0		26.0
Max Q Clear Time (g_c+I1), s		12.4		6.9	17.0	10.9		8.2
Green Ext Time (p_c), s		20.4		0.7	0.6	12.3		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			16.1
HCM 2010 LOS			B

5: 43 Street N & 5 Ave N

Future 2022 AM Peak Hour - Mitigated

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	91	160	267	1186	563	44
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	105	0	307	1363	647	51
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	296	136	348	2641	1593	713
Arrive On Green	0.09	0.00	0.20	0.78	0.51	0.51
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	105	0	307	1363	647	51
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	3.1	0.0	17.5	15.0	12.8	1.9
Cycle Q Clear(g_c), s	3.1	0.0	17.5	15.0	12.8	1.9
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	296	136	348	2641	1593	713
V/C Ratio(X)	0.35	0.00	0.88	0.52	0.41	0.07
Avail Cap(c_a), veh/h	313	144	495	2641	1593	713
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	0.0	38.7	4.2	15.0	12.4
Incr Delay (d2), s/veh	0.7	0.0	12.7	0.7	0.8	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	9.4	7.1	5.7	0.7
LnGrp Delay(d),s/veh	43.1	0.0	51.4	4.9	15.8	12.6
LnGrp LOS	D		D	A	B	B
Approach Vol, veh/h	105			1670	698	
Approach Delay, s/veh	43.1			13.5	15.6	
Approach LOS	D			B	B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		84.0		16.0	26.4	57.7		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	29.0	42.0		
Max Q Clear Time (g_c+I1), s		17.0		5.1	19.5	14.8		
Green Ext Time (p_c), s		32.0		0.1	0.9	19.5		

Intersection Summary			
HCM 2010 Ctrl Delay			15.3
HCM 2010 LOS			B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	480	659	9	266	641	589	283	750	192	432	438	227
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	522	716	10	289	697	0	308	815	0	470	476	247
Adj No. of Lanes	2	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	588	929	13	335	1093	489	618	872	390	534	993	444
Arrive On Green	0.09	0.28	0.28	0.13	0.33	0.00	0.08	0.27	0.00	0.13	0.32	0.32
Sat Flow, veh/h	3163	3284	46	1660	3312	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	522	354	372	289	697	0	308	815	0	470	476	247
Grp Sat Flow(s),veh/h/ln	1581	1626	1704	1660	1656	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	11.0	25.4	25.4	15.2	22.7	0.0	8.9	30.9	0.0	13.6	15.6	18.6
Cycle Q Clear(g_c), s	11.0	25.4	25.4	15.2	22.7	0.0	8.9	30.9	0.0	13.6	15.6	18.6
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	588	460	482	335	1093	489	618	872	390	534	993	444
V/C Ratio(X)	0.89	0.77	0.77	0.86	0.64	0.00	0.50	0.93	0.00	0.88	0.48	0.56
Avail Cap(c_a), veh/h	588	460	482	335	1093	489	618	877	392	596	1061	475
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.2	41.8	41.8	29.5	36.2	0.0	30.7	45.6	0.0	31.1	35.1	36.1
Incr Delay (d2), s/veh	15.3	11.8	11.3	20.1	2.8	0.0	0.6	16.7	0.0	13.3	0.4	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	12.9	13.5	8.8	10.8	0.0	4.0	16.1	0.0	6.7	6.8	7.4
LnGrp Delay(d),s/veh	53.5	53.6	53.1	49.6	39.0	0.0	31.3	62.4	0.0	44.4	35.4	37.3
LnGrp LOS	D	D	D	D	D		C	E		D	D	D
Approach Vol, veh/h		1248			986			1123			1193	
Approach Delay, s/veh		53.4			42.1			53.8			39.4	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.0	43.0	21.4	39.8	17.0	49.0	15.0	46.2
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	17.0	36.0	19.0	34.0	11.0	42.0	10.0	43.0
Max Q Clear Time (g_c+I1), s	17.2	27.4	15.6	32.9	13.0	24.7	10.9	20.6
Green Ext Time (p_c), s	0.0	5.8	0.8	0.9	0.0	9.7	0.0	12.0

Intersection Summary		
HCM 2010 Ctrl Delay		47.4
HCM 2010 LOS		D

Intersection	
Int Delay, s/veh	11.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	75	236	38	63	5	78	104	25	5	49	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	750	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	21	97	306	49	82	6	101	135	32	6	64	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	479	451	68	636	438	151	71	0	0	168	0	0
Stage 1	81	81	-	354	354	-	-	-	-	-	-	-
Stage 2	398	370	-	282	84	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	494	501	990	388	509	890	1498	-	-	1329	-	-
Stage 1	922	824	-	659	627	-	-	-	-	-	-	-
Stage 2	624	617	-	721	821	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	399	461	990	211	468	890	1498	-	-	1329	-	-
Mov Cap-2 Maneuver	399	461	-	211	468	-	-	-	-	-	-	-
Stage 1	853	820	-	610	580	-	-	-	-	-	-	-
Stage 2	492	571	-	436	817	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	16.2			18.8			2.9			0.6		
HCM LOS	C			C								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1498	-	-	741	211	485	1329	-	-
HCM Lane V/C Ratio	0.068	-	-	0.573	0.234	0.182	0.005	-	-
HCM Control Delay (s)	7.6	0	-	16.2	27.2	14.1	7.7	0	-
HCM Lane LOS	A	A	-	C	D	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	3.7	0.9	0.7	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	23	9	248	186	25	33	144	477	42	9	904	56
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	29	11	0	232	31	41	180	596	0	11	1130	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	273	347	295	336	141	187	211	2160	966	450	1634	731
Arrive On Green	0.19	0.19	0.00	0.19	0.19	0.19	0.13	0.68	0.00	0.48	0.48	0.00
Sat Flow, veh/h	1273	1792	1524	1398	729	964	1601	3195	1429	780	3374	1509
Grp Volume(v), veh/h	29	11	0	232	0	72	180	596	0	11	1130	0
Grp Sat Flow(s),veh/h/ln	1273	1792	1524	1398	0	1693	1601	1597	1429	780	1687	1509
Q Serve(g_s), s	2.0	0.5	0.0	16.1	0.0	3.6	11.0	7.4	0.0	0.7	26.0	0.0
Cycle Q Clear(g_c), s	5.5	0.5	0.0	16.6	0.0	3.6	11.0	7.4	0.0	0.7	26.0	0.0
Prop In Lane	1.00		1.00	1.00		0.57	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	273	347	295	336	0	328	211	2160	966	450	1634	731
V/C Ratio(X)	0.11	0.03	0.00	0.69	0.00	0.22	0.85	0.28	0.00	0.02	0.69	0.00
Avail Cap(c_a), veh/h	326	421	358	394	0	398	288	2160	966	450	1634	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	36.3	32.7	0.0	39.5	0.0	33.9	42.5	6.4	0.0	13.5	20.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	4.1	0.0	0.3	16.3	0.3	0.0	0.1	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.3	0.0	6.6	0.0	1.7	5.8	3.3	0.0	0.2	12.6	0.0
LnGrp Delay(d),s/veh	36.4	32.7	0.0	43.6	0.0	34.3	58.8	6.8	0.0	13.6	22.4	0.0
LnGrp LOS	D	C		D		C	E	A		B	C	
Approach Vol, veh/h		40			304			776			1141	
Approach Delay, s/veh		35.4			41.4			18.8			22.3	
Approach LOS		D			D			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		74.1		25.9	19.2	54.9		25.9
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		63.5		23.5	18.0	39.5		23.5
Max Q Clear Time (g_c+I1), s		9.4		7.5	13.0	28.0		18.6
Green Ext Time (p_c), s		23.5		1.5	0.3	8.8		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			23.9
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary

Timing Plan: FU2022-PM

5: 43 Street N & 5 Ave N

Future 2022 PM Peak Hour

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	51	274	230	697	1406	112
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	57	0	256	774	1562	124
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	261	120	289	2548	1879	841
Arrive On Green	0.08	0.00	0.18	0.79	0.55	0.55
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	57	0	256	774	1562	124
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.6	0.0	15.5	6.6	38.0	4.0
Cycle Q Clear(g_c), s	1.6	0.0	15.5	6.6	38.0	4.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	261	120	289	2548	1879	841
V/C Ratio(X)	0.22	0.00	0.89	0.30	0.83	0.15
Avail Cap(c_a), veh/h	328	151	355	2548	1879	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.1	0.0	40.1	2.9	18.5	10.9
Incr Delay (d2), s/veh	0.4	0.0	19.8	0.3	4.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	8.5	3.0	19.0	1.7
LnGrp Delay(d),s/veh	43.5	0.0	59.8	3.2	23.0	11.3
LnGrp LOS	D		E	A	C	B
Approach Vol, veh/h	57			1030	1686	
Approach Delay, s/veh	43.5			17.3	22.1	
Approach LOS	D			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.6		14.4	23.9	61.7		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	22.0	49.0		
Max Q Clear Time (g_c+I1), s		8.6		3.6	17.5	40.0		
Green Ext Time (p_c), s		44.3		0.1	0.4	8.3		

Intersection Summary			
HCM 2010 Ctrl Delay			20.8
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: FU2022-PM
Future 2022 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	216	627	6	288	781	303	387	374	313	452	694	350
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	235	682	7	313	849	0	421	407	0	491	754	380
Adj No. of Lanes	1	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	282	1042	11	391	1272	569	490	882	395	705	826	369
Arrive On Green	0.08	0.31	0.31	0.14	0.38	0.00	0.11	0.26	0.00	0.10	0.25	0.25
Sat Flow, veh/h	1645	3328	34	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	235	336	353	313	849	0	421	407	0	491	754	380
Grp Sat Flow(s),veh/h/ln	1645	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	10.0	23.0	23.0	15.7	27.2	0.0	12.2	13.2	0.0	13.0	29.3	33.0
Cycle Q Clear(g_c), s	10.0	23.0	23.0	15.7	27.2	0.0	12.2	13.2	0.0	13.0	29.3	33.0
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	282	514	539	391	1272	569	490	882	395	705	826	369
V/C Ratio(X)	0.83	0.65	0.65	0.80	0.67	0.00	0.86	0.46	0.00	0.70	0.91	1.03
Avail Cap(c_a), veh/h	282	514	539	452	1272	569	490	882	395	705	826	369
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.7	38.6	38.6	26.7	33.7	0.0	34.5	40.3	0.0	34.8	47.1	48.5
Incr Delay (d2), s/veh	18.7	6.4	6.1	8.7	2.8	0.0	14.2	0.4	0.0	3.0	14.5	54.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	11.4	11.9	8.3	13.1	0.0	6.5	6.2	0.0	6.8	14.8	18.8
LnGrp Delay(d),s/veh	54.5	44.9	44.7	35.5	36.5	0.0	48.7	40.7	0.0	37.8	61.6	102.9
LnGrp LOS	D	D	D	D	D		D	D		D	E	F
Approach Vol, veh/h		924			1162			828			1625	
Approach Delay, s/veh		47.3			36.2			44.7			64.1	
Approach LOS		D			D			D			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.3	47.7	18.0	40.0	16.0	56.0	19.0	39.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	23.0	36.0	13.0	34.0	10.0	49.0	14.0	33.0
Max Q Clear Time (g_c+I1), s	17.7	25.0	15.0	15.2	12.0	29.2	14.2	35.0
Green Ext Time (p_c), s	0.6	7.5	0.0	10.6	0.0	11.4	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	50.0
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	14.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	39	194	14	81	0	295	70	60	9	161	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	11	42	209	15	87	0	317	75	65	10	173	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	994	983	190	1076	968	108	206	0	0	140	0	0
Stage 1	209	209	-	742	742	-	-	-	-	-	-	-
Stage 2	785	774	-	334	226	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	222	247	847	195	252	940	1336	-	-	1362	-	-
Stage 1	788	725	-	404	419	-	-	-	-	-	-	-
Stage 2	383	405	-	676	713	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	114	182	847	97	185	940	1336	-	-	1362	-	-
Mov Cap-2 Maneuver	114	182	-	97	185	-	-	-	-	-	-	-
Stage 1	584	719	-	299	310	-	-	-	-	-	-	-
Stage 2	204	300	-	476	707	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.8	58.3	5.9	0.3
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1336	-	-	458	163	1362	-	-
HCM Lane V/C Ratio	0.237	-	-	0.571	0.627	0.007	-	-
HCM Control Delay (s)	8.5	0	-	22.8	58.3	7.7	0	-
HCM Lane LOS	A	A	-	C	F	A	A	-
HCM 95th %tile Q(veh)	0.9	-	-	3.5	3.5	0	-	-

2: 43 Street N & 18 Ave N

Intersection	
Int Delay, s/veh	159.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	20	9	179	218	31	25	106	338	60	7	279	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	92	92	92	86	86	86	86	86	86
Heavy Vehicles, %	9	9	9	10	10	10	9	9	9	8	8	8
Mvmt Flow	23	10	208	237	34	27	123	393	70	8	324	15

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1053	1057	332	1132	1030	428	340	0	0	463	0	0
Stage 1	348	348	-	674	674	-	-	-	-	-	-	-
Stage 2	705	709	-	458	356	-	-	-	-	-	-	-
Critical Hdwy	7.19	6.59	6.29	7.2	6.6	6.3	4.19	-	-	4.18	-	-
Critical Hdwy Stg 1	6.19	5.59	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.19	5.59	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.581	4.081	3.381	3.59	4.09	3.39	2.281	-	-	2.272	-	-
Pot Cap-1 Maneuver	198	219	694	~ 174	226	610	1181	-	-	1067	-	-
Stage 1	654	622	-	431	442	-	-	-	-	-	-	-
Stage 2	416	427	-	568	615	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	145	186	694	~ 103	192	610	1181	-	-	1067	-	-
Mov Cap-2 Maneuver	145	186	-	~ 103	192	-	-	-	-	-	-	-
Stage 1	561	616	-	370	379	-	-	-	-	-	-	-
Stage 2	311	366	-	387	609	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.6	$ 768.6	1.8	0.2
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1181	-	-	468	118	1067	-	-
HCM Lane V/C Ratio	0.104	-	-	0.517	2.524	0.008	-	-
HCM Control Delay (s)	8.4	0	-	20.6	$ 768.6	8.4	0	-
HCM Lane LOS	A	A	-	C	F	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	2.9	26.7	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s   +: Computation Not Defined   *: All major volume in platoon

Intersection	
Int Delay, s/veh	193.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	14	2	89	212	6	25	17	489	58	7	653	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	92	83	92	92	92	83	83	92	92	83	83
Heavy Vehicles, %	3	3	3	10	10	10	9	9	9	10	10	10
Mvmt Flow	17	2	107	230	7	27	20	589	63	8	787	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1482	1497	789	1521	1469	621	792	0	0	652	0	0
Stage 1	804	804	-	662	662	-	-	-	-	-	-	-
Stage 2	678	693	-	859	807	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.2	6.6	6.3	4.19	-	-	4.2	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.59	4.09	3.39	2.281	-	-	2.29	-	-
Pot Cap-1 Maneuver	103	122	389	~ 93	122	473	798	-	-	898	-	-
Stage 1	375	394	-	438	447	-	-	-	-	-	-	-
Stage 2	440	443	-	340	383	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	89	115	389	~ 64	115	473	798	-	-	898	-	-
Mov Cap-2 Maneuver	89	115	-	~ 64	115	-	-	-	-	-	-	-
Stage 1	360	388	-	420	429	-	-	-	-	-	-	-
Stage 2	392	425	-	241	377	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.1	$ 1345.6	0.3	0.1
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	798	-	-	261	71	898	-	-
HCM Lane V/C Ratio	0.026	-	-	0.484	3.72	0.008	-	-
HCM Control Delay (s)	9.6	0	-	31.1	$ 1345.6	9	0	-
HCM Lane LOS	A	A	-	D	F	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	2.5	27.7	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
2: 43 Street N & 18 Ave N

Timing Plan: FU2022-PM-Mit
Future 2022 PM Peak Hour - Mitigated

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	20	9	179	218	31	25	106	338	60	7	279	13
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1743	1900	1900	1727	1900	1900	1743	1900	1900	1759	1900
Adj Flow Rate, veh/h	23	10	208	237	34	27	123	393	70	8	324	15
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	9	9	10	10	10	9	9	9	8	8	8
Cap, veh/h	71	47	496	355	45	33	181	526	90	43	828	38
Arrive On Green	0.37	0.37	0.37	0.37	0.37	0.37	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	87	128	1352	791	122	91	273	1046	179	13	1645	75
Grp Volume(v), veh/h	241	0	0	298	0	0	586	0	0	347	0	0
Grp Sat Flow(s),veh/h/ln	1567	0	0	1003	0	0	1498	0	0	1733	0	0
Q Serve(g_s), s	0.0	0.0	0.0	16.5	0.0	0.0	18.9	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	12.0	0.0	0.0	28.5	0.0	0.0	31.3	0.0	0.0	12.3	0.0	0.0
Prop In Lane	0.10		0.86	0.80		0.09	0.21		0.12	0.02		0.04
Lane Grp Cap(c), veh/h	614	0	0	433	0	0	797	0	0	909	0	0
V/C Ratio(X)	0.39	0.00	0.00	0.69	0.00	0.00	0.74	0.00	0.00	0.38	0.00	0.00
Avail Cap(c_a), veh/h	614	0	0	433	0	0	797	0	0	909	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	23.8	0.0	0.0	30.5	0.0	0.0	19.8	0.0	0.0	15.4	0.0	0.0
Incr Delay (d2), s/veh	1.9	0.0	0.0	8.7	0.0	0.0	6.0	0.0	0.0	1.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	0.0	0.0	8.6	0.0	0.0	14.3	0.0	0.0	6.2	0.0	0.0
LnGrp Delay(d),s/veh	25.7	0.0	0.0	39.2	0.0	0.0	25.8	0.0	0.0	16.6	0.0	0.0
LnGrp LOS	C			D			C			B		
Approach Vol, veh/h		241			298			586			347	
Approach Delay, s/veh		25.7			39.2			25.8			16.6	
Approach LOS		C			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		56.8		43.2		56.8		43.2
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		50.3		36.7		50.3		36.7
Max Q Clear Time (g_c+I1), s		33.3		14.0		14.3		30.5
Green Ext Time (p_c), s		6.7		4.4		8.9		2.1

Intersection Summary		
HCM 2010 Ctrl Delay		26.3
HCM 2010 LOS		C

HCM 2010 Signalized Intersection Summary
3: 43 Street N & 14 Ave N

Timing Plan: FU2022-PM-Mit
Future 2022 PM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Volume (veh/h)	14	2	89	212	6	25	17	489	58	7	653	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1727	1900	1743	1743	1900	1900	1727	1900
Adj Flow Rate, veh/h	17	2	107	230	7	27	20	589	63	8	787	5
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.83	0.92	0.83	0.92	0.92	0.92	0.83	0.83	0.92	0.92	0.83	0.83
Percent Heavy Veh, %	3	3	3	10	10	10	9	9	9	10	10	10
Cap, veh/h	82	32	412	377	9	36	270	890	95	39	978	6
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	139	109	1396	1049	32	123	638	1548	166	5	1702	11
Grp Volume(v), veh/h	126	0	0	264	0	0	20	0	652	800	0	0
Grp Sat Flow(s),veh/h/ln	1644	0	0	1204	0	0	638	0	1714	1718	0	0
Q Serve(g_s), s	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.0	0.0	0.0	20.0	0.0	0.0	5.4	0.0	26.1	36.7	0.0	0.0
Prop In Lane	0.13		0.85	0.87		0.10	1.00		0.10	0.01		0.01
Lane Grp Cap(c), veh/h	526	0	0	422	0	0	270	0	985	1024	0	0
V/C Ratio(X)	0.24	0.00	0.00	0.62	0.00	0.00	0.07	0.00	0.66	0.78	0.00	0.00
Avail Cap(c_a), veh/h	526	0	0	422	0	0	270	0	985	1024	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	27.0	0.0	0.0	32.0	0.0	0.0	10.2	0.0	14.6	16.8	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	0.0	6.8	0.0	0.0	0.5	0.0	3.5	5.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	0.0	7.4	0.0	0.0	0.3	0.0	13.1	19.0	0.0	0.0
LnGrp Delay(d),s/veh	28.0	0.0	0.0	38.8	0.0	0.0	10.7	0.0	18.1	22.8	0.0	0.0
LnGrp LOS	C			D			B		B	C		
Approach Vol, veh/h		126			264			672			800	
Approach Delay, s/veh		28.0			38.8			17.8			22.8	
Approach LOS		C			D			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.0		36.0		64.0		36.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		57.5		29.5		57.5		29.5
Max Q Clear Time (g_c+I1), s		28.1		8.0		38.7		22.0
Green Ext Time (p_c), s		15.0		2.9		11.4		1.6

Intersection Summary		
HCM 2010 Ctrl Delay		23.6
HCM 2010 LOS		C

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2022-PM-Mit
Future 2022 PM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	23	9	248	186	25	33	144	477	42	9	904	56
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	29	11	0	232	31	41	180	596	0	11	1130	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	273	347	295	336	141	187	211	2160	966	450	1634	731
Arrive On Green	0.19	0.19	0.00	0.19	0.19	0.19	0.13	0.68	0.00	0.48	0.48	0.00
Sat Flow, veh/h	1273	1792	1524	1398	729	964	1601	3195	1429	780	3374	1509
Grp Volume(v), veh/h	29	11	0	232	0	72	180	596	0	11	1130	0
Grp Sat Flow(s),veh/h/ln	1273	1792	1524	1398	0	1693	1601	1597	1429	780	1687	1509
Q Serve(g_s), s	2.0	0.5	0.0	16.1	0.0	3.6	11.0	7.4	0.0	0.7	26.0	0.0
Cycle Q Clear(g_c), s	5.5	0.5	0.0	16.6	0.0	3.6	11.0	7.4	0.0	0.7	26.0	0.0
Prop In Lane	1.00		1.00	1.00		0.57	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	273	347	295	336	0	328	211	2160	966	450	1634	731
V/C Ratio(X)	0.11	0.03	0.00	0.69	0.00	0.22	0.85	0.28	0.00	0.02	0.69	0.00
Avail Cap(c_a), veh/h	326	421	358	394	0	398	288	2160	966	450	1634	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	36.3	32.7	0.0	39.5	0.0	33.9	42.5	6.4	0.0	13.5	20.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	4.1	0.0	0.3	16.3	0.3	0.0	0.1	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.3	0.0	6.6	0.0	1.7	5.8	3.3	0.0	0.2	12.6	0.0
LnGrp Delay(d),s/veh	36.4	32.7	0.0	43.6	0.0	34.3	58.8	6.8	0.0	13.6	22.4	0.0
LnGrp LOS	D	C		D		C	E	A		B	C	
Approach Vol, veh/h		40			304			776			1141	
Approach Delay, s/veh		35.4			41.4			18.8			22.3	
Approach LOS		D			D			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		74.1		25.9	19.2	54.9		25.9
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		63.5		23.5	18.0	39.5		23.5
Max Q Clear Time (g_c+I1), s		9.4		7.5	13.0	28.0		18.6
Green Ext Time (p_c), s		23.5		1.5	0.3	8.8		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			23.9
HCM 2010 LOS			C

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	51	274	230	697	1406	112
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	57	0	256	774	1562	124
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	261	120	289	2548	1879	841
Arrive On Green	0.08	0.00	0.18	0.79	0.55	0.55
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	57	0	256	774	1562	124
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.6	0.0	15.5	6.6	38.0	4.0
Cycle Q Clear(g_c), s	1.6	0.0	15.5	6.6	38.0	4.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	261	120	289	2548	1879	841
V/C Ratio(X)	0.22	0.00	0.89	0.30	0.83	0.15
Avail Cap(c_a), veh/h	328	151	355	2548	1879	841
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.1	0.0	40.1	2.9	18.5	10.9
Incr Delay (d2), s/veh	0.4	0.0	19.8	0.3	4.5	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	8.5	3.0	19.0	1.7
LnGrp Delay(d),s/veh	43.5	0.0	59.8	3.2	23.0	11.3
LnGrp LOS	D		E	A	C	B
Approach Vol, veh/h	57			1030	1686	
Approach Delay, s/veh	43.5			17.3	22.1	
Approach LOS	D			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.6		14.4	23.9	61.7		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	22.0	49.0		
Max Q Clear Time (g_c+I1), s		8.6		3.6	17.5	40.0		
Green Ext Time (p_c), s		44.3		0.1	0.4	8.3		

Intersection Summary			
HCM 2010 Ctrl Delay			20.8
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: FU2022-PM-Mit
Future 2022 PM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	216	627	6	288	781	303	387	374	313	452	694	350
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	235	682	7	313	849	0	421	407	0	491	754	380
Adj No. of Lanes	2	2	0	1	2	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	527	981	10	380	1220	546	508	907	406	745	876	392
Arrive On Green	0.08	0.29	0.29	0.14	0.36	0.00	0.11	0.27	0.00	0.11	0.27	0.27
Sat Flow, veh/h	3191	3328	34	1691	3374	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	235	336	353	313	849	0	421	407	0	491	754	380
Grp Sat Flow(s),veh/h/ln	1596	1641	1721	1691	1687	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	6.5	23.6	23.6	16.1	27.9	0.0	11.9	13.0	0.0	14.0	28.7	33.6
Cycle Q Clear(g_c), s	6.5	23.6	23.6	16.1	27.9	0.0	11.9	13.0	0.0	14.0	28.7	33.6
Prop In Lane	1.00		0.02	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	527	484	507	380	1220	546	508	907	406	745	876	392
V/C Ratio(X)	0.45	0.70	0.70	0.82	0.70	0.00	0.83	0.45	0.00	0.66	0.86	0.97
Avail Cap(c_a), veh/h	527	484	507	436	1220	546	509	909	407	745	876	392
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.5	40.6	40.7	28.1	35.4	0.0	33.4	39.5	0.0	31.5	45.2	46.9
Incr Delay (d2), s/veh	0.6	8.0	7.7	10.9	3.3	0.0	11.0	0.3	0.0	2.2	8.7	37.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	11.8	12.4	8.6	13.5	0.0	6.1	6.1	0.0	6.6	13.9	17.6
LnGrp Delay(d),s/veh	30.1	48.7	48.3	39.1	38.7	0.0	44.4	39.8	0.0	33.6	53.9	84.3
LnGrp LOS	C	D	D	D	D		D	D		C	D	F
Approach Vol, veh/h		924			1162			828			1625	
Approach Delay, s/veh		43.8			38.8			42.1			54.9	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	24.7	45.3	19.0	40.9	16.0	54.0	18.9	41.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	23.0	34.0	14.0	35.0	10.0	47.0	14.0	35.0
Max Q Clear Time (g_c+I1), s	18.1	25.6	16.0	15.0	8.5	29.9	13.9	35.6
Green Ext Time (p_c), s	0.6	6.0	0.0	10.9	0.2	10.4	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	46.2
HCM 2010 LOS	D

Intersection	
Int Delay, s/veh	12.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	39	194	14	81	0	295	70	60	9	161	31
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	750	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	11	42	209	15	87	0	317	75	65	10	173	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	994	983	190	1076	968	108	206	0	0	140	0	0
Stage 1	209	209	-	742	742	-	-	-	-	-	-	-
Stage 2	785	774	-	334	226	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	222	247	847	195	252	940	1336	-	-	1362	-	-
Stage 1	788	725	-	404	419	-	-	-	-	-	-	-
Stage 2	383	405	-	676	713	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	114	182	847	97	185	940	1336	-	-	1362	-	-
Mov Cap-2 Maneuver	114	182	-	97	185	-	-	-	-	-	-	-
Stage 1	584	719	-	299	310	-	-	-	-	-	-	-
Stage 2	204	300	-	476	707	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.8	41.9	5.9	0.3
HCM LOS	C	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1336	-	-	458	97	185	1362	-	-
HCM Lane V/C Ratio	0.237	-	-	0.571	0.155	0.471	0.007	-	-
HCM Control Delay (s)	8.5	0	-	22.8	48.8	40.7	7.7	0	-
HCM Lane LOS	A	A	-	C	E	E	A	A	-
HCM 95th %tile Q(veh)	0.9	-	-	3.5	0.5	2.3	0	-	-

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	13	35	149	54	8	6	249	212	243	28	376	15
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1696	1900	1900	1727	1900	1900	1727	1900	1900	1845	1900
Adj Flow Rate, veh/h	17	45	191	59	9	7	319	272	312	36	482	19
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	12	12	12	10	10	10	10	10	10	3	3	3
Cap, veh/h	52	90	319	253	37	23	272	191	219	78	931	36
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	48	315	1119	662	130	82	382	326	374	67	1591	61
Grp Volume(v), veh/h	253	0	0	75	0	0	903	0	0	537	0	0
Grp Sat Flow(s),veh/h/ln	1483	0	0	874	0	0	1083	0	0	1719	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	41.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	14.5	0.0	0.0	9.5	0.0	0.0	58.5	0.0	0.0	17.2	0.0	0.0
Prop In Lane	0.07		0.75	0.79		0.09	0.35		0.35	0.07		0.04
Lane Grp Cap(c), veh/h	461	0	0	314	0	0	682	0	0	1044	0	0
V/C Ratio(X)	0.55	0.00	0.00	0.24	0.00	0.00	1.32	0.00	0.00	0.51	0.00	0.00
Avail Cap(c_a), veh/h	461	0	0	314	0	0	682	0	0	1044	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	30.8	0.0	0.0	28.6	0.0	0.0	24.9	0.0	0.0	12.2	0.0	0.0
Incr Delay (d2), s/veh	4.6	0.0	0.0	1.8	0.0	0.0	155.9	0.0	0.0	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	0.0	0.0	1.8	0.0	0.0	48.3	0.0	0.0	9.2	0.0	0.0
LnGrp Delay(d),s/veh	35.4	0.0	0.0	30.4	0.0	0.0	180.8	0.0	0.0	14.0	0.0	0.0
LnGrp LOS	D			C			F			B		
Approach Vol, veh/h		253			75			903			537	
Approach Delay, s/veh		35.4			30.4			180.8			14.0	
Approach LOS		D			C			F			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.0		35.0		65.0		35.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		58.5		28.5		58.5		28.5
Max Q Clear Time (g_c+I1), s		60.5		16.5		19.2		11.5
Green Ext Time (p_c), s		0.0		1.8		20.0		2.2

Intersection Summary	
HCM 2010 Ctrl Delay	102.9
HCM 2010 LOS	F

HCM 2010 Signalized Intersection Summary
3: 43 Street N & 14 Ave N

Timing Plan: FU2037-AM
Future 2037 AM Peak Hour - (With BG2037 Mitigation)

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (veh/h)	4	7	27	53	2	6	101	670	236	28	532	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1226	1900	1900	1727	1900	1727	1727	1900	1900	1792	1900
Adj Flow Rate, veh/h	5	9	33	58	2	7	125	827	291	35	657	26
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	55	55	55	10	10	10	10	10	10	6	6	6
Cap, veh/h	52	60	170	325	14	32	164	788	277	38	441	17
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	52	268	755	1146	60	141	700	1222	430	0	684	26
Grp Volume(v), veh/h	47	0	0	67	0	0	125	0	1118	718	0	0
Grp Sat Flow(s),veh/h/ln	1075	0	0	1347	0	0	700	0	1651	710	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.5	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.5	0.0	0.0	3.3	0.0	0.0	64.5	0.0	64.5	64.5	0.0	0.0
Prop In Lane	0.11		0.70	0.87		0.10	1.00		0.26	0.05		0.04
Lane Grp Cap(c), veh/h	282	0	0	370	0	0	164	0	1065	496	0	0
V/C Ratio(X)	0.17	0.00	0.00	0.18	0.00	0.00	0.76	0.00	1.05	1.45	0.00	0.00
Avail Cap(c_a), veh/h	282	0	0	370	0	0	164	0	1065	496	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	31.4	0.0	0.0	31.3	0.0	0.0	26.3	0.0	17.8	33.5	0.0	0.0
Incr Delay (d2), s/veh	1.3	0.0	0.0	1.1	0.0	0.0	28.0	0.0	41.5	213.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.0	1.6	0.0	0.0	4.7	0.0	41.3	41.9	0.0	0.0
LnGrp Delay(d),s/veh	32.7	0.0	0.0	32.4	0.0	0.0	54.3	0.0	59.3	246.4	0.0	0.0
LnGrp LOS	C			C			D		F	F		
Approach Vol, veh/h		47			67			1243			718	
Approach Delay, s/veh		32.7			32.4			58.8			246.4	
Approach LOS		C			C			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		71.0		29.0		71.0		29.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		64.5		22.5		64.5		22.5
Max Q Clear Time (g_c+I1), s		66.5		5.5		66.5		5.3
Green Ext Time (p_c), s		0.0		0.5		0.0		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	122.3
HCM 2010 LOS	F

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	39	32	116	46	12	11	282	971	193	38	551	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	47	39	0	55	14	13	340	1170	0	46	664	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	181	183	155	153	66	61	349	2553	1142	296	1659	742
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.21	0.77	0.00	0.50	0.50	0.00
Sat Flow, veh/h	1364	1845	1568	1022	668	620	1660	3312	1482	447	3312	1482
Grp Volume(v), veh/h	47	39	0	55	0	27	340	1170	0	46	664	0
Grp Sat Flow(s),veh/h/ln	1364	1845	1568	1022	0	1288	1660	1656	1482	447	1656	1482
Q Serve(g_s), s	3.3	1.9	0.0	5.2	0.0	1.9	20.3	12.5	0.0	5.7	12.5	0.0
Cycle Q Clear(g_c), s	5.2	1.9	0.0	7.2	0.0	1.9	20.3	12.5	0.0	5.7	12.5	0.0
Prop In Lane	1.00		1.00	1.00		0.48	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	181	183	155	153	0	128	349	2553	1142	296	1659	742
V/C Ratio(X)	0.26	0.21	0.00	0.36	0.00	0.21	0.98	0.46	0.00	0.16	0.40	0.00
Avail Cap(c_a), veh/h	400	480	408	318	0	335	349	2553	1142	296	1659	742
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.9	41.5	0.0	44.8	0.0	41.5	39.2	4.1	0.0	13.9	15.6	0.0
Incr Delay (d2), s/veh	0.8	0.6	0.0	1.4	0.0	0.8	41.4	0.6	0.0	1.1	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	1.0	0.0	1.5	0.0	0.7	13.4	5.9	0.0	0.8	5.9	0.0
LnGrp Delay(d),s/veh	44.6	42.0	0.0	46.2	0.0	42.3	80.7	4.7	0.0	15.0	16.3	0.0
LnGrp LOS	D	D		D		D	F	A		B	B	
Approach Vol, veh/h		86			82			1510			710	
Approach Delay, s/veh		43.4			44.9			21.8			16.2	
Approach LOS		D			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		83.6		16.4	27.0	56.6		16.4
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	21.0	34.0		26.0
Max Q Clear Time (g_c+I1), s		14.5		7.2	22.3	14.5		9.2
Green Ext Time (p_c), s		25.3		0.8	0.0	14.3		0.7

Intersection Summary			
HCM 2010 Ctrl Delay			21.7
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Timing Plan: FU2037-AM
Future 2037 AM Peak Hour - (With BG2037 Mitigation)

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	98	213	356	1405	711	53
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	113	0	409	1615	817	61
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	300	138	444	2637	1414	633
Arrive On Green	0.10	0.00	0.26	0.77	0.45	0.45
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	113	0	409	1615	817	61
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	3.4	0.0	23.3	20.4	19.4	2.5
Cycle Q Clear(g_c), s	3.4	0.0	23.3	20.4	19.4	2.5
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	300	138	444	2637	1414	633
V/C Ratio(X)	0.38	0.00	0.92	0.61	0.58	0.10
Avail Cap(c_a), veh/h	313	144	495	2637	1414	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	0.0	36.0	4.8	20.2	15.6
Incr Delay (d2), s/veh	0.8	0.0	21.6	1.1	1.7	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	13.7	9.8	8.6	1.0
LnGrp Delay(d),s/veh	43.2	0.0	57.6	5.9	21.9	15.9
LnGrp LOS	D		E	A	C	B
Approach Vol, veh/h	113			2024	878	
Approach Delay, s/veh	43.2			16.4	21.5	
Approach LOS	D			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		83.9		16.1	32.0	51.9		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	29.0	42.0		
Max Q Clear Time (g_c+I1), s		22.4		5.4	25.3	21.4		
Green Ext Time (p_c), s		39.3		0.2	0.7	17.8		

Intersection Summary			
HCM 2010 Ctrl Delay			18.9
HCM 2010 LOS			B

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: FU2037-AM
Future 2037 AM Peak Hour - (With BG2037 Mitigation)

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	582	878	12	354	854	722	377	967	255	561	571	290
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	633	954	13	385	928	0	410	1051	0	610	621	315
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	549	1453	20	577	1537	479	534	833	373	580	1038	465
Arrive On Green	0.08	0.31	0.31	0.10	0.32	0.00	0.08	0.25	0.00	0.15	0.33	0.33
Sat Flow, veh/h	3163	4751	65	3221	4759	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	633	625	342	385	928	0	410	1051	0	610	621	315
Grp Sat Flow(s),veh/h/ln	1581	1558	1700	1610	1586	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	11.0	22.7	22.7	10.5	21.3	0.0	10.0	33.0	0.0	20.0	21.5	25.2
Cycle Q Clear(g_c), s	11.0	22.7	22.7	10.5	21.3	0.0	10.0	33.0	0.0	20.0	21.5	25.2
Prop In Lane	1.00		0.04	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	549	953	520	577	1537	479	534	833	373	580	1038	465
V/C Ratio(X)	1.15	0.66	0.66	0.67	0.60	0.00	0.77	1.26	0.00	1.05	0.60	0.68
Avail Cap(c_a), veh/h	549	953	520	670	1537	479	534	833	373	580	1038	465
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.7	39.2	39.2	29.0	37.0	0.0	37.6	48.5	0.0	38.8	36.3	37.5
Incr Delay (d2), s/veh	88.4	3.5	6.4	2.1	1.8	0.0	6.7	127.3	0.0	51.5	0.9	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	11.8	10.2	11.5	4.8	9.6	0.0	3.2	29.7	0.0	14.5	9.5	10.2
LnGrp Delay(d),s/veh	128.2	42.7	45.6	31.1	38.8	0.0	44.3	175.8	0.0	90.2	37.2	41.5
LnGrp LOS	F	D	D	C	D		D	F		F	D	D
Approach Vol, veh/h		1600			1313			1461			1546	
Approach Delay, s/veh		77.1			36.5			138.9			59.0	
Approach LOS		E			D			F			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.2	46.8	25.0	39.0	17.0	49.0	15.0	49.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	17.0	36.0	20.0	33.0	11.0	42.0	10.0	43.0
Max Q Clear Time (g_c+I1), s	12.5	24.7	22.0	35.0	13.0	23.3	12.0	27.2
Green Ext Time (p_c), s	0.8	8.9	0.0	0.0	0.0	13.2	0.0	11.9

Intersection Summary		
HCM 2010 Ctrl Delay		78.6
HCM 2010 LOS		E

1: 43 Street N & 26 Ave N/Twp Rd 92

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Intersection	
Int Delay, s/veh	18.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	17	99	299	44	84	6	100	113	31	6	58	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	22	129	388	57	109	8	130	147	40	8	75	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	580	542	80	781	527	167	84	0	0	187	0	0
Stage 1	95	95	-	427	427	-	-	-	-	-	-	-
Stage 2	485	447	-	354	100	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	423	445	975	310	453	872	1482	-	-	1307	-	-
Stage 1	907	812	-	602	582	-	-	-	-	-	-	-
Stage 2	560	570	-	659	808	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	307	399	975	130	406	872	1482	-	-	1307	-	-
Mov Cap-2 Maneuver	307	399	-	130	406	-	-	-	-	-	-	-
Stage 1	818	807	-	543	525	-	-	-	-	-	-	-
Stage 2	397	514	-	331	803	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	27.4	28.6	3.1	0.7
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1482	-	-	680	130	421	1307	-	-
HCM Lane V/C Ratio	0.088	-	-	0.793	0.44	0.278	0.006	-	-
HCM Control Delay (s)	7.7	0	-	27.4	52.8	16.8	7.8	0	-
HCM Lane LOS	A	A	-	D	F	C	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	7.9	1.9	1.1	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	17	99	299	44	84	6	100	113	31	6	58	7
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1776	1900	1900	1638	1900
Adj Flow Rate, veh/h	22	129	388	57	109	8	130	147	40	8	75	9
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Percent Heavy Veh, %	4	4	4	4	4	4	7	7	7	16	16	16
Cap, veh/h	85	148	405	191	319	20	304	316	75	97	538	60
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	29	421	1158	271	912	57	520	810	192	49	1379	155
Grp Volume(v), veh/h	539	0	0	174	0	0	317	0	0	92	0	0
Grp Sat Flow(s),veh/h/ln	1609	0	0	1240	0	0	1522	0	0	1583	0	0
Q Serve(g_s), s	6.7	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.4	0.0	0.0	3.5	0.0	0.0	7.7	0.0	0.0	1.8	0.0	0.0
Prop In Lane	0.04		0.72	0.33		0.05	0.41		0.13	0.09		0.10
Lane Grp Cap(c), veh/h	638	0	0	530	0	0	695	0	0	696	0	0
V/C Ratio(X)	0.84	0.00	0.00	0.33	0.00	0.00	0.46	0.00	0.00	0.13	0.00	0.00
Avail Cap(c_a), veh/h	638	0	0	530	0	0	695	0	0	696	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	15.8	0.0	0.0	11.7	0.0	0.0	11.5	0.0	0.0	9.9	0.0	0.0
Incr Delay (d2), s/veh	10.1	0.0	0.0	0.4	0.0	0.0	2.2	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.0	0.0	0.0	1.7	0.0	0.0	3.7	0.0	0.0	0.9	0.0	0.0
LnGrp Delay(d),s/veh	26.0	0.0	0.0	12.0	0.0	0.0	13.7	0.0	0.0	10.3	0.0	0.0
LnGrp LOS	C			B			B			B		
Approach Vol, veh/h		539			174			317			92	
Approach Delay, s/veh		26.0			12.0			13.7			10.3	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		26.0		24.0		26.0		24.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		19.5		17.5		19.5		17.5
Max Q Clear Time (g_c+I1), s		9.7		18.4		3.8		5.5
Green Ext Time (p_c), s		1.9		0.0		2.5		4.5

Intersection Summary	
HCM 2010 Ctrl Delay	19.1
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
2: 43 Street N & 18 Ave N

Timing Plan: FU2037-AM-Mit
Future 2037 AM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (veh/h)	13	35	149	54	8	6	249	212	243	28	376	15
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1696	1900	1900	1727	1900	1727	1727	1900	1900	1845	1900
Adj Flow Rate, veh/h	17	45	191	59	9	7	319	272	312	36	482	19
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Percent Heavy Veh, %	12	12	12	10	10	10	10	10	10	3	3	3
Cap, veh/h	49	60	217	154	22	12	594	500	574	87	1097	42
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.68	0.68	0.68	0.68	0.68	0.68
Sat Flow, veh/h	54	318	1144	476	117	61	829	735	843	71	1611	62
Grp Volume(v), veh/h	253	0	0	75	0	0	319	0	584	537	0	0
Grp Sat Flow(s),veh/h/ln	1516	0	0	654	0	0	829	0	1578	1744	0	0
Q Serve(g_s), s	4.2	0.0	0.0	0.0	0.0	0.0	14.9	0.0	18.8	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.1	0.0	0.0	12.0	0.0	0.0	28.1	0.0	18.8	13.2	0.0	0.0
Prop In Lane	0.07		0.75	0.79		0.09	1.00		0.53	0.07		0.04
Lane Grp Cap(c), veh/h	325	0	0	188	0	0	594	0	1074	1226	0	0
V/C Ratio(X)	0.78	0.00	0.00	0.40	0.00	0.00	0.54	0.00	0.54	0.44	0.00	0.00
Avail Cap(c_a), veh/h	370	0	0	223	0	0	594	0	1074	1226	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	39.4	0.0	0.0	37.2	0.0	0.0	10.6	0.0	8.1	7.2	0.0	0.0
Incr Delay (d2), s/veh	8.9	0.0	0.0	1.4	0.0	0.0	3.4	0.0	2.0	1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.6	0.0	0.0	2.0	0.0	0.0	5.8	0.0	8.7	7.0	0.0	0.0
LnGrp Delay(d),s/veh	48.4	0.0	0.0	38.6	0.0	0.0	14.0	0.0	10.1	8.4	0.0	0.0
LnGrp LOS	D			D			B		B	A		
Approach Vol, veh/h		253			75			903			537	
Approach Delay, s/veh		48.4			38.6			11.5			8.4	
Approach LOS		D			D			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		74.6		25.4		74.6		25.4
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		65.0		22.0		65.0		22.0
Max Q Clear Time (g_c+I1), s		30.1		18.1		15.2		14.0
Green Ext Time (p_c), s		15.6		0.8		17.8		1.4

Intersection Summary			
HCM 2010 Ctrl Delay			16.9
HCM 2010 LOS			B

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (veh/h)	4	7	27	53	2	6	101	670	236	28	532	21
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1226	1900	1900	1727	1900	1727	1727	1900	1900	1792	1900
Adj Flow Rate, veh/h	5	9	33	58	2	7	125	827	291	35	657	26
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Percent Heavy Veh, %	55	55	55	10	10	10	10	10	10	6	6	6
Cap, veh/h	44	18	52	151	4	10	377	981	345	68	1120	43
Arrive On Green	0.07	0.07	0.07	0.07	0.07	0.07	0.80	0.80	0.80	0.80	0.80	0.80
Sat Flow, veh/h	61	266	769	1253	66	154	700	1222	430	37	1394	54
Grp Volume(v), veh/h	47	0	0	67	0	0	125	0	1118	718	0	0
Grp Sat Flow(s),veh/h/ln	1095	0	0	1472	0	0	700	0	1651	1485	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	41.3	7.4	0.0	0.0
Cycle Q Clear(g_c), s	4.1	0.0	0.0	4.1	0.0	0.0	49.0	0.0	41.3	48.7	0.0	0.0
Prop In Lane	0.11		0.70	0.87		0.10	1.00		0.26	0.05		0.04
Lane Grp Cap(c), veh/h	113	0	0	166	0	0	377	0	1326	1230	0	0
V/C Ratio(X)	0.42	0.00	0.00	0.40	0.00	0.00	0.33	0.00	0.84	0.58	0.00	0.00
Avail Cap(c_a), veh/h	502	0	0	640	0	0	377	0	1326	1230	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	45.5	0.0	0.0	45.4	0.0	0.0	7.1	0.0	6.0	4.0	0.0	0.0
Incr Delay (d2), s/veh	2.4	0.0	0.0	1.6	0.0	0.0	2.4	0.0	6.7	2.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.0	0.0	1.9	0.0	0.0	2.6	0.0	20.8	7.1	0.0	0.0
LnGrp Delay(d),s/veh	47.9	0.0	0.0	47.0	0.0	0.0	9.5	0.0	12.7	6.0	0.0	0.0
LnGrp LOS	D			D			A		B	A		
Approach Vol, veh/h		47			67			1243			718	
Approach Delay, s/veh		47.9			47.0			12.4			6.0	
Approach LOS		D			D			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		86.8		13.2		86.8		13.2
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		43.5		43.5		43.5		43.5
Max Q Clear Time (g_c+I1), s		51.0		6.1		50.7		6.1
Green Ext Time (p_c), s		0.0		0.8		0.0		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	12.1
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2037-AM-Mit
Future 2037 AM Peak Hour - Mitigated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	39	32	116	46	12	11	282	971	193	38	551	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1845	1397	1397	1900	1743	1743	1743	1743	1743	1743
Adj Flow Rate, veh/h	47	39	0	55	14	13	340	1170	0	46	664	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	3	36	36	36	9	9	9	9	9	9
Cap, veh/h	181	183	155	153	66	61	374	2553	1142	289	1609	720
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.10	0.23	0.77	0.00	0.49	0.49	0.00
Sat Flow, veh/h	1364	1845	1568	1022	668	620	1660	3312	1482	447	3312	1482
Grp Volume(v), veh/h	47	39	0	55	0	27	340	1170	0	46	664	0
Grp Sat Flow(s),veh/h/ln	1364	1845	1568	1022	0	1288	1660	1656	1482	447	1656	1482
Q Serve(g_s), s	3.3	1.9	0.0	5.2	0.0	1.9	20.0	12.5	0.0	5.9	12.9	0.0
Cycle Q Clear(g_c), s	5.2	1.9	0.0	7.2	0.0	1.9	20.0	12.5	0.0	5.9	12.9	0.0
Prop In Lane	1.00		1.00	1.00		0.48	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	181	183	155	153	0	128	374	2553	1142	289	1609	720
V/C Ratio(X)	0.26	0.21	0.00	0.36	0.00	0.21	0.91	0.46	0.00	0.16	0.41	0.00
Avail Cap(c_a), veh/h	400	480	408	318	0	335	432	2553	1142	289	1609	720
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	43.9	41.5	0.0	44.8	0.0	41.5	37.7	4.1	0.0	14.7	16.5	0.0
Incr Delay (d2), s/veh	0.8	0.6	0.0	1.4	0.0	0.8	21.2	0.6	0.0	1.2	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	1.0	0.0	1.5	0.0	0.7	11.4	5.9	0.0	0.8	6.1	0.0
LnGrp Delay(d),s/veh	44.6	42.0	0.0	46.2	0.0	42.3	59.0	4.7	0.0	15.9	17.3	0.0
LnGrp LOS	D	D		D		D	E	A		B	B	
Approach Vol, veh/h		86			82			1510			710	
Approach Delay, s/veh		43.4			44.9			16.9			17.2	
Approach LOS		D			D			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		83.6		16.4	28.5	55.1		16.4
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	26.0	29.0		26.0
Max Q Clear Time (g_c+I1), s		14.5		7.2	22.0	14.9		9.2
Green Ext Time (p_c), s		25.3		0.8	0.6	11.0		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	18.9
HCM 2010 LOS	B

5: 43 Street N & 5 Ave N

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	98	213	356	1405	711	53
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1696	1792	1792	1638	1638
Adj Flow Rate, veh/h	113	0	409	1615	817	61
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	12	12	6	6	16	16
Cap, veh/h	398	183	449	2341	1054	471
Arrive On Green	0.13	0.00	0.26	0.69	0.34	0.34
Sat Flow, veh/h	3134	1442	1707	3495	3194	1392
Grp Volume(v), veh/h	113	0	409	1615	817	61
Grp Sat Flow(s),veh/h/ln	1567	1442	1707	1703	1556	1392
Q Serve(g_s), s	2.3	0.0	16.3	19.7	16.5	2.1
Cycle Q Clear(g_c), s	2.3	0.0	16.3	19.7	16.5	2.1
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	398	183	449	2341	1054	471
V/C Ratio(X)	0.28	0.00	0.91	0.69	0.78	0.13
Avail Cap(c_a), veh/h	448	206	463	2341	1054	471
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.7	0.0	25.0	6.5	20.8	16.0
Incr Delay (d2), s/veh	0.4	0.0	21.7	1.7	5.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	10.3	9.5	7.9	0.9
LnGrp Delay(d),s/veh	28.1	0.0	46.7	8.2	26.3	16.6
LnGrp LOS	C		D	A	C	B
Approach Vol, veh/h	113			2024	878	
Approach Delay, s/veh	28.1			16.0	25.7	
Approach LOS	C			B	C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		54.6		15.4	24.4	30.2		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		47.0		10.0	19.0	22.0		
Max Q Clear Time (g_c+I1), s		21.7		4.3	18.3	18.5		
Green Ext Time (p_c), s		21.3		0.2	0.2	3.4		

Intersection Summary						
HCM 2010 Ctrl Delay			19.3			
HCM 2010 LOS			B			

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	582	878	12	354	854	722	377	967	255	561	571	290
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1712	1712	1900	1743	1743	1743	1727	1727	1727	1652	1652	1652
Adj Flow Rate, veh/h	633	954	13	385	928	0	410	1051	0	610	621	315
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	11	11	11	9	9	9	10	10	10	15	15	15
Cap, veh/h	473	1227	17	519	1354	422	647	1085	486	501	1096	490
Arrive On Green	0.08	0.26	0.26	0.10	0.28	0.00	0.10	0.33	0.00	0.12	0.35	0.35
Sat Flow, veh/h	3163	4751	65	3221	4759	1482	3191	3282	1468	3053	3139	1404
Grp Volume(v), veh/h	633	625	342	385	928	0	410	1051	0	610	621	315
Grp Sat Flow(s),veh/h/ln	1581	1558	1700	1610	1586	1482	1596	1641	1468	1526	1570	1404
Q Serve(g_s), s	10.0	24.2	24.2	11.3	22.5	0.0	10.8	41.0	0.0	16.0	20.9	24.5
Cycle Q Clear(g_c), s	10.0	24.2	24.2	11.3	22.5	0.0	10.8	41.0	0.0	16.0	20.9	24.5
Prop In Lane	1.00		0.04	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	473	805	439	519	1354	422	647	1085	486	501	1096	490
V/C Ratio(X)	1.34	0.78	0.78	0.74	0.69	0.00	0.63	0.97	0.00	1.22	0.57	0.64
Avail Cap(c_a), veh/h	473	805	439	533	1354	422	730	1086	486	501	1096	490
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	43.3	44.7	44.7	33.5	41.3	0.0	25.9	42.8	0.0	37.3	34.3	35.5
Incr Delay (d2), s/veh	165.8	7.3	12.7	5.4	2.8	0.0	1.5	20.0	0.0	115.3	0.7	2.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	15.0	11.2	12.9	5.4	10.2	0.0	4.9	21.6	0.0	17.0	9.2	9.9
LnGrp Delay(d),s/veh	209.1	52.0	57.5	38.9	44.2	0.0	27.4	62.8	0.0	152.6	35.0	38.3
LnGrp LOS	F	D	E	D	D		C	E		F	D	D
Approach Vol, veh/h		1600			1313			1461			1546	
Approach Delay, s/veh		115.3			42.6			52.9			82.1	
Approach LOS		F			D			D			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	19.4	40.6	21.0	49.0	16.0	44.0	18.6	51.4
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	14.0	33.0	16.0	43.0	10.0	37.0	17.0	42.0
Max Q Clear Time (g_c+I1), s	13.3	26.2	18.0	43.0	12.0	24.5	12.8	26.5
Green Ext Time (p_c), s	0.2	5.6	0.0	0.0	0.0	9.6	0.8	11.7

Intersection Summary			
HCM 2010 Ctrl Delay			75.1
HCM 2010 LOS			E

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	26	9	239	218	31	25	141	426	60	7	331	14
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1743	1900	1900	1727	1900	1900	1743	1900	1900	1759	1900
Adj Flow Rate, veh/h	30	10	278	237	34	27	164	495	70	8	385	16
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	9	9	10	10	10	9	9	9	8	8	8
Cap, veh/h	67	31	405	226	23	18	217	588	81	43	970	40
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	97	107	1422	568	81	65	295	1005	138	11	1658	68
Grp Volume(v), veh/h	318	0	0	298	0	0	729	0	0	409	0	0
Grp Sat Flow(s),veh/h/ln	1626	0	0	714	0	0	1438	0	0	1737	0	0
Q Serve(g_s), s	0.0	0.0	0.0	10.5	0.0	0.0	29.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	18.0	0.0	0.0	28.5	0.0	0.0	42.4	0.0	0.0	12.7	0.0	0.0
Prop In Lane	0.09		0.87	0.80		0.09	0.22		0.10	0.02		0.04
Lane Grp Cap(c), veh/h	503	0	0	268	0	0	885	0	0	1053	0	0
V/C Ratio(X)	0.63	0.00	0.00	1.11	0.00	0.00	0.82	0.00	0.00	0.39	0.00	0.00
Avail Cap(c_a), veh/h	503	0	0	268	0	0	885	0	0	1053	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	32.2	0.0	0.0	41.3	0.0	0.0	17.2	0.0	0.0	11.2	0.0	0.0
Incr Delay (d2), s/veh	5.9	0.0	0.0	88.2	0.0	0.0	8.6	0.0	0.0	1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.7	0.0	0.0	13.9	0.0	0.0	18.7	0.0	0.0	6.3	0.0	0.0
LnGrp Delay(d),s/veh	38.2	0.0	0.0	129.5	0.0	0.0	25.8	0.0	0.0	12.3	0.0	0.0
LnGrp LOS	D			F			C			B		
Approach Vol, veh/h		318			298			729			409	
Approach Delay, s/veh		38.2			129.5			25.8			12.3	
Approach LOS		D			F			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.0		35.0		65.0		35.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		58.5		28.5		58.5		28.5
Max Q Clear Time (g_c+I1), s		44.4		20.0		14.7		30.5
Green Ext Time (p_c), s		7.6		3.1		12.9		0.0

Intersection Summary			
HCM 2010 Ctrl Delay			42.5
HCM 2010 LOS			D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (veh/h)	18	2	119	212	6	25	23	616	58	7	760	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1727	1900	1743	1743	1900	1900	1727	1900
Adj Flow Rate, veh/h	22	2	143	230	7	27	28	742	63	8	916	5
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.83	0.92	0.83	0.92	0.92	0.92	0.83	0.83	0.92	0.92	0.83	0.83
Percent Heavy Veh, %	3	3	3	10	10	10	9	9	9	10	10	10
Cap, veh/h	71	26	331	271	6	24	268	1022	87	39	1099	6
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	133	114	1471	906	28	106	566	1585	135	5	1704	9
Grp Volume(v), veh/h	167	0	0	264	0	0	28	0	805	929	0	0
Grp Sat Flow(s),veh/h/ln	1718	0	0	1040	0	0	566	0	1719	1718	0	0
Q Serve(g_s), s	0.0	0.0	0.0	13.5	0.0	0.0	0.0	0.0	31.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.0	0.0	0.0	22.5	0.0	0.0	7.6	0.0	31.3	41.4	0.0	0.0
Prop In Lane	0.13		0.86	0.87		0.10	1.00		0.08	0.01		0.01
Lane Grp Cap(c), veh/h	427	0	0	301	0	0	268	0	1109	1144	0	0
V/C Ratio(X)	0.39	0.00	0.00	0.88	0.00	0.00	0.10	0.00	0.73	0.81	0.00	0.00
Avail Cap(c_a), veh/h	427	0	0	301	0	0	268	0	1109	1144	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	33.5	0.0	0.0	40.9	0.0	0.0	7.7	0.0	11.8	13.6	0.0	0.0
Incr Delay (d2), s/veh	2.7	0.0	0.0	28.1	0.0	0.0	0.8	0.0	4.2	6.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	0.0	0.0	9.6	0.0	0.0	0.4	0.0	15.8	21.4	0.0	0.0
LnGrp Delay(d),s/veh	36.2	0.0	0.0	69.0	0.0	0.0	8.4	0.0	16.0	20.0	0.0	0.0
LnGrp LOS	D			E			A		B	B		
Approach Vol, veh/h		167			264			833			929	
Approach Delay, s/veh		36.2			69.0			15.8			20.0	
Approach LOS		D			E			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		71.0		29.0		71.0		29.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		64.5		22.5		64.5		22.5
Max Q Clear Time (g_c+I1), s		33.3		11.0		43.4		24.5
Green Ext Time (p_c), s		19.9		2.5		15.1		0.0

Intersection Summary			
HCM 2010 Ctrl Delay			25.5
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Timing Plan: FU2037-PM
Future 2037 PM Peak Hour - (With BG2037 Mitigation)

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↳		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	28	11	330	222	29	37	192	590	48	10	1037	63
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	35	14	0	278	36	46	240	738	0	12	1296	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	305	402	341	376	167	213	269	2064	923	358	1411	631
Arrive On Green	0.22	0.22	0.00	0.22	0.22	0.22	0.17	0.65	0.00	0.42	0.42	0.00
Sat Flow, veh/h	1261	1792	1524	1394	744	951	1601	3195	1429	684	3374	1509
Grp Volume(v), veh/h	35	14	0	278	0	82	240	738	0	12	1296	0
Grp Sat Flow(s),veh/h/ln	1261	1792	1524	1394	0	1695	1601	1597	1429	684	1687	1509
Q Serve(g_s), s	2.3	0.6	0.0	19.5	0.0	3.9	14.7	10.6	0.0	1.0	36.3	0.0
Cycle Q Clear(g_c), s	6.3	0.6	0.0	20.1	0.0	3.9	14.7	10.6	0.0	1.0	36.3	0.0
Prop In Lane	1.00		1.00	1.00		0.56	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	305	402	341	376	0	380	269	2064	923	358	1411	631
V/C Ratio(X)	0.11	0.03	0.00	0.74	0.00	0.22	0.89	0.36	0.00	0.03	0.92	0.00
Avail Cap(c_a), veh/h	319	421	358	391	0	398	288	2064	923	358	1411	631
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	34.2	30.3	0.0	38.2	0.0	31.6	40.7	8.2	0.0	17.2	27.5	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	7.0	0.0	0.3	26.6	0.5	0.0	0.2	11.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.3	0.0	8.2	0.0	1.9	8.5	4.8	0.0	0.2	18.9	0.0
LnGrp Delay(d),s/veh	34.4	30.4	0.0	45.2	0.0	31.9	67.3	8.6	0.0	17.4	38.6	0.0
LnGrp LOS	C	C		D		C	E	A		B	D	
Approach Vol, veh/h		49			360			978			1308	
Approach Delay, s/veh		33.2			42.2			23.0			38.4	
Approach LOS		C			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		71.1		28.9	22.8	48.3		28.9
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		63.5		23.5	18.0	39.5		23.5
Max Q Clear Time (g_c+I1), s		12.6		8.3	16.7	38.3		22.1
Green Ext Time (p_c), s		29.3		1.8	0.1	1.1		0.3

Intersection Summary			
HCM 2010 Ctrl Delay			33.2
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
5: 43 Street N & 5 Ave N

Timing Plan: FU2037-PM
Future 2037 PM Peak Hour - (With BG2037 Mitigation)

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	61	365	306	883	1705	125
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	68	0	340	981	1894	139
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	278	128	355	2531	1720	770
Arrive On Green	0.08	0.00	0.22	0.79	0.51	0.51
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	68	0	340	981	1894	139
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	1.9	0.0	20.8	9.4	50.5	5.0
Cycle Q Clear(g_c), s	1.9	0.0	20.8	9.4	50.5	5.0
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	278	128	355	2531	1720	770
V/C Ratio(X)	0.24	0.00	0.96	0.39	1.10	0.18
Avail Cap(c_a), veh/h	328	151	355	2531	1720	770
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.8	0.0	38.5	3.3	24.7	13.5
Incr Delay (d2), s/veh	0.5	0.0	36.3	0.4	54.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	12.8	4.2	36.8	2.2
LnGrp Delay(d),s/veh	43.2	0.0	74.9	3.8	79.6	14.0
LnGrp LOS	D		E	A	F	B
Approach Vol, veh/h	68			1321	2033	
Approach Delay, s/veh	43.2			22.1	75.1	
Approach LOS	D			C	E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		85.0		15.0	28.0	57.0		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		77.0		10.0	22.0	49.0		
Max Q Clear Time (g_c+I1), s		11.4		3.9	22.8	52.5		
Green Ext Time (p_c), s		54.6		0.1	0.0	0.0		

Intersection Summary			
HCM 2010 Ctrl Delay			54.0
HCM 2010 LOS			D

HCM 2010 Signalized Intersection Summary
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: FU2037-PM
Future 2037 PM Peak Hour - (With BG2037 Mitigation)

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	273	836	8	384	1041	387	516	483	417	544	870	410
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	297	909	9	417	1132	0	561	525	0	591	946	446
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	426	1195	12	550	1321	411	613	1150	514	821	1009	451
Arrive On Green	0.08	0.25	0.25	0.11	0.27	0.00	0.15	0.34	0.00	0.12	0.31	0.31
Sat Flow, veh/h	3191	4815	48	3281	4848	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	297	593	325	417	1132	0	561	525	0	591	946	446
Grp Sat Flow(s),veh/h/ln	1596	1572	1719	1640	1616	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	8.8	22.6	22.6	12.1	28.6	0.0	16.5	15.7	0.0	15.0	36.5	39.3
Cycle Q Clear(g_c), s	8.8	22.6	22.6	12.1	28.6	0.0	16.5	15.7	0.0	15.0	36.5	39.3
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	780	427	550	1321	411	613	1150	514	821	1009	451
V/C Ratio(X)	0.70	0.76	0.76	0.76	0.86	0.00	0.91	0.46	0.00	0.72	0.94	0.99
Avail Cap(c_a), veh/h	429	780	427	550	1321	411	640	1177	527	821	1009	451
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.2	44.9	44.9	33.6	44.5	0.0	35.8	33.2	0.0	28.3	43.3	44.2
Incr Delay (d2), s/veh	4.9	6.9	12.1	6.1	7.3	0.0	17.4	0.3	0.0	3.1	15.6	39.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.1	10.6	12.2	5.8	13.7	0.0	11.3	7.3	0.0	3.0	18.6	20.6
LnGrp Delay(d),s/veh	40.0	51.8	57.0	39.7	51.9	0.0	53.2	33.5	0.0	31.4	58.9	83.4
LnGrp LOS	D	D	E	D	D		D	C		C	E	F
Approach Vol, veh/h		1215			1549			1086			1983	
Approach Delay, s/veh		50.3			48.6			43.7			56.2	
Approach LOS		D			D			D			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	39.0	20.0	50.0	16.9	42.1	24.0	46.0
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	14.0	32.0	15.0	45.0	11.0	35.0	20.0	40.0
Max Q Clear Time (g_c+I1), s	14.1	24.6	17.0	17.7	10.8	30.6	18.5	41.3
Green Ext Time (p_c), s	0.0	6.4	0.0	16.7	0.0	3.9	0.5	0.0

Intersection Summary			
HCM 2010 Ctrl Delay			50.6
HCM 2010 LOS			D

Intersection	
Int Delay, s/veh	110.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	11	51	254	17	108	0	379	81	73	12	174	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	4	4	4	4	4	4	7	7	7	16	16	16
Mvmt Flow	12	55	273	18	116	0	408	87	78	13	187	38

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1231	1213	206	1337	1192	126	225	0	0	166	0	0
Stage 1	232	232	-	941	941	-	-	-	-	-	-	-
Stage 2	999	981	-	396	251	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.54	6.24	7.14	6.54	6.24	4.17	-	-	4.26	-	-
Critical Hdwy Stg 1	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.54	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.536	4.036	3.336	3.536	4.036	3.336	2.263	-	-	2.344	-	-
Pot Cap-1 Maneuver	153	180	829	129	185	919	1315	-	-	1331	-	-
Stage 1	766	709	-	313	339	-	-	-	-	-	-	-
Stage 2	291	325	-	625	695	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	14	117	829	41	120	919	1315	-	-	1331	-	-
Mov Cap-2 Maneuver	14	117	-	41	120	-	-	-	-	-	-	-
Stage 1	502	701	-	205	222	-	-	-	-	-	-	-
Stage 2	91	213	-	382	687	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	$ 350.2	143.4	6.4	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1315	-	-	207	41	120	1331	-	-
HCM Lane V/C Ratio	0.31	-	-	1.641	0.446	0.968	0.01	-	-
HCM Control Delay (s)	9	0	-	$ 350.2	150.2	142.3	7.7	0	-
HCM Lane LOS	A	A	-	F	F	F	A	A	-
HCM 95th %tile Q(veh)	1.3	-	-	22.3	1.6	6.4	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (veh/h)	11	51	254	17	108	0	379	81	73	12	174	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1776	1900	1900	1638	1900
Adj Flow Rate, veh/h	12	55	273	18	116	0	408	87	78	13	187	38
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	4	4	4	7	7	7	16	16	16
Cap, veh/h	80	79	345	110	452	0	547	90	81	90	616	120
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.00	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	22	292	1278	104	1674	0	901	192	172	30	1312	255
Grp Volume(v), veh/h	340	0	0	134	0	0	573	0	0	238	0	0
Grp Sat Flow(s),veh/h/ln	1591	0	0	1778	0	0	1265	0	0	1596	0	0
Q Serve(g_s), s	1.6	0.0	0.0	0.0	0.0	0.0	17.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.9	0.0	0.0	2.9	0.0	0.0	21.8	0.0	0.0	4.7	0.0	0.0
Prop In Lane	0.04		0.80	0.13		0.00	0.71		0.14	0.05		0.16
Lane Grp Cap(c), veh/h	505	0	0	562	0	0	718	0	0	826	0	0
V/C Ratio(X)	0.67	0.00	0.00	0.24	0.00	0.00	0.80	0.00	0.00	0.29	0.00	0.00
Avail Cap(c_a), veh/h	630	0	0	694	0	0	718	0	0	826	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	14.4	0.0	0.0	12.4	0.0	0.0	8.3	0.0	0.0
Incr Delay (d2), s/veh	2.0	0.0	0.0	0.2	0.0	0.0	9.0	0.0	0.0	0.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	0.0	0.0	1.5	0.0	0.0	9.3	0.0	0.0	2.3	0.0	0.0
LnGrp Delay(d),s/veh	18.9	0.0	0.0	14.6	0.0	0.0	21.5	0.0	0.0	9.1	0.0	0.0
LnGrp LOS	B			B			C			A		
Approach Vol, veh/h		340			134			573			238	
Approach Delay, s/veh		18.9			14.6			21.5			9.1	
Approach LOS		B			B			C			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		30.0		20.0		30.0		20.0
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		19.5		17.5		19.5		17.5
Max Q Clear Time (g_c+I1), s		23.8		11.9		6.7		4.9
Green Ext Time (p_c), s		0.0		1.7		5.2		2.9

Intersection Summary	
HCM 2010 Ctrl Delay	17.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (veh/h)	26	9	239	218	31	25	141	426	60	7	331	14
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1743	1900	1900	1727	1900	1743	1743	1900	1900	1759	1900
Adj Flow Rate, veh/h	30	10	278	237	34	27	164	495	70	8	385	16
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	9	9	10	10	10	9	9	9	8	8	8
Cap, veh/h	75	42	539	328	43	30	434	721	102	42	799	33
Arrive On Green	0.39	0.39	0.39	0.39	0.39	0.39	0.48	0.48	0.48	0.48	0.48	0.48
Sat Flow, veh/h	91	109	1392	679	110	79	917	1494	211	11	1655	68
Grp Volume(v), veh/h	318	0	0	298	0	0	164	0	565	409	0	0
Grp Sat Flow(s),veh/h/ln	1593	0	0	868	0	0	917	0	1706	1734	0	0
Q Serve(g_s), s	0.0	0.0	0.0	17.6	0.0	0.0	6.1	0.0	25.6	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.3	0.0	0.0	33.9	0.0	0.0	21.9	0.0	25.6	15.8	0.0	0.0
Prop In Lane	0.09		0.87	0.80		0.09	1.00		0.12	0.02		0.04
Lane Grp Cap(c), veh/h	656	0	0	401	0	0	434	0	823	874	0	0
V/C Ratio(X)	0.48	0.00	0.00	0.74	0.00	0.00	0.38	0.00	0.69	0.47	0.00	0.00
Avail Cap(c_a), veh/h	726	0	0	453	0	0	434	0	823	874	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	23.8	0.0	0.0	31.6	0.0	0.0	20.5	0.0	20.0	17.5	0.0	0.0
Incr Delay (d2), s/veh	0.6	0.0	0.0	5.7	0.0	0.0	2.5	0.0	4.6	1.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.9	0.0	0.0	8.4	0.0	0.0	3.6	0.0	13.0	8.0	0.0	0.0
LnGrp Delay(d),s/veh	24.3	0.0	0.0	37.3	0.0	0.0	23.0	0.0	24.6	19.3	0.0	0.0
LnGrp LOS	C			D			C		C	B		
Approach Vol, veh/h		318			298			729			409	
Approach Delay, s/veh		24.3			37.3			24.3			19.3	
Approach LOS		C			D			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		54.8		45.2		54.8		45.2
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		43.5		43.5		43.5		43.5
Max Q Clear Time (g_c+I1), s		27.6		18.3		17.8		35.9
Green Ext Time (p_c), s		7.5		5.5		9.6		2.8

Intersection Summary			
HCM 2010 Ctrl Delay			25.3
HCM 2010 LOS			C

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Volume (veh/h)	18	2	119	212	6	25	23	616	58	7	760	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1845	1900	1900	1727	1900	1743	1743	1900	1900	1727	1900
Adj Flow Rate, veh/h	22	2	143	230	7	27	28	742	63	8	916	5
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.83	0.92	0.83	0.92	0.92	0.92	0.83	0.83	0.92	0.92	0.83	0.83
Percent Heavy Veh, %	3	3	3	10	10	10	9	9	9	10	10	10
Cap, veh/h	79	30	408	338	8	32	195	928	79	39	998	5
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.59	0.59	0.59	0.59	0.59	0.59
Sat Flow, veh/h	136	105	1437	953	29	112	566	1585	135	5	1704	9
Grp Volume(v), veh/h	167	0	0	264	0	0	28	0	805	929	0	0
Grp Sat Flow(s),veh/h/ln	1678	0	0	1094	0	0	566	0	1719	1717	0	0
Q Serve(g_s), s	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	36.5	8.6	0.0	0.0
Cycle Q Clear(g_c), s	8.3	0.0	0.0	23.3	0.0	0.0	10.7	0.0	36.5	48.6	0.0	0.0
Prop In Lane	0.13		0.86	0.87		0.10	1.00		0.08	0.01		0.01
Lane Grp Cap(c), veh/h	518	0	0	378	0	0	195	0	1007	1042	0	0
V/C Ratio(X)	0.32	0.00	0.00	0.70	0.00	0.00	0.14	0.00	0.80	0.89	0.00	0.00
Avail Cap(c_a), veh/h	750	0	0	557	0	0	195	0	1007	1042	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	28.6	0.0	0.0	34.7	0.0	0.0	10.8	0.0	16.1	18.6	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	2.3	0.0	0.0	1.5	0.0	6.6	11.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	0.0	7.1	0.0	0.0	0.5	0.0	19.1	26.0	0.0	0.0
LnGrp Delay(d),s/veh	29.0	0.0	0.0	37.0	0.0	0.0	12.3	0.0	22.7	30.0	0.0	0.0
LnGrp LOS	C			D			B		C	C		
Approach Vol, veh/h		167			264			833			929	
Approach Delay, s/veh		29.0			37.0			22.4			30.0	
Approach LOS		C			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.1		34.9		65.1		34.9
Change Period (Y+Rc), s		6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s		43.5		43.5		43.5		43.5
Max Q Clear Time (g_c+I1), s		38.5		10.3		50.6		25.3
Green Ext Time (p_c), s		4.4		3.7		0.0		3.1

Intersection Summary			
HCM 2010 Ctrl Delay			27.9
HCM 2010 LOS			C

HCM 2010 Signalized Intersection Summary
4: 43 Street N & 9 Ave N

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (veh/h)	28	11	330	222	29	37	192	590	48	10	1037	63
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1792	1863	1863	1900	1681	1681	1681	1776	1776	1776
Adj Flow Rate, veh/h	35	14	0	278	36	46	240	738	0	12	1296	0
Adj No. of Lanes	1	1	1	1	1	0	1	2	1	1	2	1
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	6	6	6	2	2	2	13	13	13	7	7	7
Cap, veh/h	310	408	347	381	170	217	240	2052	918	368	1458	652
Arrive On Green	0.23	0.23	0.00	0.23	0.23	0.23	0.15	0.64	0.00	0.43	0.43	0.00
Sat Flow, veh/h	1261	1792	1524	1394	744	951	1601	3195	1429	684	3374	1509
Grp Volume(v), veh/h	35	14	0	278	0	82	240	738	0	12	1296	0
Grp Sat Flow(s),veh/h/ln	1261	1792	1524	1394	0	1695	1601	1597	1429	684	1687	1509
Q Serve(g_s), s	2.3	0.6	0.0	19.4	0.0	3.9	15.0	10.7	0.0	1.0	35.4	0.0
Cycle Q Clear(g_c), s	6.2	0.6	0.0	20.0	0.0	3.9	15.0	10.7	0.0	1.0	35.4	0.0
Prop In Lane	1.00		1.00	1.00		0.56	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	310	408	347	381	0	386	240	2052	918	368	1458	652
V/C Ratio(X)	0.11	0.03	0.00	0.73	0.00	0.21	1.00	0.36	0.00	0.03	0.89	0.00
Avail Cap(c_a), veh/h	350	466	396	426	0	441	240	2052	918	368	1458	652
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	33.9	30.0	0.0	37.8	0.0	31.3	42.5	8.3	0.0	16.4	26.2	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	5.5	0.0	0.3	57.8	0.5	0.0	0.2	8.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.3	0.0	8.1	0.0	1.9	10.5	4.9	0.0	0.2	18.1	0.0
LnGrp Delay(d),s/veh	34.0	30.1	0.0	43.4	0.0	31.6	100.3	8.8	0.0	16.6	34.6	0.0
LnGrp LOS	C	C		D		C	F	A		B	C	
Approach Vol, veh/h		49			360			978			1308	
Approach Delay, s/veh		32.9			40.7			31.3			34.4	
Approach LOS		C			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		70.7		29.3	21.0	49.7		29.3
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		6.5
Max Green Setting (Gmax), s		61.0		26.0	15.0	40.0		26.0
Max Q Clear Time (g_c+I1), s		12.7		8.2	17.0	37.4		22.0
Green Ext Time (p_c), s		28.4		1.9	0.0	2.4		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	34.1
HCM 2010 LOS	C

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (veh/h)	61	365	306	883	1705	125
Number	7	14	5	2	6	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1696	1696	1792	1792
Adj Flow Rate, veh/h	68	0	340	981	1894	139
Adj No. of Lanes	2	1	1	2	2	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	7	7	12	12	6	6
Cap, veh/h	245	113	337	2633	1903	851
Arrive On Green	0.07	0.00	0.21	0.82	0.56	0.56
Sat Flow, veh/h	3281	1509	1616	3308	3495	1524
Grp Volume(v), veh/h	68	0	340	981	1894	139
Grp Sat Flow(s),veh/h/ln	1640	1509	1616	1612	1703	1524
Q Serve(g_s), s	2.4	0.0	25.0	9.6	66.4	5.3
Cycle Q Clear(g_c), s	2.4	0.0	25.0	9.6	66.4	5.3
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	245	113	337	2633	1903	851
V/C Ratio(X)	0.28	0.00	1.01	0.37	1.00	0.16
Avail Cap(c_a), veh/h	273	126	337	2633	1903	851
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	52.5	0.0	47.5	2.9	26.3	12.9
Incr Delay (d2), s/veh	0.6	0.0	51.6	0.4	19.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.1	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	16.0	4.4	36.2	2.3
LnGrp Delay(d),s/veh	53.1	0.0	99.2	3.3	45.9	13.3
LnGrp LOS	D		F	A	D	B
Approach Vol, veh/h	68			1321	2033	
Approach Delay, s/veh	53.1			28.0	43.7	
Approach LOS	D			C	D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		104.5		15.5	31.0	73.5		
Change Period (Y+Rc), s		6.5		6.5	6.0	6.5		
Max Green Setting (Gmax), s		97.0		10.0	25.0	66.0		
Max Q Clear Time (g_c+I1), s		11.6		4.4	27.0	68.4		
Green Ext Time (p_c), s		67.6		0.1	0.0	0.0		

Intersection Summary			
HCM 2010 Ctrl Delay			37.8
HCM 2010 LOS			D

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (veh/h)	273	836	8	384	1041	387	516	483	417	544	870	410
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1727	1727	1900	1776	1776	1776	1776	1776	1776	1712	1712	1712
Adj Flow Rate, veh/h	297	909	9	417	1132	0	561	525	0	591	946	446
Adj No. of Lanes	2	3	0	2	3	1	2	2	1	2	2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	10	10	10	7	7	7	7	7	7	11	11	11
Cap, veh/h	398	1127	11	533	1286	400	618	1137	508	866	1061	474
Arrive On Green	0.08	0.23	0.23	0.11	0.27	0.00	0.14	0.34	0.00	0.13	0.33	0.33
Sat Flow, veh/h	3191	4815	48	3281	4848	1509	3281	3374	1509	3163	3252	1455
Grp Volume(v), veh/h	297	593	325	417	1132	0	561	525	0	591	946	446
Grp Sat Flow(s),veh/h/ln	1596	1572	1719	1640	1616	1509	1640	1687	1509	1581	1626	1455
Q Serve(g_s), s	9.0	22.8	22.9	12.3	28.7	0.0	15.7	15.7	0.0	15.9	35.4	38.2
Cycle Q Clear(g_c), s	9.0	22.8	22.9	12.3	28.7	0.0	15.7	15.7	0.0	15.9	35.4	38.2
Prop In Lane	1.00		0.03	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	398	736	402	533	1286	400	618	1137	508	866	1061	474
V/C Ratio(X)	0.75	0.81	0.81	0.78	0.88	0.00	0.91	0.46	0.00	0.68	0.89	0.94
Avail Cap(c_a), veh/h	398	736	402	533	1286	400	660	1184	530	866	1066	477
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.6	46.4	46.4	34.6	45.1	0.0	33.6	33.4	0.0	24.4	41.0	42.0
Incr Delay (d2), s/veh	7.5	9.2	15.8	7.4	8.8	0.0	15.8	0.3	0.0	2.2	9.6	26.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	10.8	12.6	6.1	13.8	0.0	11.1	7.3	0.0	7.2	17.3	18.8
LnGrp Delay(d),s/veh	44.1	55.6	62.2	42.1	54.0	0.0	49.4	33.7	0.0	26.6	50.7	68.8
LnGrp LOS	D	E	E	D	D		D	C		C	D	E
Approach Vol, veh/h		1215			1549			1086			1983	
Approach Delay, s/veh		54.5			50.8			41.8			47.6	
Approach LOS		D			D			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.0	37.0	22.0	49.2	16.0	41.0	23.4	47.8
Change Period (Y+Rc), s	6.0	7.0	5.0	6.0	6.0	7.0	5.0	6.0
Max Green Setting (Gmax), s	14.0	30.0	17.0	45.0	10.0	34.0	20.0	42.0
Max Q Clear Time (g_c+I1), s	14.3	24.9	17.9	17.7	11.0	30.7	17.7	40.2
Green Ext Time (p_c), s	0.0	4.5	0.0	16.7	0.0	3.0	0.7	1.6

Intersection Summary			
HCM 2010 Ctrl Delay			48.8
HCM 2010 LOS			D

Appendix D

Synchro Capacity Analysis Results Reports

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	3	12	77	18	6	4	188	305	73	11	293	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.937				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1309	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.750			0.748			0.950			0.533		
Satd. Flow (perm)	1383	1845	1568	1045	1309	0	1656	3312	1482	929	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			104		5				88			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	4	14	93	22	7	5	227	367	88	13	353	14
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	14	93	22	12	0	227	367	88	13	353	14
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		20.0	67.0	67.0	47.0	47.0	47.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		20.0%	67.0%	67.0%	47.0%	47.0%	47.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		14.0	60.5	60.5	40.5	40.5	40.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	10.2	10.2	10.2	10.2	10.2		21.6	81.4	81.4	52.6	52.6	52.6
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10		0.22	0.81	0.81	0.53	0.53	0.53
v/c Ratio	0.03	0.07	0.37	0.21	0.09		0.64	0.14	0.07	0.03	0.20	0.02
Control Delay	40.7	41.6	11.4	46.2	33.4		41.8	1.7	0.2	14.6	14.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.7	41.6	11.4	46.2	33.4		41.8	1.7	0.2	14.6	14.5	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	B	A
Approach Delay		16.3			41.7			14.9			14.0	
Approach LOS		B			D			B			B	
Queue Length 50th (m)	0.8	2.6	0.0	4.2	1.3		42.7	9.4	0.6	1.3	20.6	0.0
Queue Length 95th (m)	3.8	7.9	9.9	11.0	6.3		59.6	2.2	0.0	4.7	29.4	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	366	488	491	276	350		357	2696	1223	488	1740	828
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	0.01	0.03	0.19	0.08	0.03		0.64	0.14	0.07	0.03	0.20	0.02

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 15.5 Intersection LOS: B

Intersection Capacity Utilization 49.6% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	19	142	237	585	396	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		163				30
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	22	163	272	672	455	30
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	163	272	672	455	30
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	25.0		22.0	75.0	53.0	53.0
Total Split (%)	25.0%		22.0%	75.0%	53.0%	53.0%
Maximum Green (s)	18.5		16.0	68.5	46.5	46.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	23.5	90.8	57.4	57.4
Actuated g/C Ratio	0.10	1.00	0.24	0.91	0.57	0.57
v/c Ratio	0.07	0.11	0.68	0.22	0.25	0.04
Control Delay	41.5	0.2	44.3	1.8	6.7	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.5	0.2	44.3	1.8	6.7	1.6

5: 43 Street N & 5 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	A	A
Approach Delay	5.1			14.1	6.3	
Approach LOS	A			B	A	
Queue Length 50th (m)	2.1	0.0	50.3	0.0	8.3	0.2
Queue Length 95th (m)	5.7	0.0	75.1	21.1	15.8	0.0
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	578	1442	399	3092	1787	812
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	0.04	0.11	0.68	0.22	0.25	0.04

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 49.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	273	585	8	236	569	355	251	534	170	346	356	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.261			0.290			0.478			0.193		
Satd. Flow (perm)	447	3246	0	506	3312	1482	1602	3282	1468	619	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				386			185			183
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	297	636	9	257	618	386	273	580	185	376	387	183
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	645	0	257	618	386	273	580	185	376	387	183
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	54.3	35.3		50.1	33.2	33.2	38.2	25.0	25.0	44.1	27.9	27.9
Actuated g/C Ratio	0.47	0.31		0.43	0.29	0.29	0.33	0.22	0.22	0.38	0.24	0.24
v/c Ratio	0.76	0.65		0.68	0.65	0.55	0.39	0.82	0.40	0.68	0.51	0.38
Control Delay	33.0	40.1		28.4	41.1	6.8	24.6	53.8	8.2	30.1	40.5	7.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.0	40.1		28.4	41.1	6.8	24.6	53.8	8.2	30.1	40.5	7.5
LOS	C	D		C	D	A	C	D	A	C	D	A
Approach Delay		37.9			28.0			38.0			30.0	
Approach LOS		D			C			D			C	

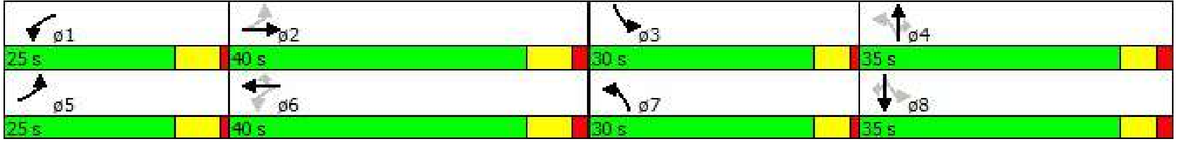
6: 43 Street S/43 Street N & Hwy 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 50th (m)	42.8	72.6		35.8	70.1	0.0	21.9	70.2	0.0	31.4	42.4	0.0
Queue Length 95th (m)	#83.6	102.9		60.6	97.5	26.2	31.3	95.4	19.1	43.1	59.8	18.2
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	407	992		423	951	701	984	829	509	775	838	509
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	0.73	0.65		0.61	0.65	0.55	0.28	0.70	0.36	0.49	0.46	0.36

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 115.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 33.1 Intersection LOS: C
Intersection Capacity Utilization 76.4% 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	13	5	220	98	11	12	128	301	18	3	355	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.922				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1717	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.738			0.754			0.950			0.529		
Satd. Flow (perm)	1323	1792	1524	1405	1717	0	1597	3195	1429	939	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			275		15				38			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	16	6	275	122	14	15	160	376	22	4	444	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	6	275	122	29	0	160	376	22	4	444	24
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		20.0	67.0	67.0	47.0	47.0	47.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		20.0%	67.0%	67.0%	47.0%	47.0%	47.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		14.0	60.5	60.5	40.5	40.5	40.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	14.4	14.4	14.4	14.4	14.4		15.5	72.6	72.6	51.1	51.1	51.1
Actuated g/C Ratio	0.14	0.14	0.14	0.14	0.14		0.16	0.73	0.73	0.51	0.51	0.51
v/c Ratio	0.08	0.02	0.61	0.61	0.11		0.65	0.16	0.02	0.01	0.26	0.03
Control Delay	35.8	34.2	10.6	52.2	22.8		48.4	3.5	1.1	16.3	15.7	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
Total Delay	35.8	34.2	10.6	52.2	22.8		48.4	3.5	1.1	16.3	15.7	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C	B	D	C		D	A	A	B	B	A
Approach Delay		12.4			46.6			16.3			15.0	
Approach LOS		B			D			B			B	
90th %ile Green (s)	19.9	19.9	19.9	19.9	19.9		20.6	67.1	67.1	40.5	40.5	40.5
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	16.5	16.5	16.5	16.5	16.5		18.1	70.5	70.5	46.4	46.4	46.4
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	14.0	14.0	14.0	14.0	14.0		15.7	73.0	73.0	51.3	51.3	51.3
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	11.5	11.5	11.5	11.5	11.5		13.3	75.5	75.5	56.2	56.2	56.2
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		9.8	77.0	77.0	61.2	61.2	61.2
10th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	14	6	28	89	13		117	98	3	2	199	0
Fuel Used(l)	2	1	18	12	2		18	27	1	0	29	1
CO Emissions (g/hr)	30	12	337	223	39		341	503	28	5	545	19
NOx Emissions (g/hr)	6	2	65	43	8		66	97	5	1	105	4
VOC Emissions (g/hr)	7	3	78	51	9		79	116	6	1	126	4
Dilemma Vehicles (#)	0	0	0	0	0		0	10	0	0	18	0
Queue Length 50th (m)	2.9	1.1	0.0	23.8	2.5		31.3	2.7	0.2	0.4	25.5	0.0
Queue Length 95th (m)	7.5	4.0	13.2	35.1	8.7		43.9	18.7	1.5	2.3	38.6	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	350	474	605	372	466		263	2320	1048	479	1724	822
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	0.05	0.01	0.45	0.33	0.06		0.61	0.16	0.02	0.01	0.26	0.03

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 18.2 Intersection LOS: B

Intersection Capacity Utilization 53.3% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	27	243	204	496	798	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		270				40
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	30	270	227	551	887	40
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	270	227	551	887	40
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	25.0		22.0	75.0	53.0	53.0
Total Split (%)	25.0%		22.0%	75.0%	53.0%	53.0%
Maximum Green (s)	18.5		16.0	68.5	46.5	46.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	20.3	86.2	57.3	57.3
Actuated g/C Ratio	0.10	1.00	0.20	0.86	0.57	0.57
v/c Ratio	0.09	0.18	0.69	0.20	0.45	0.04
Control Delay	41.7	0.3	48.1	2.4	13.4	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.7	0.3	48.1	2.4	13.4	4.4

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	4.4			15.8	13.0	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		24.5	77.0	46.5	46.5
90th %ile Term Code	Min		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		23.0	77.0	48.0	48.0
70th %ile Term Code	Min		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		21.1	77.0	49.9	49.9
50th %ile Term Code	Min		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		18.5	93.5	69.0	69.0
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		14.4	93.5	73.1	73.1
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	25	0	184	86	458	5
Fuel Used(l)	3	17	25	31	84	3
CO Emissions (g/hr)	61	314	462	583	1565	57
NOx Emissions (g/hr)	12	61	89	113	302	11
VOC Emissions (g/hr)	14	72	107	134	361	13
Dilemma Vehicles (#)	0	0	0	17	33	0
Queue Length 50th (m)	2.9	0.0	42.8	13.2	68.9	0.2
Queue Length 95th (m)	7.5	0.0	66.1	17.9	53.4	m4.0
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	605	1509	332	2778	1951	890
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	0.05	0.18	0.68	0.20	0.45	0.04

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 12.8 Intersection LOS: B

Intersection Capacity Utilization 57.5% ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 5: 43 Street N & 5 Ave N

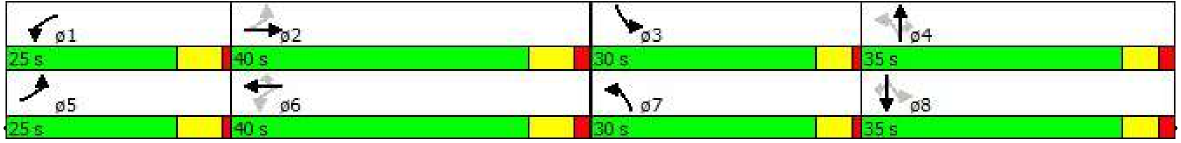
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	151	557	5	256	694	226	344	292	278	245	470	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3279	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.242			0.269			0.228			0.560		
Satd. Flow (perm)	418	3279	0	478	3374	1509	785	3374	1509	1860	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				246			302			176
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	164	605	5	278	754	246	374	317	302	266	511	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	610	0	278	754	246	374	317	302	266	511	176
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	47.2	33.3		53.4	36.4	36.4	43.3	26.5	26.5	35.6	22.6	22.6
Actuated g/C Ratio	0.42	0.30		0.48	0.32	0.32	0.39	0.24	0.24	0.32	0.20	0.20
v/c Ratio	0.52	0.63		0.69	0.69	0.38	0.57	0.40	0.51	0.36	0.78	0.41
Control Delay	23.6	39.1		28.2	38.5	6.0	26.5	37.7	7.3	24.0	51.8	8.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.6	39.1		28.2	38.5	6.0	26.5	37.7	7.3	24.0	51.8	8.7
LOS	C	D		C	D	A	C	D	A	C	D	A
Approach Delay		35.8			30.0			24.2			36.1	
Approach LOS		D			C			C			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	18.8	33.0		19.0	33.2	33.2	20.4	34.5	34.5	14.9	29.0	29.0
90th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Max	Max
70th %ile Green (s)	14.6	33.0		19.0	37.4	37.4	18.0	31.6	31.6	13.1	26.7	26.7
70th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
50th %ile Green (s)	11.9	33.0		17.3	38.4	38.4	16.1	27.2	27.2	11.7	22.8	22.8
50th %ile Term Code	Gap	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
30th %ile Green (s)	10.1	33.0		14.4	37.3	37.3	14.1	23.6	23.6	10.4	19.9	19.9
30th %ile Term Code	Gap	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
10th %ile Green (s)	10.0	33.0		11.1	34.1	34.1	11.4	17.3	17.3	10.0	15.9	15.9
10th %ile Term Code	Min	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Min	Gap	Gap
Stops (vph)	89	472		151	575	23	221	232	27	166	430	20
Fuel Used(l)	13	64		30	96	16	28	27	13	24	59	11
CO Emissions (g/hr)	245	1186		556	1786	301	516	511	249	438	1094	200
NOx Emissions (g/hr)	47	229		107	345	58	100	99	48	85	211	39
VOC Emissions (g/hr)	57	274		128	412	69	119	118	57	101	252	46
Dilemma Vehicles (#)	0	25		0	30	0	0	13	0	0	20	0
Queue Length 50th (m)	20.2	64.8		36.9	78.2	0.0	30.1	32.7	0.0	20.7	59.8	0.0
Queue Length 95th (m)	39.4	97.3		66.6	#123.5	20.6	42.2	48.5	22.5	30.6	84.1	18.8
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	407	975		441	1096	656	872	926	633	1029	850	510
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	0.40	0.63		0.63	0.69	0.38	0.43	0.34	0.48	0.26	0.60	0.35

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 112
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 31.2 Intersection LOS: C
Intersection Capacity Utilization 73.7% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 125.4
70th %ile Actuated Cycle: 120.7
50th %ile Actuated Cycle: 113.2
30th %ile Actuated Cycle: 105.4
10th %ile Actuated Cycle: 95.4
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	10	13	81	19	7	5	198	381	77	12	320	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.936				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1308	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.748			0.747			0.950			0.488		
Satd. Flow (perm)	1380	1845	1568	1044	1308	0	1656	3312	1482	851	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			104		6				93			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	12	16	98	23	8	6	239	459	93	14	386	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	16	98	23	14	0	239	459	93	14	386	17
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		20.0	67.0	67.0	47.0	47.0	47.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		20.0%	67.0%	67.0%	47.0%	47.0%	47.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		14.0	60.5	60.5	40.5	40.5	40.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	10.2	10.2	10.2	10.2	10.2		23.2	81.4	81.4	50.9	50.9	50.9
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10		0.23	0.81	0.81	0.51	0.51	0.51
v/c Ratio	0.09	0.09	0.39	0.22	0.10		0.62	0.17	0.08	0.03	0.23	0.02
Control Delay	42.0	41.7	12.4	46.4	32.7		39.1	1.4	0.2	15.3	15.4	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
Total Delay	42.0	41.7	12.4	46.4	32.7		39.1	1.4	0.2	15.3	15.4	0.1

Lanes, Volumes, Timings
4: 43 Street N & 9 Ave N

Timing Plan: BG2019-AM
Background 2019 AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	B	A
Approach Delay		19.0			41.2			12.7			14.8	
Approach LOS		B			D			B			B	
90th %ile Green (s)	11.1	11.1	11.1	11.1	11.1		25.5	75.9	75.9	44.4	44.4	44.4
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		23.8	77.0	77.0	47.2	47.2	47.2
70th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		22.9	77.0	77.0	48.1	48.1	48.1
50th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		22.2	77.0	77.0	48.8	48.8	48.8
30th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		21.6	93.5	93.5	65.9	65.9	65.9
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	11	14	14	19	10		176	40	0	8	177	0
Fuel Used(l)	1	2	7	2	1		27	31	6	1	26	1
CO Emissions (g/hr)	24	31	128	42	24		499	575	110	19	489	14
NOx Emissions (g/hr)	5	6	25	8	5		96	111	21	4	94	3
VOC Emissions (g/hr)	6	7	29	10	5		115	133	25	4	113	3
Dilemma Vehicles (#)	0	0	0	0	0		0	11	0	0	16	0
Queue Length 50th (m)	2.3	3.0	0.0	4.4	1.5		39.0	3.0	0.0	1.5	23.4	0.0
Queue Length 95th (m)	7.2	8.7	11.3	11.3	6.8		62.1	3.6	0.2	4.9	32.6	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	365	488	491	276	351		384	2695	1223	432	1685	805
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.03	0.20	0.08	0.04		0.62	0.17	0.08	0.03	0.23	0.02

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 14.7 Intersection LOS: B
Intersection Capacity Utilization 49.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

5: 43 Street N & 5 Ave N

Background 2019 AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	33	150	249	662	426	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		172				34
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	38	172	286	761	490	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	172	286	761	490	34
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	25.0		22.0	75.0	53.0	53.0
Total Split (%)	25.0%		22.0%	75.0%	53.0%	53.0%
Maximum Green (s)	18.5		16.0	68.5	46.5	46.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	24.8	86.2	52.8	52.8
Actuated g/C Ratio	0.10	1.00	0.25	0.86	0.53	0.53
v/c Ratio	0.12	0.12	0.68	0.26	0.30	0.05
Control Delay	42.1	0.2	43.4	2.6	7.4	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	0.2	43.4	2.6	7.4	1.4

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	A	A
Approach Delay	7.8			13.8	7.0	
Approach LOS	A			B	A	
90th %ile Green (s)	10.0		24.5	77.0	46.5	46.5
90th %ile Term Code	Min		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		24.5	77.0	46.5	46.5
70th %ile Term Code	Min		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		24.5	77.0	46.5	46.5
50th %ile Term Code	Min		Max	Coord	Coord	Coord
30th %ile Green (s)	0.0		25.1	93.5	62.4	62.4
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		25.2	93.5	62.3	62.3
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	30	0	223	121	89	1
Fuel Used(l)	4	10	29	42	38	2
CO Emissions (g/hr)	75	193	547	784	706	44
NOx Emissions (g/hr)	14	37	106	151	136	8
VOC Emissions (g/hr)	17	45	126	181	163	10
Dilemma Vehicles (#)	0	0	0	22	20	0
Queue Length 50th (m)	3.7	0.0	53.1	19.5	11.0	0.2
Queue Length 95th (m)	8.5	0.0	79.2	24.3	16.6	0.0
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	578	1442	421	2936	1644	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	0.07	0.12	0.68	0.26	0.30	0.05

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.68

Intersection Signal Delay: 11.1 Intersection LOS: B

Intersection Capacity Utilization 50.5% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N

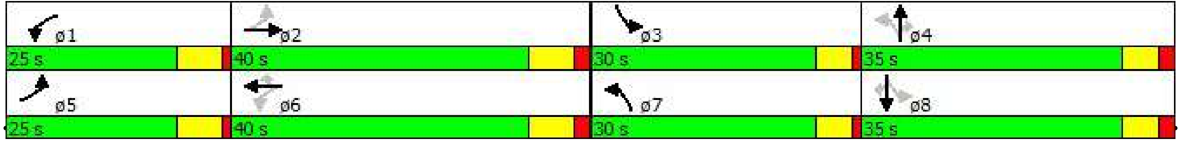
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	306	615	9	248	598	381	264	581	179	366	378	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.229			0.256			0.459			0.163		
Satd. Flow (perm)	392	3246	0	446	3312	1482	1538	3282	1468	522	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				414			195			197
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	333	668	10	270	650	414	287	632	195	398	411	197
Shared Lane Traffic (%)												
Lane Group Flow (vph)	333	678	0	270	650	414	287	632	195	398	411	197
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	55.0	35.2		51.0	33.1	33.1	40.4	26.8	26.8	47.3	30.3	30.3
Actuated g/C Ratio	0.46	0.30		0.43	0.28	0.28	0.34	0.23	0.23	0.40	0.25	0.25
v/c Ratio	0.88	0.71		0.74	0.71	0.58	0.41	0.85	0.41	0.73	0.52	0.39
Control Delay	48.4	43.5		33.2	44.3	7.1	24.7	56.7	8.0	32.3	40.7	7.2
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	48.4	43.5		33.2	44.3	7.1	24.7	56.7	8.0	32.3	40.7	7.2
LOS	D	D		C	D	A	C	E	A	C	D	A
Approach Delay		45.1			30.5			40.0			30.8	
Approach LOS		D			C			D			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	15.7	29.0	29.0	20.3	33.6	33.6
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
70th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	13.7	29.0	29.0	17.7	33.0	33.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
50th %ile Green (s)	19.0	33.1		18.9	33.0	33.0	12.4	29.0	29.0	16.0	32.6	32.6
50th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
30th %ile Green (s)	19.0	35.9		16.1	33.0	33.0	11.3	26.5	26.5	14.3	29.5	29.5
30th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Gap	Gap	Gap	Gap	Hold	Hold
10th %ile Green (s)	19.0	39.9		12.1	33.0	33.0	10.0	21.1	21.1	12.1	23.2	23.2
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Min	Gap	Gap	Gap	Hold	Hold
Stops (vph)	181	544		156	526	37	176	532	21	239	312	20
Fuel Used(l)	33	74		30	87	28	21	65	9	37	43	12
CO Emissions (g/hr)	606	1379		566	1621	512	393	1217	165	692	799	218
NOx Emissions (g/hr)	117	266		109	313	99	76	235	32	134	154	42
VOC Emissions (g/hr)	140	318		131	374	118	91	281	38	160	184	50
Dilemma Vehicles (#)	0	26		0	25	0	0	24	0	0	16	0
Queue Length 50th (m)	52.1	81.9		40.2	77.5	0.0	23.1	78.7	0.0	33.6	45.5	0.0
Queue Length 95th (m)	#116.0	110.1		#64.8	104.3	27.4	32.7	#107.8	19.5	45.7	64.0	18.8
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	378	960		392	920	710	976	801	506	745	831	516
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	0.88	0.71		0.69	0.71	0.58	0.29	0.79	0.39	0.53	0.49	0.38

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 119
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 36.2 Intersection LOS: D
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 125.3
70th %ile Actuated Cycle: 122.7
50th %ile Actuated Cycle: 121
30th %ile Actuated Cycle: 116.8
10th %ile Actuated Cycle: 109.2
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	16	6	231	103	12	13	135	344	19	4	472	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.923				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1719	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.737			0.752			0.950			0.502		
Satd. Flow (perm)	1321	1792	1524	1401	1719	0	1597	3195	1429	891	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			289		16				38			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	20	8	289	129	15	16	169	430	24	5	590	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	8	289	129	31	0	169	430	24	5	590	36
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		12.0	22.5	22.5	22.5	22.5	22.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		20.0	67.0	67.0	47.0	47.0	47.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		20.0%	67.0%	67.0%	47.0%	47.0%	47.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		14.0	60.5	60.5	40.5	40.5	40.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	14.8	14.8	14.8	14.8	14.8		15.9	72.2	72.2	50.3	50.3	50.3
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15		0.16	0.72	0.72	0.50	0.50	0.50
v/c Ratio	0.10	0.03	0.61	0.62	0.12		0.67	0.19	0.02	0.01	0.35	0.04
Control Delay	35.7	33.7	10.4	52.4	22.4		49.1	4.0	1.2	16.5	17.2	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
Total Delay	35.7	33.7	10.4	52.4	22.4		49.1	4.0	1.2	16.5	17.2	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C	B	D	C		D	A	A	B	B	A
Approach Delay		12.5			46.6			16.1			16.2	
Approach LOS		B			D			B			B	
90th %ile Green (s)	20.6	20.6	20.6	20.6	20.6		19.9	66.4	66.4	40.5	40.5	40.5
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	17.1	17.1	17.1	17.1	17.1		18.8	69.9	69.9	45.1	45.1	45.1
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	14.5	14.5	14.5	14.5	14.5		16.4	72.5	72.5	50.1	50.1	50.1
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	12.0	12.0	12.0	12.0	12.0		14.0	75.0	75.0	55.0	55.0	55.0
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		10.4	77.0	77.0	60.6	60.6	60.6
10th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	15	7	29	94	14		125	118	3	3	281	0
Fuel Used(l)	2	1	19	13	2		19	31	2	0	40	2
CO Emissions (g/hr)	36	14	353	235	43		362	581	29	7	745	28
NOx Emissions (g/hr)	7	3	68	45	8		70	112	6	1	144	5
VOC Emissions (g/hr)	8	3	81	54	10		84	134	7	2	172	7
Dilemma Vehicles (#)	0	0	0	0	0		0	12	0	0	24	0
Queue Length 50th (m)	3.6	1.4	0.0	25.1	2.7		33.0	3.5	0.2	0.5	36.6	0.0
Queue Length 95th (m)	8.7	4.8	13.2	36.5	8.9		46.5	22.3	1.8	2.7	51.7	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	350	474	616	371	467		265	2305	1041	447	1695	810
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	0.06	0.02	0.47	0.35	0.07		0.64	0.19	0.02	0.01	0.35	0.04

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 18.3 Intersection LOS: B

Intersection Capacity Utilization 53.6% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

5: 43 Street N & 5 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	35	256	215	542	916	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		284				66
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	39	284	239	602	1018	66
Shared Lane Traffic (%)						
Lane Group Flow (vph)	39	284	239	602	1018	66
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	25.0		22.0	75.0	53.0	53.0
Total Split (%)	25.0%		22.0%	75.0%	53.0%	53.0%
Maximum Green (s)	18.5		16.0	68.5	46.5	46.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	21.5	86.2	56.1	56.1
Actuated g/C Ratio	0.10	1.00	0.22	0.86	0.56	0.56
v/c Ratio	0.12	0.19	0.69	0.22	0.53	0.07
Control Delay	42.0	0.3	46.7	2.5	13.2	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	0.3	46.7	2.5	13.2	2.8

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	5.3			15.1	12.6	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		24.5	77.0	46.5	46.5
90th %ile Term Code	Min		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		24.3	77.0	46.7	46.7
70th %ile Term Code	Min		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		22.4	77.0	48.6	48.6
50th %ile Term Code	Min		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		20.3	93.5	67.2	67.2
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		16.2	93.5	71.3	71.3
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	32	0	193	96	462	6
Fuel Used(l)	4	18	26	34	94	5
CO Emissions (g/hr)	79	330	482	639	1756	90
NOx Emissions (g/hr)	15	64	93	123	339	17
VOC Emissions (g/hr)	18	76	111	147	405	21
Dilemma Vehicles (#)	0	0	0	19	39	0
Queue Length 50th (m)	3.8	0.0	44.7	14.7	83.8	0.3
Queue Length 95th (m)	9.0	0.0	69.8	19.7	53.9	3.6
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	605	1509	347	2778	1909	883
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	0.06	0.19	0.69	0.22	0.53	0.07

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 61.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N

6: 43 Street S/43 Street N & Hwy 3

Background 2019 PM Peak Hour

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	167	585	6	269	729	242	362	316	292	272	528	201
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3275	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.206			0.237			0.190			0.546		
Satd. Flow (perm)	356	3275	0	421	3374	1509	655	3374	1509	1813	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				263			317			218
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	182	636	7	292	792	263	393	343	317	296	574	218
Shared Lane Traffic (%)												
Lane Group Flow (vph)	182	643	0	292	792	263	393	343	317	296	574	218
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	48.3	33.3		54.5	36.4	36.4	46.3	28.7	28.7	38.6	24.9	24.9
Actuated g/C Ratio	0.42	0.29		0.47	0.31	0.31	0.40	0.25	0.25	0.33	0.21	0.21
v/c Ratio	0.60	0.68		0.76	0.75	0.40	0.62	0.41	0.52	0.40	0.82	0.45
Control Delay	27.4	42.6		34.0	42.7	6.2	27.4	38.3	7.1	24.2	54.7	8.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.4	42.6		34.0	42.7	6.2	27.4	38.3	7.1	24.2	54.7	8.3
LOS	C	D		C	D	A	C	D	A	C	D	A
Approach Delay		39.2			33.7			24.9			37.1	
Approach LOS		D			C			C			D	

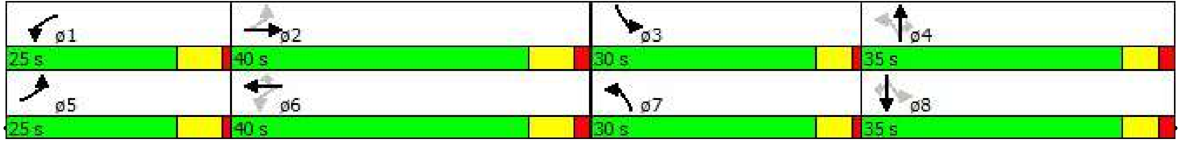
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	20.8	33.8	33.8	16.0	29.0	29.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Hold	Hold	Gap	Max	Max
70th %ile Green (s)	16.8	33.0		19.0	35.2	35.2	18.6	33.6	33.6	14.0	29.0	29.0
70th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Max	Max
50th %ile Green (s)	14.0	33.0		19.0	38.0	38.0	17.1	31.0	31.0	12.7	26.6	26.6
50th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
30th %ile Green (s)	11.1	33.0		16.4	38.3	38.3	15.0	26.4	26.4	11.2	22.6	22.6
30th %ile Term Code	Gap	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
10th %ile Green (s)	10.0	33.0		12.7	35.7	35.7	12.0	20.0	20.0	10.0	18.0	18.0
10th %ile Term Code	Min	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Min	Gap	Gap
Stops (vph)	103	513		158	617	25	230	252	28	182	488	23
Fuel Used(l)	15	70		33	104	17	29	30	14	26	67	13
CO Emissions (g/hr)	285	1297		605	1933	323	546	556	261	486	1254	246
NOx Emissions (g/hr)	55	250		117	373	62	105	107	50	94	242	47
VOC Emissions (g/hr)	66	299		140	446	75	126	128	60	112	289	57
Dilemma Vehicles (#)	0	25		0	30	0	0	13	0	0	22	0
Queue Length 50th (m)	24.9	75.4		43.0	91.6	0.0	32.7	36.9	0.0	23.9	71.0	0.0
Queue Length 95th (m)	43.9	103.7		#83.7	#140.6	21.3	44.3	52.9	23.5	33.7	95.8	20.8
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	375	939		409	1058	653	836	912	639	1031	819	529
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	0.49	0.68		0.71	0.75	0.40	0.47	0.38	0.50	0.29	0.70	0.41

Intersection Summary

Area Type: Other	
Cycle Length: 130	
Actuated Cycle Length: 116	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 33.5	Intersection LOS: C
Intersection Capacity Utilization 76.5%	ICU Level of Service D
Analysis Period (min) 15	
90th %ile Actuated Cycle: 125.8	
70th %ile Actuated Cycle: 123.6	
50th %ile Actuated Cycle: 119.7	
30th %ile Actuated Cycle: 111	
10th %ile Actuated Cycle: 99.7	

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

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	10	14	87	21	7	5	212	404	83	13	342	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.936				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1308	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.748			0.746			0.950			0.475		
Satd. Flow (perm)	1380	1845	1568	1042	1308	0	1656	3312	1482	828	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		6				100			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	12	17	105	25	8	6	255	487	100	16	412	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	17	105	25	14	0	255	487	100	16	412	18
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		32.0	67.0	67.0	35.0	35.0	35.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		32.0%	67.0%	67.0%	35.0%	35.0%	35.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		26.0	60.5	60.5	28.5	28.5	28.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	10.3	10.3	10.3	10.3	10.3		20.5	81.3	81.3	53.5	53.5	53.5
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10		0.20	0.81	0.81	0.54	0.54	0.54
v/c Ratio	0.08	0.09	0.41	0.23	0.10		0.75	0.18	0.08	0.04	0.23	0.02
Control Delay	41.9	41.6	13.6	46.9	32.5		47.6	1.4	0.3	15.8	14.9	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
Total Delay	41.9	41.6	13.6	46.9	32.5		47.6	1.4	0.3	15.8	14.9	0.1

4: 43 Street N & 9 Ave N

Background 2022 AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	B	A
Approach Delay		19.7			41.7			15.3			14.3	
Approach LOS		B			D			B			B	
90th %ile Green (s)	11.4	11.4	11.4	11.4	11.4		27.5	75.6	75.6	42.1	42.1	42.1
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		23.5	77.0	77.0	47.5	47.5	47.5
70th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		20.6	77.0	77.0	50.4	50.4	50.4
50th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		17.6	77.0	77.0	53.4	53.4	53.4
30th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		13.3	93.5	93.5	74.2	74.2	74.2
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	11	15	17	20	10		194	56	1	8	183	0
Fuel Used(l)	1	2	7	3	1		30	33	6	1	28	1
CO Emissions (g/hr)	24	33	139	47	24		563	618	119	20	516	15
NOx Emissions (g/hr)	5	6	27	9	5		109	119	23	4	100	3
VOC Emissions (g/hr)	5	8	32	11	5		130	142	27	5	119	3
Dilemma Vehicles (#)	0	0	0	0	0		0	8	0	0	17	0
Queue Length 50th (m)	2.3	3.2	0.0	4.8	1.5		49.7	2.7	0.1	1.6	24.0	0.0
Queue Length 95th (m)	7.2	9.0	12.7	11.9	6.8		64.7	3.2	0.0	5.6	36.3	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	365	488	492	276	351		435	2693	1224	443	1772	841
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.03	0.21	0.09	0.04		0.59	0.18	0.08	0.04	0.23	0.02

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 16.1 Intersection LOS: B

Intersection Capacity Utilization 49.6% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	35	160	267	706	456	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		184				37
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	40	184	307	811	524	37
Shared Lane Traffic (%)						
Lane Group Flow (vph)	40	184	307	811	524	37
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	18.0		42.0	82.0	40.0	40.0
Total Split (%)	18.0%		42.0%	82.0%	40.0%	40.0%
Maximum Green (s)	11.5		36.0	75.5	33.5	33.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	23.5	86.2	54.1	54.1
Actuated g/C Ratio	0.10	1.00	0.24	0.86	0.54	0.54
v/c Ratio	0.13	0.13	0.77	0.28	0.31	0.05
Control Delay	42.2	0.2	48.1	2.7	8.7	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.2	0.2	48.1	2.7	8.7	1.5

5: 43 Street N & 5 Ave N

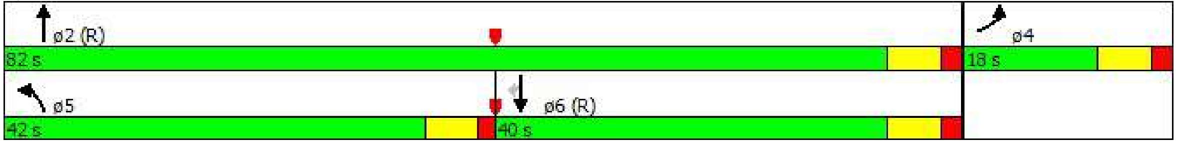
Background 2022 AM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	A	A
Approach Delay	7.7			15.2	8.2	
Approach LOS	A			B	A	
90th %ile Green (s)	10.0		31.3	77.0	39.7	39.7
90th %ile Term Code	Min		Gap	Coord	Coord	Coord
70th %ile Green (s)	10.0		26.8	77.0	44.2	44.2
70th %ile Term Code	Min		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		23.6	77.0	47.4	47.4
50th %ile Term Code	Min		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		20.3	93.5	67.2	67.2
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		15.5	93.5	72.0	72.0
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	33	0	241	131	112	1
Fuel Used(l)	4	11	33	45	42	3
CO Emissions (g/hr)	80	206	605	838	774	47
NOx Emissions (g/hr)	15	40	117	162	149	9
VOC Emissions (g/hr)	18	48	140	193	178	11
Dilemma Vehicles (#)	0	0	0	24	21	0
Queue Length 50th (m)	3.9	0.0	58.6	21.2	12.3	0.2
Queue Length 95th (m)	8.8	0.0	77.2	26.1	19.3	0.0
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	359	1442	613	2936	1683	769
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	0.11	0.13	0.50	0.28	0.31	0.05

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 12.2 Intersection LOS: B
Intersection Capacity Utilization 51.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	327	659	9	266	641	408	283	621	192	392	405	193
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.200			0.193			0.446			0.135		
Satd. Flow (perm)	342	3246	0	336	3312	1482	1495	3282	1468	433	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				408			209			210
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	355	716	10	289	697	443	308	675	209	426	440	210
Shared Lane Traffic (%)												
Lane Group Flow (vph)	355	726	0	289	697	443	308	675	209	426	440	210
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	53.8	33.7		52.4	33.1	33.1	42.0	28.0	28.0	50.3	32.3	32.3
Actuated g/C Ratio	0.44	0.28		0.43	0.27	0.27	0.35	0.23	0.23	0.41	0.27	0.27
v/c Ratio	1.01	0.81		0.84	0.77	0.63	0.44	0.89	0.42	0.77	0.53	0.40
Control Delay	78.8	49.7		46.4	48.3	9.9	24.8	61.2	8.0	36.0	40.8	7.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.8	49.7		46.4	48.3	9.9	24.8	61.2	8.0	36.0	40.8	7.0
LOS	E	D		D	D	A	C	E	A	D	D	A
Approach Delay		59.3			36.0			42.5			32.3	
Approach LOS		E			D			D			C	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	16.5	29.0	29.0	23.3	35.8	35.8
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
70th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	14.4	29.0	29.0	19.5	34.1	34.1
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
50th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	13.0	29.0	29.0	17.0	33.0	33.0
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
30th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	11.7	29.0	29.0	15.1	32.4	32.4
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
10th %ile Green (s)	19.0	36.1		15.9	33.0	33.0	10.0	23.9	23.9	12.7	26.6	26.6
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Min	Gap	Gap	Gap	Hold	Hold
Stops (vph)	198	593		168	573	58	189	563	22	264	334	20
Fuel Used(l)	43	83		35	96	31	23	72	9	41	46	12
CO Emissions (g/hr)	795	1547		658	1784	583	421	1337	176	767	857	231
NOx Emissions (g/hr)	153	299		127	344	113	81	258	34	148	165	45
VOC Emissions (g/hr)	183	357		152	411	135	97	308	41	177	198	53
Dilemma Vehicles (#)	0	27		0	26	0	0	25	0	0	16	0
Queue Length 50th (m)	~67.2	90.7		44.7	85.7	6.6	25.0	86.4	0.0	36.5	49.6	0.0
Queue Length 95th (m)	#141.9	#130.1		#100.0	116.4	40.9	34.9	#128.0	20.8	54.1	69.1	19.0
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	352	901		353	901	700	972	784	510	721	847	532
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	1.01	0.81		0.82	0.77	0.63	0.32	0.86	0.41	0.59	0.52	0.39

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 121.5

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 42.0 Intersection LOS: D

Intersection Capacity Utilization 84.2% ICU Level of Service E

Analysis Period (min) 15

90th %ile Actuated Cycle: 128.3

70th %ile Actuated Cycle: 124.5

50th %ile Actuated Cycle: 122

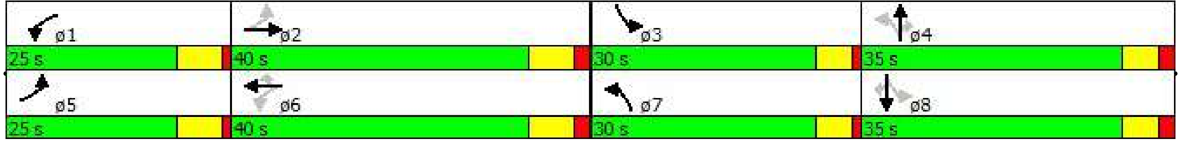
30th %ile Actuated Cycle: 120.1

10th %ile Actuated Cycle: 112.6

~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	17	6	248	111	13	14	144	366	21	4	499	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.921				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1716	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.735			0.752			0.950			0.488		
Satd. Flow (perm)	1317	1792	1524	1401	1716	0	1597	3195	1429	867	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310		18				38			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	21	8	310	139	16	18	180	458	26	5	624	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	8	310	139	34	0	180	458	26	5	624	39
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		12.0	22.5	22.5	22.5	22.5	22.5
Total Split (s)	31.0	31.0	31.0	31.0	31.0		29.0	69.0	69.0	40.0	40.0	40.0
Total Split (%)	31.0%	31.0%	31.0%	31.0%	31.0%		29.0%	69.0%	69.0%	40.0%	40.0%	40.0%
Maximum Green (s)	24.5	24.5	24.5	24.5	24.5		23.0	62.5	62.5	33.5	33.5	33.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	15.4	15.4	15.4	15.4	15.4		16.5	71.6	71.6	49.1	49.1	49.1
Actuated g/C Ratio	0.15	0.15	0.15	0.15	0.15		0.16	0.72	0.72	0.49	0.49	0.49
v/c Ratio	0.10	0.03	0.62	0.64	0.12		0.69	0.20	0.03	0.01	0.38	0.05
Control Delay	35.1	33.0	10.1	52.8	21.3		48.9	4.0	0.5	18.0	18.5	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
Total Delay	35.1	33.0	10.1	52.8	21.3		48.9	4.0	0.5	18.0	18.5	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C	B	D	C		D	A	A	B	B	A
Approach Delay		12.2			46.6			16.0			17.4	
Approach LOS		B			D			B			B	
90th %ile Green (s)	21.5	21.5	21.5	21.5	21.5		22.7	65.5	65.5	36.8	36.8	36.8
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	17.8	17.8	17.8	17.8	17.8		19.0	69.2	69.2	44.2	44.2	44.2
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	15.2	15.2	15.2	15.2	15.2		16.5	71.8	71.8	49.3	49.3	49.3
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	12.6	12.6	12.6	12.6	12.6		13.9	74.4	74.4	54.5	54.5	54.5
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		10.2	77.0	77.0	60.8	60.8	60.8
10th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	15	7	30	102	15		131	113	1	3	310	0
Fuel Used(l)	2	1	20	14	2		21	33	2	0	43	2
CO Emissions (g/hr)	37	14	377	254	46		385	611	31	7	804	30
NOx Emissions (g/hr)	7	3	73	49	9		74	118	6	1	155	6
VOC Emissions (g/hr)	9	3	87	59	11		89	141	7	2	186	7
Dilemma Vehicles (#)	0	0	0	0	0		0	17	0	0	25	0
Queue Length 50th (m)	3.7	1.4	0.0	27.0	2.8		25.7	6.4	0.2	0.5	40.1	0.0
Queue Length 95th (m)	8.9	4.8	13.1	38.5	9.3		47.6	14.4	0.3	2.9	58.8	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	322	439	607	343	434		367	2287	1033	426	1657	794
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	0.07	0.02	0.51	0.41	0.08		0.49	0.20	0.03	0.01	0.38	0.05

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.69

Intersection Signal Delay: 18.7 Intersection LOS: B

Intersection Capacity Utilization 54.1% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	37	274	230	579	976	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		304				69
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	41	304	256	643	1084	69
Shared Lane Traffic (%)						
Lane Group Flow (vph)	41	304	256	643	1084	69
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		32.0	83.5	51.5	51.5
Total Split (%)	16.5%		32.0%	83.5%	51.5%	51.5%
Maximum Green (s)	10.0		26.0	77.0	45.0	45.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	20.5	86.2	57.1	57.1
Actuated g/C Ratio	0.10	1.00	0.20	0.86	0.57	0.57
v/c Ratio	0.13	0.20	0.78	0.23	0.56	0.08
Control Delay	42.1	0.3	53.1	2.5	13.8	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	0.3	53.1	2.5	13.8	2.9

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	5.3			17.0	13.1	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		26.0	77.0	45.0	45.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
70th %ile Term Code	Max		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		21.0	77.0	50.0	50.0
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		18.0	93.5	69.5	69.5
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		13.6	93.5	73.9	73.9
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	34	0	210	103	610	6
Fuel Used(l)	5	19	29	37	105	5
CO Emissions (g/hr)	84	354	539	683	1950	95
NOx Emissions (g/hr)	16	68	104	132	376	18
VOC Emissions (g/hr)	19	82	124	158	450	22
Dilemma Vehicles (#)	0	0	0	20	22	0
Queue Length 50th (m)	4.0	0.0	49.4	16.0	90.0	0.3
Queue Length 95th (m)	9.3	0.0	73.3	21.3	53.8	m3.7
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	419	2778	1944	899
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	0.13	0.20	0.61	0.23	0.56	0.08

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 13.4 Intersection LOS: B
Intersection Capacity Utilization 63.9% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	178	627	6	288	781	259	387	338	313	290	563	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3275	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.169			0.192			0.165			0.527		
Satd. Flow (perm)	292	3275	0	341	3374	1509	568	3374	1509	1750	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				282			340			232
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	193	682	7	313	849	282	421	367	340	315	612	232
Shared Lane Traffic (%)												
Lane Group Flow (vph)	193	689	0	313	849	282	421	367	340	315	612	232
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	48.7	33.1		56.3	37.2	37.2	49.4	30.9	30.9	40.7	26.5	26.5
Actuated g/C Ratio	0.41	0.28		0.47	0.31	0.31	0.41	0.26	0.26	0.34	0.22	0.22
v/c Ratio	0.68	0.76		0.85	0.81	0.43	0.67	0.42	0.53	0.42	0.85	0.46
Control Delay	34.1	47.1		46.0	46.9	6.3	28.8	38.9	7.0	24.6	57.5	8.2
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	34.1	47.1		46.0	46.9	6.3	28.8	38.9	7.0	24.6	57.5	8.2
LOS	C	D		D	D	A	C	D	A	C	E	A
Approach Delay		44.3			38.8			25.5			38.7	
Approach LOS		D			D			C			D	

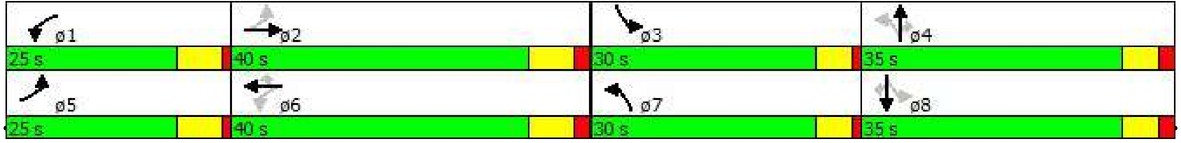
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	21.7	34.1	34.1	16.6	29.0	29.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Hold	Hold	Gap	Max	Max
70th %ile Green (s)	17.8	33.0		19.0	34.2	34.2	19.5	33.9	33.9	14.6	29.0	29.0
70th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Max	Max
50th %ile Green (s)	14.9	33.0		19.0	37.1	37.1	17.8	33.6	33.6	13.2	29.0	29.0
50th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Max	Max
30th %ile Green (s)	11.9	33.0		19.0	40.1	40.1	16.1	29.9	29.9	11.9	25.7	25.7
30th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
10th %ile Green (s)	10.0	33.0		17.1	40.1	40.1	13.2	23.6	23.6	10.0	20.4	20.4
10th %ile Term Code	Min	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Min	Gap	Gap
Stops (vph)	113	564		170	665	26	247	271	29	194	517	24
Fuel Used(l)	17	78		38	114	19	32	32	15	28	73	14
CO Emissions (g/hr)	325	1446		699	2122	346	592	599	279	519	1357	260
NOx Emissions (g/hr)	63	279		135	410	67	114	116	54	100	262	50
VOC Emissions (g/hr)	75	334		161	489	80	136	138	64	120	313	60
Dilemma Vehicles (#)	0	26		0	31	0	0	14	0	0	23	0
Queue Length 50th (m)	28.1	85.3		49.3	105.7	0.0	35.4	40.0	0.0	25.6	77.4	0.0
Queue Length 95th (m)	50.7	113.4		#110.6	#159.2	22.2	47.5	57.0	24.4	35.9	#104.2	21.6
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	343	905		374	1045	662	802	903	652	1020	789	528
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	0.56	0.76		0.84	0.81	0.43	0.52	0.41	0.52	0.31	0.78	0.44

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 119.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 36.6 Intersection LOS: D
Intersection Capacity Utilization 80.1% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 126.7
70th %ile Actuated Cycle: 124.5
50th %ile Actuated Cycle: 122.8
30th %ile Actuated Cycle: 117.8
10th %ile Actuated Cycle: 107.7

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

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	11	18	116	27	9	6	282	518	110	17	452	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.942				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1316	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.746			0.743			0.950			0.415		
Satd. Flow (perm)	1376	1845	1568	1038	1316	0	1656	3312	1482	723	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140		7				133			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	13	22	140	33	11	7	340	624	133	20	545	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	22	140	33	18	0	340	624	133	20	545	23
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		35.0	67.5	67.5	32.5	32.5	32.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		35.0%	67.5%	67.5%	32.5%	32.5%	32.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		29.0	61.0	61.0	26.0	26.0	26.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	10.6	10.6	10.6	10.6	10.6		25.4	76.4	76.4	45.0	45.0	45.0
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11		0.25	0.76	0.76	0.45	0.45	0.45
v/c Ratio	0.09	0.11	0.48	0.30	0.12		0.81	0.25	0.11	0.06	0.37	0.03
Control Delay	41.3	41.4	13.1	48.6	31.9		46.1	2.2	0.3	19.7	20.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	41.4	13.1	48.6	31.9		46.1	2.2	0.3	19.7	20.3	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	C	A
Approach Delay		18.8			42.7			15.6			19.5	
Approach LOS		B			D			B			B	
90th %ile Green (s)	12.7	12.7	12.7	12.7	12.7		32.9	74.3	74.3	35.4	35.4	35.4
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	10.2	10.2	10.2	10.2	10.2		28.8	76.8	76.8	42.0	42.0	42.0
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		25.6	77.0	77.0	45.4	45.4	45.4
50th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		22.3	77.0	77.0	48.7	48.7	48.7
30th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		17.3	77.0	77.0	53.7	53.7	53.7
10th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	11	18	20	26	12		257	76	0	12	294	0
Fuel Used(l)	1	2	10	3	2		40	43	8	2	40	1
CO Emissions (g/hr)	26	42	184	61	29		742	800	157	29	749	19
NOx Emissions (g/hr)	5	8	35	12	6		143	154	30	6	144	4
VOC Emissions (g/hr)	6	10	42	14	7		171	185	36	7	173	4
Dilemma Vehicles (#)	0	0	0	0	0		0	25	0	0	23	0
Queue Length 50th (m)	2.5	4.2	0.0	6.4	2.1		59.9	5.2	0.0	2.2	37.0	0.0
Queue Length 95th (m)	7.6	10.4	13.9	14.6	8.0		80.7	6.0	0.0	7.5	54.7	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	357	479	511	269	347		493	2531	1163	325	1491	724
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	0.04	0.05	0.27	0.12	0.05		0.69	0.25	0.11	0.06	0.37	0.03

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 17.8 Intersection LOS: B
Intersection Capacity Utilization 52.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	42	213	356	925	604	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		245				47
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	48	245	409	1063	694	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	245	409	1063	694	47
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		43.0	83.5	40.5	40.5
Total Split (%)	16.5%		43.0%	83.5%	40.5%	40.5%
Maximum Green (s)	10.0		37.0	77.0	34.0	34.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	29.2	86.2	48.4	48.4
Actuated g/C Ratio	0.10	1.00	0.29	0.86	0.48	0.48
v/c Ratio	0.15	0.17	0.82	0.36	0.46	0.07
Control Delay	42.5	0.3	46.6	3.1	11.2	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	0.3	46.6	3.1	11.2	1.1

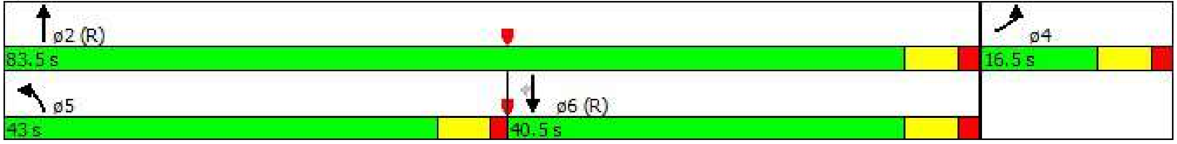
5: 43 Street N & 5 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	7.2			15.1	10.5	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		37.0	77.0	34.0	34.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		33.1	77.0	37.9	37.9
70th %ile Term Code	Max		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		29.6	77.0	41.4	41.4
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		25.9	93.5	61.6	61.6
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		20.4	93.5	67.1	67.1
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	38	0	322	191	345	2
Fuel Used(l)	5	15	43	60	63	3
CO Emissions (g/hr)	95	275	800	1114	1164	60
NOx Emissions (g/hr)	18	53	154	215	225	12
VOC Emissions (g/hr)	22	63	184	257	269	14
Dilemma Vehicles (#)	0	0	0	31	28	0
Queue Length 50th (m)	4.6	0.0	77.0	30.7	15.5	0.2
Queue Length 95th (m)	10.0	0.0	97.5	37.1	23.0	0.4
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	312	1442	630	2936	1506	697
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	0.15	0.17	0.65	0.36	0.46	0.07

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 12.8 Intersection LOS: B
Intersection Capacity Utilization 60.6% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N



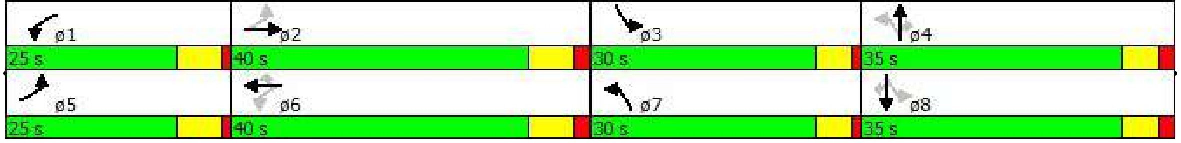
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	429	878	12	354	854	541	377	821	255	521	538	256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.121			0.121			0.329			0.118		
Satd. Flow (perm)	207	3246	0	211	3312	1482	1102	3282	1468	378	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				384			232			278
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	466	954	13	385	928	588	410	892	277	566	585	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	466	967	0	385	928	588	410	892	277	566	585	278
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	53.0	33.0		53.0	33.0	33.0	46.1	29.0	29.0	56.9	35.1	35.1
Actuated g/C Ratio	0.42	0.26		0.42	0.26	0.26	0.36	0.23	0.23	0.45	0.28	0.28
v/c Ratio	1.56	1.15		1.27	1.08	0.88	0.62	1.19	0.54	0.89	0.68	0.47
Control Delay	298.6	122.6		177.1	99.2	31.5	27.3	142.1	13.2	51.0	46.0	7.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	298.6	122.6		177.1	99.2	31.5	27.3	142.1	13.2	51.0	46.0	7.1
LOS	F	F		F	F	C	C	F	B	D	D	A
Approach Delay		179.9			94.0			89.7			40.4	
Approach LOS		F			F			F			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	20.7	29.0	29.0	25.0	33.3	33.3
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
70th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	17.5	29.0	29.0	25.0	36.5	36.5
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
50th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	16.0	29.0	29.0	23.8	36.8	36.8
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
30th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	14.4	29.0	29.0	20.6	35.2	35.2
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
10th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	12.1	29.0	29.0	16.7	33.6	33.6
10th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
Stops (vph)	258	746		223	734	201	257	676	50	393	469	26
Fuel Used(l)	129	158		83	160	58	31	144	14	62	64	17
CO Emissions (g/hr)	2391	2944		1538	2967	1073	578	2678	265	1156	1194	307
NOx Emissions (g/hr)	462	568		297	573	207	112	517	51	223	230	59
VOC Emissions (g/hr)	552	679		355	684	248	133	618	61	267	275	71
Dilemma Vehicles (#)	0	30		0	29	0	0	26	0	0	21	0
Queue Length 50th (m)	~162.7	~161.3		~115.2	~147.1	59.0	34.4	~152.6	9.7	60.2	72.3	0.0
Queue Length 95th (m)	#234.6	#207.5		#182.7	#192.4	#134.3	46.2	#197.5	37.7	#84.7	98.2	23.2
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	298	843		303	859	668	879	748	513	694	865	588
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	1.56	1.15		1.27	1.08	0.88	0.47	1.19	0.54	0.82	0.68	0.47

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 127.2
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.56
Intersection Signal Delay: 100.3 Intersection LOS: F
Intersection Capacity Utilization 104.9% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 128.8
30th %ile Actuated Cycle: 125.6
10th %ile Actuated Cycle: 121.7
~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



1: 43 Street N & 26 Ave N/Twp Rd 92

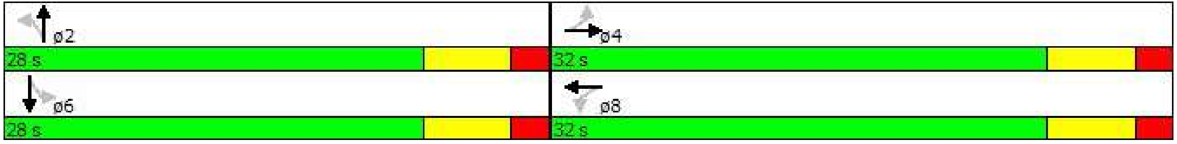
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	17	99	252	23	84	6	89	111	26	6	51	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.908			0.993			0.984			0.985	
Flt Protected		0.998			0.990			0.981			0.995	
Satd. Flow (prot)	0	1656	0	0	1796	0	0	1714	0	0	1605	0
Flt Permitted		0.979			0.864			0.835			0.950	
Satd. Flow (perm)	0	1624	0	0	1567	0	0	1459	0	0	1533	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		226			6			12			9	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		697.6			744.1			520.4			321.7	
Travel Time (s)		50.2			53.6			26.8			16.5	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	16%	16%	16%
Adj. Flow (vph)	22	129	327	30	109	8	116	144	34	8	66	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	478	0	0	147	0	0	294	0	0	83	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	32.0	32.0		32.0	32.0		28.0	28.0		28.0	28.0	
Total Split (%)	53.3%	53.3%		53.3%	53.3%		46.7%	46.7%		46.7%	46.7%	
Maximum Green (s)	25.5	25.5		25.5	25.5		21.5	21.5		21.5	21.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		14.3			14.3			13.8			13.8	
Actuated g/C Ratio		0.34			0.34			0.33			0.33	
v/c Ratio		0.68			0.27			0.60			0.16	
Control Delay		11.8			11.5			18.0			11.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		11.8			11.5			18.0			11.0	
LOS		B			B			B			B	
Approach Delay		11.8			11.5			18.0			11.0	
Approach LOS		B			B			B			B	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	25.0	25.0		25.0	25.0		21.5	21.5		21.5	21.5	
90th %ile Term Code	Gap	Gap		Hold	Hold		Max	Max		Hold	Hold	
70th %ile Green (s)	16.4	16.4		16.4	16.4		16.0	16.0		16.0	16.0	
70th %ile Term Code	Gap	Gap		Hold	Hold		Gap	Gap		Hold	Hold	
50th %ile Green (s)	12.2	12.2		12.2	12.2		12.5	12.5		12.5	12.5	
50th %ile Term Code	Gap	Gap		Hold	Hold		Gap	Gap		Hold	Hold	
30th %ile Green (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
30th %ile Term Code	Min	Min		Min	Min		Min	Min		Min	Min	
10th %ile Green (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
10th %ile Term Code	Min	Min		Hold	Hold		Min	Min		Min	Min	
Stops (vph)		157			68			165			39	
Fuel Used(l)		31			11			20			4	
CO Emissions (g/hr)		581			196			371			73	
NOx Emissions (g/hr)		112			38			72			14	
VOC Emissions (g/hr)		134			45			86			17	
Dilemma Vehicles (#)		0			0			26			7	
Queue Length 50th (m)		13.0			6.7			14.9			3.3	
Queue Length 95th (m)		30.8			16.8			37.1			11.4	
Internal Link Dist (m)		673.6			720.1			496.4			297.7	
Turn Bay Length (m)												
Base Capacity (vph)		1124			1008			795			834	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.43			0.15			0.37			0.10	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 41.7
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 52.7% ICU Level of Service A
Analysis Period (min) 15
90th %ile Actuated Cycle: 59.5
70th %ile Actuated Cycle: 45.4
50th %ile Actuated Cycle: 37.7
30th %ile Actuated Cycle: 33
10th %ile Actuated Cycle: 33

Splits and Phases: 1: 43 Street N & 26 Ave N/Twp Rd 92



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	11	18	116	27	9	6	282	518	110	17	452	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.942				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1316	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.746			0.743			0.950			0.415		
Satd. Flow (perm)	1376	1845	1568	1038	1316	0	1656	3312	1482	723	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140		7				133			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	13	22	140	33	11	7	340	624	133	20	545	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	13	22	140	33	18	0	340	624	133	20	545	23
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		35.0	67.5	67.5	32.5	32.5	32.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		35.0%	67.5%	67.5%	32.5%	32.5%	32.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		29.0	61.0	61.0	26.0	26.0	26.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	10.6	10.6	10.6	10.6	10.6		25.4	76.4	76.4	45.0	45.0	45.0
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11		0.25	0.76	0.76	0.45	0.45	0.45
v/c Ratio	0.09	0.11	0.48	0.30	0.12		0.81	0.25	0.11	0.06	0.37	0.03
Control Delay	41.3	41.4	13.1	48.6	31.9		46.1	2.2	0.3	19.7	20.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.3	41.4	13.1	48.6	31.9		46.1	2.2	0.3	19.7	20.3	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	C	A
Approach Delay		18.8			42.7			15.6			19.5	
Approach LOS		B			D			B			B	
90th %ile Green (s)	12.7	12.7	12.7	12.7	12.7		32.9	74.3	74.3	35.4	35.4	35.4
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	10.2	10.2	10.2	10.2	10.2		28.8	76.8	76.8	42.0	42.0	42.0
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		25.6	77.0	77.0	45.4	45.4	45.4
50th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		22.3	77.0	77.0	48.7	48.7	48.7
30th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		17.3	77.0	77.0	53.7	53.7	53.7
10th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	11	18	20	26	12		257	76	0	12	294	0
Fuel Used(l)	1	2	10	3	2		40	43	8	2	40	1
CO Emissions (g/hr)	26	42	184	61	29		742	800	157	29	749	19
NOx Emissions (g/hr)	5	8	35	12	6		143	154	30	6	144	4
VOC Emissions (g/hr)	6	10	42	14	7		171	185	36	7	173	4
Dilemma Vehicles (#)	0	0	0	0	0		0	25	0	0	23	0
Queue Length 50th (m)	2.5	4.2	0.0	6.4	2.1		59.9	5.2	0.0	2.2	37.0	0.0
Queue Length 95th (m)	7.6	10.4	13.9	14.6	8.0		80.7	6.0	0.0	7.5	54.7	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	357	479	511	269	347		493	2531	1163	325	1491	724
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	0.04	0.05	0.27	0.12	0.05		0.69	0.25	0.11	0.06	0.37	0.03

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 17.8 Intersection LOS: B
Intersection Capacity Utilization 52.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	42	213	356	925	604	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		245				47
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	48	245	409	1063	694	47
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	245	409	1063	694	47
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		43.0	83.5	40.5	40.5
Total Split (%)	16.5%		43.0%	83.5%	40.5%	40.5%
Maximum Green (s)	10.0		37.0	77.0	34.0	34.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	29.2	86.2	48.4	48.4
Actuated g/C Ratio	0.10	1.00	0.29	0.86	0.48	0.48
v/c Ratio	0.15	0.17	0.82	0.36	0.46	0.07
Control Delay	42.5	0.3	46.6	3.1	11.2	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	0.3	46.6	3.1	11.2	1.1

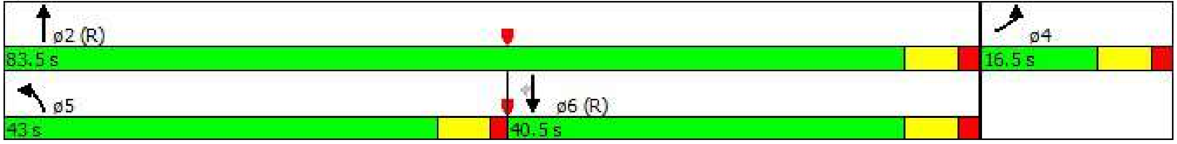
5: 43 Street N & 5 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	7.2			15.1	10.5	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		37.0	77.0	34.0	34.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		33.1	77.0	37.9	37.9
70th %ile Term Code	Max		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		29.6	77.0	41.4	41.4
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		25.9	93.5	61.6	61.6
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		20.4	93.5	67.1	67.1
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	38	0	322	191	345	2
Fuel Used(l)	5	15	43	60	63	3
CO Emissions (g/hr)	95	275	800	1114	1164	60
NOx Emissions (g/hr)	18	53	154	215	225	12
VOC Emissions (g/hr)	22	63	184	257	269	14
Dilemma Vehicles (#)	0	0	0	31	28	0
Queue Length 50th (m)	4.6	0.0	77.0	30.7	15.5	0.2
Queue Length 95th (m)	10.0	0.0	97.5	37.1	23.0	0.4
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	312	1442	630	2936	1506	697
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	0.15	0.17	0.65	0.36	0.46	0.07

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 12.8 Intersection LOS: B
Intersection Capacity Utilization 60.6% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N



Lanes, Volumes, Timings
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: BG2037-AM-Mit
Background 2037 AM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	429	878	12	354	854	541	377	821	255	521	538	256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	2		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3155	4664	0	3213	4759	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.186			0.169			0.322			0.142		
Satd. Flow (perm)	618	4664	0	571	4759	1482	1079	3282	1468	455	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				265			235			249
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	466	954	13	385	928	588	410	892	277	566	585	278
Shared Lane Traffic (%)												
Lane Group Flow (vph)	466	967	0	385	928	588	410	892	277	566	585	278
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	34.0		16.0	34.0	34.0	16.0	32.0	32.0	18.0	34.0	34.0
Total Split (%)	16.0%	34.0%		16.0%	34.0%	34.0%	16.0%	32.0%	32.0%	18.0%	34.0%	34.0%
Maximum Green (s)	10.0	27.0		10.0	27.0	27.0	11.0	26.0	26.0	13.0	28.0	28.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	38.0	27.0		38.0	27.0	27.0	37.8	26.0	26.0	42.2	28.2	28.2
Actuated g/C Ratio	0.38	0.27		0.38	0.27	0.27	0.38	0.26	0.26	0.42	0.28	0.28
v/c Ratio	0.95	0.77		0.80	0.72	0.99	0.64	1.05	0.50	1.07	0.66	0.48
Control Delay	53.4	38.3		33.0	36.9	56.4	23.2	80.4	10.0	86.0	36.1	8.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.4	38.3		33.0	36.9	56.4	23.2	80.4	10.0	86.0	36.1	8.5
LOS	D	D		C	D	E	C	F	A	F	D	A
Approach Delay		43.2			42.2			53.2			50.5	
Approach LOS		D			D			D			D	

Lanes, Volumes, Timings
Timing Plan: BG2037-AM-Mit

6: 43 Street S/43 Street N & Hwy 3

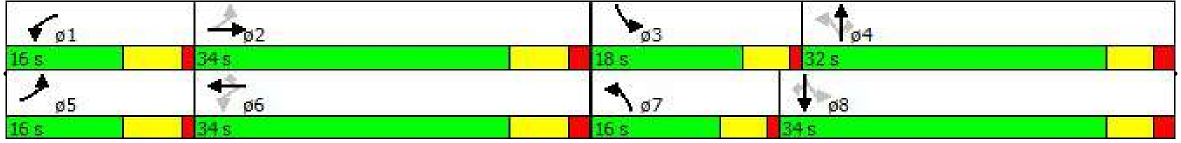
Background 2037 AM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	27.0		10.0	27.0	27.0	11.0	26.0	26.0	13.0	28.0	28.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Max	Max
70th %ile Green (s)	10.0	27.0		10.0	27.0	27.0	11.0	26.0	26.0	13.0	28.0	28.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
50th %ile Green (s)	10.0	27.0		10.0	27.0	27.0	11.0	26.0	26.0	13.0	28.0	28.0
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
30th %ile Green (s)	10.0	27.0		10.0	27.0	27.0	11.0	26.0	26.0	13.0	28.0	28.0
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
10th %ile Green (s)	10.0	27.0		10.0	27.0	27.0	10.2	26.0	26.0	13.0	28.8	28.8
10th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
Stops (vph)	265	795		223	750	279	251	715	50	326	463	42
Fuel Used(l)	48	103		43	120	73	30	106	14	74	60	17
CO Emissions (g/hr)	893	1922		808	2223	1350	552	1977	253	1377	1113	322
NOx Emissions (g/hr)	172	371		156	429	261	107	382	49	266	215	62
VOC Emissions (g/hr)	206	443		186	513	311	127	456	58	318	257	74
Dilemma Vehicles (#)	0	44		0	43	0	0	37	0	0	27	0
Queue Length 50th (m)	31.3	66.3		25.1	62.8	73.9	26.4	~104.5	6.6	~51.5	55.5	4.4
Queue Length 95th (m)	#60.3	82.8		#43.1	78.6	#149.3	37.2	#144.1	29.3	#86.3	75.0	26.2
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	488	1260		481	1284	593	641	853	555	528	883	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	0.95	0.77		0.80	0.72	0.99	0.64	1.05	0.50	1.07	0.66	0.48

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 47.0 Intersection LOS: D
Intersection Capacity Utilization 86.5% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 100
70th %ile Actuated Cycle: 100
50th %ile Actuated Cycle: 100
30th %ile Actuated Cycle: 100
10th %ile Actuated Cycle: 100
~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	22	8	330	147	17	18	192	479	27	5	632	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.923				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1719	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.729			0.751			0.950			0.426		
Satd. Flow (perm)	1307	1792	1524	1399	1719	0	1597	3195	1429	756	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			412		22				38			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	28	10	412	184	21	22	240	599	34	6	790	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	10	412	184	43	0	240	599	34	6	790	48
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		29.0	67.5	67.5	38.5	38.5	38.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		29.0%	67.5%	67.5%	38.5%	38.5%	38.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		23.0	61.0	61.0	32.0	32.0	32.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	18.4	18.4	18.4	18.4	18.4		19.3	68.6	68.6	43.3	43.3	43.3
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.19	0.69	0.69	0.43	0.43	0.43
v/c Ratio	0.12	0.03	0.67	0.72	0.13		0.78	0.27	0.03	0.02	0.54	0.07
Control Delay	32.4	30.1	9.2	53.3	19.2		51.1	5.0	0.7	22.0	24.8	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	30.1	9.2	53.3	19.2		51.1	5.0	0.7	22.0	24.8	0.2

4: 43 Street N & 9 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	B		D	A	A	C	C	A
Approach Delay		11.1			46.8			17.5			23.4	
Approach LOS		B			D			B			C	
90th %ile Green (s)	25.5	25.5	25.5	25.5	25.5		23.5	61.5	61.5	32.0	32.0	32.0
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	21.4	21.4	21.4	21.4	21.4		23.0	65.6	65.6	36.6	36.6	36.6
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	18.4	18.4	18.4	18.4	18.4		20.1	68.6	68.6	42.5	42.5	42.5
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	15.4	15.4	15.4	15.4	15.4		17.2	71.6	71.6	48.4	48.4	48.4
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	11.1	11.1	11.1	11.1	11.1		12.9	75.9	75.9	57.0	57.0	57.0
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	18	8	35	134	17		177	161	2	5	468	0
Fuel Used(l)	3	1	27	18	3		28	44	2	1	60	2
CO Emissions (g/hr)	47	17	495	337	56		520	814	40	9	1121	37
NOx Emissions (g/hr)	9	3	96	65	11		100	157	8	2	216	7
VOC Emissions (g/hr)	11	4	114	78	13		120	188	9	2	259	9
Dilemma Vehicles (#)	0	0	0	0	0		0	23	0	0	32	0
Queue Length 50th (m)	4.8	1.7	0.0	35.6	3.6		39.2	10.5	0.3	0.7	62.1	0.0
Queue Length 95th (m)	10.3	5.1	12.5	47.3	10.1		62.0	27.4	0.3	3.4	82.9	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	339	465	701	363	463		369	2192	992	327	1460	712
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	0.08	0.02	0.59	0.51	0.09		0.65	0.27	0.03	0.02	0.54	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.1 Intersection LOS: C

Intersection Capacity Utilization 62.5% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

5: 43 Street N & 5 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	47	365	306	765	1275	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		406				83
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	52	406	340	850	1417	83
Shared Lane Traffic (%)						
Lane Group Flow (vph)	52	406	340	850	1417	83
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		30.0	83.5	53.5	53.5
Total Split (%)	16.5%		30.0%	83.5%	53.5%	53.5%
Maximum Green (s)	10.0		24.0	77.0	47.0	47.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	23.1	81.6	51.2	51.2
Actuated g/C Ratio	0.10	1.00	0.23	0.82	0.51	0.51
v/c Ratio	0.16	0.27	0.91	0.32	0.81	0.10
Control Delay	42.5	0.4	67.6	3.5	22.1	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	0.4	67.6	3.5	22.1	2.6

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	E	A	C	A
Approach Delay	5.2			21.8	21.1	
Approach LOS	A			C	C	
90th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
50th %ile Term Code	Max		Max	Coord	Coord	Coord
30th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
30th %ile Term Code	Max		Max	Coord	Coord	Coord
10th %ile Green (s)	0.0		19.7	93.5	67.8	67.8
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	42	0	270	184	1064	5
Fuel Used(l)	6	25	42	51	154	6
CO Emissions (g/hr)	107	472	775	942	2860	113
NOx Emissions (g/hr)	21	91	150	182	552	22
VOC Emissions (g/hr)	25	109	179	217	660	26
Dilemma Vehicles (#)	0	0	0	33	31	0
Queue Length 50th (m)	5.1	0.0	67.1	23.0	145.5	0.4
Queue Length 95th (m)	11.0	0.0	#118.1	29.8	#187.6	m3.8
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	386	2629	1742	820
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	0.16	0.27	0.88	0.32	0.81	0.10

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 19.0 Intersection LOS: B
Intersection Capacity Utilization 76.4% 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: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	235	836	8	384	1041	343	516	447	417	382	739	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3279	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.132			0.095			0.114			0.400		
Satd. Flow (perm)	228	3279	0	169	3374	1509	393	3374	1509	1328	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				290			333			184
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	255	909	9	417	1132	373	561	486	453	415	803	297
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	918	0	417	1132	373	561	486	453	415	803	297
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	43.0		31.0	58.0	58.0	20.0	41.0	41.0	15.0	36.0	36.0
Total Split (%)	12.3%	33.1%		23.8%	44.6%	44.6%	15.4%	31.5%	31.5%	11.5%	27.7%	27.7%
Maximum Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	47.0	36.0		68.0	51.0	51.0	51.0	35.0	35.0	41.0	30.0	30.0
Actuated g/C Ratio	0.36	0.28		0.52	0.39	0.39	0.39	0.27	0.27	0.32	0.23	0.23
v/c Ratio	1.34	1.01		1.10	0.86	0.49	1.15	0.54	0.70	0.74	1.07	0.62
Control Delay	210.5	79.1		111.7	43.8	9.0	123.1	43.1	17.6	39.8	100.6	23.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	210.5	79.1		111.7	43.8	9.0	123.1	43.1	17.6	39.8	100.6	23.0
LOS	F	E		F	D	A	F	D	B	D	F	C
Approach Delay		107.7			51.8			65.3			68.8	
Approach LOS		F			D			E			E	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Max	Max
70th %ile Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
50th %ile Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
30th %ile Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
10th %ile Green (s)	10.0	36.0		25.0	51.0	51.0	15.0	35.0	35.0	10.0	30.0	30.0
10th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
Stops (vph)	143	758		273	922	64	335	373	118	325	649	100
Fuel Used(l)	55	125		72	152	27	80	45	26	43	119	23
CO Emissions (g/hr)	1015	2321		1342	2821	503	1489	828	482	809	2220	433
NOx Emissions (g/hr)	196	448		259	544	97	287	160	93	156	429	84
VOC Emissions (g/hr)	234	535		309	651	116	343	191	111	187	512	100
Dilemma Vehicles (#)	0	30		0	40	0	0	17	0	0	26	0
Queue Length 50th (m)	~71.2	~133.1		~111.3	145.4	14.3	~75.8	59.1	27.6	39.9	~126.1	26.6
Queue Length 95th (m)	#127.5	#179.7		#178.4	176.4	41.3	#113.4	77.4	69.5	53.5	#167.4	59.2
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	191	908		380	1323	768	486	908	649	559	750	477
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	1.34	1.01		1.10	0.86	0.49	1.15	0.54	0.70	0.74	1.07	0.62

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.34

Intersection Signal Delay: 70.1 Intersection LOS: E

Intersection Capacity Utilization 99.8% ICU Level of Service F

Analysis Period (min) 15

90th %ile Actuated Cycle: 130

70th %ile Actuated Cycle: 130

50th %ile Actuated Cycle: 130

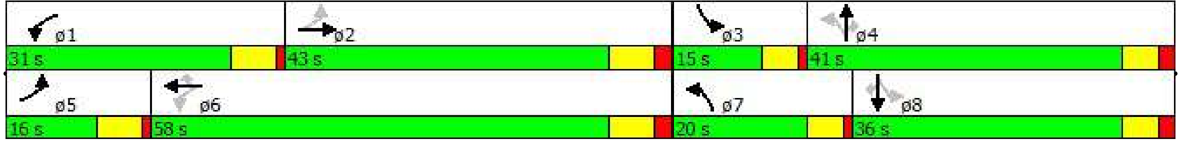
30th %ile Actuated Cycle: 130

10th %ile Actuated Cycle: 130

~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	11	51	242	12	108	0	335	75	54	12	172	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.893						0.984			0.978	
Flt Protected		0.998			0.995			0.965			0.997	
Satd. Flow (prot)	0	1628	0	0	1818	0	0	1686	0	0	1597	0
Flt Permitted		0.983			0.935			0.645			0.966	
Satd. Flow (perm)	0	1604	0	0	1708	0	0	1127	0	0	1547	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		260						16			23	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		697.6			744.1			520.4			321.7	
Travel Time (s)		50.2			53.6			26.8			16.5	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	16%	16%	16%
Adj. Flow (vph)	12	55	260	13	116	0	360	81	58	13	185	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	327	0	0	129	0	0	499	0	0	236	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	23.0	23.0		23.0	23.0		37.0	37.0		37.0	37.0	
Total Split (%)	38.3%	38.3%		38.3%	38.3%		61.7%	61.7%		61.7%	61.7%	
Maximum Green (s)	16.5	16.5		16.5	16.5		30.5	30.5		30.5	30.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.3			11.3			25.5			25.5	
Actuated g/C Ratio		0.23			0.23			0.51			0.51	
v/c Ratio		0.58			0.33			0.86			0.30	
Control Delay		9.9			20.6			28.4			7.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		9.9			20.6			28.4			7.5	
LOS		A			C			C			A	
Approach Delay		9.9			20.6			28.4			7.5	
Approach LOS		A			C			C			A	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	15.8	15.8		15.8	15.8		30.5	30.5		30.5	30.5	
90th %ile Term Code	Gap	Gap		Hold	Hold		Max	Max		Hold	Hold	
70th %ile Green (s)	10.8	10.8		10.8	10.8		30.5	30.5		30.5	30.5	
70th %ile Term Code	Gap	Gap		Hold	Hold		Max	Max		Hold	Hold	
50th %ile Green (s)	10.0	10.0		10.0	10.0		28.8	28.8		28.8	28.8	
50th %ile Term Code	Min	Min		Min	Min		Gap	Gap		Hold	Hold	
30th %ile Green (s)	10.0	10.0		10.0	10.0		22.7	22.7		22.7	22.7	
30th %ile Term Code	Min	Min		Min	Min		Gap	Gap		Hold	Hold	
10th %ile Green (s)	10.0	10.0		10.0	10.0		16.3	16.3		16.3	16.3	
10th %ile Term Code	Min	Min		Hold	Hold		Gap	Gap		Hold	Hold	
Stops (vph)		78			94			325			97	
Fuel Used(l)		24			12			44			11	
CO Emissions (g/hr)		450			232			820			209	
NOx Emissions (g/hr)		87			45			158			40	
VOC Emissions (g/hr)		104			54			189			48	
Dilemma Vehicles (#)		0			0			43			21	
Queue Length 50th (m)		5.6			11.1			32.4			9.4	
Queue Length 95th (m)		24.6			24.2			#101.7			24.5	
Internal Link Dist (m)		673.6			720.1			496.4			297.7	
Turn Bay Length (m)												
Base Capacity (vph)		712			574			706			970	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.46			0.22			0.71			0.24	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 50.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 18.3 Intersection LOS: B
Intersection Capacity Utilization 74.0% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 59.3
70th %ile Actuated Cycle: 54.3
50th %ile Actuated Cycle: 51.8
30th %ile Actuated Cycle: 45.7
10th %ile Actuated Cycle: 39.3

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

Splits and Phases: 1: 43 Street N & 26 Ave N/Twp Rd 92

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	22	8	330	147	17	18	192	479	27	5	632	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.923				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1719	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.729			0.751			0.950			0.426		
Satd. Flow (perm)	1307	1792	1524	1399	1719	0	1597	3195	1429	756	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			412		22				38			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	28	10	412	184	21	22	240	599	34	6	790	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	10	412	184	43	0	240	599	34	6	790	48
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		29.0	67.5	67.5	38.5	38.5	38.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		29.0%	67.5%	67.5%	38.5%	38.5%	38.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		23.0	61.0	61.0	32.0	32.0	32.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	18.4	18.4	18.4	18.4	18.4		19.3	68.6	68.6	43.3	43.3	43.3
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.19	0.69	0.69	0.43	0.43	0.43
v/c Ratio	0.12	0.03	0.67	0.72	0.13		0.78	0.27	0.03	0.02	0.54	0.07
Control Delay	32.4	30.1	9.2	53.3	19.2		51.1	5.0	0.7	22.0	24.8	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	30.1	9.2	53.3	19.2		51.1	5.0	0.7	22.0	24.8	0.2

4: 43 Street N & 9 Ave N

Background 2037 PM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	B		D	A	A	C	C	A
Approach Delay		11.1			46.8			17.5			23.4	
Approach LOS		B			D			B			C	
90th %ile Green (s)	25.5	25.5	25.5	25.5	25.5		23.5	61.5	61.5	32.0	32.0	32.0
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	21.4	21.4	21.4	21.4	21.4		23.0	65.6	65.6	36.6	36.6	36.6
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	18.4	18.4	18.4	18.4	18.4		20.1	68.6	68.6	42.5	42.5	42.5
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	15.4	15.4	15.4	15.4	15.4		17.2	71.6	71.6	48.4	48.4	48.4
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	11.1	11.1	11.1	11.1	11.1		12.9	75.9	75.9	57.0	57.0	57.0
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	18	8	35	134	17		177	161	2	5	468	0
Fuel Used(l)	3	1	27	18	3		28	44	2	1	60	2
CO Emissions (g/hr)	47	17	495	337	56		520	814	40	9	1121	37
NOx Emissions (g/hr)	9	3	96	65	11		100	157	8	2	216	7
VOC Emissions (g/hr)	11	4	114	78	13		120	188	9	2	259	9
Dilemma Vehicles (#)	0	0	0	0	0		0	23	0	0	32	0
Queue Length 50th (m)	4.8	1.7	0.0	35.6	3.6		39.2	10.5	0.3	0.7	62.1	0.0
Queue Length 95th (m)	10.3	5.1	12.5	47.3	10.1		62.0	27.4	0.3	3.4	82.9	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	339	465	701	363	463		369	2192	992	327	1460	712
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	0.08	0.02	0.59	0.51	0.09		0.65	0.27	0.03	0.02	0.54	0.07

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 21.1 Intersection LOS: C

Intersection Capacity Utilization 62.5% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	47	365	306	765	1275	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		406				83
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	52	406	340	850	1417	83
Shared Lane Traffic (%)						
Lane Group Flow (vph)	52	406	340	850	1417	83
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		30.0	83.5	53.5	53.5
Total Split (%)	16.5%		30.0%	83.5%	53.5%	53.5%
Maximum Green (s)	10.0		24.0	77.0	47.0	47.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	23.1	81.6	51.2	51.2
Actuated g/C Ratio	0.10	1.00	0.23	0.82	0.51	0.51
v/c Ratio	0.16	0.27	0.91	0.32	0.81	0.10
Control Delay	42.5	0.4	67.6	3.5	22.1	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	0.4	67.6	3.5	22.1	2.6

Lanes, Volumes, Timings
5: 43 Street N & 5 Ave N

Timing Plan: BG2037-PM-Mit
Background 2037 PM Peak Hour - Mitigated

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	E	A	C	A
Approach Delay	5.2			21.8	21.1	
Approach LOS	A			C	C	
90th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
50th %ile Term Code	Max		Max	Coord	Coord	Coord
30th %ile Green (s)	10.0		24.0	77.0	47.0	47.0
30th %ile Term Code	Max		Max	Coord	Coord	Coord
10th %ile Green (s)	0.0		19.7	93.5	67.8	67.8
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	42	0	270	184	1064	5
Fuel Used(l)	6	25	42	51	154	6
CO Emissions (g/hr)	107	472	775	942	2860	113
NOx Emissions (g/hr)	21	91	150	182	552	22
VOC Emissions (g/hr)	25	109	179	217	660	26
Dilemma Vehicles (#)	0	0	0	33	31	0
Queue Length 50th (m)	5.1	0.0	67.1	23.0	145.5	0.4
Queue Length 95th (m)	11.0	0.0	#118.1	29.8	#187.6	m3.8
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	386	2629	1742	820
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	0.16	0.27	0.88	0.32	0.81	0.10

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 19.0 Intersection LOS: B
Intersection Capacity Utilization 76.4% 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: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	235	836	8	384	1041	343	516	447	417	382	739	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	2		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3183	4711	0	3273	4848	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.174			0.190			0.174			0.370		
Satd. Flow (perm)	583	4711	0	655	4848	1509	599	3374	1509	1229	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				331			277			257
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	255	909	9	417	1132	373	561	486	453	415	803	297
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	918	0	417	1132	373	561	486	453	415	803	297
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	30.0		16.0	30.0	30.0	15.0	29.0	29.0	15.0	29.0	29.0
Total Split (%)	17.8%	33.3%		17.8%	33.3%	33.3%	16.7%	32.2%	32.2%	16.7%	32.2%	32.2%
Maximum Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	34.0	23.0		34.0	23.0	23.0	34.0	23.0	23.0	34.0	23.0	23.0
Actuated g/C Ratio	0.38	0.26		0.38	0.26	0.26	0.38	0.26	0.26	0.38	0.26	0.26
v/c Ratio	0.50	0.76		0.78	0.91	0.59	1.07	0.56	0.77	0.61	0.97	0.53
Control Delay	19.2	35.8		28.2	45.1	9.4	82.8	32.1	21.7	21.4	58.5	9.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	35.8		28.2	45.1	9.4	82.8	32.1	21.7	21.4	58.5	9.5
LOS	B	D		C	D	A	F	C	C	C	E	A
Approach Delay		32.2			34.5			47.9			38.7	
Approach LOS		C			C			D			D	

6: 43 Street S/43 Street N & Hwy 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Max	Max
70th %ile Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Max	Max
50th %ile Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
30th %ile Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
10th %ile Green (s)	10.0	23.0		10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
10th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
Stops (vph)	145	756		245	942	61	315	377	161	256	652	52
Fuel Used(l)	20	97		46	154	27	63	41	29	36	95	19
CO Emissions (g/hr)	374	1796		853	2862	501	1179	760	532	667	1776	351
NOx Emissions (g/hr)	72	347		165	552	97	228	147	103	129	343	68
VOC Emissions (g/hr)	86	414		197	660	116	272	175	123	154	410	81
Dilemma Vehicles (#)	0	47		0	56	0	0	24	0	0	38	0
Queue Length 50th (m)	13.9	56.5		24.1	73.4	5.9	~42.3	40.5	28.9	24.6	76.1	5.6
Queue Length 95th (m)	21.7	72.0		#40.3	#100.1	31.7	#75.9	56.8	#77.9	35.4	#115.2	28.0
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	509	1204		538	1238	632	523	862	591	678	831	563
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.76		0.78	0.91	0.59	1.07	0.56	0.77	0.61	0.97	0.53

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 38.4 Intersection LOS: D

Intersection Capacity Utilization 83.6% ICU Level of Service E

Analysis Period (min) 15

90th %ile Actuated Cycle: 90

70th %ile Actuated Cycle: 90

50th %ile Actuated Cycle: 90

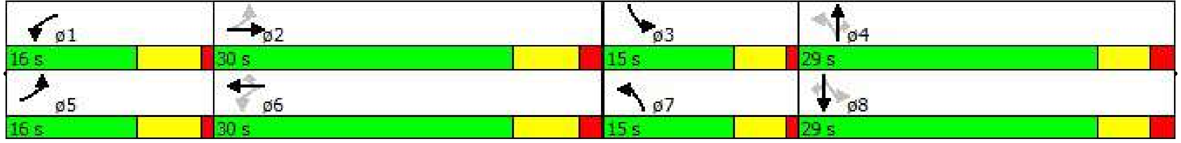
30th %ile Actuated Cycle: 90

10th %ile Actuated Cycle: 90

~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	10	21	81	48	9	11	198	381	179	34	320	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.919				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1284	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.742			0.741			0.950			0.488		
Satd. Flow (perm)	1369	1845	1568	1035	1284	0	1656	3312	1482	851	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			104		13				216			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	12	25	98	58	11	13	239	459	216	41	386	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	25	98	58	24	0	239	459	216	41	386	17
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	33.0	33.0	33.0	33.0	33.0		32.0	67.0	67.0	35.0	35.0	35.0
Total Split (%)	33.0%	33.0%	33.0%	33.0%	33.0%		32.0%	67.0%	67.0%	35.0%	35.0%	35.0%
Maximum Green (s)	26.5	26.5	26.5	26.5	26.5		26.0	60.5	60.5	28.5	28.5	28.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	12.1	12.1	12.1	12.1	12.1		19.6	79.5	79.5	52.6	52.6	52.6
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12		0.20	0.80	0.80	0.53	0.53	0.53
v/c Ratio	0.07	0.11	0.35	0.46	0.14		0.74	0.17	0.18	0.09	0.22	0.02
Control Delay	38.1	38.8	10.5	52.4	25.8		47.1	1.7	0.7	17.6	15.8	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
Total Delay	38.1	38.8	10.5	52.4	25.8		47.1	1.7	0.7	17.6	15.8	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	B	A
Approach Delay		18.2			44.6			13.3			15.4	
Approach LOS		B			D			B			B	
90th %ile Green (s)	16.6	16.6	16.6	16.6	16.6		26.4	70.4	70.4	38.0	38.0	38.0
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	13.2	13.2	13.2	13.2	13.2		22.5	73.8	73.8	45.3	45.3	45.3
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.9	10.9	10.9	10.9	10.9		19.6	76.1	76.1	50.5	50.5	50.5
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		16.7	77.0	77.0	54.3	54.3	54.3
30th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		12.6	93.5	93.5	74.9	74.9	74.9
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	10	20	13	44	12		180	69	12	21	177	0
Fuel Used(l)	1	3	7	6	2		28	32	14	3	26	1
CO Emissions (g/hr)	23	48	125	110	35		524	594	264	54	491	14
NOx Emissions (g/hr)	4	9	24	21	7		101	115	51	10	95	3
VOC Emissions (g/hr)	5	11	29	25	8		121	137	61	13	113	3
Dilemma Vehicles (#)	0	0	0	0	0		0	9	0	0	16	0
Queue Length 50th (m)	2.2	4.7	0.0	11.4	2.1		43.4	3.4	0.0	4.2	22.2	0.0
Queue Length 95th (m)	6.7	10.9	10.6	21.2	8.4		61.5	7.3	0.1	11.9	36.8	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	362	488	491	274	349		431	2631	1222	447	1742	828
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.05	0.20	0.21	0.07		0.55	0.17	0.18	0.09	0.22	0.02

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.74

Intersection Signal Delay: 16.0 Intersection LOS: B

Intersection Capacity Utilization 50.6% ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

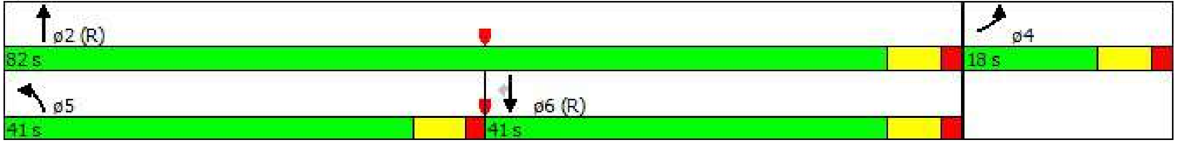
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	44	150	249	753	452	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		172				38
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	51	172	286	866	520	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	51	172	286	866	520	38
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	18.0		41.0	82.0	41.0	41.0
Total Split (%)	18.0%		41.0%	82.0%	41.0%	41.0%
Maximum Green (s)	11.5		35.0	75.5	34.5	34.5
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	22.2	81.6	52.1	52.1
Actuated g/C Ratio	0.10	1.00	0.22	0.82	0.52	0.52
v/c Ratio	0.16	0.12	0.76	0.31	0.32	0.05
Control Delay	42.6	0.2	48.8	3.4	9.8	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.6	0.2	48.8	3.4	9.8	2.4

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	A	A
Approach Delay	9.9			14.7	9.3	
Approach LOS	A			B	A	
90th %ile Green (s)	10.0		29.8	77.0	41.2	41.2
90th %ile Term Code	Min		Gap	Coord	Coord	Coord
70th %ile Green (s)	10.0		25.4	77.0	45.6	45.6
70th %ile Term Code	Min		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		22.3	77.0	48.7	48.7
50th %ile Term Code	Min		Gap	Coord	Coord	Coord
30th %ile Green (s)	10.0		19.1	77.0	51.9	51.9
30th %ile Term Code	Min		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		14.5	93.5	73.0	73.0
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	40	0	225	179	131	3
Fuel Used(l)	5	10	30	50	42	3
CO Emissions (g/hr)	100	193	567	925	787	50
NOx Emissions (g/hr)	19	37	109	178	152	10
VOC Emissions (g/hr)	23	45	131	213	181	12
Dilemma Vehicles (#)	0	0	0	32	20	0
Queue Length 50th (m)	5.0	0.0	54.8	23.1	14.5	0.0
Queue Length 95th (m)	10.4	0.0	73.2	28.4	21.8	1.8
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	359	1442	596	2779	1620	743
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	0.14	0.12	0.48	0.31	0.32	0.05

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 12.6 Intersection LOS: B
Intersection Capacity Utilization 50.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	335	615	9	248	598	415	264	609	179	376	386	189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.226			0.250			0.462			0.145		
Satd. Flow (perm)	387	3246	0	436	3312	1482	1548	3282	1468	465	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				409			195			205
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	364	668	10	270	650	451	287	662	195	409	420	205
Shared Lane Traffic (%)												
Lane Group Flow (vph)	364	678	0	270	650	451	287	662	195	409	420	205
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	55.0	35.1		51.1	33.1	33.1	41.2	27.7	27.7	49.0	31.7	31.7
Actuated g/C Ratio	0.46	0.29		0.42	0.27	0.27	0.34	0.23	0.23	0.41	0.26	0.26
v/c Ratio	0.98	0.72		0.76	0.72	0.64	0.41	0.88	0.40	0.75	0.51	0.39
Control Delay	68.0	44.5		34.8	45.3	10.2	24.5	59.1	8.0	34.1	40.3	7.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.0	44.5		34.8	45.3	10.2	24.5	59.1	8.0	34.1	40.3	7.1
LOS	E	D		C	D	B	C	E	A	C	D	A
Approach Delay		52.7			31.7			41.7			31.2	
Approach LOS		D			C			D			C	

6: 43 Street S/43 Street N & Hwy 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	15.7	29.0	29.0	21.8	35.1	35.1
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
70th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	13.8	29.0	29.0	18.3	33.5	33.5
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
50th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	12.4	29.0	29.0	16.3	32.9	32.9
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Gap	Hold	Hold
30th %ile Green (s)	19.0	35.8		16.2	33.0	33.0	11.2	28.6	28.6	14.6	32.0	32.0
30th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Gap	Gap	Gap	Gap	Hold	Hold
10th %ile Green (s)	19.0	39.6		12.4	33.0	33.0	10.0	22.9	22.9	12.3	25.2	25.2
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Min	Gap	Gap	Gap	Hold	Hold
Stops (vph)	199	547		156	527	63	176	553	21	247	316	20
Fuel Used(l)	41	75		31	88	32	21	70	9	39	44	12
CO Emissions (g/hr)	759	1392		572	1630	600	392	1294	164	721	812	227
NOx Emissions (g/hr)	146	269		110	315	116	76	250	32	139	157	44
VOC Emissions (g/hr)	175	321		132	376	138	90	298	38	166	187	52
Dilemma Vehicles (#)	0	25		0	25	0	0	24	0	0	16	0
Queue Length 50th (m)	~62.6	82.3		40.4	77.8	7.9	23.1	83.7	0.0	34.6	46.7	0.0
Queue Length 95th (m)	#138.1	111.6		#71.0	105.8	43.4	32.7	#121.7	19.6	49.7	65.4	18.8
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	372	946		385	909	703	981	792	502	731	846	528
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	0.98	0.72		0.70	0.72	0.64	0.29	0.84	0.39	0.56	0.50	0.39

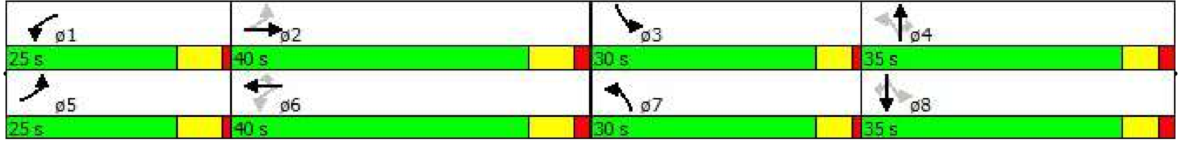
Intersection Summary

Area Type: Other	
Cycle Length: 130	
Actuated Cycle Length: 120.4	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.98	
Intersection Signal Delay: 38.9	Intersection LOS: D
Intersection Capacity Utilization 82.8%	ICU Level of Service E
Analysis Period (min) 15	
90th %ile Actuated Cycle: 126.8	
70th %ile Actuated Cycle: 123.3	
50th %ile Actuated Cycle: 121.3	
30th %ile Actuated Cycle: 119.2	
10th %ile Actuated Cycle: 111.2	

~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	16	9	231	195	19	33	135	344	51	11	472	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.905				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1686	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.715			0.750			0.950			0.502		
Satd. Flow (perm)	1282	1792	1524	1397	1686	0	1597	3195	1429	891	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			289		41				64			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	20	11	289	244	24	41	169	430	64	14	590	36
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	11	289	244	65	0	169	430	64	14	590	36
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		12.0	22.5	22.5	22.5	22.5	22.5
Total Split (s)	35.0	35.0	35.0	35.0	35.0		27.0	65.0	65.0	38.0	38.0	38.0
Total Split (%)	35.0%	35.0%	35.0%	35.0%	35.0%		27.0%	65.0%	65.0%	38.0%	38.0%	38.0%
Maximum Green (s)	28.5	28.5	28.5	28.5	28.5		21.0	58.5	58.5	31.5	31.5	31.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	22.1	22.1	22.1	22.1	22.1		15.6	64.9	64.9	43.3	43.3	43.3
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22		0.16	0.65	0.65	0.43	0.43	0.43
v/c Ratio	0.07	0.03	0.51	0.79	0.16		0.68	0.21	0.07	0.04	0.40	0.05
Control Delay	28.6	27.4	7.0	54.4	14.5		49.8	6.9	1.5	22.0	22.6	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
Total Delay	28.6	27.4	7.0	54.4	14.5		49.8	6.9	1.5	22.0	22.6	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	D	B		D	A	A	C	C	A
Approach Delay		9.1			46.0			17.3			21.4	
Approach LOS		A			D			B			C	
90th %ile Green (s)	28.5	28.5	28.5	28.5	28.5		21.0	58.5	58.5	31.5	31.5	31.5
90th %ile Term Code	Hold	Hold	Hold	Max	Max		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	26.0	26.0	26.0	26.0	26.0		18.3	61.0	61.0	36.7	36.7	36.7
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	22.7	22.7	22.7	22.7	22.7		15.8	64.3	64.3	42.5	42.5	42.5
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	19.2	19.2	19.2	19.2	19.2		13.3	67.8	67.8	48.5	48.5	48.5
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	14.2	14.2	14.2	14.2	14.2		9.7	72.8	72.8	57.1	57.1	57.1
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	14	8	25	179	19		125	146	9	9	325	0
Fuel Used(l)	2	1	18	24	4		20	33	4	1	43	2
CO Emissions (g/hr)	34	19	340	451	79		364	612	79	20	808	28
NOx Emissions (g/hr)	6	4	66	87	15		70	118	15	4	156	5
VOC Emissions (g/hr)	8	4	78	104	18		84	141	18	5	186	7
Dilemma Vehicles (#)	0	0	0	0	0		0	16	0	0	24	0
Queue Length 50th (m)	3.2	1.8	0.0	46.9	3.9		33.3	7.6	0.0	1.6	43.0	0.0
Queue Length 95th (m)	7.7	5.2	11.8	60.0	11.4		46.0	27.6	3.3	6.0	60.4	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	365	510	640	398	509		335	2072	949	385	1459	711
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	0.05	0.02	0.45	0.61	0.13		0.50	0.21	0.07	0.04	0.40	0.05

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 21.9 Intersection LOS: C

Intersection Capacity Utilization 58.7% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

5: 43 Street N & 5 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	38	256	215	571	998	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		284				77
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	42	284	239	634	1109	77
Shared Lane Traffic (%)						
Lane Group Flow (vph)	42	284	239	634	1109	77
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		31.0	83.5	52.5	52.5
Total Split (%)	16.5%		31.0%	83.5%	52.5%	52.5%
Maximum Green (s)	10.0		25.0	77.0	46.0	46.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	19.5	86.2	58.1	58.1
Actuated g/C Ratio	0.10	1.00	0.20	0.86	0.58	0.58
v/c Ratio	0.13	0.19	0.76	0.23	0.56	0.08
Control Delay	42.1	0.3	53.1	2.5	15.7	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.1	0.3	53.1	2.5	15.7	4.2

5: 43 Street N & 5 Ave N

Future 2019 PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	B	A
Approach Delay	5.7			16.4	14.9	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		25.0	77.0	46.0	46.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		22.9	77.0	48.1	48.1
70th %ile Term Code	Max		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		20.0	77.0	51.0	51.0
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	0.0		17.0	93.5	70.5	70.5
30th %ile Term Code	Skip		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		12.8	93.5	74.7	74.7
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	34	0	197	103	661	8
Fuel Used(l)	5	18	27	36	110	6
CO Emissions (g/hr)	86	330	505	674	2043	107
NOx Emissions (g/hr)	17	64	97	130	394	21
VOC Emissions (g/hr)	20	76	116	156	471	25
Dilemma Vehicles (#)	0	0	0	20	15	0
Queue Length 50th (m)	4.0	0.0	46.2	15.6	98.8	0.9
Queue Length 95th (m)	9.4	0.0	69.3	21.0	64.1	m5.4
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	403	2778	1977	917
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	0.13	0.19	0.59	0.23	0.56	0.08

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 14.2 Intersection LOS: B
Intersection Capacity Utilization 63.7% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: 43 Street N & 5 Ave N

Lanes, Volumes, Timings
6: 43 Street S/43 Street N & Hwy 3

Timing Plan: FU2019-PM
Future 2019 PM Peak Hour

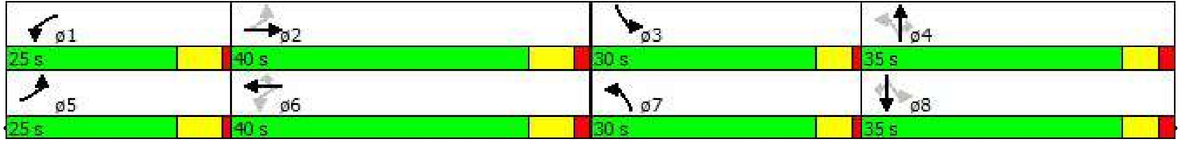
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	176	585	6	269	729	253	362	325	292	303	553	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3275	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.198			0.236			0.183			0.519		
Satd. Flow (perm)	342	3275	0	419	3374	1509	630	3374	1509	1723	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				275			317			247
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	191	636	7	292	792	275	393	353	317	329	601	247
Shared Lane Traffic (%)												
Lane Group Flow (vph)	191	643	0	292	792	275	393	353	317	329	601	247
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	25.0	40.0		25.0	40.0	40.0	30.0	35.0	35.0	30.0	35.0	35.0
Total Split (%)	19.2%	30.8%		19.2%	30.8%	30.8%	23.1%	26.9%	26.9%	23.1%	26.9%	26.9%
Maximum Green (s)	19.0	33.0		19.0	33.0	33.0	25.0	29.0	29.0	25.0	29.0	29.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	48.6	33.2		54.3	36.1	36.1	46.5	29.0	29.0	40.4	25.9	25.9
Actuated g/C Ratio	0.42	0.28		0.46	0.31	0.31	0.40	0.25	0.25	0.35	0.22	0.22
v/c Ratio	0.63	0.69		0.77	0.76	0.42	0.63	0.42	0.52	0.43	0.83	0.48
Control Delay	29.1	43.2		34.9	43.8	6.3	27.7	39.1	7.2	24.6	55.2	8.2
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	29.1	43.2		34.9	43.8	6.3	27.7	39.1	7.2	24.6	55.2	8.2
LOS	C	D		C	D	A	C	D	A	C	E	A
Approach Delay		40.0			34.3			25.4			36.7	
Approach LOS		D			C			C			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	19.0	33.0		19.0	33.0	33.0	20.5	32.4	32.4	17.1	29.0	29.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Hold	Hold	Gap	Max	Max
70th %ile Green (s)	17.5	33.0		19.0	34.5	34.5	18.4	32.4	32.4	15.0	29.0	29.0
70th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Max	Max
50th %ile Green (s)	14.6	33.0		19.0	37.4	37.4	16.9	31.4	31.4	13.6	28.1	28.1
50th %ile Term Code	Gap	MaxR		Max	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
30th %ile Green (s)	11.6	33.0		16.8	38.2	38.2	15.2	28.2	28.2	12.0	25.0	25.0
30th %ile Term Code	Gap	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Gap	Gap	Gap
10th %ile Green (s)	10.0	33.0		12.8	35.8	35.8	12.1	21.3	21.3	10.0	19.2	19.2
10th %ile Term Code	Min	MaxR		Gap	Hold	Hold	Gap	Hold	Hold	Min	Gap	Gap
Stops (vph)	109	515		161	623	25	231	262	29	202	509	25
Fuel Used(l)	16	70		33	105	18	29	31	14	29	71	15
CO Emissions (g/hr)	305	1305		612	1951	337	548	577	262	542	1315	277
NOx Emissions (g/hr)	59	252		118	377	65	106	111	51	105	254	53
VOC Emissions (g/hr)	70	301		141	450	78	126	133	60	125	303	64
Dilemma Vehicles (#)	0	25		0	30	0	0	13	0	0	23	0
Queue Length 50th (m)	26.9	76.6		44.0	94.0	0.0	32.7	38.5	0.0	26.9	75.0	0.0
Queue Length 95th (m)	45.8	103.3		#84.0	#140.0	21.8	44.3	55.2	23.9	37.4	100.5	22.1
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	367	929		404	1039	655	829	891	631	1020	811	548
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	0.52	0.69		0.72	0.76	0.42	0.47	0.40	0.50	0.32	0.74	0.45

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 117
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 33.9 Intersection LOS: C
Intersection Capacity Utilization 77.2% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 125.5
70th %ile Actuated Cycle: 123.4
50th %ile Actuated Cycle: 121
30th %ile Actuated Cycle: 114
10th %ile Actuated Cycle: 101.1
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	38	28	87	40	10	10	212	857	166	34	441	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.925				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1292	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.742			0.735			0.950			0.277		
Satd. Flow (perm)	1369	1845	1568	1027	1292	0	1656	3312	1482	483	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		12				200			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	46	34	105	48	12	12	255	1033	200	41	531	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	34	105	48	24	0	255	1033	200	41	531	25
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		27.0	67.5	67.5	40.5	40.5	40.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		27.0%	67.5%	67.5%	40.5%	40.5%	40.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		21.0	61.0	61.0	34.0	34.0	34.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	11.4	11.4	11.4	11.4	11.4		20.7	80.2	80.2	52.2	52.2	52.2
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11		0.21	0.80	0.80	0.52	0.52	0.52
v/c Ratio	0.29	0.16	0.39	0.41	0.15		0.75	0.39	0.16	0.16	0.31	0.03
Control Delay	44.9	40.8	12.2	51.4	27.6		44.2	2.3	0.4	19.7	16.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	40.8	12.2	51.4	27.6		44.2	2.3	0.4	19.7	16.7	0.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	B	B	A
Approach Delay		25.6			43.4			9.2			16.2	
Approach LOS		C			D			A			B	
90th %ile Green (s)	15.1	15.1	15.1	15.1	15.1		27.0	71.9	71.9	38.9	38.9	38.9
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	12.1	12.1	12.1	12.1	12.1		23.7	74.9	74.9	45.2	45.2	45.2
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		20.9	77.0	77.0	50.1	50.1	50.1
50th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		18.0	77.0	77.0	53.0	53.0	53.0
30th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	0.0	0.0	0.0	0.0	0.0		13.7	93.5	93.5	73.8	73.8	73.8
10th %ile Term Code	Skip	Skip	Skip	Skip	Skip		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	34	26	17	38	13		175	136	2	22	254	0
Fuel Used(l)	5	3	7	5	2		29	72	13	3	37	1
CO Emissions (g/hr)	89	64	138	91	36		541	1331	239	56	687	20
NOx Emissions (g/hr)	17	12	27	18	7		104	257	46	11	133	4
VOC Emissions (g/hr)	21	15	32	21	8		125	307	55	13	159	5
Dilemma Vehicles (#)	0	0	0	0	0		0	33	0	0	22	0
Queue Length 50th (m)	8.9	6.5	0.0	9.4	2.3		36.6	12.1	0.0	4.4	32.5	0.0
Queue Length 95th (m)	17.7	13.9	12.1	18.6	8.8		56.3	13.2	0.0	12.8	50.0	0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	355	479	485	267	344		376	2655	1227	251	1729	823
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	0.13	0.07	0.22	0.18	0.07		0.68	0.39	0.16	0.16	0.31	0.03

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 13.3 Intersection LOS: B
Intersection Capacity Utilization 61.3% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	91	160	267	1186	563	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		184				51
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	105	184	307	1363	647	51
Shared Lane Traffic (%)						
Lane Group Flow (vph)	105	184	307	1363	647	51
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		35.0	83.5	48.5	48.5
Total Split (%)	16.5%		35.0%	83.5%	48.5%	48.5%
Maximum Green (s)	10.0		29.0	77.0	42.0	42.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	22.8	81.6	51.5	51.5
Actuated g/C Ratio	0.10	1.00	0.23	0.82	0.52	0.52
v/c Ratio	0.34	0.13	0.79	0.49	0.40	0.07
Control Delay	45.2	0.2	50.9	4.5	8.5	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.2	0.2	50.9	4.5	8.5	1.2

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	D	A	A	A
Approach Delay	16.5			13.0	8.0	
Approach LOS	B			B	A	
90th %ile Green (s)	10.0		29.0	77.0	42.0	42.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		26.3	77.0	44.7	44.7
70th %ile Term Code	Max		Gap	Coord	Coord	Coord
50th %ile Green (s)	10.0		23.2	77.0	47.8	47.8
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	10.0		20.1	77.0	50.9	50.9
30th %ile Term Code	Max		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		15.4	93.5	72.1	72.1
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	83	0	244	351	211	3
Fuel Used(l)	11	11	33	82	54	4
CO Emissions (g/hr)	211	206	618	1517	998	65
NOx Emissions (g/hr)	41	40	119	293	193	13
VOC Emissions (g/hr)	49	48	142	350	230	15
Dilemma Vehicles (#)	0	0	0	50	25	0
Queue Length 50th (m)	10.4	0.0	58.9	45.3	13.4	0.0
Queue Length 95th (m)	18.2	0.0	80.0	53.6	19.7	1.3
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	312	1442	493	2779	1602	741
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	0.34	0.13	0.62	0.49	0.40	0.07

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 12.1 Intersection LOS: B
Intersection Capacity Utilization 54.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N

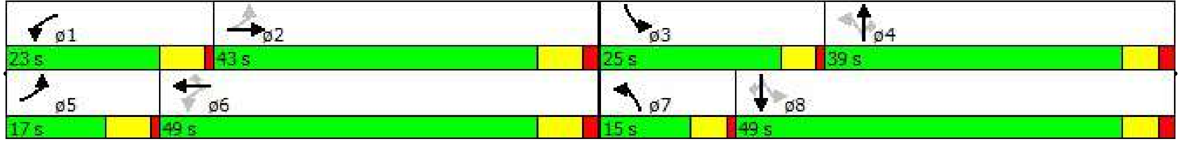
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	480	659	9	266	641	589	283	750	192	432	438	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1626	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.288			0.162			0.480			0.105		
Satd. Flow (perm)	493	3246	0	282	3312	1482	1608	3282	1468	337	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				288			199			247
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	522	716	10	289	697	640	308	815	209	470	476	247
Shared Lane Traffic (%)												
Lane Group Flow (vph)	522	726	0	289	697	640	308	815	209	470	476	247
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	17.0	43.0		23.0	49.0	49.0	15.0	39.0	39.0	25.0	49.0	49.0
Total Split (%)	13.1%	33.1%		17.7%	37.7%	37.7%	11.5%	30.0%	30.0%	19.2%	37.7%	37.7%
Maximum Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	48.0	36.0		60.0	42.0	42.0	44.0	33.0	33.0	57.5	41.5	41.5
Actuated g/C Ratio	0.37	0.28		0.47	0.33	0.33	0.34	0.26	0.26	0.45	0.32	0.32
v/c Ratio	1.86	0.80		0.92	0.64	0.94	0.46	0.97	0.40	0.87	0.47	0.40
Control Delay	424.7	50.8		61.6	40.4	47.0	25.3	71.5	8.5	49.7	36.5	5.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	424.7	50.8		61.6	40.4	47.0	25.3	71.5	8.5	49.7	36.5	5.7
LOS	F	D		E	D	D	C	E	A	D	D	A
Approach Delay		207.2			46.8			50.9			35.3	
Approach LOS		F			D			D			D	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
70th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
50th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
30th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	18.2	41.2	41.2
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Gap	Hold	Hold
10th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	14.6	37.6	37.6
10th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Gap	Hold	Hold
Stops (vph)	279	605		158	535	324	196	675	26	309	340	21
Fuel Used(l)	190	84		38	90	76	23	93	10	51	48	14
CO Emissions (g/hr)	3531	1570		705	1671	1412	428	1723	180	941	887	266
NOx Emissions (g/hr)	682	303		136	323	273	83	333	35	182	171	51
VOC Emissions (g/hr)	814	362		163	385	326	99	397	41	217	204	61
Dilemma Vehicles (#)	0	26		0	25	0	0	27	0	0	17	0
Queue Length 50th (m)	~206.3	96.1		50.7	84.6	106.2	25.4	115.4	2.1	48.4	53.1	0.0
Queue Length 95th (m)	#285.2	120.8		#106.6	106.7	#188.9	35.4	#159.0	22.6	#73.7	70.1	19.1
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	280	909		313	1082	678	673	842	525	572	1050	634
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	1.86	0.80		0.92	0.64	0.94	0.46	0.97	0.40	0.82	0.45	0.39

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 128.6
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.86
Intersection Signal Delay: 82.3 Intersection LOS: F
Intersection Capacity Utilization 99.6% ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 130
30th %ile Actuated Cycle: 128.2
10th %ile Actuated Cycle: 124.6
~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	11	35	112	54	8	6	187	179	243	28	298	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.904			0.987			0.946			0.995	
Flt Protected		0.997			0.962			0.985			0.996	
Satd. Flow (prot)	0	1529	0	0	1640	0	0	1609	0	0	1828	0
Flt Permitted		0.980			0.633			0.731			0.901	
Satd. Flow (perm)	0	1503	0	0	1079	0	0	1194	0	0	1654	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		120			5			61			3	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		716.1			196.5			496.3			520.4	
Travel Time (s)		51.6			14.1			25.5			26.8	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	12%	10%	10%	10%	10%	10%	10%	3%	3%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	14	45	144	59	9	7	240	229	312	36	382	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	203	0	0	75	0	0	781	0	0	433	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		26.5	26.5		22.5	22.5	
Total Split (s)	33.0	33.0		33.0	33.0		67.0	67.0		67.0	67.0	
Total Split (%)	33.0%	33.0%		33.0%	33.0%		67.0%	67.0%		67.0%	67.0%	
Maximum Green (s)	26.5	26.5		26.5	26.5		60.5	60.5		60.5	60.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		26.5			26.5			60.5			60.5	
Actuated g/C Ratio		0.26			0.26			0.60			0.60	
v/c Ratio		0.42			0.26			1.05			0.43	
Control Delay		15.7			30.0			45.8			12.2	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		15.7			30.0			45.8			12.2	
LOS		B			C			D			B	
Approach Delay		15.7			30.0			45.8			12.2	
Approach LOS		B			C			D			B	
Queue Length 50th (m)		13.2			11.3			~168.4			43.4	
Queue Length 95th (m)		25.1			24.0			#184.1			52.7	
Internal Link Dist (m)		692.1			172.5			472.3			496.4	
Turn Bay Length (m)												
Base Capacity (vph)		486			289			746			1001	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.42			0.26			1.05			0.43	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 86 (86%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 31.1 Intersection LOS: C
Intersection Capacity Utilization 91.5% ICU Level of Service F
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.

Splits and Phases: 2: 43 Street N & 18 Ave N

Lanes, Volumes, Timings
3: 43 Street N & 14 Ave N

Timing Plan: FU2022-AM-Mit
Future 2022 AM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (vph)	4	7	21	53	2	6	76	582	236	28	421	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	75.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.912			0.986			0.957			0.995	
Flt Protected		0.994			0.959		0.950				0.997	
Satd. Flow (prot)	0	1111	0	0	1633	0	1641	1653	0	0	1778	0
Flt Permitted		0.971			0.733		0.432				0.669	
Satd. Flow (perm)	0	1086	0	0	1248	0	746	1653	0	0	1193	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			5			41			4	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		748.5			168.6			405.2			496.3	
Travel Time (s)		53.9			12.1			20.8			25.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	55%	55%	55%	10%	10%	10%	10%	10%	10%	6%	6%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	5	9	26	58	2	7	94	719	291	35	520	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	40	0	0	67	0	94	1010	0	0	575	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	29.0	29.0		29.0	29.0		71.0	71.0		71.0	71.0	
Total Split (%)	29.0%	29.0%		29.0%	29.0%		71.0%	71.0%		71.0%	71.0%	
Maximum Green (s)	22.5	22.5		22.5	22.5		64.5	64.5		64.5	64.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		6.5			6.5		6.5	6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Recall Mode	Max	Max		Max	Max		Max	Max		Max	Max	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)		22.5			22.5		64.5	64.5			64.5	
Actuated g/C Ratio		0.22			0.22		0.64	0.64			0.64	
v/c Ratio		0.15			0.24		0.20	0.94			0.75	
Control Delay		17.9			32.0		6.3	27.9			20.3	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		17.9			32.0		6.3	27.9			20.3	
LOS		B			C		A	C			C	
Approach Delay		17.9			32.0			26.0			20.3	
Approach LOS		B			C			C			C	
Queue Length 50th (m)		2.3			10.4		4.8	177.3			75.4	
Queue Length 95th (m)		9.6			22.7		7.9	203.9			96.6	
Internal Link Dist (m)		724.5			144.6			381.2			472.3	
Turn Bay Length (m)							75.0					
Base Capacity (vph)		264			284		481	1080			770	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.15			0.24		0.20	0.94			0.75	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 63 (63%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 24.2 Intersection LOS: C
Intersection Capacity Utilization 67.1% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 3: 43 Street N & 14 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	38	28	87	40	10	10	212	857	166	34	441	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Ped Bike Factor												
Frt			0.850		0.925				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1292	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.742			0.735			0.950			0.277		
Satd. Flow (perm)	1369	1845	1568	1027	1292	0	1656	3312	1482	483	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105		12				200			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	46	34	105	48	12	12	255	1033	200	41	531	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	46	34	105	48	24	0	255	1033	200	41	531	25
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		31.0	67.5	67.5	36.5	36.5	36.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		31.0%	67.5%	67.5%	36.5%	36.5%	36.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		25.0	61.0	61.0	30.0	30.0	30.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	11.4	11.4	11.4	11.4	11.4		20.4	80.2	80.2	52.4	52.4	52.4
Actuated g/C Ratio	0.11	0.11	0.11	0.11	0.11		0.20	0.80	0.80	0.52	0.52	0.52
v/c Ratio	0.29	0.16	0.39	0.41	0.15		0.75	0.39	0.16	0.16	0.31	0.03
Control Delay	44.9	40.8	12.2	51.4	27.6		47.9	2.8	0.5	24.0	19.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	40.8	12.2	51.4	27.6		47.9	2.8	0.5	24.0	19.2	0.0
LOS	D	D	B	D	C		D	A	A	C	B	A
Approach Delay		25.6			43.4			10.2			18.8	
Approach LOS		C			D			B			B	
Queue Length 50th (m)	8.9	6.5	0.0	9.4	2.3		42.8	19.5	0.0	5.1	34.8	0.0
Queue Length 95th (m)	17.7	13.9	12.1	18.6	8.8		47.2	21.6	0.6	m9.7	54.9	m0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	355	479	485	267	344		422	2655	1227	252	1736	826
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	0.13	0.07	0.22	0.18	0.07		0.60	0.39	0.16	0.16	0.31	0.03

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 87 (87%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 61.3% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: 43 Street N & 9 Ave N

5: 43 Street N & 5 Ave N

Future 2022 AM Peak Hour - Mitigated

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	91	160	267	1186	563	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		184				51
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	105	184	307	1363	647	51
Shared Lane Traffic (%)						
Lane Group Flow (vph)	105	184	307	1363	647	51
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		35.0	83.5	48.5	48.5
Total Split (%)	16.5%		35.0%	83.5%	48.5%	48.5%
Maximum Green (s)	10.0		29.0	77.0	42.0	42.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0		3.0	3.0	3.0	3.0

5: 43 Street N & 5 Ave N

Future 2022 AM Peak Hour - Mitigated

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Time Before Reduce (s)	0.0		0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0		0.0	0.0	0.0	0.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	22.8	81.6	51.5	51.5
Actuated g/C Ratio	0.10	1.00	0.23	0.82	0.52	0.52
v/c Ratio	0.34	0.13	0.79	0.49	0.40	0.07
Control Delay	45.2	0.2	50.9	4.5	11.1	1.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.2	0.2	50.9	4.5	11.1	1.6
LOS	D	A	D	A	B	A
Approach Delay	16.5			13.0	10.4	
Approach LOS	B			B	B	
Queue Length 50th (m)	10.4	0.0	58.9	45.3	50.8	0.4
Queue Length 95th (m)	18.2	0.0	80.0	53.6	17.7	1.3
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	312	1442	493	2779	1602	741
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	0.34	0.13	0.62	0.49	0.40	0.07

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 32 (32%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 12.7 Intersection LOS: B
Intersection Capacity Utilization 54.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 5: 43 Street N & 5 Ave N

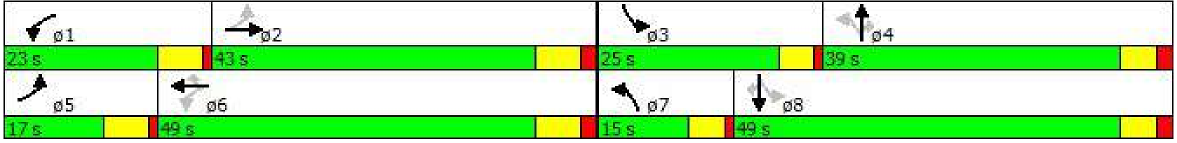
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	480	659	9	266	641	589	283	750	192	432	438	227
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor												
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3155	3246	0	1656	3312	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.288			0.162			0.480			0.105		
Satd. Flow (perm)	956	3246	0	282	3312	1482	1608	3282	1468	337	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				288			199			247
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
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
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	522	716	10	289	697	640	308	815	209	470	476	247
Shared Lane Traffic (%)												
Lane Group Flow (vph)	522	726	0	289	697	640	308	815	209	470	476	247
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	17.0	43.0		23.0	49.0	49.0	15.0	39.0	39.0	25.0	49.0	49.0
Total Split (%)	13.1%	33.1%		17.7%	37.7%	37.7%	11.5%	30.0%	30.0%	19.2%	37.7%	37.7%
Maximum Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	48.0	36.0		60.0	42.0	42.0	44.0	33.0	33.0	57.5	41.5	41.5
Actuated g/C Ratio	0.37	0.28		0.47	0.33	0.33	0.34	0.26	0.26	0.45	0.32	0.32
v/c Ratio	0.96	0.80		0.92	0.64	0.94	0.46	0.97	0.40	0.87	0.47	0.40
Control Delay	57.8	50.8		61.6	40.4	47.0	25.3	71.5	8.5	49.7	36.5	5.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.8	50.8		61.6	40.4	47.0	25.3	71.5	8.5	49.7	36.5	5.7
LOS	E	D		E	D	D	C	E	A	D	D	A
Approach Delay		53.7			46.8			50.9			35.3	
Approach LOS		D			D			D			D	
Queue Length 50th (m)	45.8	96.1		50.7	84.6	106.2	25.4	115.4	2.1	48.4	53.1	0.0
Queue Length 95th (m)	#78.5	120.8		#106.6	106.7	#188.9	35.4	#159.0	22.6	#73.7	70.1	19.1
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	545	909		313	1082	678	673	842	525	572	1050	634
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	0.96	0.80		0.92	0.64	0.94	0.46	0.97	0.40	0.82	0.45	0.39

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 128.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 46.9 Intersection LOS: D
Intersection Capacity Utilization 86.7% 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: 6: 43 Street S/43 Street N & Hwy 3



Lanes, Volumes, Timings
4: 43 Street N & 9 Ave N

Timing Plan: FU2022-PM
Future 2022 PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	23	9	248	186	25	33	144	477	42	9	904	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.915				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1704	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.710			0.750			0.950			0.427		
Satd. Flow (perm)	1273	1792	1524	1397	1704	0	1597	3195	1429	758	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310		41				52			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	29	11	310	232	31	41	180	596	52	11	1130	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	11	310	232	72	0	180	596	52	11	1130	70
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		12.0	22.5	22.5	22.5	22.5	22.5
Total Split (s)	30.0	30.0	30.0	30.0	30.0		24.0	70.0	70.0	46.0	46.0	46.0
Total Split (%)	30.0%	30.0%	30.0%	30.0%	30.0%		24.0%	70.0%	70.0%	46.0%	46.0%	46.0%
Maximum Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	20.3	20.3	20.3	20.3	20.3		15.3	66.7	66.7	45.4	45.4	45.4
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.20		0.15	0.67	0.67	0.45	0.45	0.45
v/c Ratio	0.11	0.03	0.56	0.82	0.19		0.74	0.28	0.05	0.03	0.74	0.09
Control Delay	31.9	30.1	7.9	60.5	17.3		54.3	6.1	1.5	18.8	27.6	1.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.9	30.1	7.9	60.5	17.3		54.3	6.1	1.5	18.8	27.6	1.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	E	B		D	A	A	B	C	A
Approach Delay		10.6			50.2			16.3			26.0	
Approach LOS		B			D			B			C	
90th %ile Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
90th %ile Term Code	Hold	Hold	Hold	Max	Max		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
70th %ile Term Code	Hold	Hold	Hold	Max	Max		Max	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	22.0	22.0	22.0	22.0	22.0		16.4	65.0	65.0	42.6	42.6	42.6
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	18.7	18.7	18.7	18.7	18.7		13.9	68.3	68.3	48.4	48.4	48.4
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	13.9	13.9	13.9	13.9	13.9		10.2	73.1	73.1	56.9	56.9	56.9
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	19	9	29	171	24		135	205	8	6	722	3
Fuel Used(l)	3	1	20	24	5		21	45	4	1	90	3
CO Emissions (g/hr)	49	20	369	446	91		398	845	66	15	1672	58
NOx Emissions (g/hr)	9	4	71	86	18		77	163	13	3	323	11
VOC Emissions (g/hr)	11	5	85	103	21		92	195	15	3	386	13
Dilemma Vehicles (#)	0	0	0	0	0		0	22	0	0	45	0
Queue Length 50th (m)	4.8	1.8	0.0	44.5	5.1		35.4	28.5	0.5	1.3	102.2	0.0
Queue Length 95th (m)	10.9	5.6	12.7	61.4	13.9		50.5	34.3	2.1	4.5	114.3	2.2
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	299	421	595	328	431		287	2130	970	343	1531	741
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	0.10	0.03	0.52	0.71	0.17		0.63	0.28	0.05	0.03	0.74	0.09

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 23.8 Intersection LOS: C
Intersection Capacity Utilization 66.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	51	274	230	697	1406	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		304				124
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	57	304	256	774	1562	124
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	304	256	774	1562	124
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		28.0	83.5	55.5	55.5
Total Split (%)	16.5%		28.0%	83.5%	55.5%	55.5%
Maximum Green (s)	10.0		22.0	77.0	49.0	49.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	19.5	81.6	54.8	54.8
Actuated g/C Ratio	0.10	1.00	0.20	0.82	0.55	0.55
v/c Ratio	0.17	0.20	0.82	0.29	0.84	0.14
Control Delay	42.7	0.3	59.0	3.3	15.2	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.7	0.3	59.0	3.3	15.2	1.2

Lanes, Volumes, Timings
5: 43 Street N & 5 Ave N

Timing Plan: FU2022-PM
Future 2022 PM Peak Hour

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	E	A	B	A
Approach Delay	7.0			17.2	14.2	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		22.0	77.0	49.0	49.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		22.0	77.0	49.0	49.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		21.3	77.0	49.7	49.7
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	10.0		18.3	77.0	52.7	52.7
30th %ile Term Code	Max		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		13.9	93.5	73.6	73.6
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	46	0	210	162	804	5
Fuel Used(l)	6	19	30	46	150	9
CO Emissions (g/hr)	116	354	559	853	2793	165
NOx Emissions (g/hr)	22	68	108	165	539	32
VOC Emissions (g/hr)	27	82	129	197	644	38
Dilemma Vehicles (#)	0	0	0	30	54	0
Queue Length 50th (m)	5.5	0.0	49.2	20.3	46.5	0.1
Queue Length 95th (m)	11.8	0.0	#83.5	26.6	#201.4	m2.3
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	354	2629	1866	891
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	0.20	0.72	0.29	0.84	0.14

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 14.4 Intersection LOS: B
Intersection Capacity Utilization 75.8% 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: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	216	627	6	288	781	303	387	374	313	452	694	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	1		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1641	3275	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.250			0.203			0.120			0.418		
Satd. Flow (perm)	432	3275	0	360	3374	1509	413	3374	1509	1388	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				329			313			204
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	235	682	7	313	849	329	421	407	340	491	754	380
Shared Lane Traffic (%)												
Lane Group Flow (vph)	235	689	0	313	849	329	421	407	340	491	754	380
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	43.0		29.0	56.0	56.0	19.0	40.0	40.0	18.0	39.0	39.0
Total Split (%)	12.3%	33.1%		22.3%	43.1%	43.1%	14.6%	30.8%	30.8%	13.8%	30.0%	30.0%
Maximum Green (s)	10.0	36.0		23.0	49.0	49.0	14.0	34.0	34.0	13.0	33.0	33.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	50.3	39.3		65.6	49.0	49.0	48.3	33.3	33.3	46.3	32.3	32.3
Actuated g/C Ratio	0.39	0.30		0.51	0.38	0.38	0.37	0.26	0.26	0.36	0.25	0.25
v/c Ratio	0.90	0.69		0.82	0.66	0.42	0.91	0.47	0.55	0.73	0.93	0.74
Control Delay	60.8	44.8		38.3	36.5	4.6	56.3	42.6	9.4	35.8	65.9	29.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.8	44.8		38.3	36.5	4.6	56.3	42.6	9.4	35.8	65.9	29.6
LOS	E	D		D	D	A	E	D	A	D	E	C
Approach Delay		48.9			29.8			37.9			48.3	
Approach LOS		D			C			D			D	

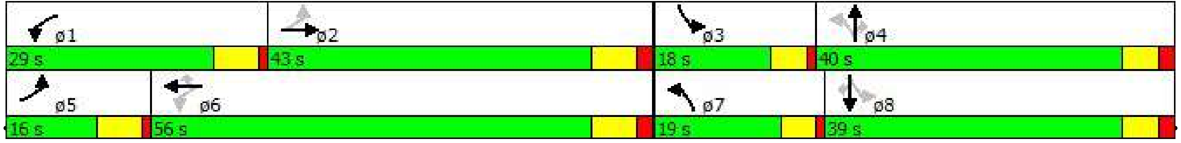
6: 43 Street S/43 Street N & Hwy 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	36.0		23.0	49.0	49.0	14.0	34.0	34.0	13.0	33.0	33.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
70th %ile Green (s)	10.0	36.0		23.0	49.0	49.0	14.0	34.0	34.0	13.0	33.0	33.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
50th %ile Green (s)	10.0	38.3		20.7	49.0	49.0	14.0	34.0	34.0	13.0	33.0	33.0
50th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
30th %ile Green (s)	10.0	41.0		18.0	49.0	49.0	14.0	34.0	34.0	13.0	33.0	33.0
30th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
10th %ile Green (s)	10.0	45.1		13.9	49.0	49.0	14.0	30.5	30.5	13.0	29.5	29.5
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Gap	Gap
Stops (vph)	138	551		172	633	24	261	308	42	350	638	162
Fuel Used(l)	26	76		36	106	21	40	37	16	49	94	33
CO Emissions (g/hr)	477	1411		669	1972	390	753	687	297	910	1757	608
NOx Emissions (g/hr)	92	272		129	381	75	145	133	57	176	339	117
VOC Emissions (g/hr)	110	326		154	455	90	174	159	68	210	405	140
Dilemma Vehicles (#)	0	24		0	30	0	0	14	0	0	26	0
Queue Length 50th (m)	35.4	87.2		49.5	99.5	0.0	41.8	48.7	5.5	47.3	104.4	44.5
Queue Length 95th (m)	#79.3	113.1		#80.0	123.0	19.4	#72.4	65.3	33.2	62.1	#141.6	84.6
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	261	996		419	1278	776	463	887	627	674	830	523
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.90	0.69		0.75	0.66	0.42	0.91	0.46	0.54	0.73	0.91	0.73

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 129.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 40.8 Intersection LOS: D
Intersection Capacity Utilization 83.8% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 130
30th %ile Actuated Cycle: 130
10th %ile Actuated Cycle: 126.5
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	20	9	179	218	31	25	106	338	60	7	279	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.883			0.988			0.984			0.994	
Flt Protected		0.995			0.962			0.990			0.999	
Satd. Flow (prot)	0	1531	0	0	1642	0	0	1698	0	0	1747	0
Flt Permitted		0.949			0.581			0.825			0.986	
Satd. Flow (perm)	0	1461	0	0	992	0	0	1415	0	0	1724	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		208			6			10			3	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		716.1			264.9			496.3			520.4	
Travel Time (s)		51.6			19.1			25.5			26.8	
Peak Hour Factor	0.86	0.86	0.86	0.92	0.92	0.92	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	9%	9%	9%	10%	10%	10%	9%	9%	9%	8%	8%	8%
Adj. Flow (vph)	23	10	208	237	34	27	123	393	70	8	324	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	298	0	0	586	0	0	347	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		26.5	26.5		22.5	22.5	
Total Split (s)	43.2	43.2		43.2	43.2		56.8	56.8		56.8	56.8	
Total Split (%)	43.2%	43.2%		43.2%	43.2%		56.8%	56.8%		56.8%	56.8%	
Maximum Green (s)	36.7	36.7		36.7	36.7		50.3	50.3		50.3	50.3	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		36.7			36.7			50.3			50.3	
Actuated g/C Ratio		0.37			0.37			0.50			0.50	
v/c Ratio		0.36			0.81			0.82			0.40	
Control Delay		6.4			47.3			18.8			17.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		6.4			47.3			18.8			17.1	
LOS		A			D			B			B	
Approach Delay		6.4			47.3			18.8			17.1	
Approach LOS		A			D			B			B	
Stops (vph)		33			227			228			177	
Fuel Used(l)		16			22			38			24	
CO Emissions (g/hr)		295			408			700			452	
NOx Emissions (g/hr)		57			79			135			87	
VOC Emissions (g/hr)		68			94			162			104	
Dilemma Vehicles (#)		0			0			38			15	
Queue Length 50th (m)		4.3			53.1			17.8			41.8	
Queue Length 95th (m)		18.3			#100.8			100.1			60.1	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (m)		692.1			240.9			472.3			496.4	
Turn Bay Length (m)												
Base Capacity (vph)		667			367			716			868	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.36			0.81			0.82			0.40	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 86 (86%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 65

Control Type: Pretimed

Maximum v/c Ratio: 0.82

Intersection Signal Delay: 22.1 Intersection LOS: C

Intersection Capacity Utilization 92.7% ICU Level of Service F

Analysis Period (min) 15

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

Splits and Phases: 2: 43 Street N & 18 Ave N

Lanes, Volumes, Timings | Timing Plan: FU2022-PM-Mit
3: 43 Street N & 14 Ave N | Future 2022 PM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (vph)	14	2	89	212	6	25	17	489	58	7	653	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	75.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.885			0.986			0.986			0.999	
Flt Protected		0.993			0.958		0.950					
Satd. Flow (prot)	0	1621	0	0	1632	0	1656	1719	0	0	1726	0
Flt Permitted		0.937			0.684		0.307				0.993	
Satd. Flow (perm)	0	1530	0	0	1165	0	535	1719	0	0	1713	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		107			6			9			1	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		748.5			244.9			405.2			496.3	
Travel Time (s)		53.9			17.6			20.8			25.5	
Peak Hour Factor	0.83	0.92	0.83	0.92	0.92	0.92	0.83	0.83	0.92	0.92	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	10%	10%	10%	9%	9%	9%	10%	10%	10%
Adj. Flow (vph)	17	2	107	230	7	27	20	589	63	8	787	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	126	0	0	264	0	20	652	0	0	800	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	36.0	36.0		36.0	36.0		64.0	64.0		64.0	64.0	
Total Split (%)	36.0%	36.0%		36.0%	36.0%		64.0%	64.0%		64.0%	64.0%	
Maximum Green (s)	29.5	29.5		29.5	29.5		57.5	57.5		57.5	57.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		6.5			6.5		6.5	6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		29.5			29.5		57.5	57.5			57.5	
Actuated g/C Ratio		0.30			0.30		0.58	0.58			0.58	
v/c Ratio		0.24			0.76		0.07	0.66			0.81	
Control Delay		8.5			47.3		8.6	16.2			22.1	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		8.5			47.3		8.6	16.2			22.1	
LOS		A			D		A	B			C	
Approach Delay		8.5			47.3			15.9			22.1	
Approach LOS		A			D			B			C	
Stops (vph)		23			206		6	342			473	
Fuel Used(l)		9			19		1	49			59	
CO Emissions (g/hr)		161			355		23	906			1096	
NOx Emissions (g/hr)		31			69		4	175			212	
VOC Emissions (g/hr)		37			82		5	209			253	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Dilemma Vehicles (#)		0			0		0	24			57	
Queue Length 50th (m)		2.8			47.7		1.4	53.2			108.0	
Queue Length 95th (m)		16.3			#88.2		3.4	62.7			147.7	
Internal Link Dist (m)		724.5			220.9			381.2			472.3	
Turn Bay Length (m)							75.0					
Base Capacity (vph)		526			347		307	992			985	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.24			0.76		0.07	0.66			0.81	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 63 (63%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 70

Control Type: Pretimed

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 22.5 Intersection LOS: C

Intersection Capacity Utilization 71.3% 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: 43 Street N & 14 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	23	9	248	186	25	33	144	477	42	9	904	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.915				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1792	1524	1770	1704	0	1597	3195	1429	1687	3374	1509
Flt Permitted	0.710			0.750			0.950			0.427		
Satd. Flow (perm)	1273	1792	1524	1397	1704	0	1597	3195	1429	758	3374	1509
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310		41				52			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	6%	6%	6%	2%	2%	2%	13%	13%	13%	7%	7%	7%
Adj. Flow (vph)	29	11	310	232	31	41	180	596	52	11	1130	70
Shared Lane Traffic (%)												
Lane Group Flow (vph)	29	11	310	232	72	0	180	596	52	11	1130	70
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		12.0	22.5	22.5	22.5	22.5	22.5
Total Split (s)	30.0	30.0	30.0	30.0	30.0		24.0	70.0	70.0	46.0	46.0	46.0
Total Split (%)	30.0%	30.0%	30.0%	30.0%	30.0%		24.0%	70.0%	70.0%	46.0%	46.0%	46.0%
Maximum Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0			11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	20.3	20.3	20.3	20.3	20.3		15.3	66.7	66.7	45.4	45.4	45.4
Actuated g/C Ratio	0.20	0.20	0.20	0.20	0.20		0.15	0.67	0.67	0.45	0.45	0.45
v/c Ratio	0.11	0.03	0.56	0.82	0.19		0.74	0.28	0.05	0.03	0.74	0.09
Control Delay	31.9	30.1	7.9	60.5	17.3		54.3	6.1	1.5	20.8	25.4	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.9	30.1	7.9	60.5	17.3		54.3	6.1	1.5	20.8	25.4	2.9

4: 43 Street N & 9 Ave N

Future 2022 PM Peak Hour - Mitigated

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C	A	E	B		D	A	A	C	C	A
Approach Delay		10.6			50.2			16.3			24.1	
Approach LOS		B			D			B			C	
90th %ile Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
90th %ile Term Code	Hold	Hold	Hold	Max	Max		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	23.5	23.5	23.5	23.5	23.5		18.0	63.5	63.5	39.5	39.5	39.5
70th %ile Term Code	Hold	Hold	Hold	Max	Max		Max	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	22.0	22.0	22.0	22.0	22.0		16.4	65.0	65.0	42.6	42.6	42.6
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	18.7	18.7	18.7	18.7	18.7		13.9	68.3	68.3	48.4	48.4	48.4
30th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	13.9	13.9	13.9	13.9	13.9		10.2	73.1	73.1	56.9	56.9	56.9
10th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	19	9	29	171	24		135	205	8	7	638	7
Fuel Used(l)	3	1	20	24	5		21	45	4	1	86	3
CO Emissions (g/hr)	49	20	369	446	91		398	845	66	16	1593	61
NOx Emissions (g/hr)	9	4	71	86	18		77	163	13	3	307	12
VOC Emissions (g/hr)	11	5	85	103	21		92	195	15	4	367	14
Dilemma Vehicles (#)	0	0	0	0	0		0	22	0	0	59	0
Queue Length 50th (m)	4.8	1.8	0.0	44.5	5.1		35.4	28.5	0.5	1.2	80.1	0.1
Queue Length 95th (m)	10.9	5.6	12.7	61.4	13.9		50.5	34.3	2.1	m2.3	104.1	m0.8
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	299	421	595	328	431		287	2130	970	343	1531	741
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	0.10	0.03	0.52	0.71	0.17		0.63	0.28	0.05	0.03	0.74	0.09

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 85 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 22.9 Intersection LOS: C
Intersection Capacity Utilization 66.9% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: 43 Street N & 9 Ave N

	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	51	274	230	697	1406	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3273	1509	1612	3223	3406	1524
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3273	1509	1612	3223	3406	1524
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		304				124
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			240.1	882.4	
Travel Time (s)	52.4			14.4	52.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	7%	12%	12%	6%	6%
Adj. Flow (vph)	57	304	256	774	1562	124
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	304	256	774	1562	124
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		28.0	83.5	55.5	55.5
Total Split (%)	16.5%		28.0%	83.5%	55.5%	55.5%
Maximum Green (s)	10.0		22.0	77.0	49.0	49.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	19.5	81.6	54.8	54.8
Actuated g/C Ratio	0.10	1.00	0.20	0.82	0.55	0.55
v/c Ratio	0.17	0.20	0.82	0.29	0.84	0.14
Control Delay	42.7	0.3	59.0	3.3	15.2	1.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.7	0.3	59.0	3.3	15.2	1.2

5: 43 Street N & 5 Ave N

Future 2022 PM Peak Hour - Mitigated

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	E	A	B	A
Approach Delay	7.0			17.2	14.2	
Approach LOS	A			B	B	
90th %ile Green (s)	10.0		22.0	77.0	49.0	49.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		22.0	77.0	49.0	49.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		21.3	77.0	49.7	49.7
50th %ile Term Code	Max		Gap	Coord	Coord	Coord
30th %ile Green (s)	10.0		18.3	77.0	52.7	52.7
30th %ile Term Code	Max		Gap	Coord	Coord	Coord
10th %ile Green (s)	0.0		13.9	93.5	73.6	73.6
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Stops (vph)	46	0	210	162	770	5
Fuel Used(l)	6	19	30	46	149	9
CO Emissions (g/hr)	116	354	559	853	2773	165
NOx Emissions (g/hr)	22	68	108	165	535	32
VOC Emissions (g/hr)	27	82	129	197	639	38
Dilemma Vehicles (#)	0	0	0	30	61	0
Queue Length 50th (m)	5.5	0.0	49.2	20.3	47.5	0.1
Queue Length 95th (m)	11.8	0.0	#83.5	26.6	#201.3	m2.3
Internal Link Dist (m)	704.0			216.1	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	327	1509	354	2629	1866	891
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	0.20	0.72	0.29	0.84	0.14

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 14.3 Intersection LOS: B

Intersection Capacity Utilization 75.8% 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: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↱		↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	216	627	6	288	781	303	387	374	313	452	694	350
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	1		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.95	0.95	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3183	3275	0	1687	3374	1509	3273	3374	1509	3155	3252	1455
Flt Permitted	0.245			0.190			0.136			0.407		
Satd. Flow (perm)	821	3275	0	337	3374	1509	469	3374	1509	1352	3252	1455
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				329			315			202
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			401.6	
Travel Time (s)		20.2			35.0			27.3			24.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	10%	10%	10%	7%	7%	7%	7%	7%	7%	11%	11%	11%
Adj. Flow (vph)	235	682	7	313	849	329	421	407	340	491	754	380
Shared Lane Traffic (%)												
Lane Group Flow (vph)	235	689	0	313	849	329	421	407	340	491	754	380
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	41.0		29.0	54.0	54.0	19.0	41.0	41.0	19.0	41.0	41.0
Total Split (%)	12.3%	31.5%		22.3%	41.5%	41.5%	14.6%	31.5%	31.5%	14.6%	31.5%	31.5%
Maximum Green (s)	10.0	34.0		23.0	47.0	47.0	14.0	35.0	35.0	14.0	35.0	35.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	47.9	36.9		63.6	47.0	47.0	48.3	33.3	33.3	48.3	33.3	33.3
Actuated g/C Ratio	0.37	0.29		0.50	0.37	0.37	0.38	0.26	0.26	0.38	0.26	0.26
v/c Ratio	0.48	0.73		0.83	0.69	0.43	0.87	0.47	0.54	0.70	0.89	0.72
Control Delay	22.9	47.6		41.7	38.2	4.8	48.5	41.9	9.1	32.7	59.9	28.2
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	22.9	47.6		41.7	38.2	4.8	48.5	41.9	9.1	32.7	59.9	28.2
LOS	C	D		D	D	A	D	D	A	C	E	C
Approach Delay		41.3			31.6			34.7			44.3	
Approach LOS		D			C			C			D	

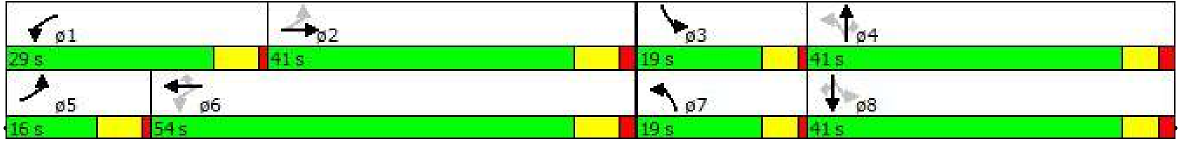
6: 43 Street S/43 Street N & Hwy 3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	34.0		23.0	47.0	47.0	14.0	35.0	35.0	14.0	35.0	35.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
70th %ile Green (s)	10.0	34.0		23.0	47.0	47.0	14.0	35.0	35.0	14.0	35.0	35.0
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
50th %ile Green (s)	10.0	34.7		22.3	47.0	47.0	14.0	35.0	35.0	14.0	35.0	35.0
50th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Max	Max
30th %ile Green (s)	10.0	38.5		18.5	47.0	47.0	14.0	33.9	33.9	14.0	33.9	33.9
30th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Gap	Gap
10th %ile Green (s)	10.0	43.1		13.9	47.0	47.0	14.0	27.8	27.8	14.0	27.8	27.8
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Hold	Hold	Max	Gap	Gap
Stops (vph)	139	562		178	647	24	256	306	41	329	640	161
Fuel Used(l)	19	78		37	108	21	38	37	16	47	91	32
CO Emissions (g/hr)	361	1448		689	2006	391	706	682	295	877	1699	601
NOx Emissions (g/hr)	70	280		133	387	75	136	132	57	169	328	116
VOC Emissions (g/hr)	83	334		159	463	90	163	157	68	202	392	139
Dilemma Vehicles (#)	0	25		0	30	0	0	14	0	0	26	0
Queue Length 50th (m)	17.4	91.0		51.2	102.2	0.0	38.6	48.2	5.0	45.9	102.1	44.1
Queue Length 95th (m)	25.3	115.7		#90.8	126.4	19.9	#66.9	64.5	32.2	60.4	#134.2	83.3
Internal Link Dist (m)		425.3			752.8			430.3			377.6	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	490	943		410	1236	761	482	920	640	705	887	544
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	0.48	0.73		0.76	0.69	0.43	0.87	0.44	0.53	0.70	0.85	0.70

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 128.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 38.0 Intersection LOS: D
Intersection Capacity Utilization 83.7% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 130
30th %ile Actuated Cycle: 128.9
10th %ile Actuated Cycle: 122.8
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



2: 43 Street N & 18 Ave N

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	13	35	149	54	8	6	249	212	243	28	376	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.898			0.987			0.953			0.995	
Flt Protected		0.997			0.962			0.983			0.997	
Satd. Flow (prot)	0	1519	0	0	1640	0	0	1618	0	0	1830	0
Flt Permitted		0.980			0.595			0.645			0.905	
Satd. Flow (perm)	0	1493	0	0	1014	0	0	1062	0	0	1661	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		155			5			46			3	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		716.1			196.5			496.3			520.4	
Travel Time (s)		51.6			14.1			25.5			26.8	
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	12%	12%	12%	10%	10%	10%	10%	10%	10%	3%	3%	3%
Adj. Flow (vph)	17	45	191	59	9	7	319	272	312	36	482	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	253	0	0	75	0	0	903	0	0	537	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		26.5	26.5		22.5	22.5	
Total Split (s)	35.0	35.0		35.0	35.0		65.0	65.0		65.0	65.0	
Total Split (%)	35.0%	35.0%		35.0%	35.0%		65.0%	65.0%		65.0%	65.0%	
Maximum Green (s)	28.5	28.5		28.5	28.5		58.5	58.5		58.5	58.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		28.5			28.5			58.5			58.5	
Actuated g/C Ratio		0.28			0.28			0.58			0.58	
v/c Ratio		0.47			0.26			1.41			0.55	
Control Delay		14.8			28.6			204.0			15.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.8			28.6			204.0			15.4	
LOS		B			C			F			B	
Approach Delay		14.8			28.6			204.0			15.4	
Approach LOS		B			C			F			B	
Stops (vph)		66			49			351			247	
Fuel Used(l)		17			4			154			34	
CO Emissions (g/hr)		318			73			2871			624	
NOx Emissions (g/hr)		61			14			554			120	
VOC Emissions (g/hr)		73			17			662			144	
Dilemma Vehicles (#)		0			0			33			21	
Queue Length 50th (m)		15.3			11.0			~243.2			62.3	
Queue Length 95th (m)		28.0			23.5			m#233.4			73.2	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (m)		692.1			172.5			472.3			496.4	
Turn Bay Length (m)												
Base Capacity (vph)		536			292			640			972	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.47			0.26			1.41			0.55	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 86 (86%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Pretimed
Maximum v/c Ratio: 1.41
Intersection Signal Delay: 112.2 Intersection LOS: F
Intersection Capacity Utilization 101.6% ICU Level of Service G
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: 43 Street N & 18 Ave N

3: 43 Street N & 14 Ave N

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↱			✥	
Volume (vph)	4	7	27	53	2	6	101	670	236	28	532	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	75.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.905			0.986			0.961			0.995	
Flt Protected		0.995			0.959		0.950				0.998	
Satd. Flow (prot)	0	1104	0	0	1633	0	1641	1660	0	0	1780	0
Flt Permitted		0.975			0.728		0.368				0.501	
Satd. Flow (perm)	0	1082	0	0	1240	0	636	1660	0	0	894	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		33			5			36			4	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		748.5			168.6			405.2			496.3	
Travel Time (s)		53.9			12.1			20.8			25.5	
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	55%	55%	55%	10%	10%	10%	10%	10%	10%	6%	6%	6%
Adj. Flow (vph)	5	9	33	58	2	7	125	827	291	35	657	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	47	0	0	67	0	125	1118	0	0	718	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	29.0	29.0		29.0	29.0		71.0	71.0		71.0	71.0	
Total Split (%)	29.0%	29.0%		29.0%	29.0%		71.0%	71.0%		71.0%	71.0%	
Maximum Green (s)	22.5	22.5		22.5	22.5		64.5	64.5		64.5	64.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		6.5			6.5		6.5	6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		22.5			22.5		64.5	64.5			64.5	
Actuated g/C Ratio		0.22			0.22		0.64	0.64			0.64	
v/c Ratio		0.17			0.24		0.30	1.03			1.24	
Control Delay		16.7			32.1		7.8	49.3			146.6	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		16.7			32.1		7.8	49.3			146.6	
LOS		B			C		A	D			F	
Approach Delay		16.7			32.1			45.2			146.6	
Approach LOS		B			C			D			F	
Stops (vph)		15			47		27	613			428	
Fuel Used(l)		4			4		7	106			108	
CO Emissions (g/hr)		66			67		126	1968			2008	
NOx Emissions (g/hr)		13			13		24	380			388	
VOC Emissions (g/hr)		15			15		29	454			463	

3: 43 Street N & 14 Ave N

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Dilemma Vehicles (#)		0			0		0	37			38	
Queue Length 50th (m)		2.3			10.4		7.3	~182.5			~177.2	
Queue Length 95th (m)		10.1			22.7		11.0	#130.1			#213.5	
Internal Link Dist (m)		724.5			144.6			381.2			472.3	
Turn Bay Length (m)							75.0					
Base Capacity (vph)		269			282		410	1083			578	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.17			0.24		0.30	1.03			1.24	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 63 (63%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Pretimed

Maximum v/c Ratio: 1.24

Intersection Signal Delay: 79.2 Intersection LOS: E

Intersection Capacity Utilization 73.1% 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.

Splits and Phases: 3: 43 Street N & 14 Ave N

4: 43 Street N & 9 Ave N

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	39	32	116	46	12	11	282	971	193	38	551	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.928				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1296	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.740			0.732			0.950			0.242		
Satd. Flow (perm)	1365	1845	1568	1023	1296	0	1656	3312	1482	422	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140		13				233			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	47	39	140	55	14	13	340	1170	233	46	664	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	39	140	55	27	0	340	1170	233	46	664	30
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		27.0	67.5	67.5	40.5	40.5	40.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		27.0%	67.5%	67.5%	40.5%	40.5%	40.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		21.0	61.0	61.0	34.0	34.0	34.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	12.0	12.0	12.0	12.0	12.0		28.0	75.0	75.0	41.0	41.0	41.0
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12		0.28	0.75	0.75	0.41	0.41	0.41
v/c Ratio	0.29	0.18	0.45	0.45	0.16		0.73	0.47	0.20	0.27	0.49	0.04
Control Delay	43.9	40.4	11.6	52.3	27.1		35.5	3.0	0.4	29.8	28.7	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	40.4	11.6	52.3	27.1		35.5	3.0	0.4	29.8	28.7	0.0

4: 43 Street N & 9 Ave N

Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	C	C	A
Approach Delay		23.3			44.0			9.0			27.6	
Approach LOS		C			D			A			C	
90th %ile Green (s)	16.2	16.2	16.2	16.2	16.2		30.8	70.8	70.8	34.0	34.0	34.0
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Max	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	12.9	12.9	12.9	12.9	12.9		29.8	74.1	74.1	38.3	38.3	38.3
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.7	10.7	10.7	10.7	10.7		28.6	76.3	76.3	41.7	41.7	41.7
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		27.1	77.0	77.0	43.9	43.9	43.9
30th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		23.9	77.0	77.0	47.1	47.1	47.1
10th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
Stops (vph)	34	29	18	42	13		211	162	2	26	387	0
Fuel Used(l)	5	4	10	6	2		36	82	15	4	54	1
CO Emissions (g/hr)	90	73	181	105	39		672	1523	277	69	996	24
NOx Emissions (g/hr)	17	14	35	20	8		130	294	54	13	192	5
VOC Emissions (g/hr)	21	17	42	24	9		155	351	64	16	230	6
Dilemma Vehicles (#)	0	0	0	0	0		0	45	0	0	39	0
Queue Length 50th (m)	9.0	7.4	0.0	10.8	2.6		44.2	16.6	0.0	6.9	53.3	0.0
Queue Length 95th (m)	17.7	15.2	13.3	20.4	9.4		68.2	17.8	0.2	m6.8	m45.8	m0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	354	479	511	265	346		464	2485	1170	172	1357	668
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	0.13	0.08	0.27	0.21	0.08		0.73	0.47	0.20	0.27	0.49	0.04

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 87 (87%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 16.1 Intersection LOS: B

Intersection Capacity Utilization 64.8% ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 4: 43 Street N & 9 Ave N

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	98	213	356	1405	711	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		245				61
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	113	245	409	1615	817	61
Shared Lane Traffic (%)						
Lane Group Flow (vph)	113	245	409	1615	817	61
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		35.0	83.5	48.5	48.5
Total Split (%)	16.5%		35.0%	83.5%	48.5%	48.5%
Maximum Green (s)	10.0		29.0	77.0	42.0	42.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	100.0	26.9	77.0	44.1	44.1
Actuated g/C Ratio	0.10	1.00	0.27	0.77	0.44	0.44
v/c Ratio	0.36	0.17	0.89	0.62	0.60	0.09
Control Delay	45.6	0.3	58.0	6.3	9.6	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.6	0.3	58.0	6.3	9.6	1.0

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	D	A	E	A	A	A
Approach Delay	14.6			16.7	9.0	
Approach LOS	B			B	A	
90th %ile Green (s)	10.0		29.0	77.0	42.0	42.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		29.0	77.0	42.0	42.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		29.0	77.0	42.0	42.0
50th %ile Term Code	Max		Max	Coord	Coord	Coord
30th %ile Green (s)	10.0		26.4	77.0	44.6	44.6
30th %ile Term Code	Max		Gap	Coord	Coord	Coord
10th %ile Green (s)	10.0		21.2	77.0	49.8	49.8
10th %ile Term Code	Max		Gap	Coord	Coord	Coord
Stops (vph)	88	0	319	553	283	3
Fuel Used(l)	12	15	46	103	69	4
CO Emissions (g/hr)	227	275	856	1914	1281	78
NOx Emissions (g/hr)	44	53	165	369	247	15
VOC Emissions (g/hr)	52	63	197	442	296	18
Dilemma Vehicles (#)	0	0	0	70	21	0
Queue Length 50th (m)	11.2	0.0	77.8	61.3	15.7	0.2
Queue Length 95th (m)	19.4	0.0	#120.9	71.7	21.8	1.6
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	312	1442	493	2622	1371	647
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	0.36	0.17	0.83	0.62	0.60	0.09

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 32 (32%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 14.4 Intersection LOS: B
Intersection Capacity Utilization 63.5% 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: 5: 43 Street N & 5 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	582	878	12	354	854	722	377	967	255	561	571	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	2		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3155	4664	0	3213	4759	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.220			0.154			0.375			0.105		
Satd. Flow (perm)	731	4664	0	521	4759	1482	1257	3282	1468	337	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				280			202			233
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	633	954	13	385	928	785	410	1051	277	610	621	315
Shared Lane Traffic (%)												
Lane Group Flow (vph)	633	967	0	385	928	785	410	1051	277	610	621	315
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	17.0	43.0		23.0	49.0	49.0	15.0	39.0	39.0	25.0	49.0	49.0
Total Split (%)	13.1%	33.1%		17.7%	37.7%	37.7%	11.5%	30.0%	30.0%	19.2%	37.7%	37.7%
Maximum Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	50.3	38.3		57.7	42.0	42.0	44.0	33.0	33.0	59.0	43.0	43.0
Actuated g/C Ratio	0.39	0.29		0.44	0.32	0.32	0.34	0.25	0.25	0.45	0.33	0.33
v/c Ratio	1.30	0.70		0.72	0.60	1.18	0.72	1.26	0.53	1.07	0.60	0.51
Control Delay	175.2	44.5		29.7	39.0	120.1	33.5	167.7	15.9	94.5	39.2	12.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	175.2	44.5		29.7	39.0	120.1	33.5	167.7	15.9	94.5	39.2	12.4
LOS	F	D		C	D	F	C	F	B	F	D	B
Approach Delay		96.2			67.6			111.8			55.6	
Approach LOS		F			E			F			E	

6: 43 Street S/43 Street N & Hwy 3

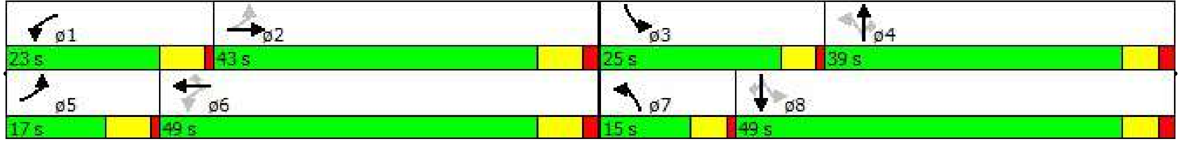
Future 2037 AM Peak Hour - (With BG2037 Mitigation)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	11.0	36.0		17.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
70th %ile Green (s)	11.0	36.3		16.7	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
70th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
50th %ile Green (s)	11.0	38.0		15.0	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
50th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
30th %ile Green (s)	11.0	39.5		13.5	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
30th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
10th %ile Green (s)	11.0	41.6		11.4	42.0	42.0	10.0	33.0	33.0	20.0	43.0	43.0
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
Stops (vph)	350	776		212	699	418	297	787	67	395	465	68
Fuel Used(l)	119	106		42	118	135	34	188	15	85	64	21
CO Emissions (g/hr)	2215	1980		779	2194	2508	636	3503	285	1577	1191	393
NOx Emissions (g/hr)	428	382		150	423	484	123	676	55	304	230	76
VOC Emissions (g/hr)	511	457		180	506	578	147	808	66	364	275	91
Dilemma Vehicles (#)	0	34		0	33	0	0	29	0	0	22	0
Queue Length 50th (m)	~79.3	85.2		32.1	76.9	~198.8	35.0	~187.0	16.0	~79.0	73.3	15.7
Queue Length 95th (m)	#122.9	104.5		43.4	92.5	#278.5	47.0	#230.6	44.6	#117.7	93.8	44.2
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	487	1374		592	1537	668	573	833	523	569	1038	620
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	1.30	0.70		0.65	0.60	1.18	0.72	1.26	0.53	1.07	0.60	0.51

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 82.5 Intersection LOS: F
Intersection Capacity Utilization 103.9% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 130
30th %ile Actuated Cycle: 130
10th %ile Actuated Cycle: 130
~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Lanes, Volumes, Timings
1: 43 Street N & 26 Ave N/Twp Rd 92

Timing Plan: FU2037-AM-Mit
Future 2037 AM Peak Hour - Mitigated

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑↱			↰↑↱			↰↑↱	
Volume (vph)	17	99	299	44	84	6	100	113	31	6	58	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.903			0.994			0.983			0.987	
Flt Protected		0.998			0.984			0.980			0.996	
Satd. Flow (prot)	0	1646	0	0	1787	0	0	1711	0	0	1610	0
Flt Permitted		0.980			0.567			0.825			0.965	
Satd. Flow (perm)	0	1617	0	0	1030	0	0	1440	0	0	1560	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		285			5			17			9	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		697.6			744.1			520.4			321.7	
Travel Time (s)		50.2			53.6			26.8			16.5	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	7%	7%	7%	16%	16%	16%
Adj. Flow (vph)	22	129	388	57	109	8	130	147	40	8	75	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	539	0	0	174	0	0	317	0	0	92	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	24.0	24.0		24.0	24.0		26.0	26.0		26.0	26.0	
Total Split (%)	48.0%	48.0%		48.0%	48.0%		52.0%	52.0%		52.0%	52.0%	
Maximum Green (s)	17.5	17.5		17.5	17.5		19.5	19.5		19.5	19.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.5			6.5			6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		14.4			14.4			22.6			22.6	
Actuated g/C Ratio		0.29			0.29			0.45			0.45	
v/c Ratio		0.81			0.58			0.48			0.13	
Control Delay		18.0			22.3			12.2			9.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.0			22.3			12.2			9.4	
LOS		B			C			B			A	
Approach Delay		18.0			22.3			12.2			9.4	
Approach LOS		B			C			B			A	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	17.5	17.5		17.5	17.5		19.5	19.5		19.5	19.5	
90th %ile Term Code	Max	Max		Hold	Hold		Coord	Coord		Coord	Coord	
70th %ile Green (s)	18.3	18.3		18.3	18.3		18.7	18.7		18.7	18.7	
70th %ile Term Code	Gap	Gap		Hold	Hold		Coord	Coord		Coord	Coord	
50th %ile Green (s)	14.9	14.9		14.9	14.9		22.1	22.1		22.1	22.1	
50th %ile Term Code	Gap	Gap		Hold	Hold		Coord	Coord		Coord	Coord	
30th %ile Green (s)	11.3	11.3		11.3	11.3		25.7	25.7		25.7	25.7	
30th %ile Term Code	Gap	Gap		Hold	Hold		Coord	Coord		Coord	Coord	
10th %ile Green (s)	10.0	10.0		10.0	10.0		27.0	27.0		27.0	27.0	
10th %ile Term Code	Min	Min		Hold	Hold		Coord	Coord		Coord	Coord	
Queue Length 50th (m)		19.5			13.1			19.2			4.3	
Queue Length 95th (m)		31.7			21.7			28.3			10.1	
Internal Link Dist (m)		673.6			720.1			496.4			297.7	
Turn Bay Length (m)												
Base Capacity (vph)		755			366			664			714	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.71			0.48			0.48			0.13	

Intersection Summary

Area Type: Other

Cycle Length: 50

Actuated Cycle Length: 50

Offset: 35 (70%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 45

Control Type: Actuated-Coordinated

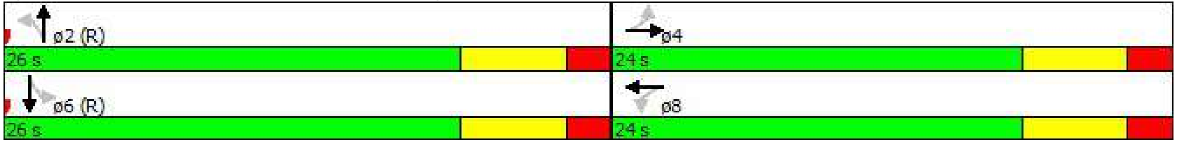
Maximum v/c Ratio: 0.81

Intersection Signal Delay: 16.3 Intersection LOS: B

Intersection Capacity Utilization 56.0% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: 43 Street N & 26 Ave N/Twp Rd 92



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑↱		↰	↑↱			↰↑↱	
Volume (vph)	13	35	149	54	8	6	249	212	243	28	376	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.898			0.987			0.920			0.995	
Flt Protected		0.997			0.962		0.950				0.997	
Satd. Flow (prot)	0	1519	0	0	1640	0	1641	1589	0	0	1830	0
Flt Permitted		0.973			0.315		0.470				0.939	
Satd. Flow (perm)	0	1482	0	0	537	0	812	1589	0	0	1723	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		142			5			118			4	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		716.1			196.5			496.3			520.4	
Travel Time (s)		51.6			14.1			25.5			26.8	
Peak Hour Factor	0.78	0.78	0.78	0.92	0.92	0.92	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	12%	12%	12%	10%	10%	10%	10%	10%	10%	3%	3%	3%
Adj. Flow (vph)	17	45	191	59	9	7	319	272	312	36	482	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	253	0	0	75	0	319	584	0	0	537	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		26.5	26.5		22.5	22.5	
Total Split (s)	28.5	28.5		28.5	28.5		71.5	71.5		71.5	71.5	
Total Split (%)	28.5%	28.5%		28.5%	28.5%		71.5%	71.5%		71.5%	71.5%	
Maximum Green (s)	22.0	22.0		22.0	22.0		65.0	65.0		65.0	65.0	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		6.5			6.5		6.5	6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)		14.9			14.9		72.1	72.1			72.1	
Actuated g/C Ratio		0.15			0.15		0.72	0.72			0.72	
v/c Ratio		0.74			0.89		0.55	0.50			0.43	
Control Delay		30.9			111.2		13.9	8.6			6.7	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		30.9			111.2		13.9	8.6			6.7	
LOS		C			F		B	A			A	
Approach Delay		30.9			111.2			10.4			6.7	
Approach LOS		C			F			B			A	
90th %ile Green (s)	22.0	22.0		22.0	22.0		65.0	65.0		65.0	65.0	
90th %ile Term Code	Max	Max		Max	Max		Coord	Coord		Coord	Coord	
70th %ile Green (s)	17.5	17.5		17.5	17.5		69.5	69.5		69.5	69.5	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
70th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
50th %ile Green (s)	14.1	14.1		14.1	14.1		72.9	72.9		72.9	72.9	
50th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
30th %ile Green (s)	10.8	10.8		10.8	10.8		76.2	76.2		76.2	76.2	
30th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
10th %ile Green (s)	10.0	10.0		10.0	10.0		77.0	77.0		77.0	77.0	
10th %ile Term Code	Min	Min		Hold	Hold		Coord	Coord		Coord	Coord	
Queue Length 50th (m)		21.5			14.4		27.8	37.8			44.8	
Queue Length 95th (m)		34.0			#34.8		m74.6	80.7			59.0	
Internal Link Dist (m)		692.1			172.5			472.3			496.4	
Turn Bay Length (m)												
Base Capacity (vph)		436			122		585	1178			1243	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.58			0.61		0.55	0.50			0.43	

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: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 16.5 Intersection LOS: B
Intersection Capacity Utilization 87.9% 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: 43 Street N & 18 Ave N

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↱			✣	
Volume (vph)	4	7	27	53	2	6	101	670	236	28	532	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		0.0	0.0		0.0	75.0		0.0	0.0		0.0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.905			0.986			0.961			0.995	
Flt Protected		0.995			0.959		0.950				0.998	
Satd. Flow (prot)	0	1104	0	0	1633	0	1641	1660	0	0	1780	0
Flt Permitted		0.957			0.721		0.402				0.884	
Satd. Flow (perm)	0	1062	0	0	1228	0	694	1660	0	0	1577	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		33			7			22			2	
Link Speed (k/h)		50			50			70			70	
Link Distance (m)		748.5			168.6			405.2			496.3	
Travel Time (s)		53.9			12.1			20.8			25.5	
Peak Hour Factor	0.81	0.81	0.81	0.92	0.92	0.92	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	55%	55%	55%	10%	10%	10%	10%	10%	10%	6%	6%	6%
Adj. Flow (vph)	5	9	33	58	2	7	125	827	291	35	657	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	47	0	0	67	0	125	1118	0	0	718	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	13.5	13.5		13.5	13.5		16.5	16.5		16.5	16.5	
Total Split (s)	50.0	50.0		50.0	50.0		50.0	50.0		50.0	50.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Maximum Green (s)	43.5	43.5		43.5	43.5		43.5	43.5		43.5	43.5	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		6.5			6.5		6.5	6.5			6.5	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)		10.4			10.4		80.6	80.6			80.6	
Actuated g/C Ratio		0.10			0.10		0.81	0.81			0.81	
v/c Ratio		0.34			0.50		0.22	0.83			0.56	
Control Delay		25.5			50.3		4.5	17.8			9.5	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		25.5			50.3		4.5	17.8			9.5	
LOS		C			D		A	B			A	
Approach Delay		25.5			50.3			16.4			9.5	
Approach LOS		C			D			B			A	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	15.0	15.0		15.0	15.0		72.0	72.0		72.0	72.0	
90th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
70th %ile Green (s)	12.0	12.0		12.0	12.0		75.0	75.0		75.0	75.0	
70th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
50th %ile Green (s)	10.0	10.0		10.0	10.0		77.0	77.0		77.0	77.0	
50th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
30th %ile Green (s)	8.0	8.0		8.0	8.0		79.0	79.0		79.0	79.0	
30th %ile Term Code	Hold	Hold		Gap	Gap		Coord	Coord		Coord	Coord	
10th %ile Green (s)	0.0	0.0		0.0	0.0		93.5	93.5		93.5	93.5	
10th %ile Term Code	Skip	Skip		Skip	Skip		Coord	Coord		Coord	Coord	
Queue Length 50th (m)		2.7			11.8		5.5	74.1			68.8	
Queue Length 95th (m)		11.2			24.7		12.0	113.8			78.7	
Internal Link Dist (m)		724.5			144.6			381.2			472.3	
Turn Bay Length (m)							75.0					
Base Capacity (vph)		480			538		559	1342			1271	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.10			0.12		0.22	0.83			0.56	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 74 (74%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

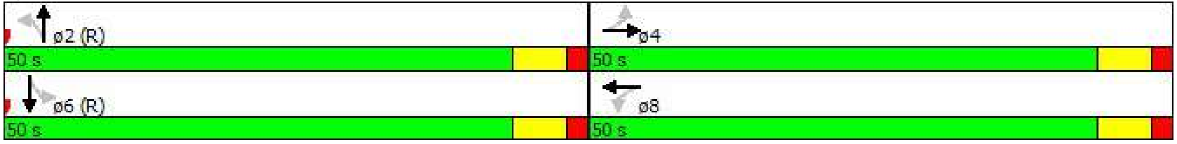
Maximum v/c Ratio: 0.83

Intersection Signal Delay: 15.3 Intersection LOS: B

Intersection Capacity Utilization 73.1% ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 3: 43 Street N & 14 Ave N



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	39	32	116	46	12	11	282	971	193	38	551	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0		50.0	100.0		0.0	100.0		50.0	125.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt			0.850		0.928				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1752	1845	1568	1327	1296	0	1656	3312	1482	1656	3312	1482
Flt Permitted	0.740			0.732			0.950			0.242		
Satd. Flow (perm)	1365	1845	1568	1023	1296	0	1656	3312	1482	422	3312	1482
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140		13				233			104
Link Speed (k/h)		50			50			60			60	
Link Distance (m)		750.2			651.0			882.4			198.2	
Travel Time (s)		54.0			46.9			52.9			11.9	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles (%)	3%	3%	3%	36%	36%	36%	9%	9%	9%	9%	9%	9%
Adj. Flow (vph)	47	39	140	55	14	13	340	1170	233	46	664	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	47	39	140	55	27	0	340	1170	233	46	664	30
Turn Type	Perm	NA	Perm	Perm	NA		Prot	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		5	2			6	
Permitted Phases	4		4	8					2	6		6
Detector Phase	4	4	4	8	8		5	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		6.0	15.0	15.0	15.0	15.0	15.0
Minimum Split (s)	32.5	32.5	32.5	32.5	32.5		12.0	32.5	32.5	32.5	32.5	32.5
Total Split (s)	32.5	32.5	32.5	32.5	32.5		32.0	67.5	67.5	35.5	35.5	35.5
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%		32.0%	67.5%	67.5%	35.5%	35.5%	35.5%
Maximum Green (s)	26.0	26.0	26.0	26.0	26.0		26.0	61.0	61.0	29.0	29.0	29.0
Yellow Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0		1.5	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5		6.0	6.5	6.5	6.5	6.5	6.5
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None		None	C-Max	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	8.0	8.0	8.0	8.0	8.0			8.0	8.0	8.0	8.0	8.0
Flash Dont Walk (s)	18.0	18.0	18.0	18.0	18.0			18.0	18.0	18.0	18.0	18.0
Pedestrian Calls (#/hr)	0	0	0	0	0			0	0	0	0	0
Act Effct Green (s)	12.0	12.0	12.0	12.0	12.0		25.7	75.0	75.0	43.3	43.3	43.3
Actuated g/C Ratio	0.12	0.12	0.12	0.12	0.12		0.26	0.75	0.75	0.43	0.43	0.43
v/c Ratio	0.29	0.18	0.45	0.45	0.16		0.80	0.47	0.20	0.25	0.46	0.04
Control Delay	43.9	40.4	11.6	52.3	27.1		48.5	5.8	1.0	20.6	17.2	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
Total Delay	43.9	40.4	11.6	52.3	27.1		48.5	5.8	1.0	20.6	17.2	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	D	B	D	C		D	A	A	C	B	A
Approach Delay		23.3			44.0			13.5			16.7	
Approach LOS		C			D			B			B	
90th %ile Green (s)	16.2	16.2	16.2	16.2	16.2		32.4	70.8	70.8	32.4	32.4	32.4
90th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
70th %ile Green (s)	12.9	12.9	12.9	12.9	12.9		29.2	74.1	74.1	38.9	38.9	38.9
70th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
50th %ile Green (s)	10.7	10.7	10.7	10.7	10.7		26.2	76.3	76.3	44.1	44.1	44.1
50th %ile Term Code	Hold	Hold	Hold	Gap	Gap		Gap	Coord	Coord	Coord	Coord	Coord
30th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		22.9	77.0	77.0	48.1	48.1	48.1
30th %ile Term Code	Min	Min	Min	Min	Min		Gap	Coord	Coord	Coord	Coord	Coord
10th %ile Green (s)	10.0	10.0	10.0	10.0	10.0		18.0	77.0	77.0	53.0	53.0	53.0
10th %ile Term Code	Min	Min	Min	Hold	Hold		Gap	Coord	Coord	Coord	Coord	Coord
Queue Length 50th (m)	9.0	7.4	0.0	10.8	2.6		64.5	37.4	0.0	3.4	27.1	0.0
Queue Length 95th (m)	17.7	15.2	13.3	20.4	9.4		80.3	54.6	4.7	m10.9	57.2	m0.0
Internal Link Dist (m)		726.2			627.0			858.4			174.2	
Turn Bay Length (m)			50.0	100.0			100.0		50.0	125.0		50.0
Base Capacity (vph)	354	479	511	265	346		462	2485	1170	182	1434	700
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	0.13	0.08	0.27	0.21	0.08		0.74	0.47	0.20	0.25	0.46	0.04

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 89 (89%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 16.1 Intersection LOS: B

Intersection Capacity Utilization 64.8% ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 4: 43 Street N & 9 Ave N

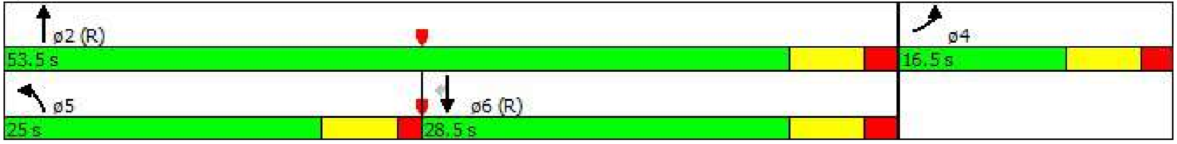
	↗	↘	↖	↑	↓	↙
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰	↱	↰	↑↑	↑↑	↱
Volume (vph)	98	213	356	1405	711	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	100.0	140.0			100.0
Storage Lanes	2	1	1			1
Taper Length (m)	7.5		7.5			
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	3127	1442	1703	3406	3112	1392
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	3127	1442	1703	3406	3112	1392
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		245				61
Link Speed (k/h)	50			60	60	
Link Distance (m)	728.0			340.2	882.4	
Travel Time (s)	52.4			20.4	52.9	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	12%	12%	6%	6%	16%	16%
Adj. Flow (vph)	113	245	409	1615	817	61
Shared Lane Traffic (%)						
Lane Group Flow (vph)	113	245	409	1615	817	61
Turn Type	Prot	Free	Prot	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Detector Phase	4		5	2	6	6
Switch Phase						
Minimum Initial (s)	10.0		6.0	15.0	15.0	15.0
Minimum Split (s)	16.5		12.0	28.5	21.5	21.5
Total Split (s)	16.5		25.0	53.5	28.5	28.5
Total Split (%)	23.6%		35.7%	76.4%	40.7%	40.7%
Maximum Green (s)	10.0		19.0	47.0	22.0	22.0
Yellow Time (s)	4.5		4.5	4.5	4.5	4.5
All-Red Time (s)	2.0		1.5	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5		6.0	6.5	6.5	6.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	C-Max	C-Max	C-Max
Walk Time (s)				8.0		
Flash Dont Walk (s)				14.0		
Pedestrian Calls (#/hr)				0		
Act Effct Green (s)	10.0	70.0	18.5	51.6	25.8	25.8
Actuated g/C Ratio	0.14	1.00	0.26	0.74	0.37	0.37
v/c Ratio	0.25	0.17	0.91	0.64	0.71	0.11
Control Delay	28.4	0.3	52.4	7.9	25.4	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.4	0.3	52.4	7.9	25.4	5.9

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	C	A	D	A	C	A
Approach Delay	9.1			16.9	24.1	
Approach LOS	A			B	C	
90th %ile Green (s)	10.0		19.0	47.0	22.0	22.0
90th %ile Term Code	Max		Max	Coord	Coord	Coord
70th %ile Green (s)	10.0		19.0	47.0	22.0	22.0
70th %ile Term Code	Max		Max	Coord	Coord	Coord
50th %ile Green (s)	10.0		19.0	47.0	22.0	22.0
50th %ile Term Code	Max		Max	Coord	Coord	Coord
30th %ile Green (s)	10.0		19.0	47.0	22.0	22.0
30th %ile Term Code	Max		Max	Coord	Coord	Coord
10th %ile Green (s)	0.0		16.4	63.5	41.1	41.1
10th %ile Term Code	Skip		Gap	Coord	Coord	Coord
Queue Length 50th (m)	7.2	0.0	53.9	61.3	54.4	0.0
Queue Length 95th (m)	13.7	0.0	#97.7	77.6	#75.7	7.1
Internal Link Dist (m)	704.0			316.2	858.4	
Turn Bay Length (m)		100.0	140.0			100.0
Base Capacity (vph)	446	1442	462	2510	1148	552
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	0.17	0.89	0.64	0.71	0.11

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 18.0 Intersection LOS: B
Intersection Capacity Utilization 63.5% 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: 5: 43 Street N & 5 Ave N



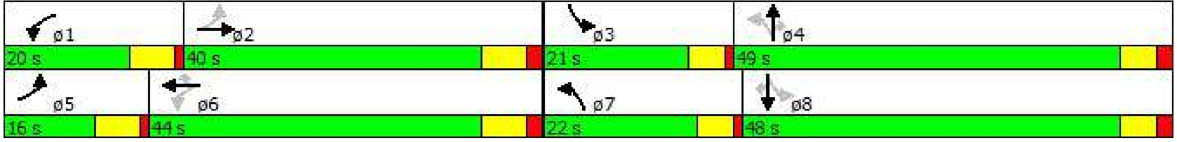
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↱		↰↰	↑↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱
Volume (vph)	582	878	12	354	854	722	377	967	255	561	571	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	140.0		0.0	125.0		150.0	100.0		80.0	80.0		80.0
Storage Lanes	2		0	2		1	2		1	2		1
Taper Length (m)	7.5			7.5			7.5			7.5		
Lane Util. Factor	0.97	0.91	0.91	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt		0.998				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3155	4664	0	3213	4759	1482	3183	3282	1468	3045	3139	1404
Flt Permitted	0.198			0.127			0.302			0.090		
Satd. Flow (perm)	658	4664	0	429	4759	1482	1012	3282	1468	288	3139	1404
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1				266			189			222
Link Speed (k/h)		80			80			60			60	
Link Distance (m)		449.3			776.8			454.3			301.5	
Travel Time (s)		20.2			35.0			27.3			18.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	11%	11%	11%	9%	9%	9%	10%	10%	10%	15%	15%	15%
Adj. Flow (vph)	633	954	13	385	928	785	410	1051	277	610	621	315
Shared Lane Traffic (%)												
Lane Group Flow (vph)	633	967	0	385	928	785	410	1051	277	610	621	315
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	10.0	20.0		10.0	20.0	20.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	16.0	27.0		16.0	27.0	27.0	15.0	16.0	16.0	15.0	22.0	22.0
Total Split (s)	16.0	40.0		20.0	44.0	44.0	22.0	49.0	49.0	21.0	48.0	48.0
Total Split (%)	12.3%	30.8%		15.4%	33.8%	33.8%	16.9%	37.7%	37.7%	16.2%	36.9%	36.9%
Maximum Green (s)	10.0	33.0		14.0	37.0	37.0	17.0	43.0	43.0	16.0	42.0	42.0
Yellow Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	2.0		1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	7.0		6.0	7.0	7.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	None
Act Effct Green (s)	44.3	33.3		51.7	37.0	37.0	58.8	43.0	43.0	61.2	44.2	44.2
Actuated g/C Ratio	0.34	0.26		0.40	0.28	0.28	0.45	0.33	0.33	0.47	0.34	0.34
v/c Ratio	1.52	0.81		0.83	0.69	1.28	0.58	0.97	0.45	1.28	0.58	0.50
Control Delay	273.5	51.7		43.7	44.4	165.6	22.5	63.7	13.4	176.2	38.3	13.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	273.5	51.7		43.7	44.4	165.6	22.5	63.7	13.4	176.2	38.3	13.5
LOS	F	D		D	D	F	C	E	B	F	D	B
Approach Delay		139.4			89.7			46.0			87.7	
Approach LOS		F			F			D			F	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
90th %ile Green (s)	10.0	33.0		14.0	37.0	37.0	17.0	43.0	43.0	16.0	42.0	42.0
90th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Max	Max	Max	Max	Hold	Hold
70th %ile Green (s)	10.0	33.0		14.0	37.0	37.0	16.6	43.0	43.0	16.0	42.4	42.4
70th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
50th %ile Green (s)	10.0	33.0		14.0	37.0	37.0	15.1	43.0	43.0	16.0	43.9	43.9
50th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
30th %ile Green (s)	10.0	33.0		14.0	37.0	37.0	13.6	43.0	43.0	16.0	45.4	45.4
30th %ile Term Code	Max	MaxR		Max	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
10th %ile Green (s)	10.0	34.5		12.5	37.0	37.0	11.5	43.0	43.0	16.0	47.5	47.5
10th %ile Term Code	Max	Hold		Gap	MaxR	MaxR	Gap	Max	Max	Max	Hold	Hold
Queue Length 50th (m)	~96.4	90.2		35.1	81.6	~214.9	31.8	146.4	16.9	~93.5	72.5	17.7
Queue Length 95th (m)	#137.2	108.0		#57.7	98.1	#294.5	42.6	#193.4	42.7	#133.4	95.0	47.9
Internal Link Dist (m)		425.3			752.8			430.3			277.5	
Turn Bay Length (m)	140.0			125.0		150.0	100.0		80.0	80.0		80.0
Base Capacity (vph)	416	1195		471	1354	612	758	1085	612	475	1068	624
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	1.52	0.81		0.82	0.69	1.28	0.54	0.97	0.45	1.28	0.58	0.50

Intersection Summary

Area Type: Other
Cycle Length: 130
Actuated Cycle Length: 130
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.52
Intersection Signal Delay: 89.8 Intersection LOS: F
Intersection Capacity Utilization 103.9% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 130
70th %ile Actuated Cycle: 130
50th %ile Actuated Cycle: 130
30th %ile Actuated Cycle: 130
10th %ile Actuated Cycle: 130
~ 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.

Splits and Phases: 6: 43 Street S/43 Street N & Hwy 3



Appendix E

Synchro Software Capacity Analyses Files

Appendix F

TAC – Traffic Signal Warrant Worksheets

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**26 Avenue/Twp Rd 92**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2018 Aug 12, Sun**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Future 2037 with Site Traffic**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,650	1
43 Street North	SB	0	0	0	1	0	0	5,000	1
26 Avenue/Twp Rd 92	WB	1	0	0	0	1	0		
26 Avenue/Twp Rd 92	EB	0	1	0	0	0	1		

Are the 26 Avenue/Twp Rd 92 WB right turns significantly impeded by through movements? (y/n) n

n

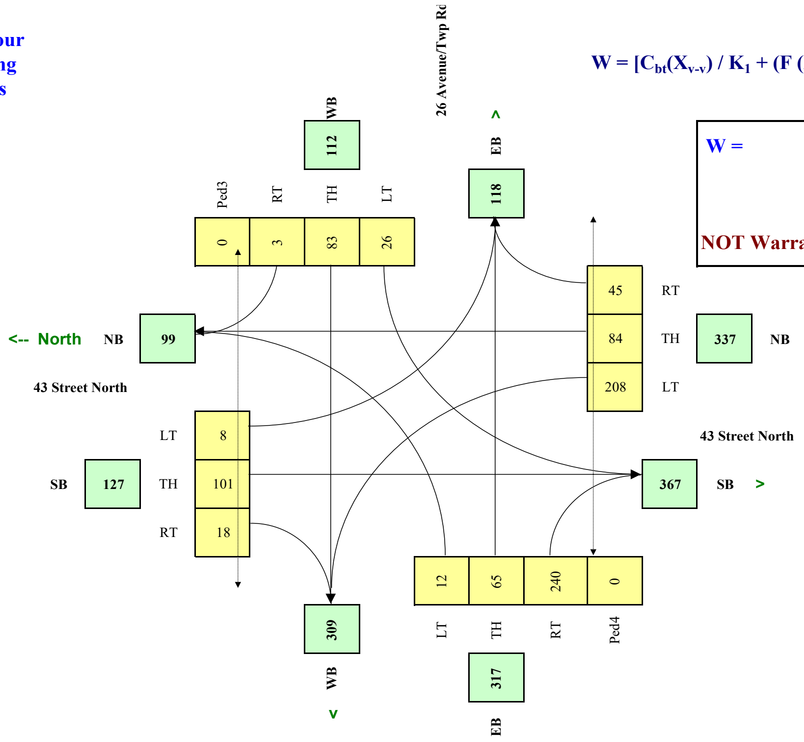
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	12.0%	n	0.0
26 Avenue/Twp Rd 92	EW	60	4.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1 NS**	**Ped2 NS**	**Ped3 EW**	**Ped4 EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	100	113	31	6	58	7	44	84	6	17	99	299				
8:00 - 9:00	100	113	31	6	58	7	44	84	6	17	99	299				
11:00 - 12:00	60	68	19	4	35	4	26	50	4	10	59	180				
12:00 - 13:00	227	49	44	7	104	21	10	65	0	7	31	152				
16:00 - 17:00	379	81	73	12	174	35	17	108	0	11	51	254				
17:00 - 18:00	379	81	73	12	174	35	17	108	0	11	51	254				
Total (6-hour peak)	**1,245**	**505**	**271**	**47**	**603**	**109**	**158**	**499**	**16**	**73**	**390**	**1,438**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**208**	**84**	**45**	**8**	**101**	**18**	**26**	**83**	**3**	**12**	**65**	**240**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$

W =	**89**	**89**	**0**
		Veh	***Ped***

NOT Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**26 Avenue/Twp Rd 92**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2018 Aug 12, Sun**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Future 2022 wth Site Traffic**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,650	1
43 Street North	SB	0	0	0	1	0	0	5,000	1
26 Avenue/Twp Rd 92	WB	1	0	0	0	1	0		
26 Avenue/Twp Rd 92	EB	0	1	0	0	0	1		

Are the 26 Avenue/Twp Rd 92 WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

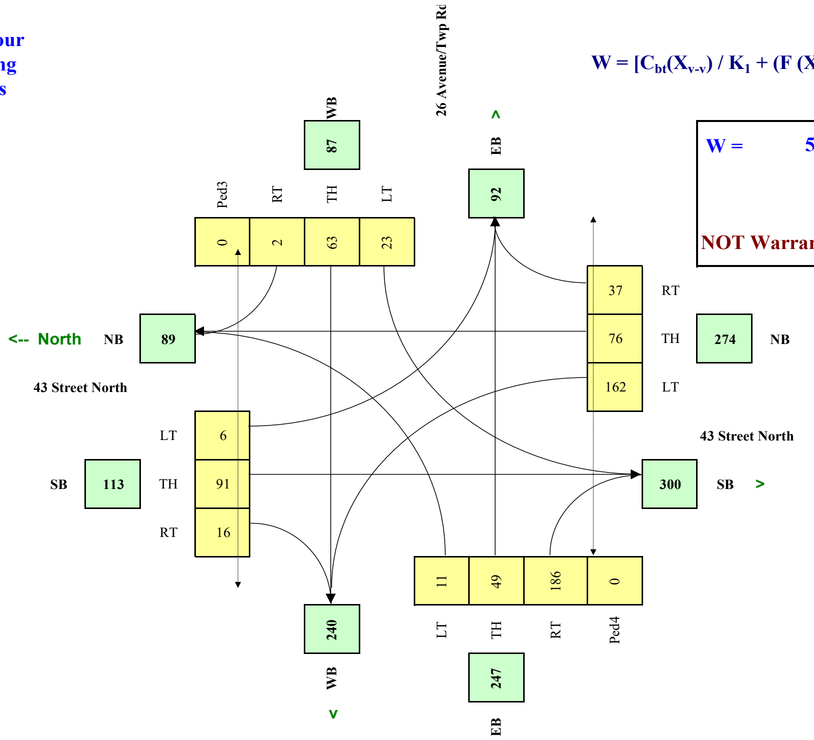
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	12.0%	n	0.0
26 Avenue/Twp Rd 92	EW	60	4.0%	n	0.0

Set Peak Hours

													Ped1	Ped2	Ped3	Ped4
Traffic Input	**NB**			**SB**			**WB**			**EB**			**NS**	**NS**	**EW**	**EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	78	104	25	5	49	6	38	63	5	16	75	236				
8:00 - 9:00	78	104	25	5	49	6	38	63	5	16	75	236				
11:00 - 12:00	47	63	15	3	29	4	23	38	3	10	45	142				
12:00 - 13:00	177	42	36	5	97	19	8	49	0	6	23	116				
16:00 - 17:00	295	70	60	9	161	31	14	81	0	10	39	194				
17:00 - 18:00	295	70	60	9	161	31	14	81	0	10	39	194				
Total (6-hour peak)	**970**	**453**	**221**	**36**	**546**	**97**	**135**	**375**	**13**	**68**	**296**	**1,118**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**162**	**76**	**37**	**6**	**91**	**16**	**23**	**63**	**2**	**11**	**49**	**186**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2]\ x\ C_i$$



W =	**59**	**59**	**0**
		Veh	***Ped***

NOT Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**18 Avenue/Site Access**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2017 Nov 02, Thu**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Background 2037 (Without Site Traffic)**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
18 Avenue/Site Access	WB	1	0	0	0	1	0		
18 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 18 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

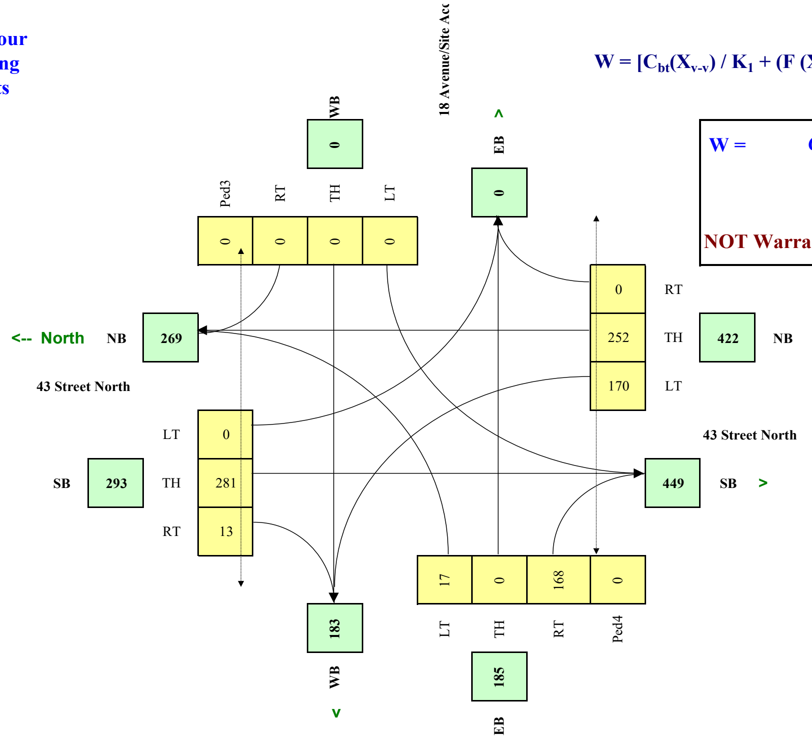
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
18 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1 NS**	**Ped2 NS**	**Ped3 EW**	**Ped4 EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	249	199	0	0	329	15	0	0	0	13	0	149				
8:00 - 9:00	249	199	0	0	329	15	0	0	0	13	0	149				
11:00 - 12:00	149	119	0	0	197	9	0	0	0	8	0	89				
12:00 - 13:00	86	230	0	0	191	8	0	0	0	16	0	143				
16:00 - 17:00	144	383	0	0	319	14	0	0	0	26	0	239				
17:00 - 18:00	144	383	0	0	319	14	0	0	0	26	0	239				
Total (6-hour peak)	**1,021**	**1,513**	**0**	**0**	**1,684**	**75**	**0**	**0**	**0**	**102**	**0**	**1,008**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**170**	**252**	**0**	**0**	**281**	**13**	**0**	**0**	**0**	**17**	**0**	**168**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$



W =	**61**	**61**	**0**
		Veh	***Ped***

NOT Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**18 Avenue/Site Access**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2018 Aug 12, Sun**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Future 2022 with Site Traffic**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
18 Avenue/Site Access	WB	1	0	0	0	1	0		
18 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 18 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

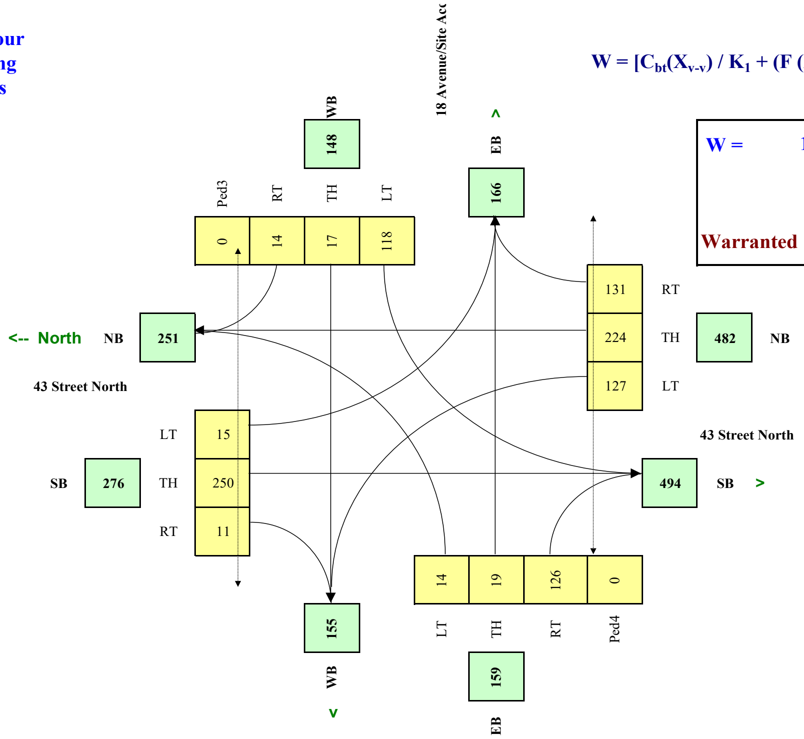
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
18 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1** **NS**	**Ped2** **NS**	**Ped3** **EW**	**Ped4** **EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	187	179	243	28	298	12	54	8	6	11	35	112				
8:00 - 9:00	187	179	243	28	298	12	54	8	6	11	35	112				
11:00 - 12:00	112	107	146	17	179	7	32	5	4	7	21	67				
12:00 - 13:00	64	203	36	4	167	8	131	19	15	12	5	107				
16:00 - 17:00	106	338	60	7	279	13	218	31	25	20	9	179				
17:00 - 18:00	106	338	60	7	279	13	218	31	25	20	9	179				
Total (6-hour peak)	**762**	**1,344**	**788**	**91**	**1,500**	**65**	**707**	**102**	**81**	**81**	**114**	**756**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**127**	**224**	**131**	**15**	**250**	**11**	**118**	**17**	**14**	**14**	**19**	**126**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F (X_{v\text{-}p}) L) / K_2] \times C_i$$



W =	**131**	**131**	**0**
		Veh	***Ped***
Warranted			

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**
Side Street (name)	**18 Avenue/Site Access**	**Direction (EW or NS)**	**EW**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**

for Warrant Calculation Results, please hit 'Page Down'

CHECK SHEET

Road Authority:	**City of Lethbridge/Lethbridge County**
City:	**Lethbridge**
Analysis Date:	**2018 Aug 12, Sun**
Count Date:	**Future 2037 with Site Traffic**
Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
18 Avenue/Site Access	WB	1	0	0	0	1	0		
18 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 18 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

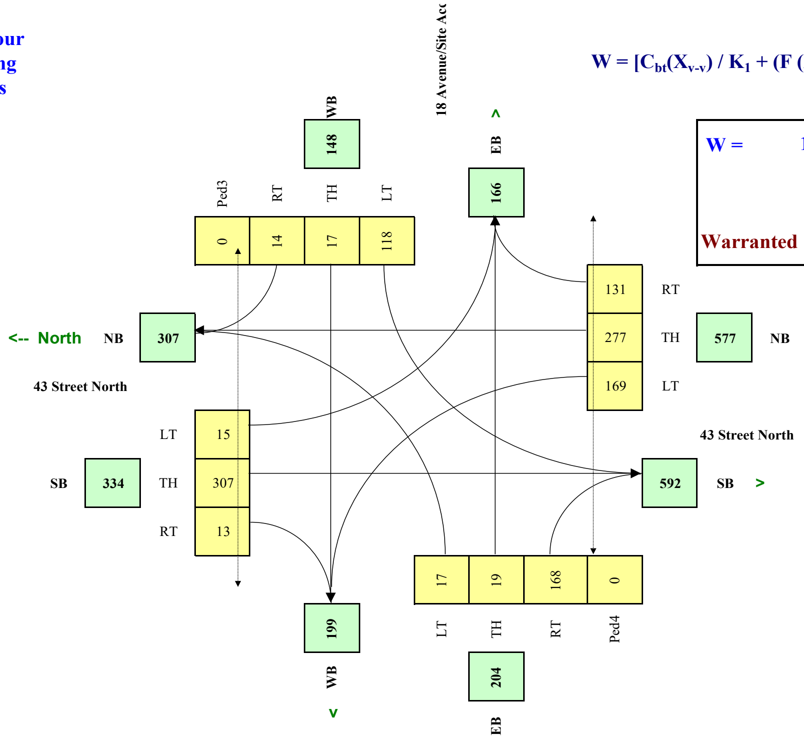
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
18 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1** **NS**	**Ped2** **NS**	**Ped3** **EW**	**Ped4** **EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	249	212	243	28	376	15	54	8	6	13	35	149				
8:00 - 9:00	249	212	243	28	376	15	54	8	6	13	35	149				
11:00 - 12:00	149	127	146	17	226	9	32	5	4	8	21	89				
12:00 - 13:00	85	256	36	4	199	8	131	19	15	16	5	143				
16:00 - 17:00	141	426	60	7	331	14	218	31	25	26	9	239				
17:00 - 18:00	141	426	60	7	331	14	218	31	25	26	9	239				
Total (6-hour peak)	**1,014**	**1,659**	**788**	**91**	**1,839**	**75**	**707**	**102**	**81**	**102**	**114**	**1,008**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**169**	**277**	**131**	**15**	**307**	**13**	**118**	**17**	**14**	**17**	**19**	**168**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements



$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$

W =	**182**	**182**	**0**
		Veh	***Ped***

Warranted

RESET SHEET

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City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**		**Direction (EW or NS)**	**NS**		**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**14 Avenue/Site Access**		**Direction (EW or NS)**	**EW**		**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**			**Analysis Date:**	**2017 Nov 02, Thu**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**					**Count Date:**	**Background 2037 (Without Site Traffic)**
						Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
14 Avenue/Site Access	WB	1	0	0	0	1	0		
14 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 14 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

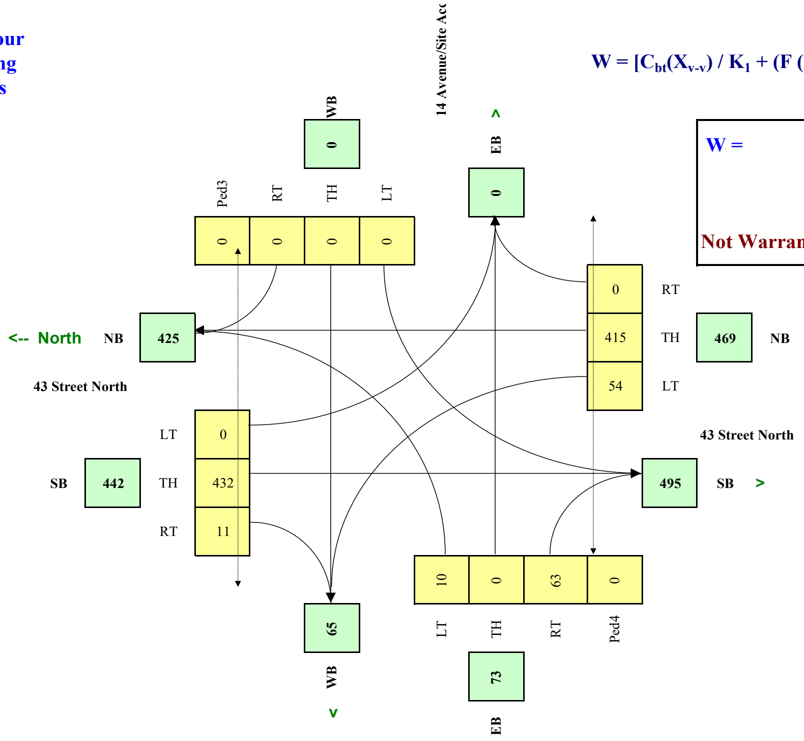
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
14 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1 NS**	**Ped2 NS**	**Ped3 EW**	**Ped4 EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	101	420	0	0	459	21	0	0	0	4	0	27				
8:00 - 9:00	101	420	0	0	459	21	0	0	0	4	0	27				
11:00 - 12:00	61	252	0	0	275	13	0	0	0	2	0	16				
12:00 - 13:00	14	323	0	0	322	2	0	0	0	11	0	71				
16:00 - 17:00	23	538	0	0	537	4	0	0	0	18	0	119				
17:00 - 18:00	23	538	0	0	537	4	0	0	0	18	0	119				
Total (6-hour peak)	**323**	**2,491**	**0**	**0**	**2,589**	**65**	**0**	**0**	**0**	**57**	**0**	**379**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**54**	**415**	**0**	**0**	**432**	**11**	**0**	**0**	**0**	**10**	**0**	**63**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$$



W =	**34**	**34**	**0**
		Veh	***Ped***

Not Warranted - Vs<75

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**14 Avenue/Site Access**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2018 Aug 12, Sun**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Future 2022 (With Site Traffic)**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
14 Avenue/Site Access	WB	1	0	0	0	1	0		
14 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 14 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

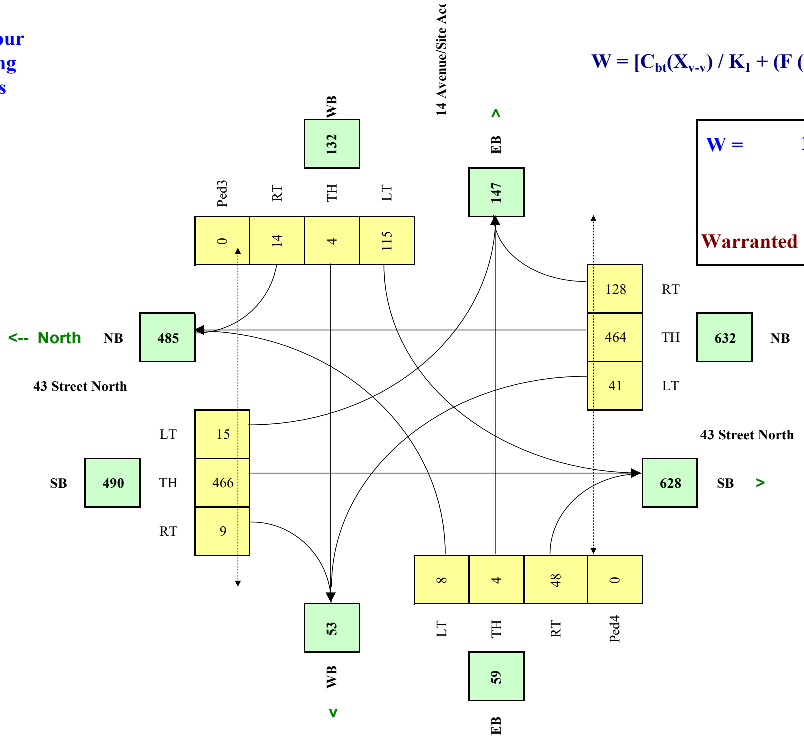
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
14 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1 NS**	**Ped2 NS**	**Ped3 EW**	**Ped4 EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	76	582	236	28	421	16	53	2	6	4	7	21				
8:00 - 9:00	76	582	236	28	421	16	53	2	6	4	7	21				
11:00 - 12:00	46	349	142	17	253	10	32	1	4	2	4	13				
12:00 - 13:00	11	293	35	4	392	3	127	4	15	9	1	53				
16:00 - 17:00	17	489	58	7	653	4	212	6	25	14	2	89				
17:00 - 18:00	17	489	58	7	653	4	212	6	25	14	2	89				
Total (6-hour peak)	**243**	**2,784**	**765**	**91**	**2,793**	**53**	**689**	**21**	**81**	**47**	**23**	**286**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**41**	**464**	**128**	**15**	**466**	**9**	**115**	**4**	**14**	**8**	**4**	**48**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v-v}) / K_1 + (F (X_{v-p}) L) / K_2] \times C_i$$



W =	**133**	**133**	**0**
		Veh	***Ped***

Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

City of Lethbridge/Lethbridge County - Traffic Signal Warrant Analysis

Main Street (name)	**43 Street North**	**Direction (EW or NS)**	**NS**	**Road Authority:**	**City of Lethbridge/Lethbridge County**
Side Street (name)	**14 Avenue/Site Access**	**Direction (EW or NS)**	**EW**	**City:**	**Lethbridge**
Quadrant / Int #	**3**	**Comments**	**60% of AM peak hour utilized for the period from 11:00 AM to 12:00 PM and 60% of PM peak hour utilized for the period from 12:00 PM to 01:00 PM**	**Analysis Date:**	**2018 Aug 12, Sun**
for Warrant Calculation Results, please hit 'Page Down'	**CHECK SHEET**			**Count Date:**	**Future 2037 (With Site Traffic)**
				Date Entry Format:	(yyyy-mm-dd)

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
43 Street North	NB	0	0	0	1	0	0	1,350	1
43 Street North	SB	0	0	0	1	0	0	5,200	1
14 Avenue/Site Access	WB	1	0	0	0	1	0		
14 Avenue/Site Access	EB	0	1	0	0	0	1		

Are the 14 Avenue/Site Access WB right turns significantly impeded by through movements? (y/n) n

n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	90,000
Central Business District	(y/n)	n

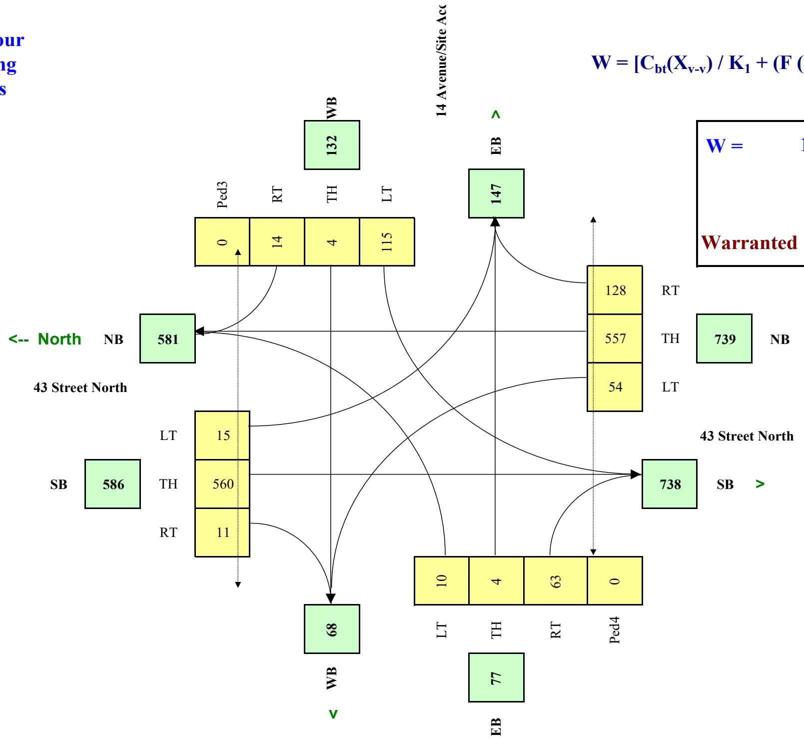
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
43 Street North	NS	70	10.0%	n	0.0
14 Avenue/Site Access	EW	50	10.0%	n	0.0

Set Peak Hours

Traffic Input	**NB**			**SB**			**WB**			**EB**			**Ped1** **NS**	**Ped2** **NS**	**Ped3** **EW**	**Ped4** **EW**
	LT	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**LT**	**Th**	**RT**	**W Side**	**E Side**	**N Side**	**S Side**
7:00 - 8:00	101	670	236	28	532	21	53	2	6	4	7	27				
8:00 - 9:00	101	670	236	28	532	21	53	2	6	4	7	27				
11:00 - 12:00	61	402	142	17	319	13	32	1	4	3	4	16				
12:00 - 13:00	14	370	35	4	456	3	127	4	15	11	1	71				
16:00 - 17:00	23	616	58	7	760	4	212	6	25	18	2	119				
17:00 - 18:00	23	616	58	7	760	4	212	6	25	18	2	119				
Total (6-hour peak)	**323**	**3,344**	**765**	**91**	**3,359**	**66**	**689**	**21**	**81**	**58**	**23**	**379**	**0**	**0**	**0**	**0**
Average (6-hour peak)	**54**	**557**	**128**	**15**	**560**	**11**	**115**	**4**	**14**	**10**	**4**	**63**	**0**	**0**	**0**	**0**

Average 6-hour Peak Turning Movements

$$W = [C_{bt}(X_{v\text{-}v}) / K_1 + (F\ (X_{v\text{-}p})\ L) / K_2] \times C_i$$



W =	**174**	**174**	**0**
		Veh	***Ped***

Warranted

RESET SHEET

Traffic Signal Warrant Spreadsheet - v3H © 2007 Transportation Association of Canada

APPENDIX B

CHINOOK INDUSTRIAL PARK ASP - STORMWATER MANAGEMENT PLAN

February 3, 2023

Prepared for:
Sumus Property Group Ltd.

Prepared by:
Stantec Consulting Ltd.

Project Number:
116549063

Chinook Industrial Park ASP - Stormwater Management Plan

This document entitled Chinook Industrial Park ASP - Stormwater Management Plan was prepared by Stantec Consulting Ltd. (“Stantec”) for the account of Sumus Property Group Ltd. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by: Emilie Hewko
Emilie Hewko

Reviewed by: ______________________
Ted Larson, P.Eng

Approved by: ______________________
Alan Ashcroft, P.Eng

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Introduction

Stantec Consulting Ltd. (Stantec) was retained by Sumus Property Group Ltd. (Sumus) to provide stormwater management planning services for the Chinook Industrial Park Area Structure Plan (ASP).

This document provides the design basis for the proposed stormwater management plan, including analysis details and summaries of hydraulic modeling performed to support the Chinook Industrial Park Area Structure Plan.

1 SITE DESCRIPTION

1.1 Study Area

The Chinook Industrial Park (study area) is in the County of Lethbridge. The study area is bound by Township Road 92 to the north, 43rd Street N (City of Lethbridge boundary) to the west, the St. Mary River Irrigation District (SMRID) canal to the east, and the Rave Industrial Park to the south. The study area boundary is shown on **Figure 1** for reference.

There is an existing Stormwater Management Facility (SWMF), Pond 100, located in the southeast corner of the study area which receives drainage from the existing southern stormwater catchment area. A current agreement between the County and SMRID exists for Pond 100 which requires the following before a pumped discharge of stormwater into the canal will be permitted:

1. Water must be sampled, tested, and meet SMRID water quality standards.
2. Available conveyance capacity within the canal must be confirmed prior to operation of pump system.

Based on the above, ponds will need to operate as zero-release facilities, storing an entire 1:100-year storm event until permission is granted by SMRID to discharge into the canal. A conveyance agreement between Lethbridge County and St. Mary River Irrigation District (SMRID) will be required to manage stormwater in the post-development condition.

1.2 Site Topography

The study area topography was determined using Altalis 7.5m LiDAR data. In general, there is a high point in the site topography which divides the study area into two major stormwater subcatchment areas (north and south). The north catchment area drains northeast towards the SMRID canal and Township Road 92. The south catchment area drains to Pond 100. **Figure 2** shows the topography throughout the study area.

2 Existing Drainage Conditions

Within the project boundary, the north subcatchment, N1, has an area of 62.3 ha, and can be characterized as an undeveloped parcel with overland sheet flow directed generally towards the SMRID canal. The southern subcatchment, S1, has an area of 44.3 ha, is substantially developed, and contains the Rave Industrial Park. For S1, the existing runoff is conveyed via ditches and drains into the existing detention pond (Pond 100). The existing SWMF (Pond 100) currently has a storage capacity of 37,270 m^3 according to the *Rave Industrial Stormwater Management Plan* (Martin Geomatics, 2013). The existing stormwater infrastructure and drainage patterns are shown on **Figure 3** for reference.

3 Proposed Drainage Conditions

In the post-development condition, the Chinook Industrial Park will straddle two major subcatchment areas, each draining to a dedicated detention pond, Pond 100 or Pond 200. The proposed stormwater infrastructure and drainage patterns can be seen on **Figure 4**.

The proposed drainage system in the post-development condition will utilize a dual drainage approach, which is comprised of a minor system and a major system. The minor system, which consists of catch basins, storm sewers, and manholes has been designed to accommodate the runoff resulting from the 1:5-year design storm. In general, each private development within the study area will require onsite storage and will be restricted to a 40 L/s/ha release rate (during a 1:5-year design storm). The release rate restriction will benefit the project by reducing sewer pipe sizes in the minor system. However, a few areas along the east edge of the study area boundary will not be restricted and will be serviced via swales instead, conveying runoff to the proposed ponds.

The major system includes overland flow paths, swales, ditches, and stormwater detention ponds. The major system has been designed to manage runoff resulting from the 1:100-year design storm.

The ponds are designed to contain the entire 1:100-year design storm and will only discharge into the SMRID canal after all the requirements noted in **Section 1.1** have been met. Each of the ponds are also expected to require a dedicated lift station to pump into the SMRID canal, based on topographic constraints.

4 HYDROLOGIC ASSESSMENTS

4.1 Computer Model Analysis (Major System)

A hydrologic model was developed for the post-development condition using PCSWMM computer modelling software. Intensity-duration-frequency (IDF) storm data for the City of Lethbridge was used as the basis for the design storms used in the analysis. The hydrologic model was evaluated using 1:5-year 24-hour and 1:100-year 24-hour design storms, with a simulation duration of 48 hours, using the Chicago Distribution. The Chicago Distribution is commonly used for stormwater analysis of urban areas. Subcatchment boundaries were determined based on the proposed grading concept for the development.

The hydrologic models take into consideration the site topography, soil characteristics, surface imperviousness, surface depression storage, and precipitation. Soil infiltration is accounted for by using the Green Ampt Infiltration method. The infiltration parameters in the models are those associated with topsoil/loam. The hydrologic parameters of the models are shown below in **Table 1**, which are typical values used for the City of Lethbridge. The post development model used 80% imperviousness for all catchments, except for roadways/easements, which are assumed 50% impervious. It has been assumed that each private parcel will be required to have onsite storage and will be restricted to a maximum release rate of 40 L/s/ha during the 1:5-year design storm.

Table 1 - Model Design Parameters

Description – Design Parameters	Value
Soil Suction (Loam, mm)	88.9
Hydraulic Conductivity (mm/hr)	3.4
Initial Deficit	0.2
Depression Storage – Impervious Surfaces (mm)	1.57
Depression Storage – Pervious Surfaces (mm)	4.67
Manning’s n Roughness – Impervious Surfaces	0.015
Manning’s n Roughness – Pervious Surfaces	0.15

4.2 Computer Model Analysis Results (Major System)

All the runoff flows from the Chinook Industrial Park will be directed to one of two stormwater detention ponds, which will provide the storage required to retain an entire 1:100-year design storm.

The south catchment has a contributing area of approximately 75.5 ha. The existing storm pond in the southeast corner of the study area (Pond 100) will be upgraded to an approximate storage volume of 82,000 m^3, accommodating the larger catchment and increased runoff flows.

The north catchment has a contributing area of approximately 31.8 ha. The north catchment will have a new dedicated detention pond (Pond 200), with an approximate storage capacity of 30,000 m^3, constructed in the northeastern corner of the study area.

Table 2 summarizes the model results for estimated temporary storage volumes required per private parcel, due to the 40 L/s/ha release rate restriction.

Table 2 - Parcel Storage Summary

Drainage Area	Subcatchment		Private Parcel Storage 1-100-year Storm (m³)
	ID	Area (ha)	
South - Pond 100	**Phase 1 Area**	15.4	6,758
	AP110-1	5.8	2,699
	AP110-2	2.0	1,014
	AP120-1	5.2	2,427
	AP120-2	1.3	687
	AP120-3	2.8	1,359
	AP130-1	2.9	1,256
	AP130-2	2.4	1,053
North - Pond 200	**AP210-1**	7.0	3,474
	AP210-2	2.2	1,156
	AP220-1	0.6	276
	AP220-2	2.1	942
	AP220-3	1.1	527
	AP230-1	1.3	558
	AP230-2	2.0	907
	AP230-3	1.7	802

4.3 Minor System Design

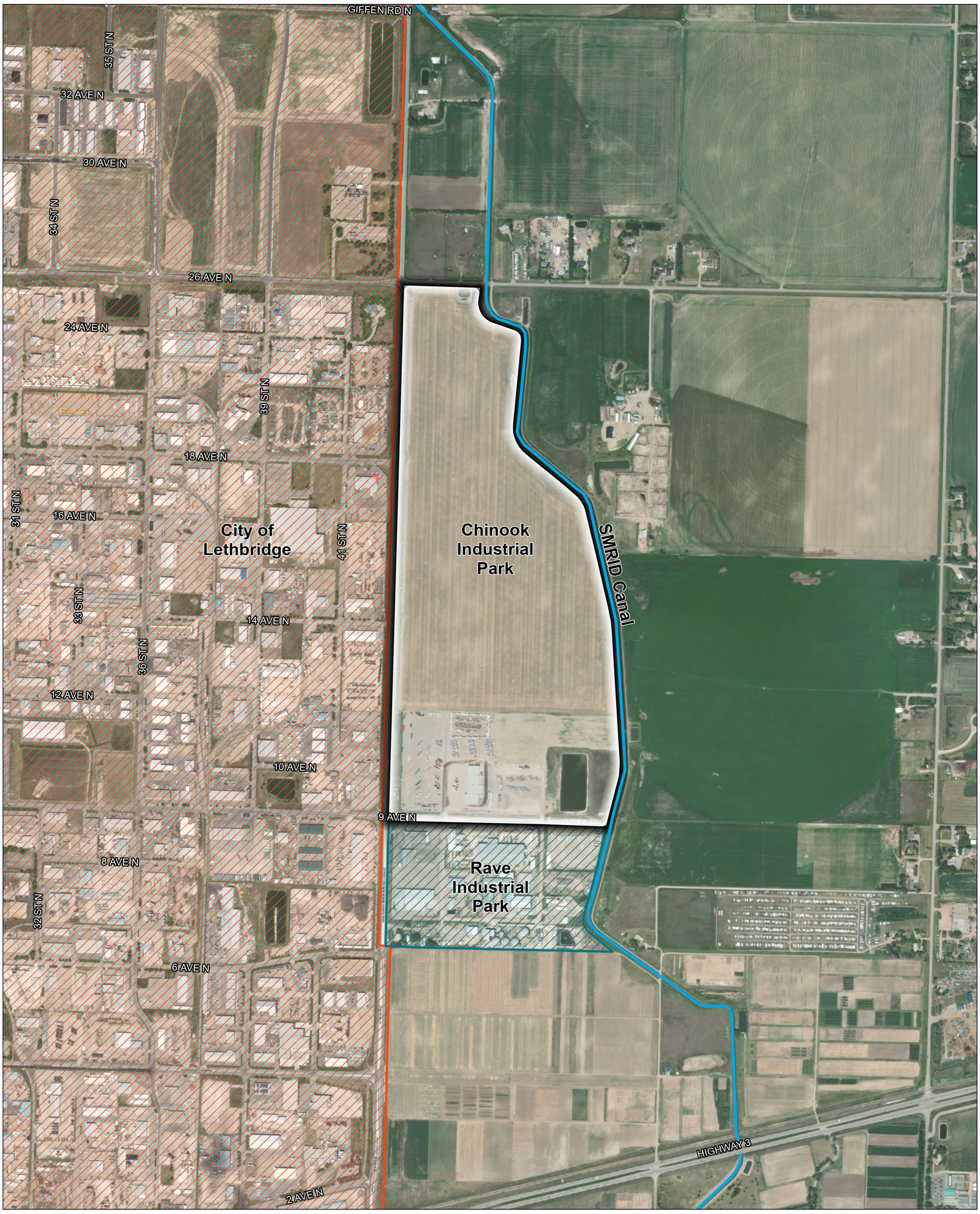
A minor storm sewer system has been designed for a 1:5 year rainfall event using the following unit rates as outlined in this report and the City of Lethbridge Design Standards:

- Roadways: 90L/s/Ha
- Private Parcels: 40L/s/Ha (Restricted 1:5 Year Outflow)

Given the parcel coverage (by buildings) in general industrial areas is typically quite small, large parking and storage areas can be utilized to reduce flows, minimizing the size of downstream infrastructure. For private parcels, this will require that future parcel designs provide some stormwater attenuation and outflow control structures as part of permitting process. Sediment control through the implementation of sumps and or other control measures to collect pollutants should be reviewed at detailed design.

5 Conclusion

The stormwater management concept for the proposed Chinook Industrial Park development provides functional stormwater servicing that can contain a 1:100-year storm, using two detention ponds, without draining into the SMRID canal until conditions meet SMRID requirements. Each of the ponds will require a dedicated lift station to pump into the SMRID canal. A conveyance agreement between Lethbridge County and St. Mary River Irrigation District (SMRID) will be required to manage stormwater in the post-development condition. Restricting private parcels to a 40 L/s/ha release rate will reduce the size of underground sewer infrastructure. The preceding stormwater management plan has been developed to support the overall Chinook Industrial Park Area Structure Plan. The calculated storage volumes and sewer pipe sizes are preliminary at this stage and will be revisited during detailed design.



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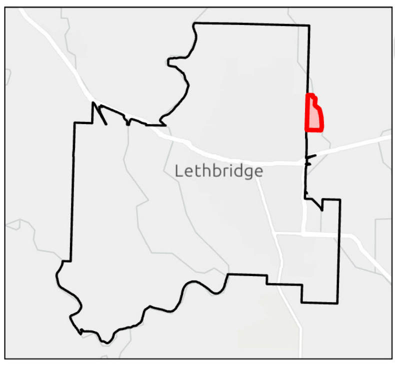

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: City of Lethbridge
3. Background: Lethbridge County, Maxar, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCan, Parks Canada

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Project Location
County of Lethbridge,
Alberta

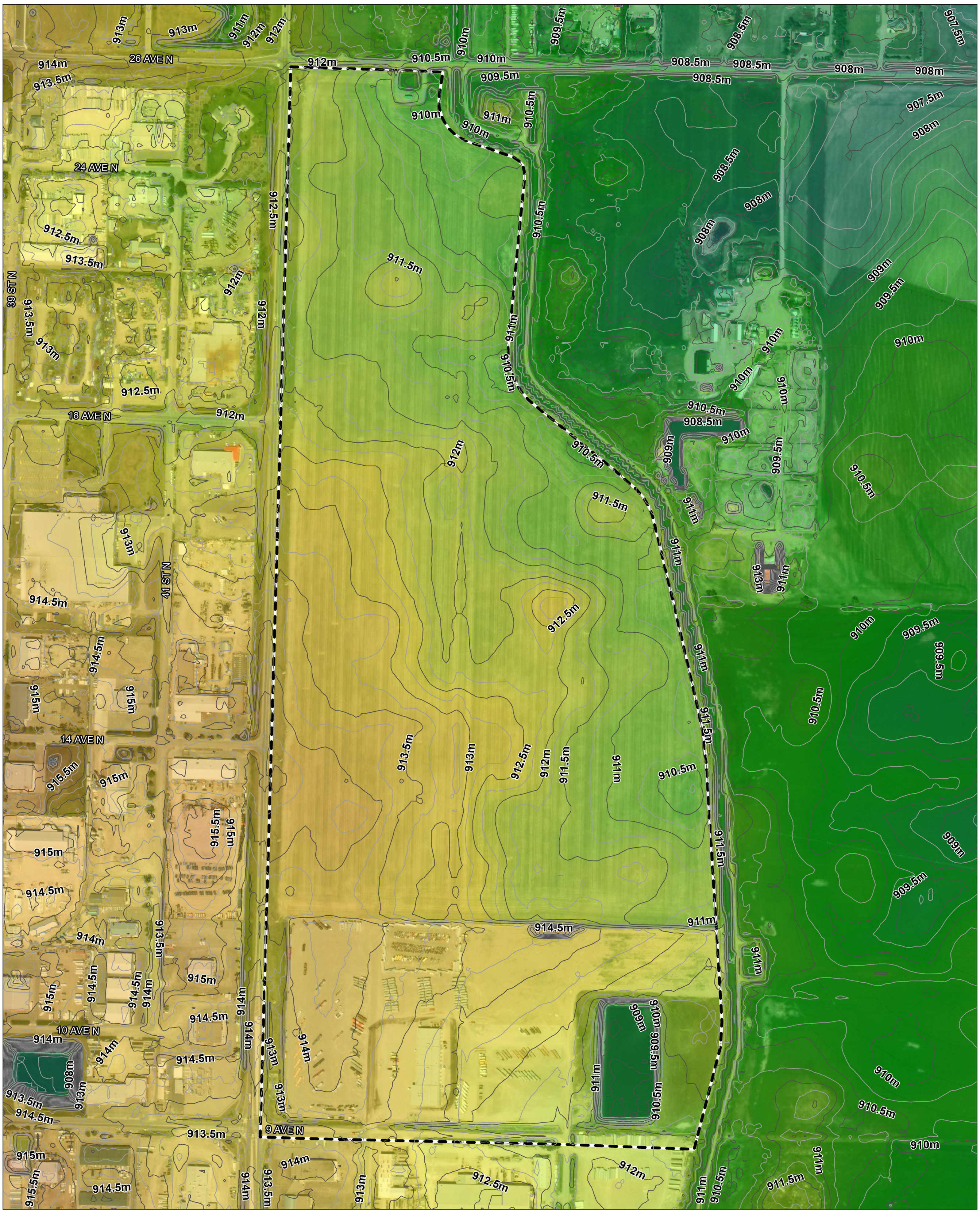
Prepared by EH on 2/3/2023
TR by MA on 2/3/2023
IR by BS on 2/3/2023

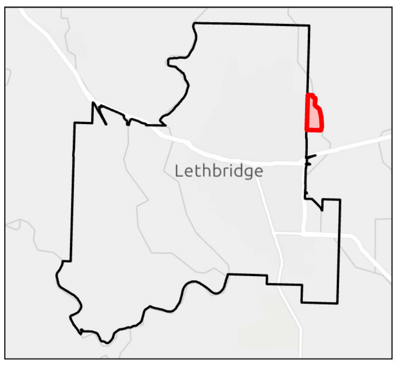
Client/Project
116549063

Sumus
Chinook Industrial Park ASP
Stormwater Management

Figure No.
1

Title
Project Location





Legend

─── Contour - 50 cm

▭ Chinook Industrial Park Boundary

Elevation (m)

919.46

903.95

0 100 200 Meters

(At original document size of 11x17)
1:6,000

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: Altalis, City of Lethbridge
3. Background: Lethbridge County, Maxar, Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCan, Parks Canada

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Client/Project
116549063

Sumus
Chinook Industrial Park ASP
Stormwater Management

Figure No.
2

Title
Existing Topography

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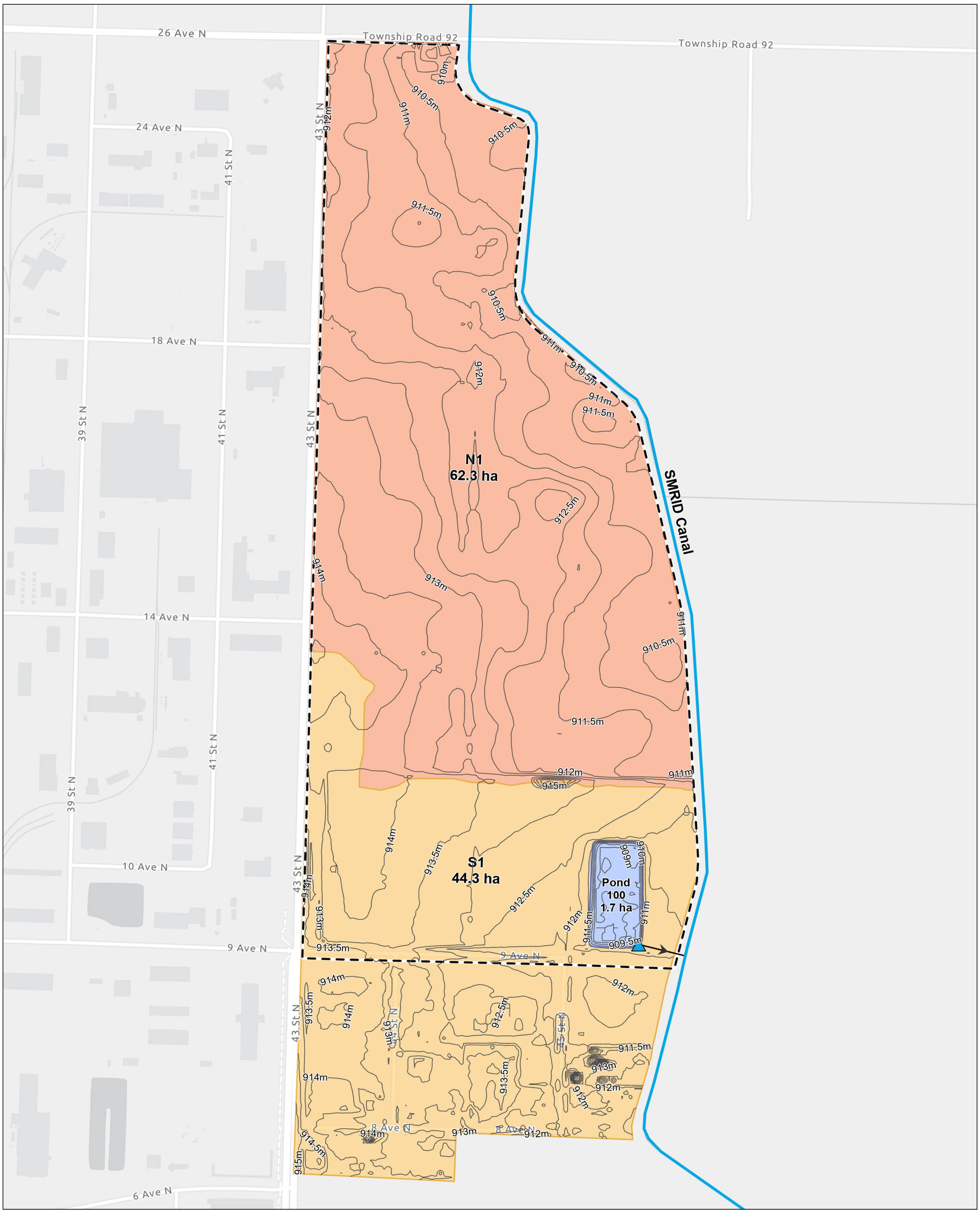


Legend

▲ Existing Switch Release

→ Sewer

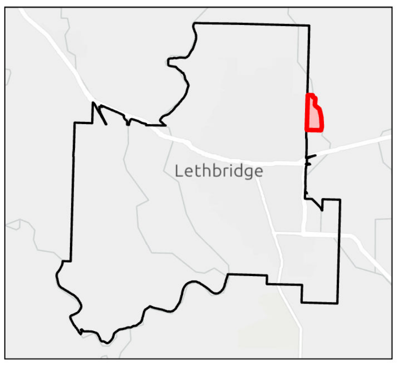
— Contour - 50 cm

🟥 North Subcatchment

🟨 South Subcatchment

🟦 Existing Pond

▭ Chinook Industrial Park Boundary



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(At original document size of 11x17)
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N

Notes
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2. Data Sources: Altalis, City of Lethbridge
3. Background: Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCan, Parks Canada, Esri Community Maps Contributors, City of Lethbridge, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada

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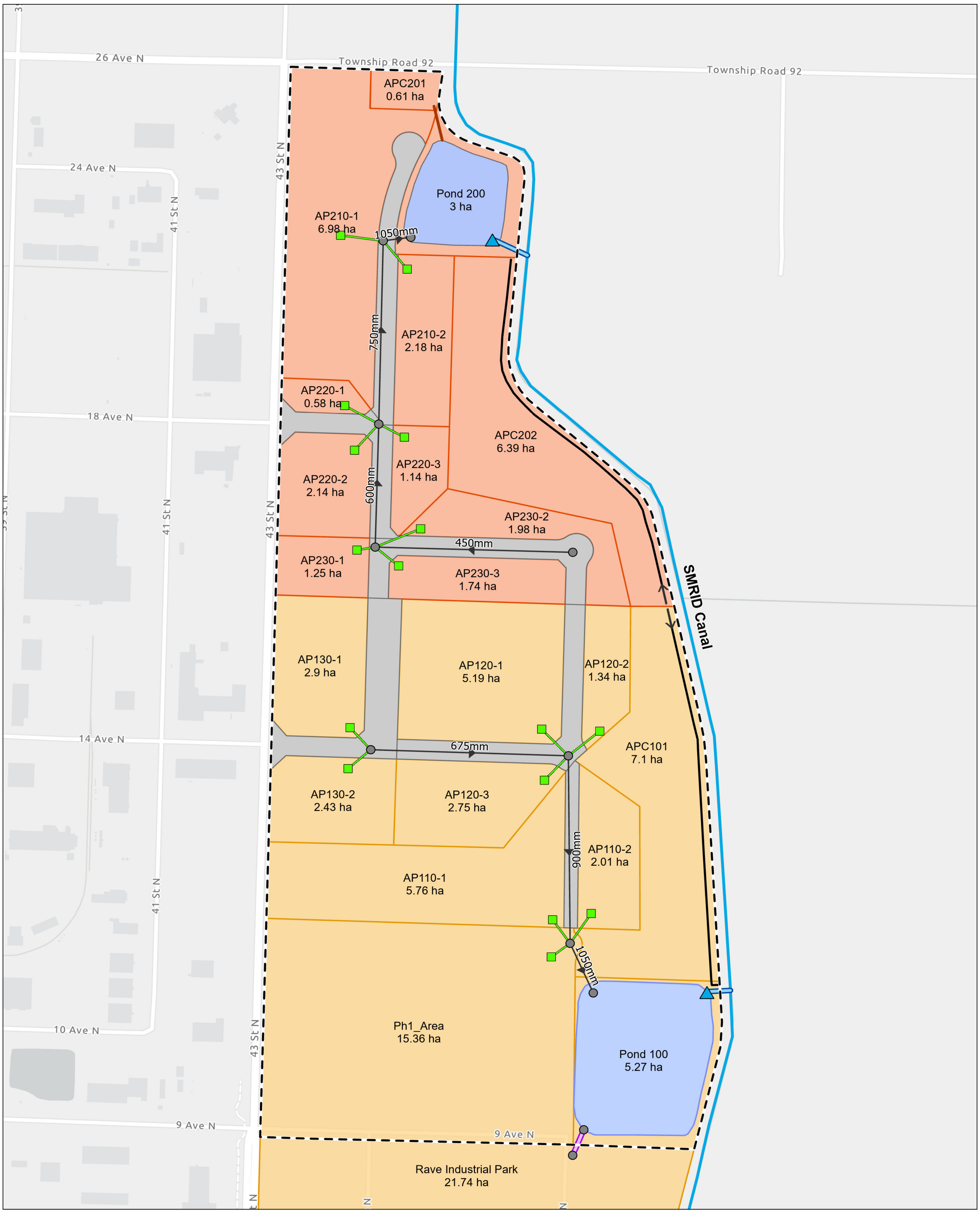
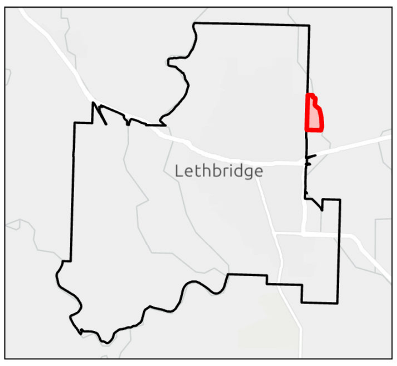
116549063
Sumus
Chinook Industrial Park ASP
Stormwater Management

Figure No.
3

Title
Existing Stormwater





Legend

- ● Maintenance Hole
- ▲ Switch Release
- 🟩 Site Storage
- Restricted Discharge to Minor System
- Ditch
- → Swale
- → Proposed Sewer
- Forcemain
- Inflow from Rave Industrial Park
- SMRID Canal
- 🟧 North Catchment
- 🟨 South Catchment
- ▨ Road
- Proposed Pond
- Chinook Industrial Park Boundary

0 100 200
Meters

(At original document size of 11x17)
1:6,000

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 12N
2. Data Sources: Altalis, City of Lethbridge
3. Background: Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCan, Parks Canada, Esri Community Maps Contributors, City of Lethbridge, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada

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IR by BS on 2/3/2023

Client/Project 116549063
Sumus
Chinook Industrial Park ASP
Stormwater Management

Figure No.
4

Title
Proposed Stormwater Management

APPENDIX C

Geotechnical Evaluation
Chinook Industrial Park Area Structure Plan
Within W ½ of Section 10 TWP 9 RGE 21 W4M
Lethbridge County, Alberta

PRESENTED TO

Sumus Property Group Ltd.

MARCH 2023
ISSUED FOR REVIEW
FILE: ENG.LGEO04625-01.001

This document has been "Issued for Review" to allow the client/design team to review and provide comments back to Tetra Tech Canada Inc. This document is subject to revision based on input received and therefore any decisions based on this unsigned document should be reviewed in relation to the subsequent "Issued for Use" document.

Tetra Tech Canada Inc.
442 - 10 Street N.
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

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FIGURES

APPENDICES

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Sumus Property Group Ltd., and his agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Sumus Property Group Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Tetra Tech's Limitations on Use of this Document are provided in Appendix A of this report.

1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation conducted by Tetra Tech Canada Inc. (Tetra Tech) for the proposed Phase 2 and Phase 3 development of the Chinook Industrial Park Area Structure Plan (ASP) to be located in the Lethbridge County, Alberta (Figure 1).

The objective of this evaluation was to determine the general subsurface stratigraphy and groundwater conditions in the area of the proposed development and to provide general recommendations for the geotechnical aspects of the development. This evaluation has been conducted with limited project details available at this stage and with an understanding that a site-specific geotechnical evaluation will be conducted after further project details become available for each of the proposed building structures.

The scope of work for the geotechnical evaluation was set out in Tetra Tech's proposal (PENG.LGEO04625-01) dated January 17, 2023. The scope of work for this evaluation comprised the drilling of 15 boreholes, a laboratory program to assist in classification of the subsurface soils, and provision of this geotechnical report with the following design and construction recommendations:

- Design parameters for shallow foundations and below-grade structures.
- Design parameters for deep foundation systems.
- Design and installation of floor slabs-on-grade.
- Design and construction of stormwater facilities.
- Site classification for seismic site response.
- Trench excavation and backfill.
- General site grading.
- Volumetric changes of soil due to changes in moisture content and/or frost.
- Mitigation for high water table, if encountered.
- Construction of subgrades, backfill materials, and compaction.
- Concrete type for structured elements in contact with soil.
- Asphalt pavement structure as per the Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

Tetra Tech has also conducted a Phase I Environmental Site Assessment (ESA) for the proposed development. The findings of the Phase I ESA have been provided in a separate report.

Authorization to proceed with the evaluation was provided by Mr. Michael Kelly, of MSK Developments, on behalf of Sumus Property Group Ltd. (Sumus), via a signed Services Agreement dated January 23, 2023.

2.0 PROJECT DESCRIPTION AND SCOPE OF WORK

The proposed Phase 2 and Phase 3 development will be located within the west half of Section 10 TWP 9 RGE 21 W4M. Tetra Tech understands that Phase 2 and Phase 3 are adjacent and to the north of Phase 1A and 1B of the Chinook Industrial Park, which is currently developed and serviced.

Based on the information provided by the client, it is understood that the proposed Phase 2 and Phase 3 project will comprise an industrial/commercial business park with major development including industrial lots, utilities and street infrastructure, as well as stormwater management facilities. The total planned area of Phase 2 and Phase 3 is approximately 60.12 hectares.

It is understood that the proposed development will be designed and constructed to the Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

Further details of the proposed development, including building locations, foundation loads, floor elevations, and locations of the other facilities such as roadways and stormwater management facilities, are not available at the time of preparation of this report.

3.0 GEOLOGY

Based on Tetra Tech's previous experience near the project site and available surficial geological map by Shetsen[1], the native soil at the project site is expected to consist of lacustrine silts and clays which were deposited in the proglacial Lethbridge Lake, underlain by glacial upper till unit that forms the Lethbridge Moraine. The glacial upper till is of even thickness, consisting of unsorted mixture of clay, silt, sand, and gravel with local water-sorted material overlying bedrock. The site assessment results reported herein are generally consistent with the published data; however, bedrock was not encountered in the boreholes up to their termination depths.

4.0 FIELD AND LABORATORY WORK

4.1 Geotechnical Fieldwork

The fieldwork for this evaluation was carried out on February 2 and 3, 2023, using a truck-mounted drilling rig, contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The rig was equipped with 150 mm diameter solid stem continuous flight augers. Tetra Tech's field representative was Mr. Syed Alam, E.I.T. Buried utility locating was carried out through Alberta One-Call and a private utility locator, contracted by Tetra Tech (LandScan Locating Ltd.).

During the fieldwork, a total of 15 boreholes, designated as 23BH001 through 23BH015, were drilled within the proposed development footprint to depths varying from 6.6 m to 9.6 m below the existing ground surface. The borehole locations are shown on Figure 2.

The borehole locations were laid out on site by Tetra Tech using a handheld GPS. The borehole ground elevations were surveyed by Tetra Tech via a laser level and a rod. The south side of a survey stake denoted as 'FD.1', located on the southwest corner of the site (and shown on Figure 2), was used as a benchmark; with an assumed elevation of 1000.00 m. The borehole coordinates (with accuracy of ±2 m) and the surveyed ground elevations are presented on the borehole logs in Appendix B and summarized in Table A.

---

[1] Shetsen 1989. Quaternary Geology, Southern Alberta. Alberta Research Council, Bulletin No. 53.

Table A: Summary of Borehole Depths

Borehole No.	Existing Ground Elevation (m)^2	Easting (m)^1	Northing (m)^1	Borehole Depth Below Existing Ground Surface (m)	Standpipe Depth Below Existing Ground Surface (m)
23BH001	999.61	371849	5508582	9.6	9.6
23BH002	997.44	372128	5508641	6.6	6.6
23BH003	996.71	372397	5508601	9.6	9.6
23BH004	996.60	372340	5508804	6.6	6.6
23BH005	998.40	372087	5508832	6.6	6.6
23BH006	999.49	371894	5508792	6.6	6.6
23BH007	999.13	371835	5509001	6.6	6.6
23BH008	997.70	372126	5509018	9.6	9.6
23BH009	996.20	372360	5508990	6.6	6.6
23BH010	996.93	372159	5509196	6.6	6.6
23BH011	998.04	371906	5509221	6.6	6.6
23BH012	997.26	371849	5509493	6.6	6.6
23BH013	997.22	372083	5509440	9.6	9.6
23BH014	995.95	372080	5509659	6.6	6.6
23BH015	996.41	371926	5509752	9.6	9.6

Notes: [1] Coordinates are based on UTM System Zone 12.
[2] Elevations are not geodetic. They are referenced to a site benchmark.

In all the boreholes drilled, disturbed grab samples were obtained at depth intervals of approximately 600 mm. Standard Penetration Tests (SPT) using an automatic SPT hammer (with an approximate efficiency of 90%) were completed at intervals of 1.5 m. All soil samples were visually classified in the field, and the individual soil strata and the interfaces between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

Slotted 25 mm diameter polyvinyl chloride (PVC) standpipes were installed in all the boreholes to monitor the short-term groundwater levels. Auger cuttings were used to backfill around the standpipes and the boreholes were sealed at the ground surface with bentonite chips.

4.2 Laboratory Program

Soil classification tests, including natural moisture content, Atterberg Limits, grain size distribution (hydrometer), soluble sulphate content, moisture-density relationship (proctor), and constant head hydraulic conductivity (also referred to as permeability) tests were subsequently performed in the laboratory on selected samples collected from the boreholes to aid in the determination of engineering properties. The results of the laboratory tests are presented on the borehole logs and the test reports for hydrometer, proctor and permeability are included as Appendix C.

5.0 SITE CONDITIONS

5.1 Location and Surface Features

The project site for Phase 2 and Phase 3 of the Chinook Industrial Park is located within the west half of Section 10 TWP 9 RGE 21 W4M and is bounded by 43 Street North to the west; 9 Avenue North to the south; the St. Mary River Irrigation District (SMRID) Canal to the east; and Township Road 92 to the north.

According to information provided by the client, the proposed Phase 2 and Phase 3 site comprises of two (2) lots in the northern portion of the Chinook Industrial: Lot 5 Block 1 Plan 1113171, and Lot 1 Block 1 Plan 0013201.

Lot 5 Block 1 Plan 1113171 is the larger half, comprising of 59.56 hectares of undeveloped farmland.

The remaining portion is Lot 1 Block 1 Plan 0013201, which is a 0.56-hectare portion of land (i.e., Lethbridge Regional Water Services commission lot) with a small building that primarily houses a water filling station.

The project site is relatively flat with drainage generally tending to the southeast except for the northern portion where there is an existing break in topography with the natural drainage tending in the northeast direction.

At the time of the geotechnical fieldwork, the site was sparsely covered with snow with the upper 0.3 m of the ground estimated to be frozen. This thickness of the frozen ground is expected to vary across the site.

5.2 Historical Aerial Photograph Review

As part of the evaluation, Tetra Tech reviewed historical aerial photographs and Google Earth Pro images of the proposed development site and surrounding area from 1950 to 2023. The following observations were noted:

- The proposed Phase 2 and Phase 3 project site has remained as undeveloped farmland since 1950 to date except for the construction of the water filling station in the northeast corner; estimated to have been constructed between 1999 and 2011.
- A winding irrigation channel exists at the eastern boundary with agricultural lands to the east and north.
- The existing 43 Street North was observed in all of the reviewed aerial photographs; thus, its construction is expected to have undertaken prior to 1950. 43 Street North borders the western boundary of the project site with undeveloped agricultural lands to its west in the 1950s; however, from 1979, industrial/commercial developments were observed in the reviewed photographs on the west side of 43 Street North.
- Additional industrial/commercial developments were observed in aerial photographs after 1979, most notably the Rave Industrial Park located at the south boundary, which was likely developed sometime between 1985 and 1991.
- Between 2012 and 2022, development of industrial lots comprising Phase 1A and 1B of the ASP was observed in the aerial photographs to the south of the Phase 2 and Phase 3 project site, with a stormwater pond in the southeast corner.

5.3 Mining Activity

Tetra Tech reviewed the possible existence of mine workings within the boundary of the proposed development area, including a review of the Alberta Energy Regulator (AER) coal mine mapping archive and other literature contained in Tetra Tech’s library. The review indicated that no mine workings exist within the proposed development area.

5.4 Background Geotechnical Review

As part of the site assessment, Tetra Tech reviewed the subsurface conditions of boreholes within 450 m of the project site, available in Tetra Tech’s library. The review indicates that subsurface conditions encountered on site, are generally consistent with those encountered earlier in the surrounding areas.

6.0 SUBSURFACE CONDITIONS

The general subsurface stratigraphy of the site comprised of a surficial layer of topsoil underlain by native clay and clay till deposits. The following subsections provide a summary of the stratigraphic units encountered at the specific borehole locations across the site. A more detailed description is provided on the borehole logs attached in Appendix B.

All noted depths in the following subsections refer to depth below the ground surface that existed at the time of the fieldwork.

6.1 Soils

6.1.1 Topsoil

A surficial layer of topsoil was encountered at all the borehole locations, with a thickness ranging from 20 mm to 130 mm. The topsoil was generally described as clay, silty, sandy, frozen to moist, and dark brown with trace rootlets and organics. Due to previous grading activities (agricultural practices) and depositional processes (i.e., wind), the thickness of the topsoil layer is expected to vary across the project site.

6.1.2 Clay

Native clay was encountered in all the boreholes underlying the topsoil and extending to depths ranging from 0.4 m and 2.0 m below ground surface. The clay was generally described as silty, some sand to sandy, damp to very moist, low to medium plastic, firm to very stiff, and brown. Silt and sand lenses/pockets, precipitates, and occasional high plastic clay inclusions were noted in the clay. Moisture contents of the selected clay samples varied from 7.7% to 23.0%. Two (2) Atterberg Limits tests conducted on clay samples indicated Plastic Limits of 14% and 15%; and Liquid Limits of 31% and 35%; indicative of low to medium plasticity. One (1) hydrometer test indicated a particle size distribution of the sand, silt, and clay size as 31%, 48%, and 21%, respectively.

SPT “N” values indicated between 5 and 10 blows per 300 mm of penetration, indicative of firm to stiff consistency.

6.1.3 Clay Till

Clay till was encountered beneath the native clay at depths varying from 0.4 m to 2.0 m below the existing ground surface in all the boreholes and extended to the borehole termination depths. The clay till was generally described as silty, some sand to sandy, trace gravel, damp to very moist, firm to very stiff, low to high plastic, and brown to dark brown with grey mottling. Silt and sand pockets up to 100 mm thick, precipitates, coal and oxide specks/staining or coal fragments were encountered within the clay till. Moisture contents of the selected samples of the clay till varied from 9.9% to 32.0%. Five (5) Atterberg Limits tests conducted on the clay till samples indicated Liquid Limits of 36%, 37%, 36%, 61%, and 29%; and Plastic Limits of 14%, 15%, 15%, 23%, and 12%; indicative of low to high plastic. High plasticity was observed only in sample D6 recovered from an approximate depth of 9.0 m from 23BH013. One (1) hydrometer test indicated a particle size distribution of the sand, silt, and clay size as 31%, 48%, and clay fraction as 21%, respectively.

SPT “N” values in the clay till ranged between 4 and 22 blows per 300 mm of penetration, indicative of firm to very stiff consistency.

Although not encountered in the boreholes, till deposits commonly contain cobbles and occasional boulders, which may be encountered during construction excavation, if any, and during installation of pile foundation.

6.2 Borehole Sloughing and Groundwater Conditions

During the field drilling, minor sloughing was encountered in 23BH009 and 23BH014 at depths of 6.1 m and 6.0 m respectively, below the existing ground. At the time of drilling, groundwater seepage was encountered in 23BH009, 23BH013, and 23BH015 at depths of 1.5 m, 7.8 m, and 6.3 m below the existing ground surface, respectively. Standpipes were installed in all the boreholes after completion of drilling. The groundwater levels were measured in the installed standpipes 7 to 8 days after completion of drilling on February 10, 2023. Table B summarizes the groundwater monitoring data.

Table B: Groundwater Monitoring Data – February 10, 2023

Borehole Number	Depth of Standpipe (m)	Borehole Elevation** (m)	Depth to Groundwater on February 10, 2023* (m)	Groundwater Elevation** (m)
23BH001	9.6	999.61	8.26	991.35
23BH002	6.6	997.44	6.37	991.07
23BH003	9.6	996.71	2.97	993.74
23BH004	6.6	996.60	5.83	990.77
23BH005	6.6	998.40	5.70	992.70
23BH006	6.6	999.49	6.42	993.07
23BH007	6.6	999.13	4.92	994.21
23BH008	9.6	997.70	5.20	992.50
23BH009	6.6	996.20	1.54	994.66
23BH010	6.6	996.93	3.65	993.28
23BH011	6.6	998.04	5.72	992.32
23BH012	6.6	997.26	Dry	-
23BH013	9.6	997.22	3.19	994.03
23BH014	6.6	995.95	2.05	993.90
23BH015	9.6	996.41	4.54	991.87

* February 10, 2023, is approximately 7 to 8 days after the completion of the borehole drilling

**Elevations are not geodetic and are referenced to a site benchmark

Based on the available groundwater information, groundwater levels were measured at depths varying from 1.54 m to 8.26 m below the existing ground surface. Groundwater levels within 3.0 m of the existing ground surface were measured in a total of three boreholes (23BH003, 23BH009, and 23BH014) located along the east boundary of the project site.

The water levels measured in the standpipes may not have stabilized at the time of the last measurement reported above. Groundwater levels may fluctuate seasonally (seasonally high in the late spring and early summer) and in response to climatic conditions; thus, they may be encountered at different depths when construction commences. Higher groundwater levels may be considered in the event construction is to occur during the late spring season and early summer. some of the observed groundwater level/seepage and sloughing noted in the boreholes is expected to be due to the presence of wet/saturated sand or silt seams within the clay or clay till.

7.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations provided in this report are valid for the project details discussed in Section 2.0. The recommendations that follow provide varying options intended to aid in the development of project concepts and specifications.

The following recommendations are based on subsurface conditions encountered in the boreholes drilled at the project site. Note that geological conditions are innately variable. At the time of preparation of this report, information on the subsurface stratigraphy was available only at discreet borehole locations. In order to develop design recommendations from this information, it is necessary to make some assumptions concerning conditions other than those present at the borehole locations.

The recommendations are based on the understanding and condition that Tetra Tech will be retained to review the relevant aspects of the final design (drawings and specifications) and to conduct such field reviews as are necessary to ensure compliance with the geotechnical aspects of the 2019 National Building Code – Alberta Edition (Building Code), Lethbridge County Engineering Guidelines and Minimum Servicing Standards, this report, and the final plans and specifications. Tetra Tech accepts no liability for any use of this report in the event that Tetra Tech is not retained to provide these review services.

Pursuant to Sections 2.2 and 2.4 of the Building Code, the proposed project will require compliance with the professional design and review requirements set out in Section 2.4 of the Building Code. These require that a geotechnical engineer be retained as a Registered Professional of Record to provide such field reviews as are necessary to certify compliance with the Building Code and to ensure that the geotechnical aspects of the project are constructed so as to substantially comply with the plans and specifications, as well as the requirements of this report.

Given that this geotechnical evaluation was completed with a limited number of boreholes and limited project details, it is advised that the recommendations presented in this report be confirmed and/or updated, as required, by conducting a site-specific geotechnical evaluation prior to design and construction of each building/development.

7.1 General

Based on the subsurface conditions encountered in the boreholes, potential geotechnical constraints exist within the site that could impact the proposed design and construction, including:

- The presence of a shallow groundwater table (as shallow as 1.54 m, 2.05 m, 2.97 m, and 3.19 m below the existing ground surface in 23HB009, 23BH014, 23BH003, and 23BH013, respectively).
- The presence of frost-susceptible soils.
- The presence of low to medium plastic clay/clay till (with occasional high plastic) below the topsoil, with firm to very stiff consistency.

On the premise of subsurface conditions encountered in the boreholes, the potential for methane generation is not expected, provided the topsoil containing organics is completely removed from potential building footprint areas and approximately 5.0 m beyond potential building footprint areas.

Considering the groundwater levels measured in the standpipes, temporary and permanent dewatering measures would be required, depending on the depth of excavation, and particularly in areas of shallow groundwater along the east boundary of the project site.

Clay till with high plasticity (i.e., Liquid Limit of 61% and Plasticity Index of 38%) was encountered in 23BH013 at a depth of 9.1 m below the existing ground surface. The high plastic clay typically has relatively higher potential of swelling and shrinkage upon wetting and drying; thus, the performance of settlement-sensitive structures may be impacted if the high plastic clay is present immediately beneath them. The presence of high plastic clay, if any, should be assessed during the site-specific geotechnical evaluation within the footprint of the settlement-sensitive structures.

All foundation design recommendations presented in this report are based on the assumption that an adequate level of monitoring by Tetra Tech will be provided during construction and that all construction will be carried out by suitably qualified contractors, experienced in foundation and earthworks construction. An adequate level of monitoring is considered to be:

- For shallow foundations; inspection of bearing surfaces prior to placement of concrete or mudslab, and design review during construction.
- For deep foundations; full-time monitoring and design review during construction.
- For earthworks; full-time monitoring and compaction testing.

Suitably qualified persons, independent of the contractor, should carry out all such monitoring. One of the purposes of providing an adequate level of monitoring is to check that recommendations, based on data obtained at discrete borehole locations, are relevant to other areas of the site.

7.2 Site Development

7.2.1 Topsoil Depth

The initial topsoil stripping depth should be considered as being of particular importance with regard to site subgrade grading design elevations. Based on the findings of the field drilling program, the surficial topsoil (A Horizon) layer thickness generally varies from 20 mm to 130 mm; however, may be variable in thickness due to historical cultivation practices of the land surface and/or depositional processes (i.e., wind). However, consideration can be given to incorporating the underlying B Horizon layer (organic content <5%) into the fill mass to be removed during general site grading. Full-time monitoring by experienced personnel is recommended in order to avoid over-stripping and to ensure appropriate material mixing and placement. To accurately estimate the topsoil stripping volume (if required), it is recommended that a site-specific field drilling program be conducted.

7.2.2 Lot Grading

The lot grading should be designed and carried out to the current Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

All lots should be graded for drainage at a minimum gradient of 3.0%. Backfill materials and compaction requirements, as to be discussed in Section 7.2.3, should be followed. Where encountered, all organics, localized soft and/or wet soils, or deleterious material must be removed to expose the underlying suitable clay soil. The excavated areas must be backfilled with general engineered fill.

If the development is to consider a raised site grading, additional settlement due to consolidation of the fill and the native soil should be expected and should be considered in the design. After the completion of the raised site grading, the construction of structures supported on raised grade should be delayed to allow for the majority of the consolidation settlement to occur prior to construction.

7.2.3 Backfill Materials and Compaction

The existing site soils comprising the predominantly low to medium plastic clay and clay till are considered suitable for use as both landscape fill and general engineered fill materials, as defined in Appendix D. Any soil containing deleterious materials should be removed from site. Sand, silt, and high plastic clay soils, if any, should be separated and used for landscape fill. The final decision on approved backfill materials should be made during site construction.

The moisture content of the site soil materials is expected to be variable with respect to the optimum moisture content (OMC); therefore, it is anticipated that moisture conditioning will be required at the site for proper backfill placement. The earthworks contractor should make their own estimate of the requirements for moisture conditioning to the recommended standards and should consider such factors as weather and construction procedures. A contingency for importation of general engineered fill is recommended in the event that the site soils cannot be moisture conditioned.

General engineered fill materials should be moisture conditioned to within a range of OMC to +2% of the OMC prior to compaction and compacted to a minimum of 98% Standard Proctor Density (SPD). The compacted thickness of each lift of backfill shall not exceed 150 mm.

Further recommendations regarding backfill materials and compaction are contained in Appendix D.

7.2.4 Construction Excavations

Excavations should be carried out in accordance with Alberta Occupational Health and Safety Regulations. The depth for the trench excavations is unknown at this time and is anticipated to be less than 6 m below existing ground surface for below-grade structures and/or utility infrastructure. The following recommendations notwithstanding, the responsibility of all excavation cutslopes resides with the Contractor, who should take into consideration site-specific conditions concerning soil stratigraphy and groundwater. All excavations should be reviewed by the Contractor and experienced geotechnical personnel prior to working within the base of the excavation.

Based on the findings of the drilling program, firm to very stiff clay soils, in moist to very moist conditions, are generally anticipated to be encountered within 6.0 m below grade during excavation. All excavations which are to be deeper than 1.5 m should have the sides shored and braced or the slopes should be cut back no steeper than 1.0 horizontal to 1.0 vertical (1.0H:1.0V). In areas where seepage is encountered, the cutslope would need to be flattened to 1.5H:1V and dewatering equipment should be on hand. When excavations are open for longer than one month or where the excavation is required deeper than 6.0 m, the slopes should be cut back flatter than 1.0H:1.0V and should be assessed during construction by a qualified geotechnical engineer.

Any encountered groundwater seepage should be directed towards sumps for removal. Conventional construction sump pumps should be capable of groundwater control.

Spoil piles or temporary surcharge loads should not be allowed within a distance equal to the depth of the excavation from an unsupported excavation face, while mobile equipment should be kept back at least 3.0 m. All excavations should be checked regularly for signs of sloughing, especially after rainfall periods. Small earth falls from the sideslopes are a potential danger to workers and must be guarded against by the contractor.

General recommendations regarding construction excavations are contained in Appendix D.

7.2.5 Trench Backfill and Compaction

Trenches must be backfilled in such a way as to minimize the potential differential settlement and/or frost heave movements. A minimum compaction level of 95% of Standard Proctor Maximum Dry Density (SPMDD) is recommended for backfill within the pipe zone of the trench (to 300 mm above the top of pipe). For the remainder of the trench backfill, a minimum compaction standard of 98% of SPMDD should be utilized in all areas. The compacted thickness of each lift of backfill shall not exceed 150 mm. Moisture conditioning to OMC and 2% over OMC of the soils should be specified for general trench backfill. The upper 1.5 m of service trenches should be cut back at a maximum slope of 1.0H:1.0V to avoid an abrupt transition between backfill and in situ soil.

It should be noted that the ultimate performance of the trench backfill is directly related to the uniformity of the backfill compaction. In order to achieve the uniformity, the lift thickness and compaction criteria should be strictly enforced.

General recommendations regarding backfill materials and compaction are contained in Appendix D.

7.3 Foundations

The following foundation recommendations have been provided assuming that no significant site grading would be undertaken at the project and foundation design recommendations would be confirmed/updated by conducting a site-specific geotechnical evaluation.

Based on the available borehole logs, firm to very stiff clay or clay till (with SPT blow count varying from 4 to 10 in the majority of the boreholes) was generally encountered at/near the anticipated depth of shallow foundation (i.e., within the upper 2.1 m below the existing ground surface). Considering the soil conditions encountered in the boreholes, shallow foundations are considered suitable to support only lightly loaded structures. Further recommendations and parameters for the design of shallow foundations are provided in Section 7.3.2.

Alternatively, deep foundation systems consisting of bored cast-in-place (CIP) concrete piles or Continuous Flight Auger (CFA) concrete piles founded in stiff to very stiff clay/clay till may be used to support the proposed development. Helical piles may also be considered to support the structures of the proposed developed; however, helical piles should be used to support only static loads (i.e., no dynamic loads). Further recommendations for bored CIP piles and CFA piles are provided in Sections 7.3.3 and 7.3.4, respectively.

7.3.1 Limit States Design

For the Limit States Design (LSD) methodology, in order to calculate the factored load capacity, the appropriate Soil Resistance Factors must be applied to each loading condition as follows:

Factored Capacity = Ultimate Capacity x Soil Resistance Factors

In general, the following soil resistance factors must be incorporated into the foundation design. These factors are considered to be in accordance with the Canadian Foundation Engineering Manual (CFEM) (2006) as well as the Building Code.

Table C: Soil Resistance Factors

<table>
<tr><th colspan="2">Description</th><th>Resistance Factor</th></tr>
<tr><td colspan="3">Shallow Foundations</td></tr>
<tr><td colspan="2">Bearing resistance</td><td>0.5</td></tr>
<tr><td colspan="2">Passive resistance</td><td>0.5</td></tr>
<tr><td colspan="2">Horizontal resistance (sliding)</td><td>0.8</td></tr>
<tr><td colspan="3">Deep Foundations</td></tr>
<tr><td rowspan="3">Resistance to Axial Compressive Load</td><td>From Semi-Empirical Analysis</td><td>0.4</td></tr>
<tr><td>From Static Loading Test Results</td><td>0.6</td></tr>
<tr><td>From Dynamic Monitoring Results (i.e., Pile Driver Analyzer Testing)</td><td>0.5</td></tr>
<tr><td rowspan="2">Uplift Resistance</td><td>From Semi-Empirical Analysis</td><td>0.3</td></tr>
<tr><td>From Loading Test Results</td><td>0.4</td></tr>
<tr><td colspan="2">Horizontal Load Resistance</td><td>0.5</td></tr>
</table>

Under LSD methodology, foundations are to be designed with consideration to both the factored Ultimate Limit State (ULS) and Serviceability Limit States (SLS).

7.3.2 Shallow Foundations

Shallow foundations consisting of strip, spread, or mat foundations bearing on firm to stiff clay may be used to support lightly loaded structures, provided other recommendations of this report are followed. Shallow footings should be constructed to a minimum of 1.4 m below the final design ground surface (frost protection requirement for footings under heated structures). For unheated structures, the footings should be constructed a minimum of 2.1 m below grade. All footings should be founded on firm to stiff native soils only. Any fill (except for the general engineered fill) and deleterious materials must be removed from the building footprint areas to expose native subgrade soils.

The future site grading plan is unknown at this time which may require footings to be placed within general engineered fill. It is noted that placement of foundations on engineered fill with thicknesses greater than 2.0 m requires special consideration regarding long-term consolidation of the fill and underlying native soils and subsequent performance issues with the foundations/floor slabs-on-grade. Recommendations and parameters for the design of the shallow foundations within the engineered fill, if any, should be assessed during site-specific geotechnical evaluation considering the grading details.

Footings should be founded on native firm to stiff native soils only. The ultimate and factored static bearing resistance may be taken as 150 kPa and 75 kPa, respectively, subject to other recommendations in this report and confirmation/update during the site-specific geotechnical evaluation. Footing dimensions should be in accordance with the minimum requirements of the Building Code.

Specific bearing certification by a geotechnical engineer in conjunction with a site-specific geotechnical evaluation is recommended for each industrial structure to ensure that the shallow foundations are placed on competent native soils. Any soft/wet/loose/weak soils encountered at footing level, should be replaced with low strength lean mix concrete. Alternatively, it may be possible to lower the footing elevation to more competent native soils, but this should be looked at on a case-by-case basis.

It is recommended to use a smooth edge-trimming bucket or Grade-All for final excavation to the foundation subgrade elevation to minimize disturbance of the founding soils. A minimum 50 mm concrete mudslab should be placed immediately following excavation and inspection, to protect the bearing surface from disturbance and inclement weather.

Gradients of 1H:1V or flatter should be maintained between the bases of adjacent footings at different elevations to avoid load transfer from one to the other.

Foundations subjected to significantly inclined, eccentric, or dynamic loading require special considerations and should be geotechnically assessed on an individual basis.

Considering the groundwater levels measured in the standpipes, groundwater seepage may be encountered during foundation excavation in some areas of the project site.

Recommendations for minimum depth of cover for footings are presented under the heading ‘Frost Protection’ in Section 7.10. Further recommendations regarding shallow foundations are given in Appendix D.

7.3.3 Bored Cast-in-Place Piles

As an alternative to shallow foundation, bored CIP piles may be considered to support the proposed structures.

Bored CIP piles, founded in stiff to very stiff native clay till, may be designed to resist axial compressive loads on the basis of the shaft and the base resistance parameters provided in Table D. The parameters provided in Table D should be confirmed/updated based on the site-specific geotechnical evaluation.

Table D: Bored Cast-in-Place Concrete Pile Design Parameters (for Compressive Loads)

Depth Below Existing Ground Surface (m)	Ultimate Shaft Resistance (kPa)	Factored Shaft Resistance (kPa)	Ultimate Base Resistance (kPa)	Factored Base Resistance (kPa)
0.0 to 2.0	0	0	N/A	N/A
2.0 to 6.0 (Native Clay / Clay Till)	40	16	N/A	N/A
6.0 to 9.6 (Clay till)	60	24	900	360

Straight shaft piles should have an overall concreted pile length not less than 6.0 m below final grade and a minimum shaft diameter of 400 mm. Longitudinal reinforcement in straight shaft piles should extend a minimum of 6.0 m below final grade to provide adequate uplift resistance against frost jacking.

Bored CIP piles should be spaced no closer than 2.5 times the base diameter (measured centre-to-centre). Bells of the CIP piles, where chosen to be constructed, should also be spaced 2.5 times the bell diameter (measured centre-to-centre).

The shaft and base resistances presented in Table D are based on the assumption that mechanical cleaning of the pile sides and bases will be undertaken during installation. Soft, loose, or wet soils, and accumulated water, if any, should be removed from the base and the side of the pile bore immediately prior to the placement of concrete. Base resistance should only be considered in the design where base cleaning can be verified during construction.

Under-reaming or belling of bored CIP piles in clay till should only be considered if a pile bell free of groundwater seepage can be constructed, and if sloughing of the pile bell is not encountered. The feasibility of construction of bell piles in clay till should be assessed and confirmed by the piling contractor prior to construction. Difficulty in bell construction may occur where silty, sandy, or gravelly clay till is encountered at the bell elevation or where groundwater seepage is encountered at the bell elevation. Accordingly, an alternate design option should also be prepared and implemented where belled piles cannot be constructed.

Bell diameters should be two to three times the shaft diameter. End-bearing should not be used for small diameter (less than 760 mm base diameter) piles because of the difficulties associated with ensuring a clean base. For bored CIP belled piles, shaft resistance should be neglected over the height of the bell and for a height of one shaft diameter above the top of the bell. A minimum depth of cover of 2.5 times the base or bell diameter has been assumed to determine the base resistances provided in Table D. Should less cover be provided, the base resistance would have to be reduced.

Pile bells cannot be formed within sloughing layers such as silt, sand, gravel, and gravelly layers of the clay till. To provide adequate support for the roof of a bell where wet sloughing layers are encountered, the minimum distance from the underside of a sloughing layer to the top of the roof of a bell should be 0.6 m.

It is noted that the clay till will require confirmation of soil conditions at pile bottom elevations for piles with base resistance consideration, as local weaker layers may be encountered during pile installation. Where weaker layers are encountered at the pile bases, additional measures considering the design details of the piles would be required.

Groundwater seepage is expected to be encountered during pile installation at the project site, primarily where wet/saturated sand/silt seams or perched groundwater are intercepted.

Temporary casing should be on hand before drilling starts and used to seal off groundwater and to prevent sloughing of the pile bore. The piling contractor should make their own estimate of temporary casing requirements and should consider such factors as construction procedures and bore diameter.

The piling contractor selected should be experienced in the placement of concrete below water using tremie pipes in light of the potential for groundwater inflows to be encountered during pile installation. The contractor should have all required and/or reasonably anticipated equipment on site prior to the construction of any pile.

Difficult drilling conditions of the bored CIP piles and bell formation in the clay till, if chosen, may be encountered due to potential presence of cobbles and/or boulders. Such drilling difficulties should be assessed by the piling contractor.

Field adjustments of pile dimensions (i.e., length and/or diameter) based on the encountered subsurface conditions may be required and should be included in contract documents.

General recommendations for the design and construction of bored CIP piles are provided in Appendix D.

7.3.4 Continuous Flight Auger Concrete Piles

As an alternative to bored CIP piles, CFA concrete piles, also known as auger-cast piles, are considered feasible for the proposed development. CFA piles are formed by drilling a continuous flight hollow stem auger into the ground, followed by pressure injection of concrete and simultaneous extraction of the auger. The sides of the hole are supported at all times by the auger, eliminating the need for temporary casing or drilling slurry. Reinforcement is placed immediately after withdrawal of the auger.

CFA piles may be designed on the basis of shaft resistance and base resistance provided in Table E.

Table E: Continuous Flight Auger Pile Design Parameters (for Compressive Loads)

Depth Below Existing Ground Surface (m)	ULS Ultimate Shaft Resistance (kPa)	ULS Factored Shaft Resistance (kPa)	ULS Ultimate Base Resistance (kPa)	ULS Factored Base Resistance (kPa)
0 to 2.0	0	0	N/A	N/A
2.0 to 6.0 (Native Clay / Clay Till)	40	16	N/A	N/A
6.0 to 9.6 (Clay till)	60	24	900	360

The base resistances provided in Table E are based on the assumption that stiff to very stiff clay till soils and a clean base are to be expected. It is impractical to confirm the base soil conditions with a clean base during pile installation, due to the CFA installation method; therefore, precautions, including, but not limited to, those discussed below, would need to be taken and should be included in the contract documents. Additional boreholes or trial CFA piles may be required prior to, or during, construction to further delineate the subsurface conditions.

Prior to design and construction, the suitability of CFA piles should also be confirmed by the designer and the contractor for the project site, considering the subsurface conditions and the potential variations. Installation records of CFA piles, such as concrete volume, concrete pressure, installation depth, pile profile, etc., should be provided by the piling contractor during construction monitoring for review. Based on the review of installation records, Pile Integrity Tests and/or Pile Driving Analyzer (PDA) tests may be required on selected CFA piles to confirm their capacities or integrities.

Pile reinforcement must be adequate to withstand all vertical, lateral, and tensile forces within the pile. A minimum pile diameter of 400 mm is recommended.

A minimum centre-to-centre pile spacing of 2.5 pile diameters is recommended. Short length (up to 10.0 m) reinforcing cages can be installed by the manual means of pushing the cage into the wet concrete, but longer cages will require the use of a vibrator, in which case it is essential that the reinforcement cages are welded. Centralizers are recommended to ensure adequate concrete cover of the reinforcing steel cages.

An important feature in the formation of CFA piles is the use of comprehensive instrumentation to monitor the performance of the rig at the time of boring. The piling rig must be capable of continuous pile monitoring using computerized technology (i.e., Pile Installation Recorder) to verify the pile cross-sectional area, concrete injection pressures, auger rotation per unit depth, boring rate, and the pressure in the rig hydraulic system. The capacity of CFA piles is highly dependent on the concrete injection pressure and on the properties of the soil into which the concrete is being injected. Continuous monitoring during pile installation is recommended to document the details of each CFA pile installed.

7.3.5 Serviceability Limit State Design for Cast-in-Place and Continuous Flight Auger Piles

The SLS must be addressed in addition to analyzing the ULS resistance of a foundation. The SLS is an analysis of the amount of settlement that a foundation element would undergo using unfactored structural loads.

Elastic compression of the pile shaft must be considered, regardless of whether the pile is designed on the basis of shaft resistance and/or base resistance. Note that the elastic compression of the pile shaft is typically small compared to the amount of compression of the soil at the base of the pile that is required to fully mobilize either the shaft resistance or base resistance.

For piles designed primarily on the basis of shaft resistance, the ultimate shaft resistance is typically mobilized after a relatively small pile displacement (approximately 5 mm to 10 mm). Full mobilization of the shaft resistance occurs prior to full mobilization of the base resistance (i.e., additional settlement is required to mobilize the base resistance).

The following expression should be used to estimate the settlement of a pile under SLS conditions, using unfactored structural loads:

$$S = (K)x\ (P/B\ E)$$

Where:

S = Foundation settlement (m).

K = 0.91.

P = Unfactored structural load (live load plus dead load, kN) applied at the pile base.

B = Pile base diameter (m).

E = Elastic modulus of the foundation soil, use 26,000 kPa at depths 6.0 m to 9.6 m below the existing ground surface.

The pile base diameter used in the above expression should be determined from the analysis of factored (ULS) structural loads and factored (ULS) base resistance for each loading case. If the calculated settlement is higher than tolerable for the structure, SLS may govern the pile design. Under such conditions, Tetra Tech should be contacted to provide further direction regarding suitable methods of settlement control. The above expression is anticipated to provide an estimate of the settlement, excluding the elastic compression of the pile.

7.3.6 Helical Piles

Helical piles are considered as an alternative option for this development, particularly preferred for lightly loaded structures. It is recommended that helical piles be considered only for statically loaded foundations (i.e., no dynamic load component). Design and construction recommendations for helical piles are provided in this section; however, it is noted that for the final design of this type of pile consideration should be given to the installation methodology of the specialty contractor, as the design capacity of helical piles is a function of the pile installation methodology.

Tetra Tech recommends using the CFEM (2006) design method for helical piles (CFEM Section 18.2.1.4). Using this methodology, the geotechnical parameters required to calculate the ultimate foundation capacity are provided in Table F. A minimum recommended depth for the upper helix is 2.1 m below the existing grade.

Table F: Geotechnical Parameters for Helical Piles

Depth (m)	Bulk Unit Weight (kN/m³)	Avg. Undrained Shear Strength Cu (kPa)	Drained Friction Angle* (Degrees)
0 to 2.0	19	-	-
2.0 to 6.0	19	50	26
6.0 to 9.6	19	100	28

*Only for long-term strength consideration with zero cohesion; friction angle should not be used together with undrained shear strength.

The total helical pile capacity is presented in the CFEM (Equation 18.10) as follows:

$R = Q_t + Q_f$

Where:

R = Total ultimate capacity of the pile (kN).

Q_t = Total ultimate multi-helix pile capacity (kN).

Q_f = Ultimate capacity due to pile shaft skin friction (kN) (for pile shafts greater than 100 mm diameter only).

To calculate the multi-helix bearing capacity, the individual bearing method presented in CFEM Equations 18.11 and 18.12 should be used, provided the helical bearing plates are spaced a minimum of three times the diameter of the largest helix. Otherwise, the cylinder shear method should be used, with consideration of overlapping stress zones between helices. This method sums up the bearing capacity of the bottom plate and the cylindrical shear capacity developed between the upper and lower plate(s).

The factored geotechnical capacity for each pile may be determined as follows, using the soil resistance factors presented in Section 7.3.1:

- Factored Pile Compression Capacity = 0.4R
- Factored Pile Uplift Capacity = 0.3R

For helical piles, the helix or helices should be founded in competent clay till and below the depth of frost penetration. Vertically installed helical piles generally require an enlarged shaft diameter in order to adequately resist lateral loads, where applicable. For bottom helices with load influence depths lower than the maximum borehole termination depth of 9.6 m, a field drill program should be conducted to confirm the soil conditions in depth. Should any of these parameters become limiting factors in the design, Tetra Tech should be contacted for more detailed review and analysis.

Construction of helical piles should consider, but not be limited to, the following recommendations:

- As the helical piles are installed, the rate of rotation and advancement should match the pitch of the helix plate. This will help to avoid “churning” of the foundation soils. It is critical that the foundation bearing soil is not excessively disturbed in order to minimize the risk of excessive foundation settlement.
- An estimate of pile capacity may be obtained by correlating capacity to installation torque. This method requires that an appropriate torque factor be selected by the pile designer (in consultation with the piling contractor). Torque factors are selected based on soil type as well as pile shaft size and shape. This method of estimating pile capacity should be used as a quality control check only and is not suitable to replace proper design procedures. Installation torque should be recorded using calibrated equipment, and the piling contractor should provide a recent calibration certificate (conducted a maximum of 1 year from pile installation) for each piling setup used on site.
- It should be noted that a high torque value can sometimes mislead estimation of bearing capacity. The occurrence of soft zones beneath the final pile depth are not represented in the recorded torque value but may adversely impact the load carrying capacity of the helical pile.
- Pile load testing is recommended. The results of the pile load tests can be correlated to the measured installation torque to develop site-specific installation criteria. In addition, a higher geotechnical resistance factor for compressive loading of 0.6 can be used if pile load testing is conducted prior to construction.

If lateral loading is considered critical to the pile performance, care must be taken during pile installation to identify voids developing around the pile shaft. Due to the nature of the pile installation process, it is common to develop voids that can significantly influence lateral loading on a pile. If voids develop, they should be backfilled with granular fill, sand, fillcrete, or grout depending on the size of the voids.

7.3.7 Laterally-Loaded Piles (Modulus of Horizontal Subgrade Reaction)

The resistance of vertical piles to horizontal load involves soil-structure interaction and is commonly analyzed using computer structural analysis software. If required, detailed lateral analysis can be carried out by Tetra Tech using commercially available software to confirm the results of structural analysis. Additional information pertaining to foundations (including but not limited to loading conditions, size, depth, and spacing) would be required prior to completing the detailed lateral analysis. Alternatively, lateral pile performance may be analyzed using a modulus of horizontal subgrade reaction (k_s) and spring constant (K).

In the event that the soil conditions do not provide adequate lateral foundation capacity for a vertical pile, battered piles may be considered. Battering or inclining piles significantly increases the resistance of a laterally-loaded pile; however, the potential impacts of ground deformation should be considered in the decision to use battered piles.

The modulus of the horizontal subgrade reaction has been estimated based on the soil properties at the project site. It is recommended that the design k_s value increase linearly from zero at the ground surface to the value calculated from the formula provided at a depth of 2.0 m below the ground surface. Below this depth, the modulus of horizontal subgrade reaction may be assumed to be constant for a given soil layer.

The SLS modulus of horizontal subgrade reaction for a pile diameter ‘B’ is calculated as follows:

$$\mathrm{k_s = k'_s/B\ (Mpa/m)}$$

Where:

k'_s = Coefficient of horizontal subgrade reaction (MPa).

= 10 MPa for the native soil from 2.0 m to 6.0 m below the existing grade.

= 20 MPa for the native soil from 6.0 m to 9.6 m below the existing grade.

B = Pile diameter (m).

The spring constant (K) for use in modelling lateral pile capacity may be obtained as follows:

$$\mathrm{K = k'_s L\ (MN/m)}$$

Where:

L = Length of pile segment (m).

7.4 Foundation Perimeter Drainage Requirements

It is recommended that a weeping tile and sump system be constructed around the outside perimeter of the buildings (at the base of the footings or grade beam to maintain a relatively consistent moisture profile of the subgrade soils beneath the floor slabs). The weeping tile system should comprise a perforated weeping tile, in turn surrounded with a minimum of 150 mm thick blanket of washed rock (maximum size 20 mm) with the granular layer wrapped in non-woven geotextile. The weeping tile should have a minimum 0.5% slope leading to a sump.

7.5 Surface Grading and Drainage

Drainage of surface water away from proposed structures should be maintained during and after construction. The finished grade of the proposed development should be designed so that surface water is drained away from structures by the shortest route. All drains should discharge well clear of structures. For construction of roof drains, caution should be taken where downspouts discharge due to the high probability of ice forming in the winter. Downspouts may be discharged onto landscaped areas, provided the water is carried, by means of a concrete splash pad or extendable section so the point of discharge of the water is at least 2 m from the structures. Landscaped surfaces adjacent to buildings should be graded to slope away from the building at a gradient of at least 5% within 2 m of the building structures' perimeter. General landscaped areas should have grades of no less than 2% to minimize ponding.

7.6 Floor Slab System

7.6.1 Floor Slabs-on-Grade

Construction of slabs-on-grade (not including basements) must consider the following precautions and construction recommendations.

In native soil areas, following removal of topsoil, soft, loose, wet, or disturbed portions of the native soils the subgrade should be scarified to a minimum depth of 300 mm, and moisture conditioned to a range of optimum to 2% over OMC and re-compacted to minimum 98% of SPMDD. High plastic clay, if any, observed on the subgrade should be removed and replaced with low to medium plastic clay, compacted to minimum 98% of SPMDD. In areas of general engineered fill placed during site grading, a minimum depth of 150 mm subgrade preparation is recommended; if weathering is evident, 300 mm subgrade preparation is required. In areas where general engineered fill is placed during site grading, a waiting period (dependent on fill thickness) prior to installation of floor slabs should be provided to reduce the potential settlement after construction. The minimum compaction should be 98% of SPMDD. The prepared subgrade should be proof-rolled and any soft or loose pockets detected should be reconditioned as recommended above or over-excavated and replaced with general engineered fill.

A levelling course of clean well-graded crushed gravel, at least 150 mm in compacted thickness, is recommended directly beneath the slabs-on-grade, unless a thicker course is required for structural purposes. The subgrade beneath slabs-on-grade should be protected at all times from moisture, frost or exposure which may cause softening or disturbance of the subgrade soils. This applies during and after the construction period (and before and after replacement of the required general engineered fill). Should the exposed surface become saturated or disturbed, it should be reworked to achieve the above standards.

If the subgrade is properly prepared as noted above, floor slab movements should be limited to less than approximately 25 mm. Slabs-on-grade should be separated from bearing members to allow some differential movement. If this range of differential movement is unacceptable, the owner should consider a structurally supported floor.

Recommended procedures for backfill materials, and further recommendations for slabs-on-grade construction are included in Appendix D.

7.6.2 Structural Slabs

If slab movements cannot be tolerated, a structurally supported floor slab system is recommended as the preferred option for this development; however, with a structurally supported floor slab system, there is a risk of ground movement relative to the slab. This relative movement can lead to problems if piping and other utilities that are connected to the slab are embedded within the ground beneath the slab. Utilities beneath the structurally supported floor slabs should be protected from differential movement by placing utilities within boxes suspended from the structural slab. In addition, a void form is recommended below the floor slab in order to prevent transfer of uplift pressures due to swelling clay soil

7.7 Below-Grade Walls

All below-grade walls, if any, should be designed to resist lateral earth pressures in an "at-rest" condition. This condition assumes a triangular pressure distribution and may be calculated using the following expression:

$$P_o = K_o (\gamma H+Q)$$

Where:

P_o = Lateral earth pressure "at-rest" condition (no wall movement occurs at a given depth).

K_o = Coefficient of earth pressure "at-rest" condition (use 0.5 for cohesive backfill and 0.45 for sand and gravel backfill).

γ = Bulk unit weight of backfill soil (use 19 or 21 kN/m³ for cohesive or granular backfill, respectively).

H = Depth below final grade (m).

Q = Surcharge pressure at ground level (kPa).

Installation of a weeping tile system along the base of the below-grade walls is recommended to avoid build-up of hydrostatic pressures. The weeping tile should have a minimum 0.5% slope leading to a sump. The preferred method would be to have provision to tie the sump into the property's on-site drainage system.

Backfill around concrete walls should not commence before the concrete has reached a minimum two-thirds of its design strength and first floor framing is in place or the walls are laterally braced. Only hand-operated compaction equipment should be employed within 600 mm of the concrete walls. Caution should be used when compacting backfill to avoid high lateral loads caused by excessive compactive effort. A compaction standard of 95% of SPMDD is recommended. To avoid differential wall pressures, the backfill should be brought up evenly around the walls. A minimum 600 mm thick clay cap should be placed at the ground surface to reduce the infiltration of surface water.

7.8 Pavement Structures

7.8.1 Subgrade Preparation

Subgrade preparation should be undertaken prior to pavement construction. In native soil areas, topsoil, soft, loose, wet, or disturbed portions of the existing soils, and soils containing organics should be removed from the subgrade areas. The recommended compaction standard for subgrade preparation is a minimum of 98% of SPMDD. Cohesive soils should be compacted at optimum to 2% over the OMC. Granular soils (granular base and sub-base layers) should be compacted with moisture content within ±1% of the OMC. A minimum depth of subgrade preparation of 600 mm within clay fill (subject to a proof-roll) or 300 mm within the native clay is recommended for all paved areas.

Backfill to raise these areas to subgrade level should be general engineered cohesive fill materials, as defined in this report, moisture conditioned and compacted as noted previously. Proof-rolling of the prepared surface is recommended to identify localized soft areas and for an indication of overall subgrade support characteristics. Where soft subgrade conditions exist below the design subgrade elevation, these materials should be subexcavated and replaced with general engineered fill.

Depending on the construction scheduling for placement of the granular sub-base and base layers, and the asphalt concrete pavement surface, further subgrade preparation may be required if the placed subgrade materials dry out or weather. This should be determined prior to the placement of the pavement structure. Should the subgrade materials be shown to deteriorate from construction completion, a minimum 300 mm of subgrade preparation is recommended prior to pavement structure placement.

It is recommended to include a contingency for woven geotextile, should localized areas of subgrade instability be encountered. Use of a woven geotextile should not be considered as a substitute for subgrade preparation, but as an option for improvement should subgrade instability exist after subgrade preparation. The woven geotextile should have a minimum grab tensile strength of 890 N.

The subgrade should be prepared and graded to allow drainage towards stormwater facilities. It is imperative that positive surface drainage be provided to prevent ponding of water within the pavement structure and subsequent softening and loss of strength of the subgrade materials. Surrounding landscaping should be such that runoff water is prevented from ponding beside paved areas in order to avoid softening and premature failure of the pavement surface.

7.8.2 Pavement Design and Construction

The minimum materials required for the pavement structures of roadways for this project should meet the Lethbridge County Engineering Guidelines and Minimum Servicing Standards. Specific roadway pavement structures should be reviewed by the Transportation Business Unit based on the following: roadway use, traffic volumes, heavy vehicles, and equivalent single-axle loads. This information was not available at the time of writing this report.

For asphalt pavement structure, all asphalt paving lifts should be compacted to a minimum of Marshall Design Density, as per current Lethbridge County Engineering Guidelines and Minimum Servicing Standards.

The pavement design should include provisions for subsurface drainage of the pavement granular layers. Subdrains will provide a means of evacuating water that infiltrates the pavement structure, either through cracks and vertical details (i.e., face of gutter), or from peripheral surface runoff. The subdrain should comprise a perforated flexible plastic drainpipe (100 mm diameter), complete with filter sock. The drain should be placed along the edge of the pavement section in a recessed area of the prepared subgrade.

7.9 Concrete Type

For this development, two (2) tests were conducted to determine the water-soluble sulphate content of the soil samples recovered from the project site. The test results indicated sulphate concentrations of 0.008% and 0.075% in the soil samples recovered from 23BH005 and 23BH013, respectively. These results indicate the potential degree of a sulphate attack on the concrete as “negligible”.

Accordingly, there are no specific requirements for the concrete related to the sulphate exposure from the site soils.

A more stringent exposure classification may be required due to structural requirements of other exposure considerations (Refer to CSA A23.1-19, Table 1).

Imported fill, if placed in contact with concrete should be tested for water-soluble sulphate content and the above recommendations should be re-evaluated.

7.10 Frost Protection

For protection against frost action, all perimeter footings must be placed a minimum of 1.4 m below final grade for heated structures. All the footings for unheated structures should be placed at a depth minimum depth 2.1 m below surrounding final grade.

Deep foundation system including CIP concrete piles, CFA piles, and helical piles, if considered and exposed to frost action, should be drilled to a minimum depth of 6.0 m and should have full-length steel reinforcement. Grade beams spanning concrete piles should have a minimum 100 mm void space on the underside of the grade beam and around the pile caps to reduce the risk of interaction with the underlying soil.

It is also preferable to backfill the final 600 mm of the exterior of the grade beam with a medium-plastic clay in order to prevent infiltration of excessive moisture and softening of the soils adjacent to the grade beam.

Pipes buried with less than 2.1 m of soil cover should be protected with insulation to avoid frost effects that might cause damage to, or breakage of, the pipes. Rigid insulation placed under areas subject to vehicular wheel loadings should be provided with a minimum thickness of 600 mm of compacted granular base.

7.11 Seismic Design

In accordance with the Building Code and based on soil stratigraphy, the project site can generally be classified as Class D for seismic site response.

7.12 Stormwater Pond Development

7.12.1 General

In the preparation of the recommendations provided in this report for the geotechnical aspects of design and construction of the stormwater management facility, Tetra Tech reviewed pertinent sections of "*Design and Construction of Liners for Municipal Wastewater Stabilization Ponds*" prepared by Komex Consultants Ltd. for the Municipal Engineering Branch of Alberta Environmental Protection (AEP), and the "*Stormwater Management Guidelines for the Province of Alberta*", dated March 2013, prepared by the Municipal Program Development Branch of AEP.

It is understood that a wet pond is being considered for this development, to be located in the northeast corner of the site, in the vicinity of 23BH014. Such facilities are normally constructed as an excavation below ground surface to provide overland stormwater storage, in accordance with the applicable municipal regulations/guidelines. Further details of the wet pond including its base elevation, normal water elevation, and high water elevation have not been provided.

7.12.2 Availability of Suitable Clay Liner Materials

As discussed in the previous sections, the subsurface stratigraphy of the site generally comprises lacustrine clay overlying glacial clay till.

Constant head hydraulic conductivity (permeability) testing was conducted on one (1) remoulded sample recovered from 23BH014, representing the clay till material at 1.5 m to 3.0 m below ground surface, within the proposed pond area. The test sample was compacted to 98% of SPMDD with a moisture content between OMC and +2% of OMC. The test result indicates a hydraulic conductivity (K Value) of 1.6 x 10^{-8} cm/sec. The laboratory test reports are included in Appendix C.

Based on the AEP publications (referenced above) and assuming a minimum liner thickness of 1.0 m, the maximum hydraulic conductivity of compacted clay liners soils should be 1.7 x 10^{-7} cm/sec or less permeable. As recommended by the AEP publications, the liner design should be based on a K value (in situ or design) that is one order of magnitude greater than the average K value (laboratory). Based on the one (1) test result, the design hydraulic conductivity value of 1.6 x 10^{-7} cm/sec is slightly lower than the minimum K value of 1.7 x 10^{-7} cm/sec. Given that the result of hydraulic conductivity test barely meets the design requirement, additional testing is recommended to be conducted during the site-specific geotechnical evaluation, considering the design details of the pond.

Any localized silts, sands, or low plastic clay soils encountered, should be removed and cannot be use as clay liner materials. Additional hydraulic conductivity testing should be completed on the potential clay liner material prior to, and during, construction to confirm their suitability as clay liner material.

Alternate liner types, such as geosynthetics, may be used but are expected to be substantially more expensive.

7.12.3 Stormwater Management Facility Concept and Design

Based on Tetra Tech's understanding of a typical stormwater management facility design, a typical wet pond might have a base elevation ranging between 3 m and 5 m below final ground surface.

Once the operational water level elevation of the wet pond is designed, it is recommended that the proposed interior sideslopes be between 5.0H:1.0V to 7.0H:1.0V for the pond in the active storage zone and 4.0H:1.0V to 5.0H:1.0V for above the active storage zone. The maximum exterior sideslopes should be 3.0H:1.0V. All the interior and the exterior sideslope should also follow the applicable municipal guidelines. Slope stability of the pond's sideslope should be confirmed prior to construction, once pond design become available.

Based on the site soil conditions, laboratory test results, and Tetra Tech's experience with the permeability of local clay till soils, it is recommended that a preliminary thickness for the remoulded compacted clay liner be 0.6 m along the base of the wet pond and 1.2 m along the sidewalls of the pond, up to design highwater elevation (minimum recommended).

Assuming the embankment between the normal water level and high water level is constructed with an engineered clay liner, the potential for erosion from wave action should be considered. Slope protection comprising rip-rap designed for potential wave erosion or other means of erosion control should be given consideration for the sideslope. The use of a filter fabric median between the native soils and rip-rap is also recommended. Design recommendations for this type of protection are beyond the scope of this report.

Given that shallow groundwater was encountered in 23BH014 at a depth of 2.05 m below ground surface, dewatering may be necessary during construction. Groundwater seepage, where encountered during construction, should be directed towards sumps for removal from the excavation. Conventional construction sump pumps should be capable of providing groundwater control.

Considering the groundwater levels measured in 23BH014 (i.e., at a depth of 2.05 m below the existing ground surface), installation of a permanent perimeter drainage below the pond's liner may be required to avoid damage to liner from groundwater's hydrostatic pressure, particularly when the pond is emptied for maintenance/cleaning or for other reasons.

The liner material should typically comprise remoulded medium- to high-plastic clay till soil. Care should be taken to reject all significant silty, low to non-plastic, local sand layers, gravel with particle size greater than 50 mm, and other deleterious materials from the liner material source. Full-time on-site construction monitoring is required to identify and reject pockets of unsuitable material if the initial liner lift comprises clay till soil that is reworked in situ.

Large pockets of silt or sand soils exhibiting seepage may be encountered during pond sideslope excavation, resulting in short-term cutslope instabilities that may require localized drainage and re-grading during construction. As well, additional temporary and permanent drainage control may also be required if vigorous seepage characteristics are observed within the exposed pond sideslopes prior to liner construction.

The liner should be placed in lifts with maximum compacted thickness of 150 mm. If compacted lift surfaces become too smooth to facilitate a good bond with the subsequent lift, they should be scarified to a minimum depth of 50 mm and moisture conditioned, as necessary, prior to placement of the subsequent lift.

The feasibility of liner placement considering the proposed pond sideslope should be confirmed by the contractor prior to construction.

The liner material should be compacted to a minimum of 98% of SPMDD at moisture content varying from 1% to 3% of the OMC.

Liner materials that freeze, dry out, or become excessively wet during construction should be rejected and removed.

The liner should be protected from construction activities and post-construction damages, as necessary. Placement of a gravel layer with a minimum thickness of 250 mm is recommended to protect the liner after its placement.

All penetrating structures into the liner should be sealed with bentonite chips or powder. Pinholes from nuclear densometer tests in the liner should be filled with bentonite powder.

Field and laboratory testing is recommended to confirm the hydraulic conductivity of the liner during and after construction. Conformance testing of on-site soils excavated within the pond area and selected for use as clay liner material must be confirmed by further laboratory testing to verify acceptable hydraulic conductivities at the time of construction.

Pipe connections to the pond including all the inlets and the outlets should be provided with clay plug to control exfiltration from the pond.

8.0 DESIGN AND CONSTRUCTION GUIDELINES

General design and construction guidelines are provided in Appendix D, under the following supplemental headings:

- Shallow Foundations
- Bored Cast-in-Place Concrete Piles
- Floor Slabs-on-Grade
- Construction Excavations
- Backfill Materials and Compaction

These guidelines are intended to present standards of good practice. Although supplemental to the main text of this report, they should be interpreted as part of the report. Design recommendations presented herein are based on the premise that these guidelines will be followed. The design and construction guidelines are not intended to represent detailed specifications for the works although they may prove useful in the preparation of such specifications. In the event of any discrepancy between the main text of this report and Appendix D, the main text should govern.

9.0 REVIEW OF DESIGN AND CONSTRUCTION

Tetra Tech should be given the opportunity to review details of the design and specifications related to geotechnical aspects for the project site prior to construction.

Full-time monitoring and compaction testing should be undertaken during subgrade preparation and fill placement to ensure that suitable subgrade conditions are prepared and that suitable fill materials are placed and properly compacted. Qualified persons, independent of the contractor, should undertake this monitoring.

10.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully Submitted,
Tetra Tech Canada Inc.

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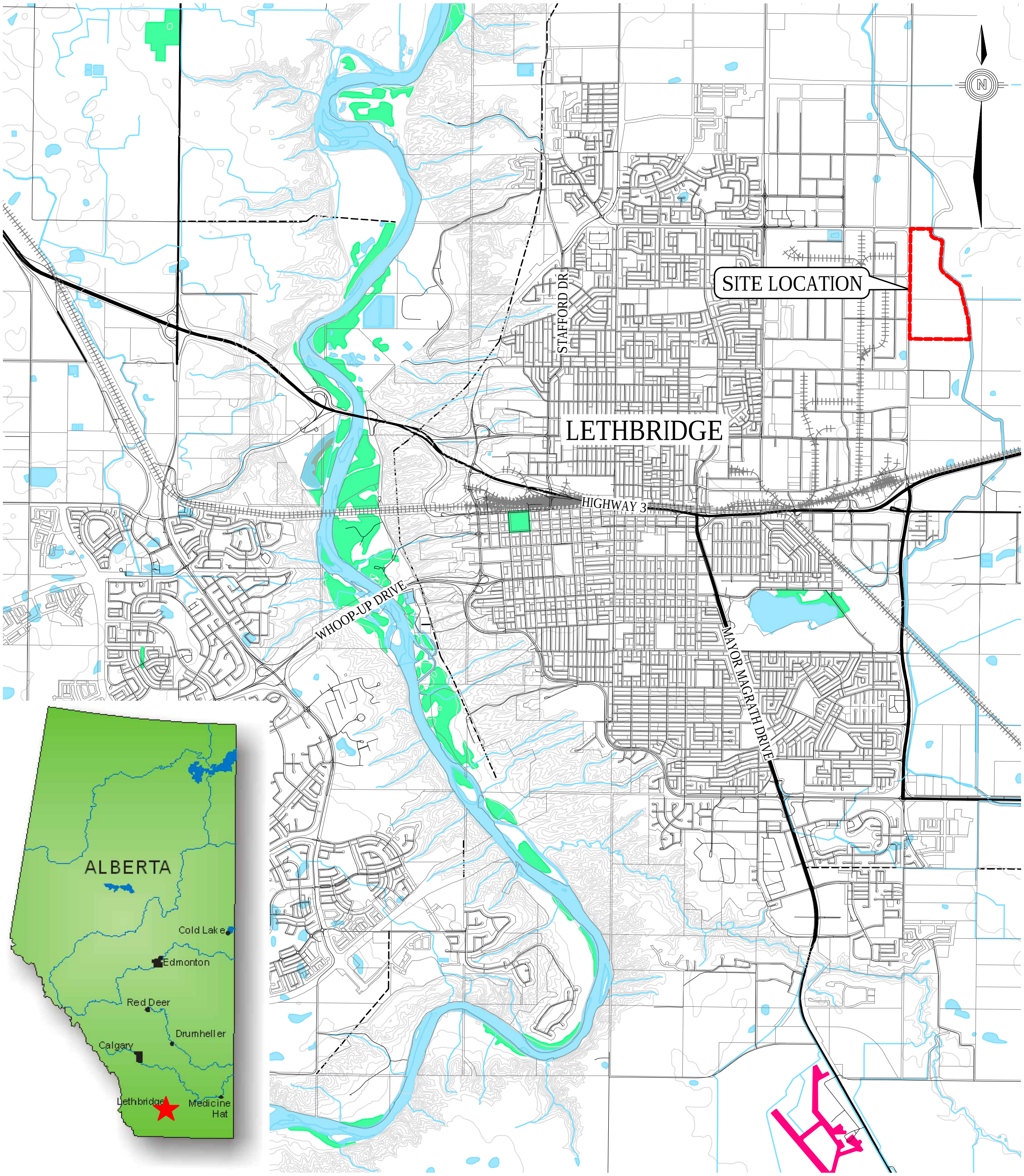
/tlp

FIGURES



NOTES
DRAWING PROVIDED BY "© Department of Natural Resources Canada. All rights reserved."

0 3,000m
Scale: 1:60,000 @ 8.5"x11"

CLIENT
Sumus Property Group Ltd.

TETRA TECH

GEOTECHNICAL EVALUATION
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

SITE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-001	LCH	VO	0

OFFICE	DATE
Tt Leth	March 2023

Figure 1

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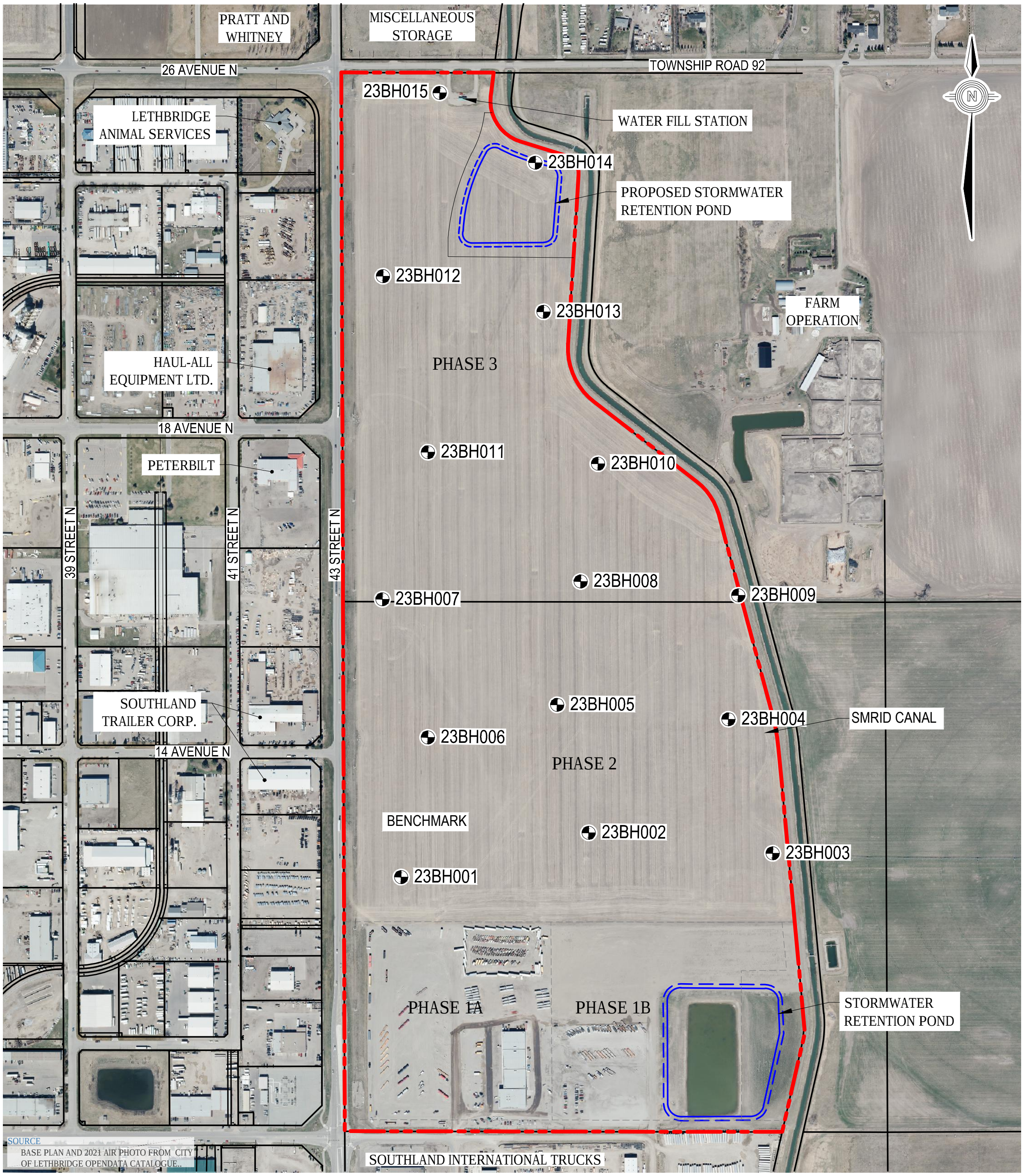

SOURCE
BASE PLAN AND 2021 AIR PHOTO FROM CITY OF LETHBRIDGE OPENDATA CATALOGUE.

LEGEND

▬ ▬ ▬ SITE BOUNDARY

◐ BOREHOLE LOCATION

0 500m

Scale: 1:10,000 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

GEOTECHNICAL EVALUATION
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

BOREHOLE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-001	LCH	VO	0

OFFICE
Tt Leth

DATE
March 2023

Figure 2

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APPENDIX A

LIMITATIONS ON USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this document, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.8 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.9 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.10 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.11 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.12 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.13 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.14 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.15 DRAINAGE SYSTEMS

Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function. Where temporary or permanent drainage systems are installed within or around a structure, these systems must protect the structure from loss of ground due to mechanisms such as internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design details regarding the geotechnical aspects of such systems (e.g. bedding material, surrounding soil, soil cover, geotextile type) should be reviewed by the geotechnical engineer to confirm the performance of the system is consistent with the conditions used in the geotechnical design.

1.16 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.17 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.18 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.

APPENDIX B

BOREHOLE LOGS

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 TO 20%	0 to 4
Loose	20 TO 40%	4 to 10
Compact	40 TO 75%	10 to 30
Dense	75 TO 90%	30 to 50
Very Dense	90 TO 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (KPA)
Very Soft	Less than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

GENERAL DESCRIPTIVE TERMS

Slickensided - having inclined planes of weakness that are slick and glossy in appearance.
Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated - composed of thin layers of varying colour and texture.
Interbedded - composed of alternate layers of different soil types.
Calcareous - containing appreciable quantities of calcium carbonate.;
Well graded - having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate size missing.

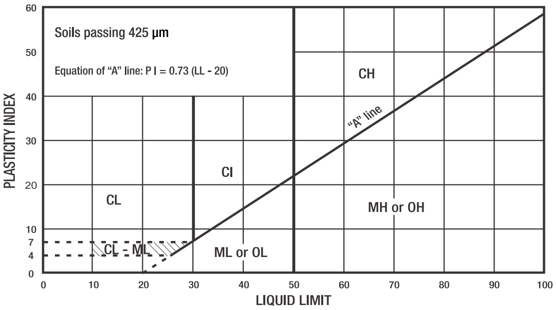
TETRA TECH

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS More than 50% retained on 75 µm sieve*	GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% Pass 75 mµsieve GW, GP, SW, SP More than 12% Pass 75 mµsieve GM, GC, SM, SC 5% to 12% Pass 75 µm sieve Borderline Classification requiring use of dual symbols	$C_U = D_{60} / D_{10}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
	SANDS More than 50% of coarse fraction passes 4.75 mm sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines		$C_U = D_{60}/D_{10}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures		Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits plot above "A" line or plasticity index greater than 7	
FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve*	SILTS	Liquid limit <50	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity			
		Liquid limit >50	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
	CLAYS Above "A" line on plasticity chart negligible organic content	Liquid limit <30	CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays			
		Liquid limit 30-50	CI	Inorganic clays of medium plasticity, silty clays			
		Liquid limit >50	CH	Inorganic clays of high plasticity, fat clays			
	ORGANIC SILTS AND CLAYS	Liquid limit <50	OL	Organic silts and organic silty clays of low plasticity			
		Liquid limit >50	OH	Organic clays of medium to high plasticity			
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils			

For classification of fine-grained soils and fine fraction of coarse-grained soils.

PLASTICITY CHART



*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

SOIL COMPONENTS

FRACTION	SIEVE SIZE		DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS	
	PASSING	RETAINED	PERCENTAGE	DESCRIPTOR
GRAVEL				
coarse	75 mm	19 mm	>35 %	"and"
fine	19 mm	4.75 mm		
			21 to 35 %	"y-adjective"
SAND				
coarse	4.75 mm	2.00 mm	10 to 20 %	"some"
medium	2.00 mm	425 µm		
fine	425 µm	75 µm	>0 to 10 %	"trace"
SILT (non plastic) or CLAY (plastic)	75 µm		as above but by behavior	

OVERSIZE MATERIAL

Rounded or subrounded

COBBLES	75 mm to 300 mm
BOULDERS	> 300 mm

Not rounded

ROCK FRAGMENTS	>75 mm
ROCKS	> 0.76 cubic metre in volume

Tt_Modified Unified Soil Classification.cdr

TETRA TECH

BOREHOLE KEYSHEET

Water Level Measurement

▼ Measured in standpipe, piezometer or well

▽ Inferred

Sample Types

- ▤ A-Casing
- ◫ Core
- ■ Disturbed, Bag, Grab
- ◧ HQ Core
- ⧄ Jar
- ⧄ Jar and Bag
- ⧓ NQ Core
- ◢ No Recovery
- ⊠ Split Spoon/SPT
- ▥ Tube

Backfill Materials

- ■ Asphalt
- ■ Bentonite
- ▒ Cement/ Grout
- ▨ Drill Cuttings
- ▒ Grout
- ▒ Gravel
- ▒ Sand
- ▥ Slough
- ▒ Topsoil Backfill

Lithology - Graphical Legend[1]

- ■ Asphalt
- ▩ Bedrock
- ▒ Cobbles/Boulders
- ▨ Clay
- ■ Coal
- ▒ Concrete
- ▩ Fill
- ▒ Gravel
- ▦ Limestone
- ▒ Mudstone
- ▒ Organics
- ▒ Peat
- ▒ Sand
- ▩ Sandstone
- ▤ Shale
- ▥ Silt
- ⊠ Siltstone
- ▩ Till
- ▒ Topsoil

1. The graphical legend is an approximation and for visual representation only. Soil strata may comprise a combination of the basic symbols shown above. Particle sizes are not drawn to scale

Sumus Property Group Ltd.

Borehole No: **23BH001**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 999.61 m
Lethbridge County, AB	UTM: 371849 E; 5508582 N; Z

Depth (m) | Method | Soil Description | SOIL SYMBOL | USC | Sample Type | Sample Number | SPT (N) | Moisture Content (%) | Elevation (m)

Method: Solid stem auger

Soil Description:

TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pockets.

... silt lenses.

... damp to moist, stiff, white precipitates.

CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, sand pockets throughout.

... sandy, low plastic for 150 mm.

... silt lenses.

... very moist, firm, dark brown with grey mottling, oxide staining, with stiff clay layers.

... heavy oxide staining.

... moist, stiff.

... occasional very moist and firm spots.

... brown to dark brown, sand pockets.

... very stiff.

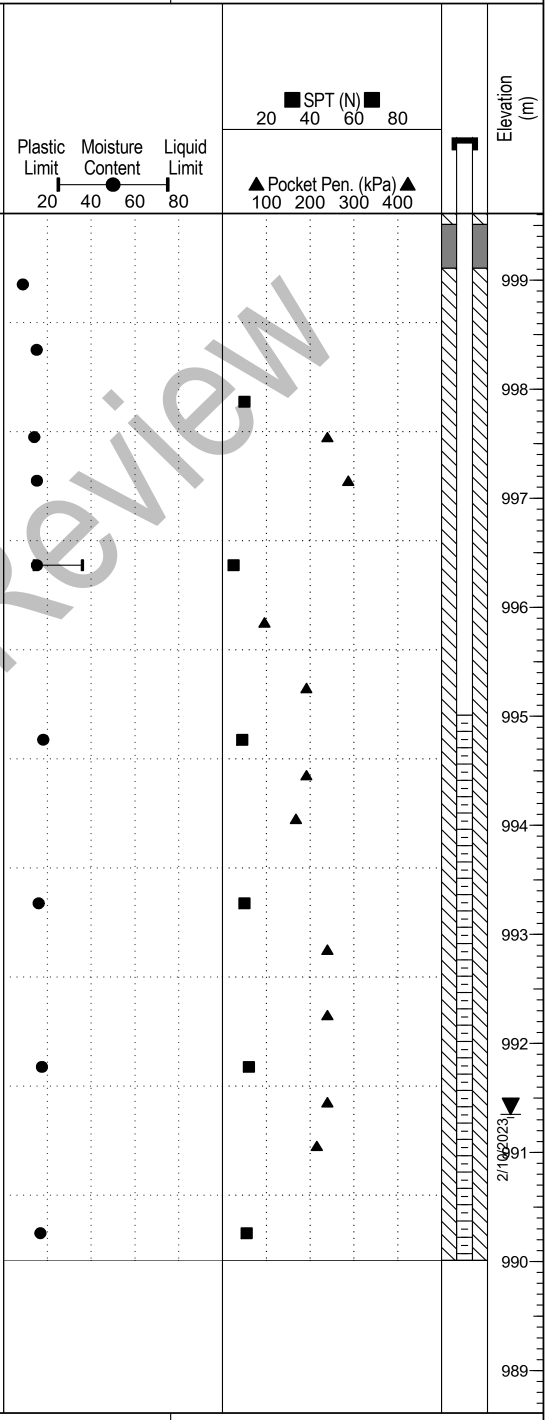
... coal fragments.

... coal smearing.

End of Borehole @ 9.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	USC	SPT (N)	Moisture Content (%)
B1			8.8
B2			15.1
D1		10	
B3			14
B4			15.2
D2	CI	5	15.2
B5			
B6			
D3		9	18.1
B7			
B8			
D4		10	16
B9			
B10			
D5		12	17.5
B11			
B12			
D6		11	16.8



Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 — 2/10/2023

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH002**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.44 m
Lethbridge County, AB	UTM: 372128 E; 5508641 N; Z

Depth (m) | Method: Solid stem auger | Soil Description

TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp to moist, very stiff, medium plastic, light brown, sand pockets.

... white precipitates, oxide specks.

CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, brown to dark brown, coal and oxide specks, white precipitates, sand pockets.

... grey mottling, white precipitates throughout.

... coal fragments.

... moist, heavy sand inclusions for 100 mm.

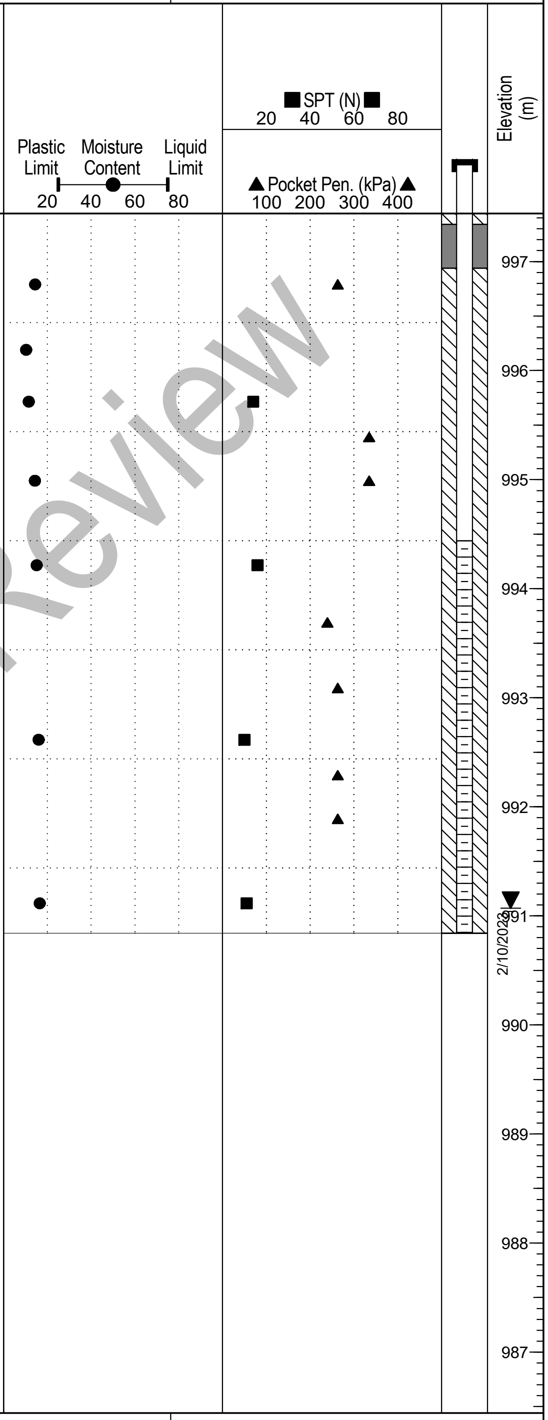
... oxide staining.

... stiff to very stiff.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Type	Sample Number	SPT (N)	Moisture Content (%)
▬	B1		14.4
▬	B2		10.3
☒	D1	14	11.5
▬	B3		
▬	B4		14.3
☒	D2	16	15.1
▬	B5		
▬	B6		
☒	D3	10	16
▬	B7		
▬	B8		
☒	D4	11	16.5



Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

TETRA TECH

Sumus Property Group Ltd.

Borehole No: **23BH003**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.71 m
Lethbridge County, AB	UTM: 372397 E; 5508601 N; Z

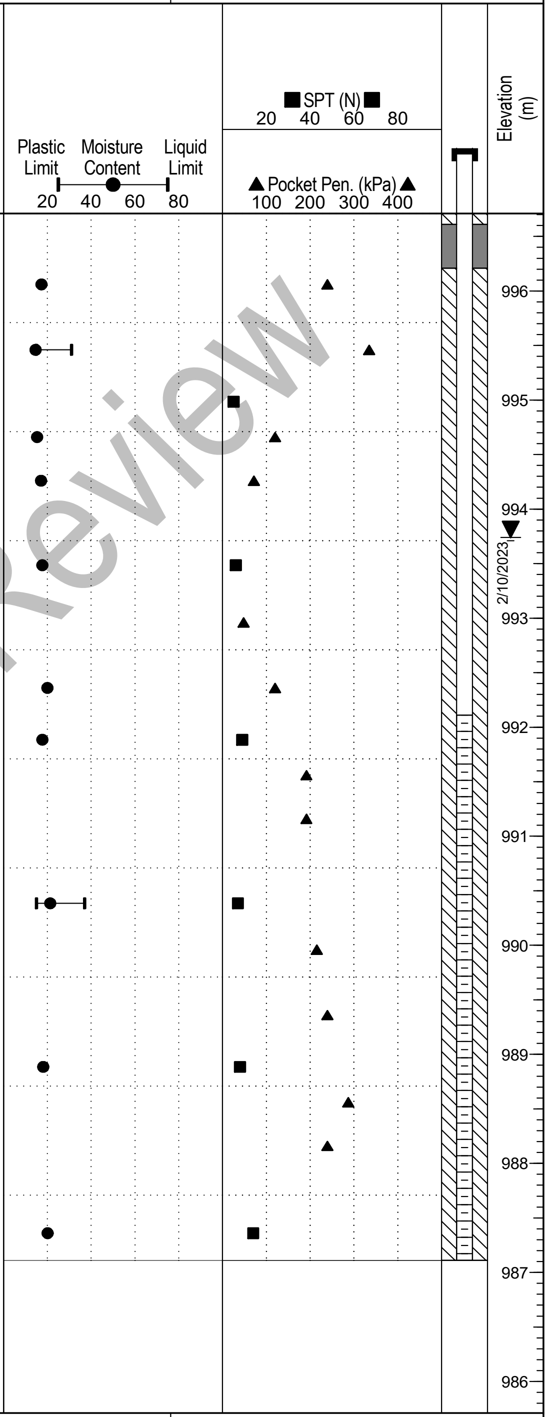
Method: Solid stem auger

Depth (m)	Soil Description	USC	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
0	TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.					
	CLAY - silty, some sand, moist, very stiff, medium plastic, brown, silt lenses.			B1		17.3
1	... damp to moist, sand pockets.	CL-CI		B2		14.6
				D1	5	
	... some sand to sandy, very moist, firm, low to medium plastic, white precipitates.					
2				B3		15.3
	CLAY (TILL) - silty, some sand, trace gravel, very moist, firm to stiff, medium plastic, brown, coal and oxide specks, sand pockets.			B4		17.1
3	... oxide staining.			D2	6	17.7
	... sand inclusions.			B5		
4				B6		20
	... stiff, grey mottling, occasional high plastic clay inclusions.			D3	9	17.7
5				B7		
	... oxide staining.			B8		
6		CI		D4	7	21.3
	... stiff to very stiff.			B9		
7				B10		
				D5	8	18.1
8	... very stiff.			B11		
				B12		
9				D6	14	20.1

2/10/2023

End of Borehole @ 9.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.



TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH004**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.6 m
Lethbridge County, AB	UTM: 372340 E; 5508804 N; Z

Depth (m) | Method: Solid stem auger

Soil Description

TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, brown, white precipitates, sand pockets.

... stiff, silt pockets.

CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown, coal and oxide specks, sand pockets throughout.

... coal fragments.

... sand pockets throughout.

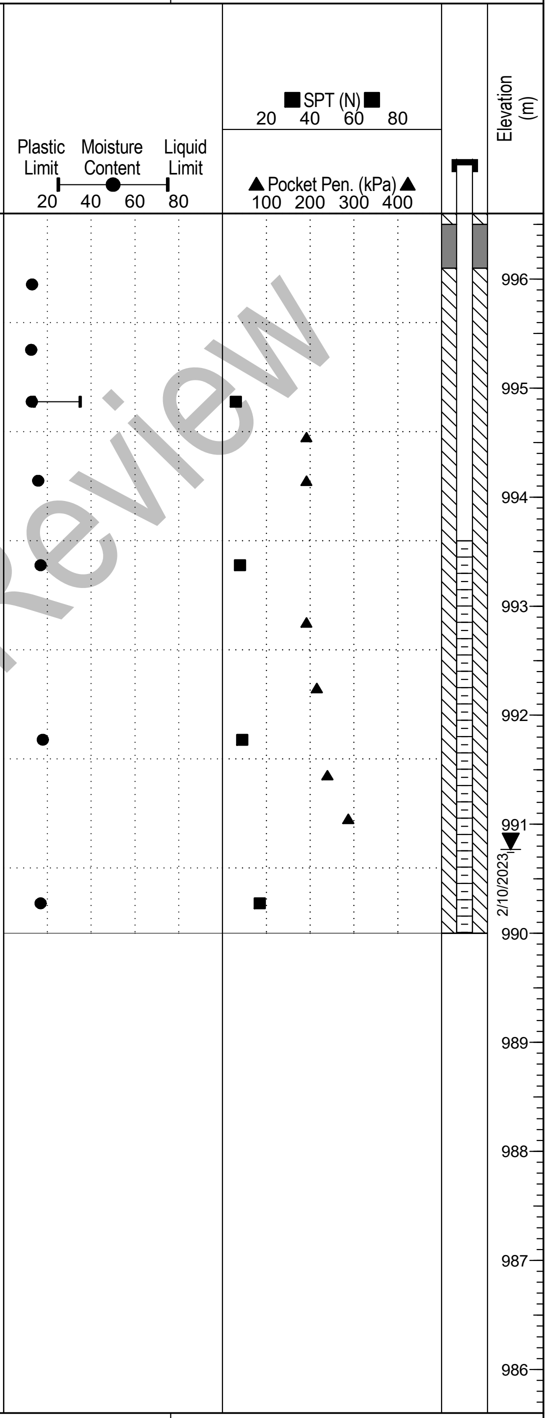
... very stiff, grey mottling, oxide staining.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

2/10/2023

USC	Sample Number	SPT (N)	Moisture Content (%)
	B1		13
	B2		12.6
CI	D1	6	12.9
	B3		
	B4		15.8
	D2	8	16.9
	B5		
	B6		
	D3	9	17.9
	B7		
	B8		
	D4	17	16.9



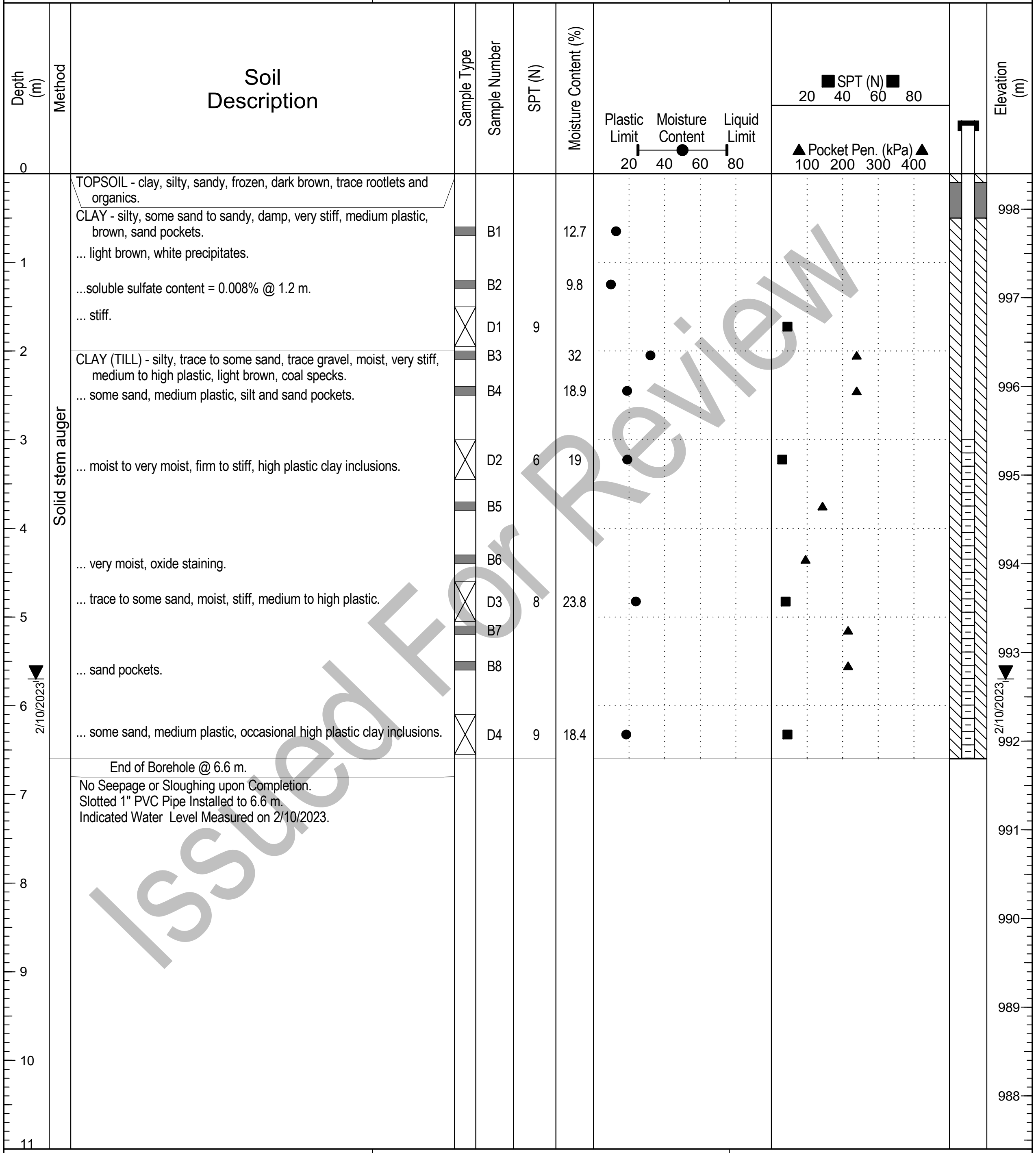
Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

TETRA TECH

Sumus Property Group Ltd.

Borehole No: **23BH005**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 998.4 m
Lethbridge County, AB	UTM: 372087 E; 5508832 N; Z



Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand to sandy, damp, very stiff, medium plastic, brown, sand pockets.	▬	B1		12.7
... light brown, white precipitates.				
...soluble sulfate content = 0.008% @ 1.2 m.	▬	B2		9.8
... stiff.	☒	D1	9	
CLAY (TILL) - silty, trace to some sand, trace gravel, moist, very stiff, medium to high plastic, light brown, coal specks.	▬	B3		32
... some sand, medium plastic, silt and sand pockets.	▬	B4		18.9
... moist to very moist, firm to stiff, high plastic clay inclusions.	☒	D2	6	19
	▬	B5		
... very moist, oxide staining.	▬	B6		
... trace to some sand, moist, stiff, medium to high plastic.	☒	D3	8	23.8
	▬	B7		
... sand pockets.	▬	B8		
... some sand, medium plastic, occasional high plastic clay inclusions.	☒	D4	9	18.4

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH006**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 999.49 m
Lethbridge County, AB	UTM: 371894 E; 5508792 N; Z

Method: Solid stem auger

Soil Description

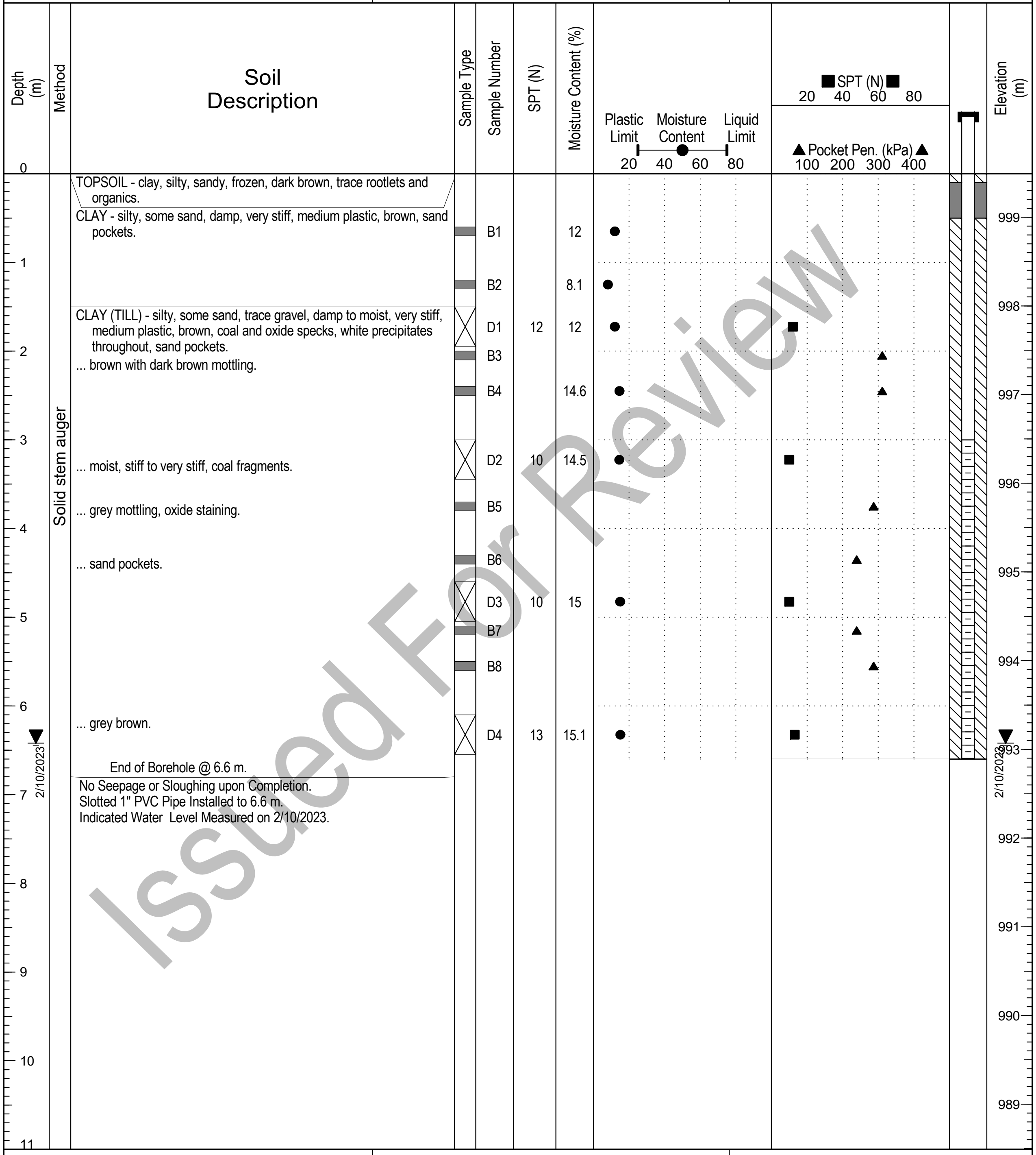
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, brown, sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, brown, coal and oxide specks, white precipitates throughout, sand pockets.
... brown with dark brown mottling.
... moist, stiff to very stiff, coal fragments.
... grey mottling, oxide staining.
... sand pockets.
... grey brown.

End of Borehole @ 6.6 m.
No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Type	Sample Number	SPT (N)	Moisture Content (%)
▬	B1		12
▬	B2		8.1
☒	D1	12	12
▬	B3		
▬	B4		14.6
☒	D2	10	14.5
▬	B5		
▬	B6		
☒	D3	10	15
▬	B7		
▬	B8		
☒	D4	13	15.1



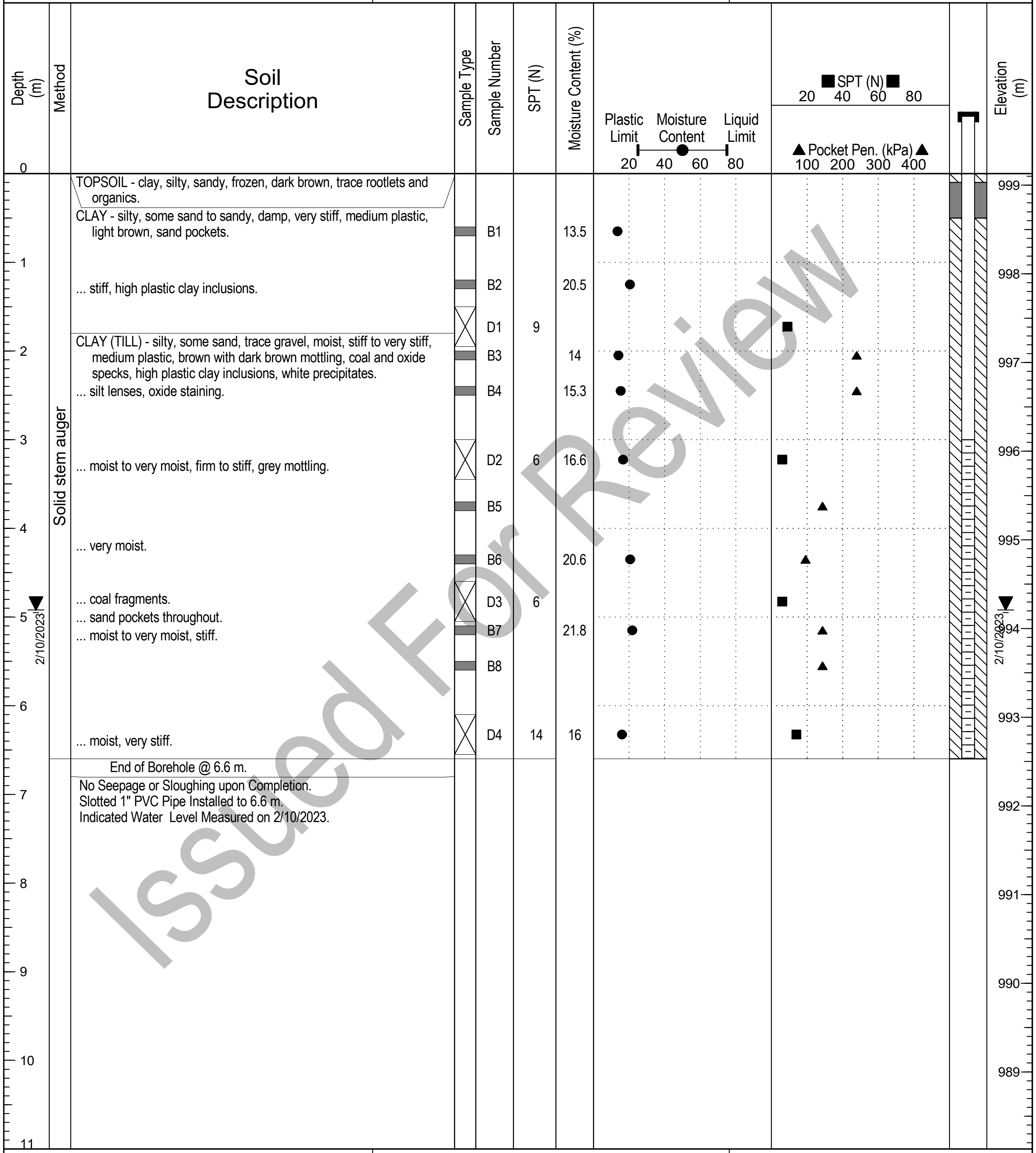
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH007**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 999.13 m
Lethbridge County, AB	UTM: 371835 E; 5509001 N; Z



Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand to sandy, damp, very stiff, medium plastic, light brown, sand pockets.	▬	B1		13.5
... stiff, high plastic clay inclusions.	▬	B2		20.5
	☒	D1	9	
CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, high plastic clay inclusions, white precipitates.	▬	B3		14
... silt lenses, oxide staining.	▬	B4		15.3
... moist to very moist, firm to stiff, grey mottling.	☒	D2	6	16.6
	▬	B5		
... very moist.	▬	B6		20.6
... coal fragments.	☒	D3	6	
... sand pockets throughout.				
... moist to very moist, stiff.	▬	B7		21.8
	▬	B8		
... moist, very stiff.	☒	D4	14	16

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

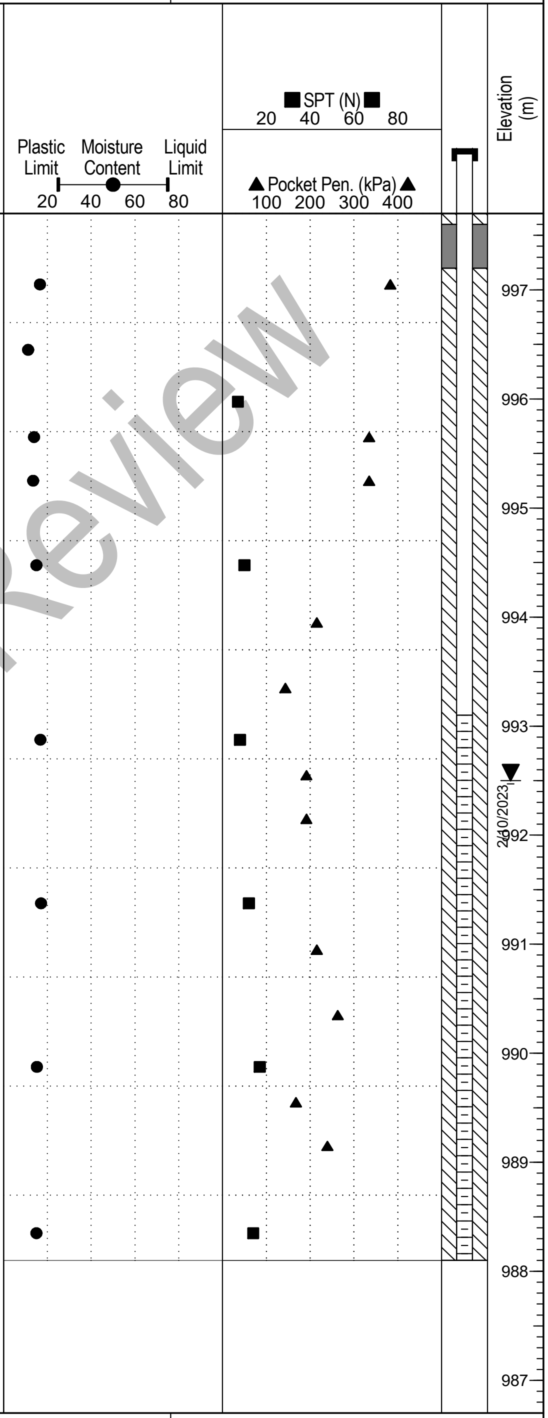
Sumus Property Group Ltd.

Borehole No: **23BH008**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.7 m
Lethbridge County, AB	UTM: 372126 E; 5509018 N; Z

Method	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
Solid stem auger	TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
	CLAY - silty, some sand, damp to moist, very stiff, medium plastic, brown, sand pockets.	▬	B1		16.6
	... damp, light brown.				
		▬	B2		11.2
		☒	D1	7	
	CLAY (TILL) - silty, some sand, trace gravel, damp, stiff, medium plastic, light brown, coal and oxide specks, low blow count probably due to less moisture (brittle).	▬	B3		13.9
	... stiff to very stiff, brown, sand pockets.	▬	B4		13.5
	... white precipitates.				
	... moist, stiff, dark brown mottling.	☒	D2	10	15
		▬	B5		
		▬	B6		
	... grey mottling and oxide staining.	☒	D3	8	16.8
		▬	B7		
		▬	B8		
	... very stiff.	☒	D4	12	17.1
	... occasional very moist and firm spots (pp = 0.75~1.25)	▬	B9		
		▬	B10		
		☒	D5	17	15.2
	... low pocket pen reading probably due to frequent sand inclusions.	▬	B11		
		▬	B12		
		☒	D6	14	15
	End of Borehole @ 9.6 m.				

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.



Depth (m): 0 1 2 3 4 5 6 7 8 9 10 11

2/10/2023

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

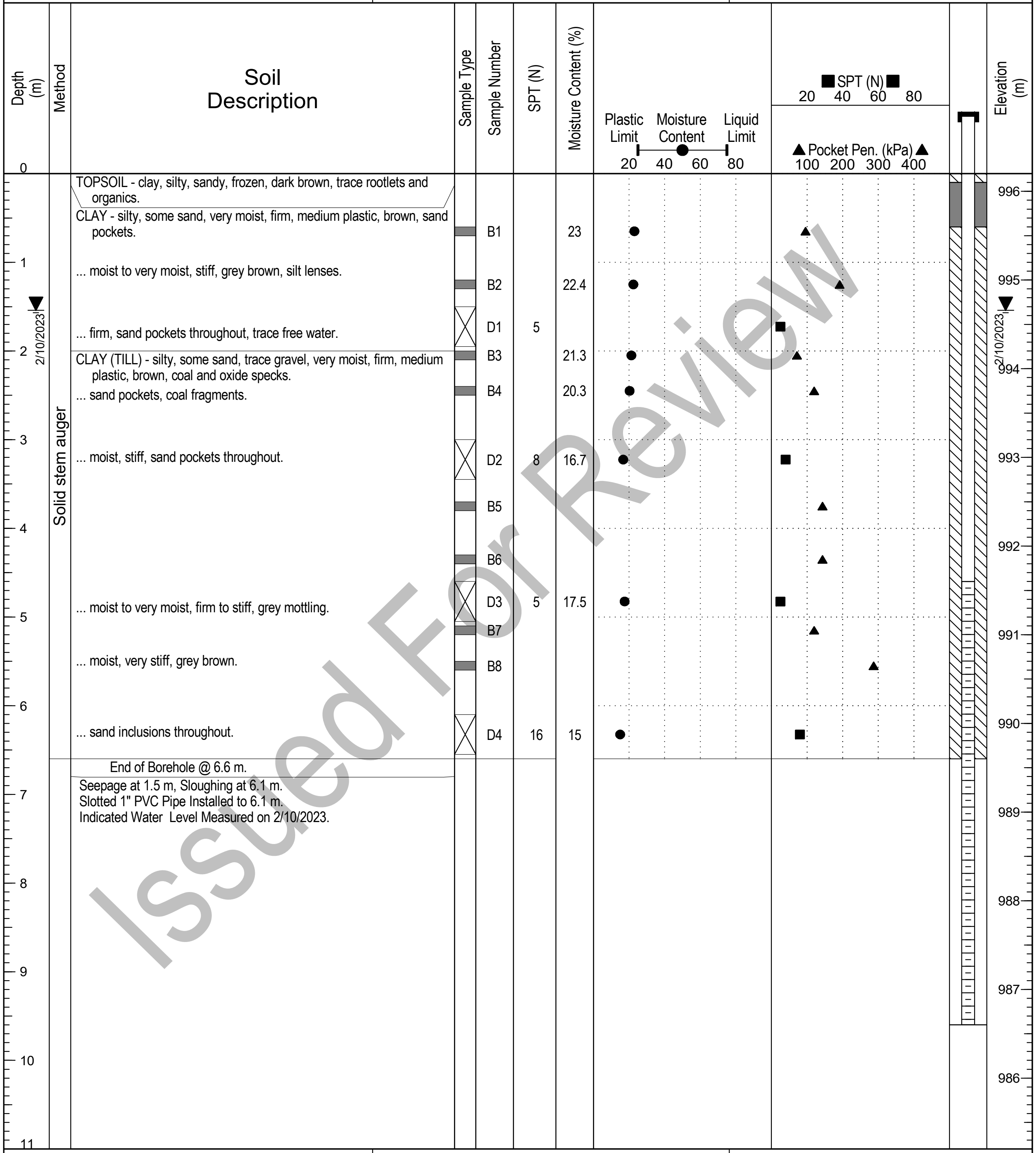
Borehole No: **23BH009**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.2 m
Lethbridge County, AB	UTM: 372360 E; 5508990 N; Z

Method: Solid stem auger

Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen, dark brown, trace rootlets and organics.				
CLAY - silty, some sand, very moist, firm, medium plastic, brown, sand pockets.	▬	B1		23
... moist to very moist, stiff, grey brown, silt lenses.	▬	B2		22.4
... firm, sand pockets throughout, trace free water.	☒	D1	5	
CLAY (TILL) - silty, some sand, trace gravel, very moist, firm, medium plastic, brown, coal and oxide specks.	▬	B3		21.3
... sand pockets, coal fragments.	▬	B4		20.3
... moist, stiff, sand pockets throughout.	☒	D2	8	16.7
	▬	B5		
	▬	B6		
... moist to very moist, firm to stiff, grey mottling.	☒	D3	5	17.5
	▬	B7		
... moist, very stiff, grey brown.	▬	B8		
... sand inclusions throughout.	☒	D4	16	15

End of Borehole @ 6.6 m.
Seepage at 1.5 m, Sloughing at 6.1 m.
Slotted 1" PVC Pipe Installed to 6.1 m.
Indicated Water Level Measured on 2/10/2023.



Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 2, 2023
Logged By: SA	Completion Date: February 2, 2023
Reviewed By: JZ	Page 1 of 1

TETRA TECH

Sumus Property Group Ltd.

Borehole No: **23BH010**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 996.93 m
Lethbridge County, AB	UTM: 372159 E; 5509196 N; Z

Depth (m) | Method: Solid stem auger | 2/10/2023

Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, damp, very stiff, medium plastic, light brown, coal and oxide specks, sand pockets, white precipitates.

... moist, brown.

... damp to moist, stiff, grey mottling, white precipitates.

... very moist, firm, oxide staining.

... firm to stiff, sand pockets throughout.

... coal fragments.

... moist, stiff.

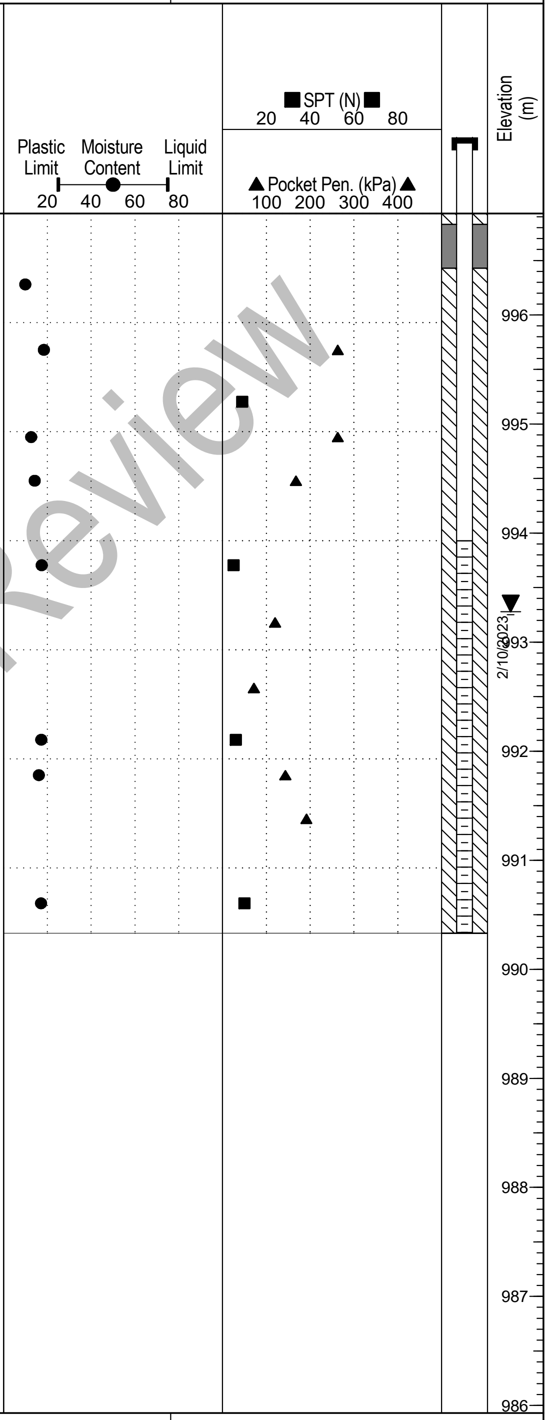
... heavy oxide staining.

... gypsum crystals.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		9.9
B2		18.4
D1	9	
B3		12.6
B4		14.2
D2	5	17.4
B5		
B6		
D3	6	17.2
B7		16.1
B8		
D4	10	17.1



Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

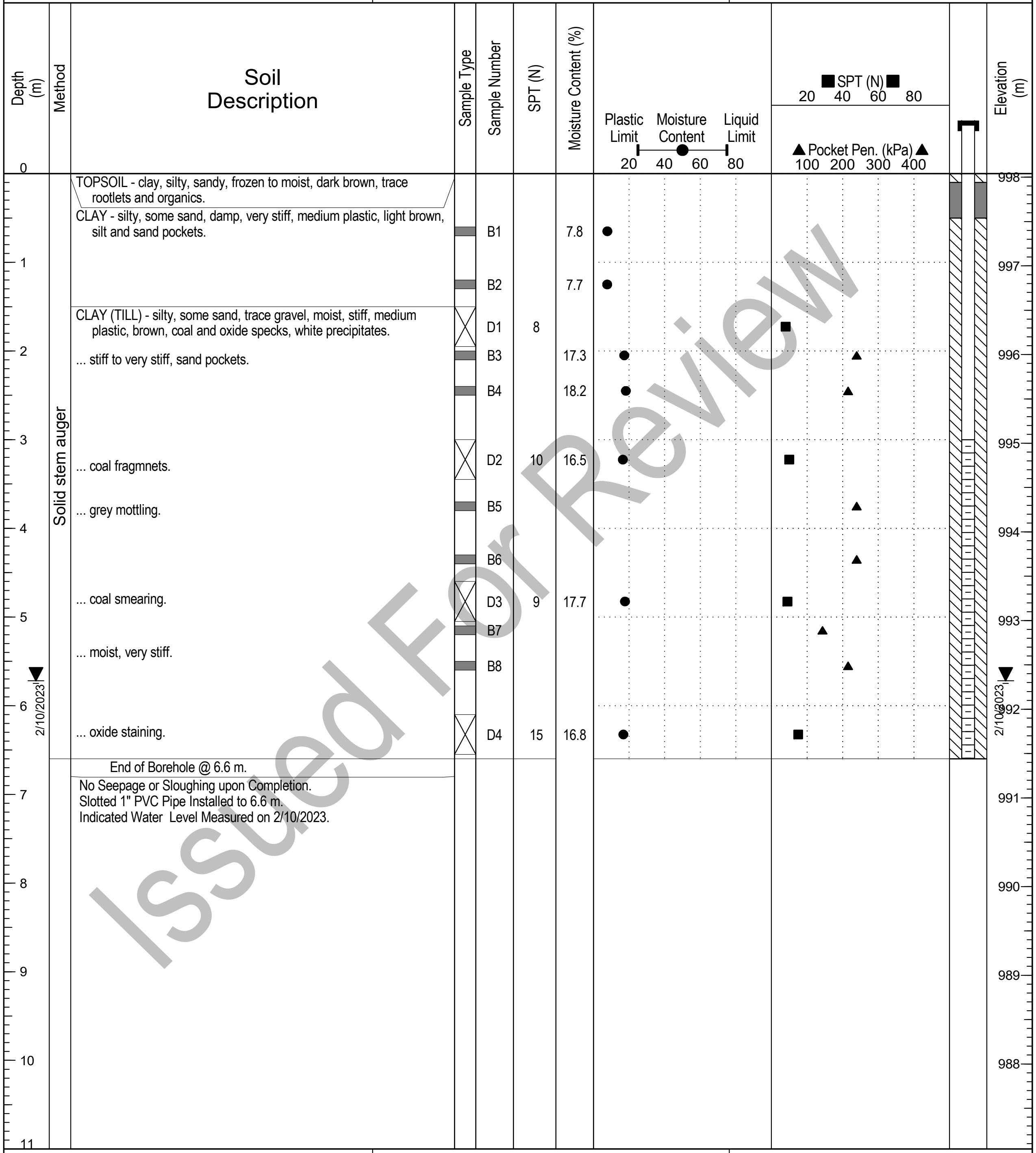
TETRA TECH

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH011**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 998.04 m
Lethbridge County, AB	UTM: 371906 E; 5509221 N; Z



Soil Description	Sample Number	SPT (N)	Moisture Content (%)
TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.			
CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, silt and sand pockets.	B1		7.8
	B2		7.7
CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown, coal and oxide specks, white precipitates.	D1	8	
... stiff to very stiff, sand pockets.	B3		17.3
	B4		18.2
... coal fragmnets.	D2	10	16.5
... grey mottling.	B5		
	B6		
... coal smearing.	D3	9	17.7
	B7		
... moist, very stiff.	B8		
... oxide staining.	D4	15	16.8

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

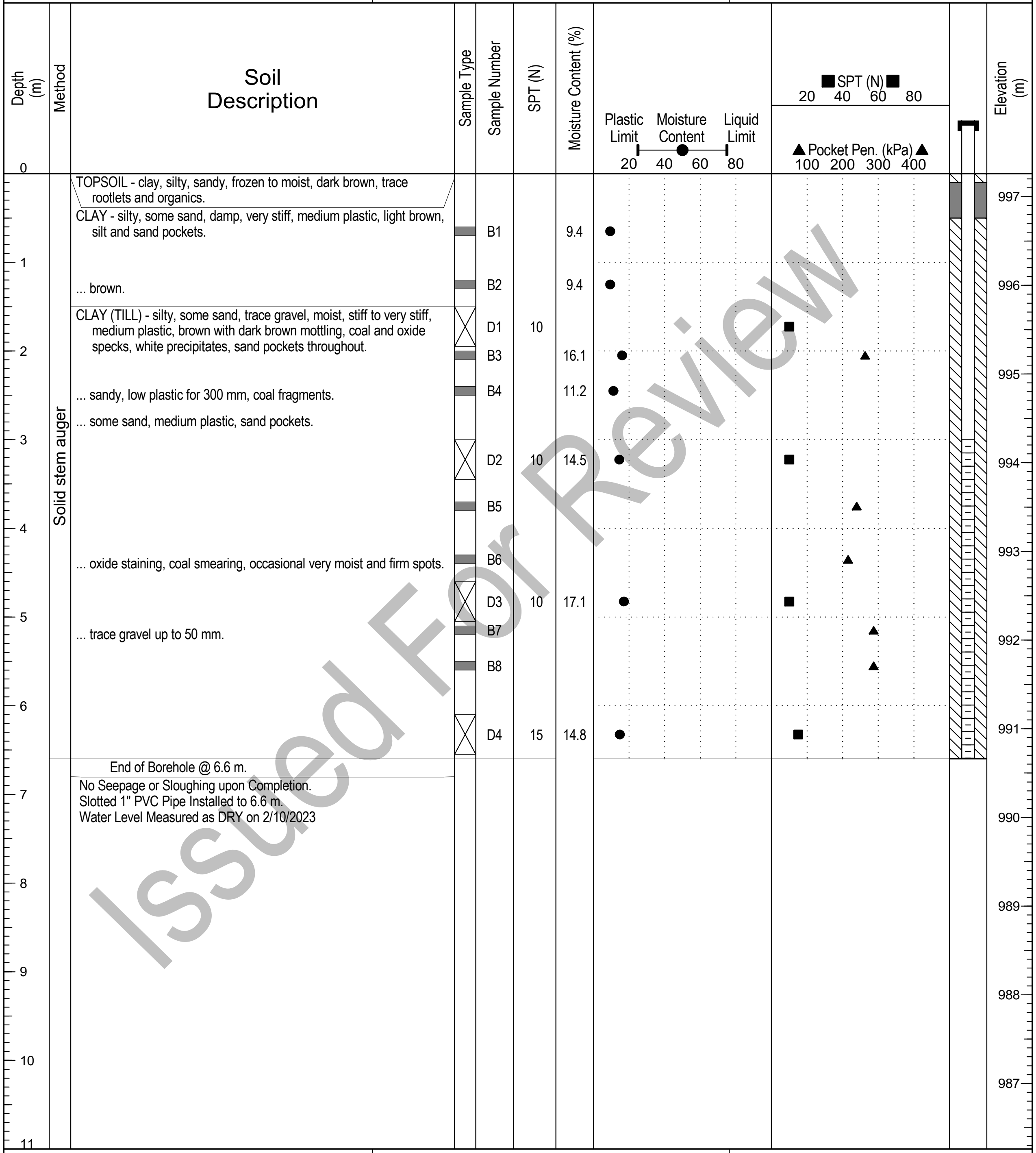
TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH012**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.26 m
Lethbridge County, AB	UTM: 371849 E; 5509493 N; Z



TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, silt and sand pockets.

... brown.

CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown with dark brown mottling, coal and oxide specks, white precipitates, sand pockets throughout.

... sandy, low plastic for 300 mm, coal fragments.

... some sand, medium plastic, sand pockets.

... oxide staining, coal smearing, occasional very moist and firm spots.

... trace gravel up to 50 mm.

End of Borehole @ 6.6 m.

No Seepage or Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Water Level Measured as DRY on 2/10/2023

Sample Number	SPT (N)	Moisture Content (%)
B1		9.4
B2		9.4
D1	10	
B3		16.1
B4		11.2
D2	10	14.5
B5		
B6		
D3	10	17.1
B7		
B8		
D4	15	14.8

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

Sumus Property Group Ltd.

Borehole No: **23BH013**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 997.22 m
Lethbridge County, AB	UTM: 372083 E; 5509440 N; Z

Method: Solid stem auger

Soil Description

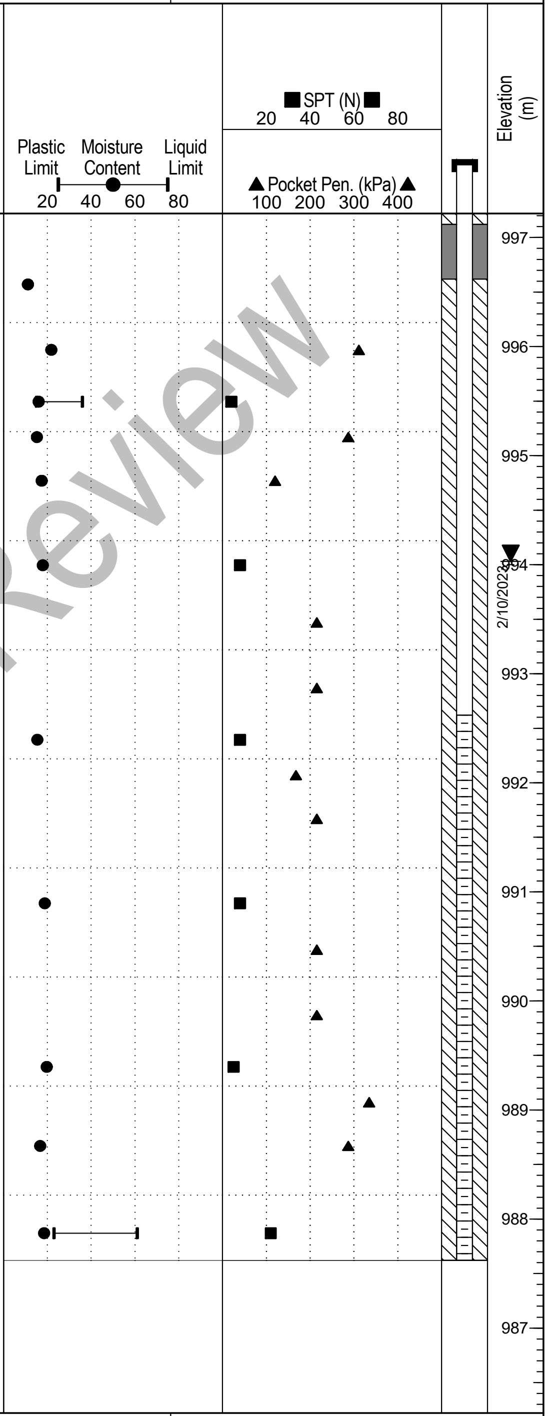
TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand to sandy, damp, very stiff, low to medium plastic, light brown, silt inclusions throughout.

CLAY (TILL) - silty, some sand, trace gravel, moist, very stiff, medium plastic, brown, coal and oxide specks, sand pockets.
...soluble sulfate content = 0.075% @ 1.5 m.
... very moist, firm, grey mottling.
... moist, very stiff for 300 mm, white precipitates.
... very moist to moist, firm to stiff.
... moist, stiff, brown with grey mottling, coal fragments.
... oxide staining.
... occasional sand pockets.
... occasional very moist and firm spots, heavy oxide staining, sand pockets throughout.
... heavy sand inclusions for 100 mm, trace free water.
... high plastic, light grey.

End of Borehole @ 9.6 m.
Seepage at 7.8 m, No Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

USC	Sample Number	SPT (N)	Moisture Content (%)
	B1		11.1
	B2		21.8
CI	D1	4	16
	B3		15.2
	B4		17.4
	D2	8	17.9
	B5		
	B6		
	D3	8	15.4
	B7		
	B8		
	D4	8	18.8
	B9		
	B10		
	D5	5	19.7
	B11		
	B12		16.7
CH	D6	22	18.5



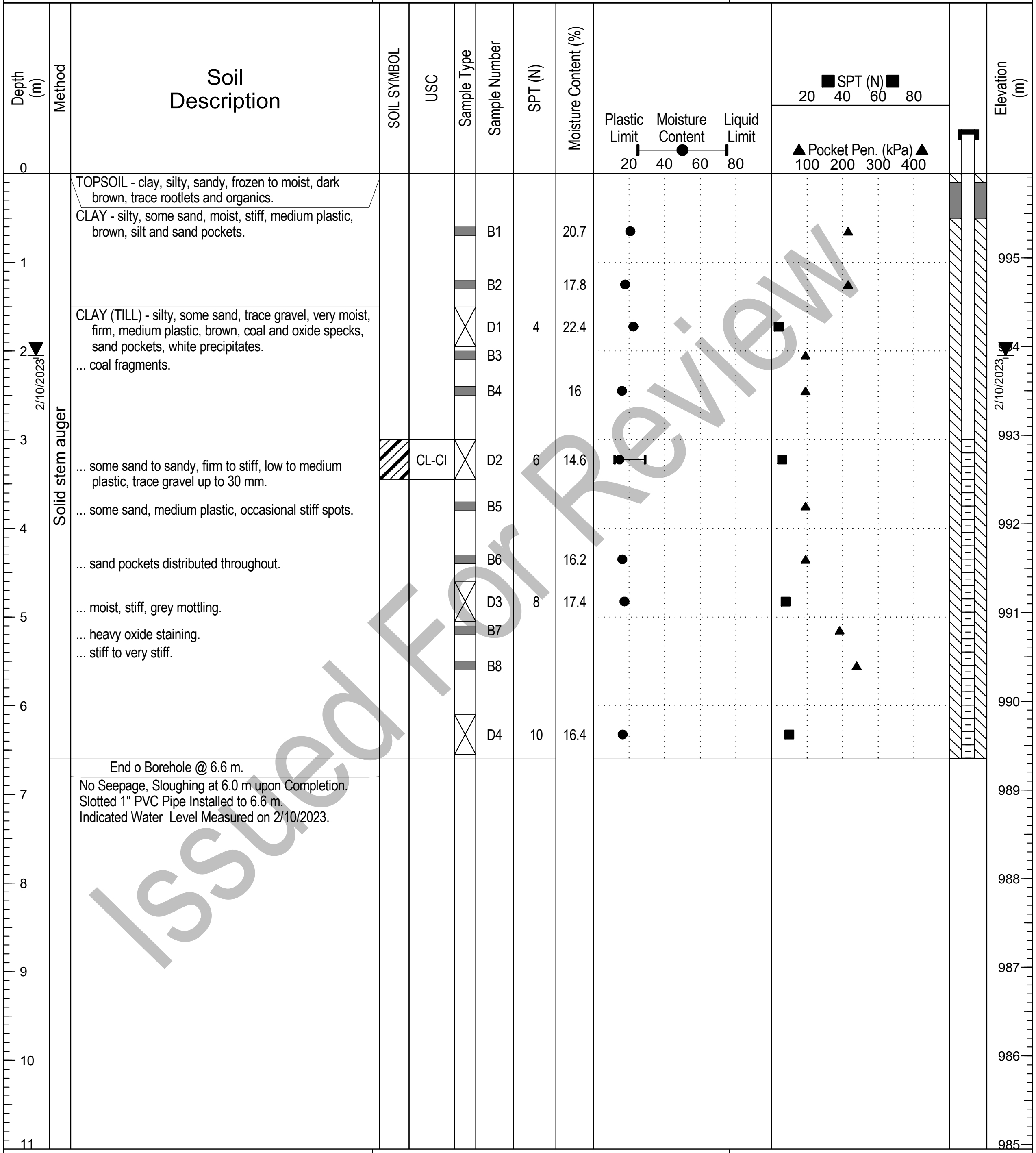
Contractor: Chilako Drilling	Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

TETRA TECH

Sumus Property Group Ltd.

Borehole No: **23BH014**

Project: Chinook Industrial Park ASP	Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M	Ground Elev: 995.95 m
Lethbridge County, AB	UTM: 372080 E; 5509659 N; Z



TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, moist, stiff, medium plastic, brown, silt and sand pockets.

CLAY (TILL) - silty, some sand, trace gravel, very moist, firm, medium plastic, brown, coal and oxide specks, sand pockets, white precipitates.

... coal fragments.

... some sand to sandy, firm to stiff, low to medium plastic, trace gravel up to 30 mm.

... some sand, medium plastic, occasional stiff spots.

... sand pockets distributed throughout.

... moist, stiff, grey mottling.

... heavy oxide staining.

... stiff to very stiff.

End o Borehole @ 6.6 m.

No Seepage, Sloughing at 6.0 m upon Completion.
Slotted 1" PVC Pipe Installed to 6.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Number	SPT (N)	Moisture Content (%)
B1		20.7
B2		17.8
D1	4	22.4
B3		
B4		16
D2	6	14.6
B5		
B6		16.2
D3	8	17.4
B7		
B8		
D4	10	16.4

TETRA TECH

Contractor: Chilako Drilling	Completion Depth: 6.6 m
Equipment Type: 150 mm Solid Stem	Start Date: February 3, 2023
Logged By: SA	Completion Date: February 3, 2023
Reviewed By: JZ	Page 1 of 1

GEOTECHNICAL 704-ENG.LGEO04625-01.GPJ EBA.GDT 3/13/23

Sumus Property Group Ltd.

Borehole No: **23BH015**

Project: Chinook Industrial Park ASP
Project No: 704-ENG.LGEO04625-01
Location: 10-9-21-W4M
Ground Elev: 996.41 m
Lethbridge County, AB
UTM: 371926 E; 5509752 N; Z

Depth (m): 0 – 11
Method: Solid stem auger
Water level: 2/10/2023

Soil Description

TOPSOIL - clay, silty, sandy, frozen to moist, dark brown, trace rootlets and organics.

CLAY - silty, some sand, damp, very stiff, medium plastic, light brown, sand pocket.

CLAY (TILL) - silty, some sand, trace gravel, moist, stiff to very stiff, medium plastic, brown to dark brown, sand pockets, white precipitates.

... coal fragments.

... moist to very moist, stiff.

... very moist, firm, heavy oxide staining, sand pockets distributed throughout.

... firm to stiff.

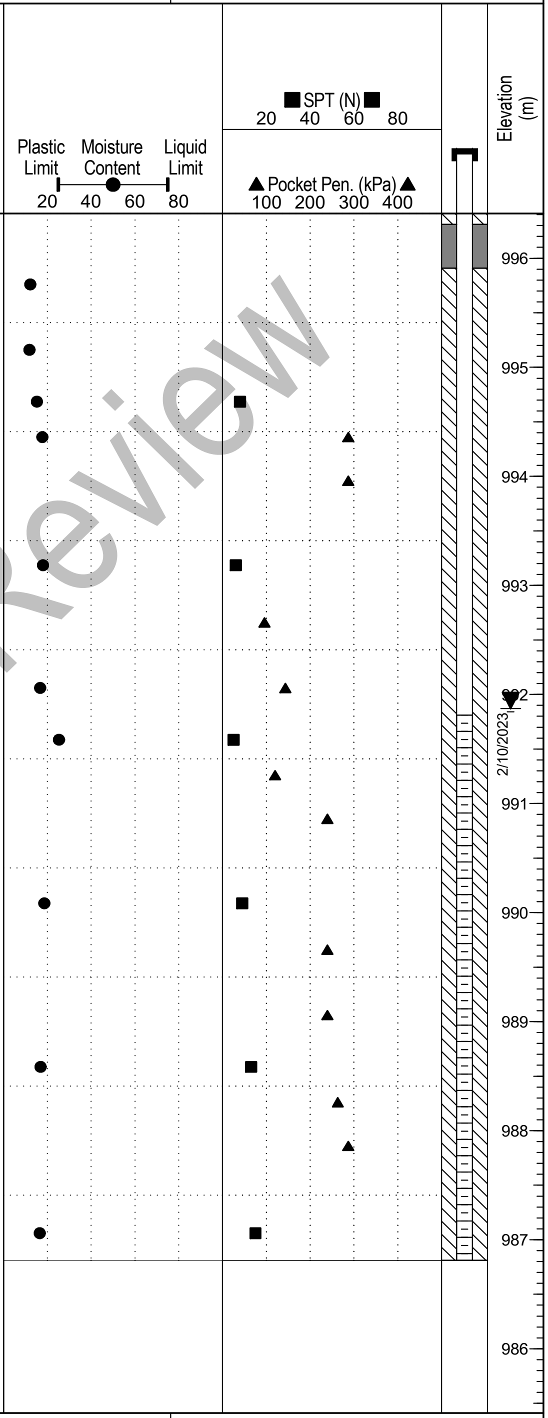
... moist, stiff to very stiff, dark brown to grey.

... trace free water.

End of Borehole @ 9.6 m.

Seepage at 6.3 m, No Sloughing upon Completion.
Slotted 1" PVC Pipe Installed to 9.6 m.
Indicated Water Level Measured on 2/10/2023.

Sample Type	Sample Number	SPT (N)	Moisture Content (%)
▬	B1		12.2
▬	B2		11.8
☒	D1	8	15.2
▬	B3		17.7
▬	B4		
☒	D2	6	18
▬	B5		
▬	B6		16.7
☒	D3	5	25.3
▬	B7		
▬	B8		
☒	D4	9	18.6
▬	B9		
▬	B10		
☒	D5	13	16.9
▬	B11		
▬	B12		
☒	D6	15	16.5



TETRA TECH

Contractor: Chilako Drilling
Completion Depth: 9.6 m
Equipment Type: 150 mm Solid Stem
Start Date: February 3, 2023
Logged By: SA
Completion Date: February 3, 2023
Reviewed By: JZ
Page 1 of 1

APPENDIX C

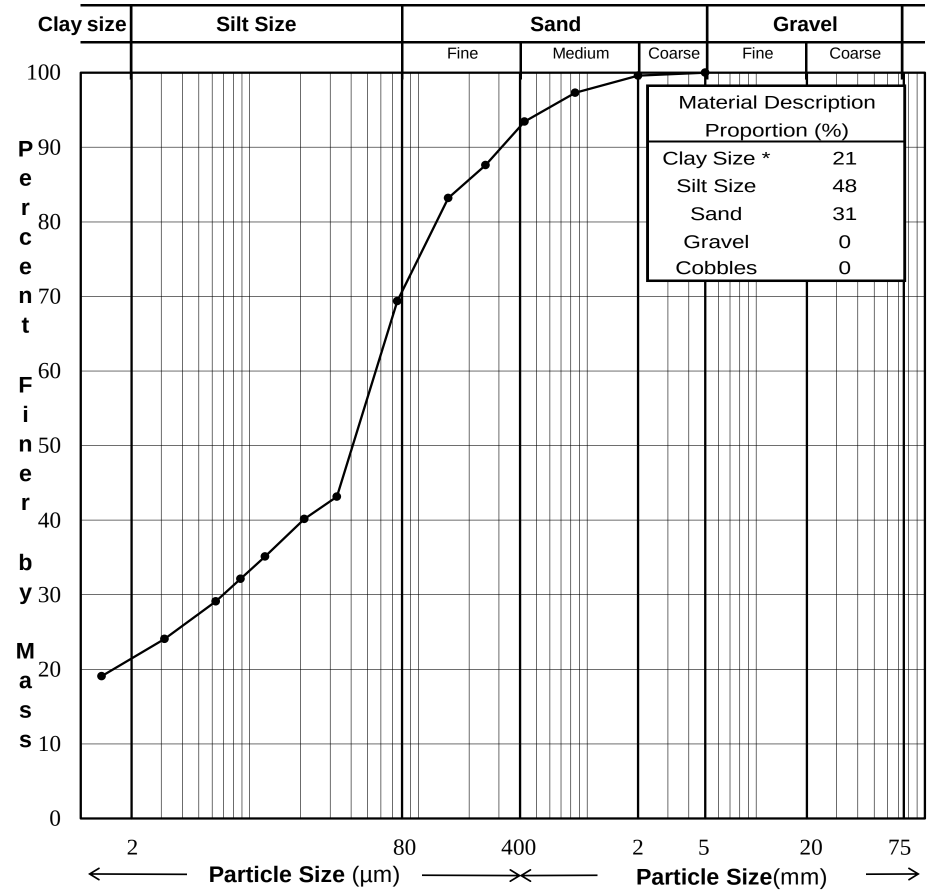
LABORATORY RESULTS

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project:	Chinook Industrial Park - ASP	Sample No.:	
Client:	Sumus Property Group Ltd.	Borehole/ TP:	23BH001
Project No.:	ENG.LGEO04625-01	Depth:	D2 (3.0 - 3.45 m)
Location:		Date Tested	February 13, 2023
Description **:	CLAY - silty, sandy.	Tested By:	SA

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	100
2 mm	100
850 µm	97
425 µm	93
250 µm	88
150 µm	83.2
75 µm	69.4
33 µm	43.2
21 µm	40.1
12 µm	35.1
9 µm	32.1
6 µm	29.1
3 µm	24.1
1 µm	19.1



Material Description	Proportion (%)
Clay Size *	21
Silt Size	48
Sand	31
Gravel	0
Cobbles	0

Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: ______________________________ P.Eng.

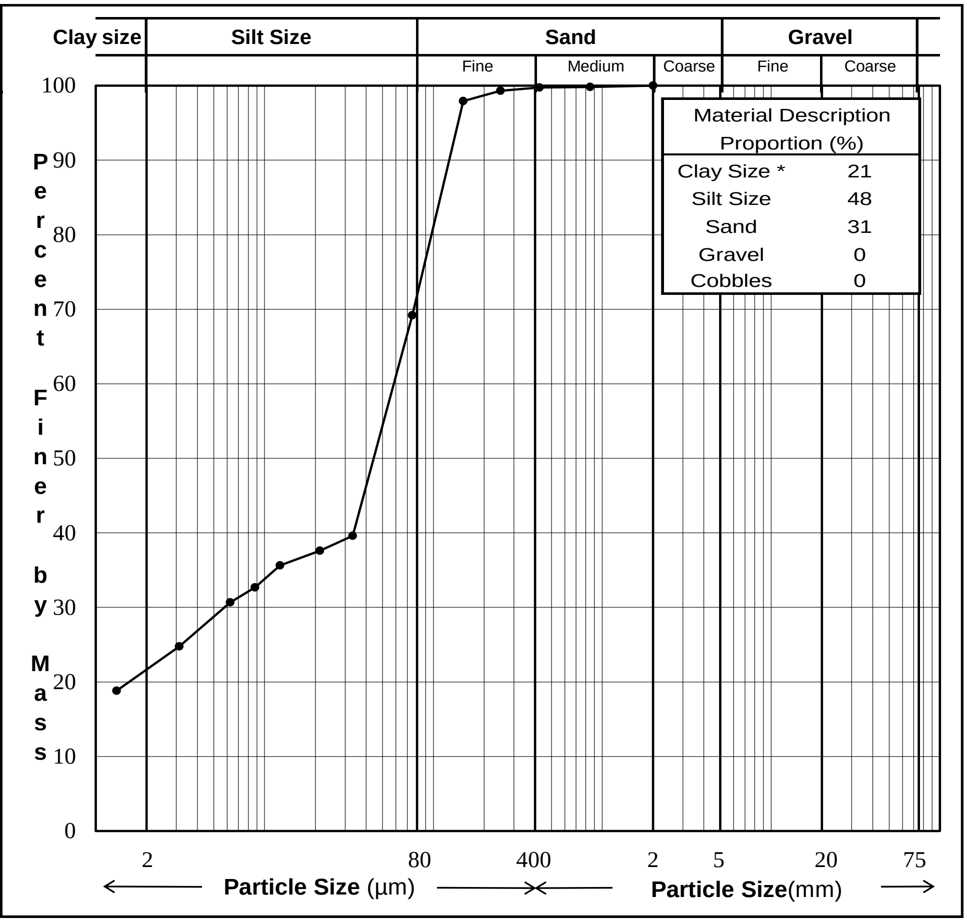
TETRA TECH

PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

Project:	Chinook Industrial Park - ASP	Sample No.:	
Client:	Sumus Property Group Ltd.	Borehole/ TP:	23BH003
Project No.:	ENG.LGEO04625-01	Depth:	B2 (1.2 m)
Location:		Date Tested	February 13, 2023
Description **:	CLAY - silty, sandy.	Tested By:	SA

Particle Size	Percent Passing
100 mm	
75 mm	
50 mm	
38 mm	
25 mm	
19 mm	
13 mm	
10 mm	
5 mm	
2 mm	100
850 µm	100
425 µm	100
250 µm	99
150 µm	97.9
75 µm	69.2
33 µm	39.6
21 µm	37.6
12 µm	35.6
9 µm	32.7
6 µm	30.7
3 µm	24.7
1 µm	18.8



Material Description	Proportion (%)
Clay Size *	21
Silt Size	48
Sand	31
Gravel	0
Cobbles	0

Remarks: * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to Tetra Tech description protocols.

Reviewed By: ______________________________ P.Eng.

CONSTANT HEAD HYDRAULIC CONDUCTIVITY TEST REPORT

ASTM D5084

Project: Chinook Industrial Park ASP
Project No.: ENG.LGEO04625-01
Client: Sumus Property Group Ltd.
Attention: Michael Kelly

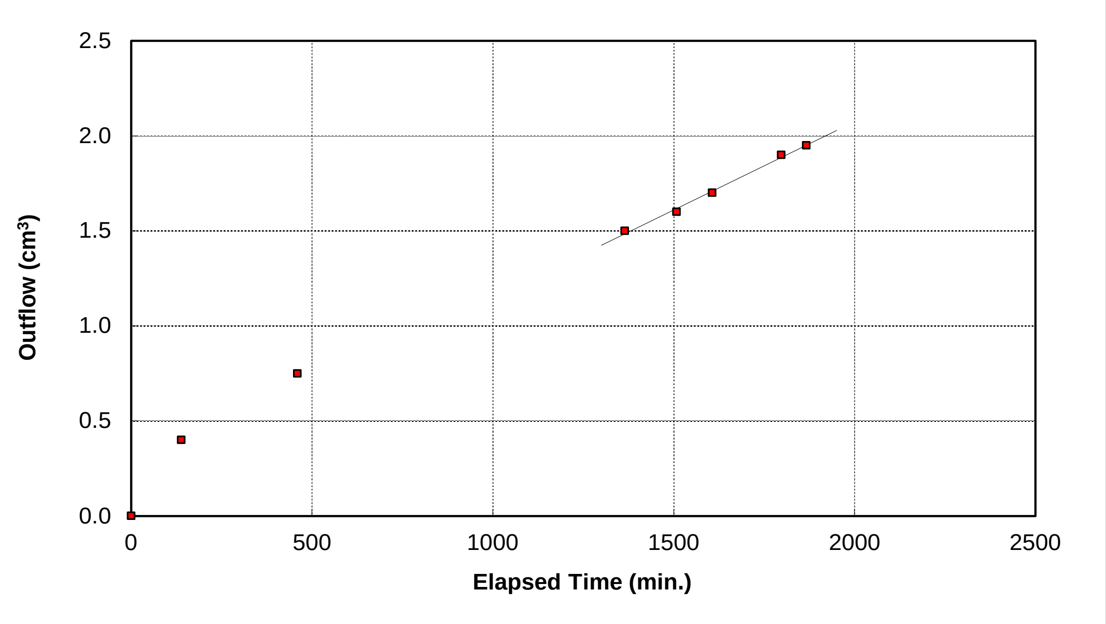
Sample No.: L-24 (P-1)
Borehole No.: 23BH-014
Depth: 1.5-3.0 m
Date Tested: February 17, 2023
Tested By: TD

Soil Description: CLAY, silty, some sand, brown

	Initial	Final
Moisture Content (%)	15.0	16.9
Dry Density (kg/m3)	1824	1835
Compaction SPD (if applicable)	97.6%	98.1%

Sample Height = 5.14 cm
Sample Diameter = 7.08 cm
Head Differential = 14 kPa
Flow Q = 1.8E-05 cm^3/sec
Hydraulic Gradient i = 27.78
Area of Sample A = 39.39 cm^2

Hydraulic Conductivity $\mathbf{k}_{20}$ = **1.6E-08 cm/sec**



Remarks: Remolded Sample

Reviewed By: V.O P.Eng.

TETRA TECH

Moisture-Density Relationship - Proctor Report

CCIL

ASTM D698

Proj No: LGE04625-01 Sample #: L-24

Project: Chinook Industrial Park ASP Site: Densities Rpt #: 1

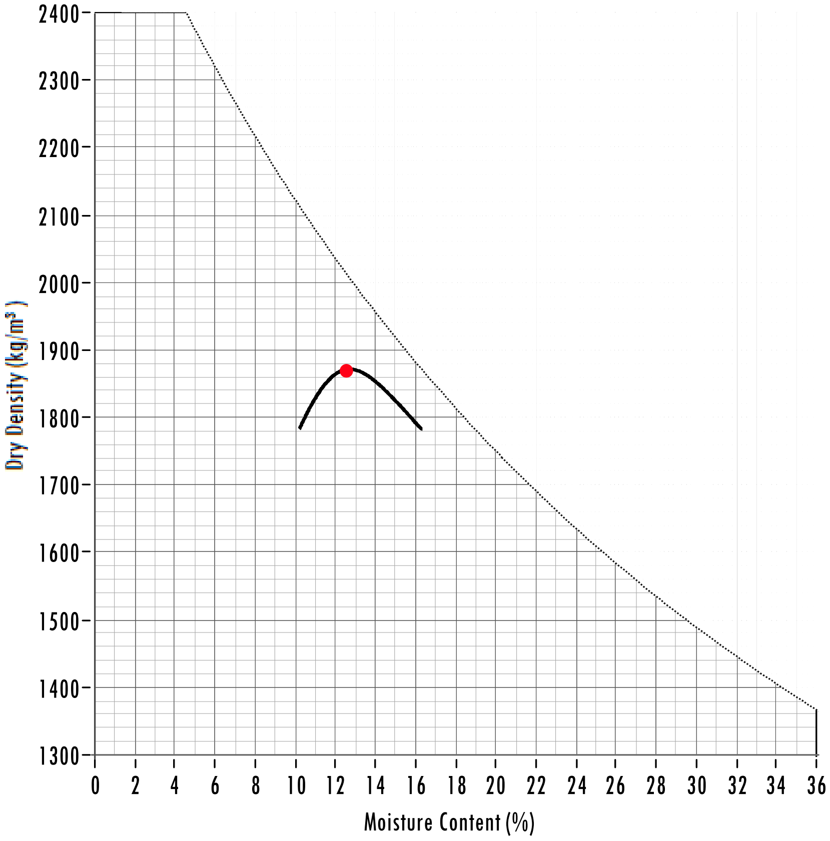
Client: Sumus Property Group Ltd Date Received: Feb 03,2023 By: SA

Address: PO Box 932 (MSK Developments), Lethbridge Alberta T1J3Z8 Date Tested: Feb 13,2023 By: MS

Description: Clay, silty, some sand

Soil Source: Native Location: 23BH-014 @ 1.5-3.0m

Attention: Michael Kelly



Maximum Density: 1870 kg/m³

Optimum Moisture: 12.5 %

as-Received Moisture: 17.3 %

Method: ☑ A ☐ B ☐ C

Compaction: Manual

Zero Air Voids SG: 2.70

Reviewed by: Christa Toles

Christa Toles, C.E.T.

Remarks:

CC:

APPENDIX D

DESIGN AND CONSTRUCTION GUIDELINES

CONSTRUCTION GUIDELINES

Revision No: 01 | Last Revised: March 31, 2016

SHALLOW FOUNDATIONS

Design and construction of shallow foundations should comply with relevant Building Code requirements.

The term ‘shallow foundations’ includes strip and spread footings, mat slab, and raft foundations.

Minimum footing dimensions in plan should be in accordance with the applicable design code of the local jurisdiction.

No loose, disturbed or sloughed material should be allowed to remain in open foundation excavations. Hand cleaning should be undertaken to prepare an acceptable bearing surface.

Foundation excavations and bearing surfaces should be protected from rain, snow, freezing temperatures, excessive drying, and the ingress of free water before, during, and after footing construction.

Footing excavations should be carried down into the designated bearing stratum.

After the bearing surface is approved, a mud slab should be poured to protect the soil against inclement weather and provide a working surface for construction.

All constructed foundations should be placed on unfrozen soils, which should be at all times protected from frost penetration.

All foundation excavations and bearing surfaces should be inspected by a qualified geotechnical engineer to check that the recommendations contained in this report have been followed.

Where over-excavation has been carried out through a weak or unsuitable stratum to reach into a suitable bearing stratum or where a foundation pad is to be placed above stripped natural ground surface such over-excavation may be backfilled to subgrade elevation utilizing either structural fill or lean-mix concrete. These materials are defined below:

- “Structural engineered fill” should comprise clean, well-graded granular soils.
- “Lean-mix concrete” should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

CONSTRUCTION GUIDELINES

Revision No: 01 | Last Revised: March 31, 2016

BORED CAST-IN-PLACE CONCRETE PILES

Design and construction of piles should comply with relevant Building Code requirements.

Piles should be installed under full-time inspection of qualified geotechnical personnel. Pile design parameters should be reviewed in light of the findings of the initial bored shafts drilled on a site. Further design review may be necessary if conditions observed during site construction do not conform to design assumptions.

Where fill material or lenses or strata of sand, silt or gravel are present within the designed pile depth, these may be incompetent and/or water bearing and may cause sloughing. Casing should be on hand before drilling starts and be used, if necessary, to seal off water and/or prevent sloughing of the bore.

If piles are to be underreamed (belled), the underreams should be formed entirely in self-supporting soil and entirely within the competent bearing stratum. Where sloughing occurs at design elevation it may be necessary to extend the base of the pile bell to a greater depth. Piles may be constructed with bells having outside diameters up to approximately three times the diameters of their shafts. Piles with shaft diameters of less than 400 mm should not be underreamed due to difficulties associated with ensuring a clean base.

Prior to pouring concrete, bottoms of pile bells or of straight shaft end bearing piles should be mechanically cleaned of all disturbed material.

Pile bores should be visually inspected after completion to ensure that disturbed materials and/or water are not present on the base so that recommended allowable bearing and skin friction parameters may apply.

Other procedures to inspect the pile shafts may be used where shaft diameters of less than 760 mm (30 inch) are constructed, such as, inspection with a light or with the use of a downhole camera.

For safety reasons, where hand cleaning and/or 'down shaft' inspection by personnel are required, the pile shaft must be cased full length prior to personnel entering the shaft.

Reinforcing steel should be on hand and should be placed as soon as the bore has been completed and approved.

Longitudinal reinforcing steel is recommended to counteract the possible tensile stresses induced by frost action and should extend to a minimum depth of 3.5 m. A minimum steel of 0.5 percent of the gross shaft area is recommended or per applicable building code requirements.

Where a limited quantity of water is present on the pile base (<50 mm), it should be removed. Where significant quantities of water are present (>50 mm), and it is impracticable to exclude water from the pile bore, concrete should be placed by tremie techniques or a concrete pump.

A "dry" pile should be poured by "free fall" of concrete only where impact of the concrete against the reinforcing cage, which can cause segregation of the concrete, will not occur. A hopper should be used to direct concrete down the centre of the pile base and to prevent impact of concrete against reinforcing steel.

Concrete used for "dry" uncased piles should be self-compacting and should have a target slump of 125 mm. Where casing is required to prevent sloughing or seepage, the slump should be increased to 150 mm. The casing should be filled with concrete and then the casing should be withdrawn smoothly and continuously. Sufficient concrete should be placed to allow for the additional volume of the casing and reduction in level of the concrete as the casing is withdrawn. Concrete should not be poured on top of previously poured concrete, after the casing is withdrawn. In order to comply with maximum water:cement ratios for the concrete, the use of chemicals (or superplasticizers) to temporarily increase the slump may be required. Concrete for each pile should be poured in one continuous operation and should be placed immediately after excavation and inspection of piles, to reduce the opportunity for the ingress of free water or deterioration of the exposed soil or rock.

If piles cannot be formed in dry conditions then the concrete should be placed by tremie tube or concrete pump. Concrete placed by tremie should have a slump of not less than 150 mm. A ball or float should be used in the tremie tube to separate the initial charge of concrete from the water in the pile bore. The outlet of the tremie tube should be maintained at all times 1.0 m to 2.0 m below the surface of the concrete. The diameter of the tremie tube should be at least 200 mm. The tube should be water tight and not be made of aluminum. Smaller diameter pipes may be used with a concrete pump. The surface of the concrete should be allowed to rise above the cut off level of the pile, so that when the temporary casing is withdrawn and the surface level of the concrete adjusts to the new volume, the top of the uncontaminated concrete is at or above the cut off level. The concrete should be placed in one continuous smooth operation without any halts or delays. Placing the lower portion of the pile by tremie tube and placing the upper portion of the pile by "free fall" should not be permitted, to ensure that defects in the pile shaft at the top of the tremie concrete do not occur. As the surface of the concrete rises in the pile bore the water in the pile bore will be displaced upwards and out of the top of the pile casing.

When concreting piles by tremie techniques, allowance should be made for the removal of contaminated or otherwise defective concrete at the tops of the piles.

An accurate record of the volume of concrete placed should be maintained as a check that a continuous pile had been formed.

Concrete should not be placed if its temperature is less than 5°C or exceeds 30°C, or if it is more than two hours old.

Where tension, horizontal or bending moment loading on the pile is foreseen, steel reinforcing should be extended and tied into the grade beam or pile cap. The steel should be designed to transfer loads to the required depth in the pile and to resist resultant bending moments and shear forces.

Void formers should be placed beneath all grade beams to reduce the risk of damage due to frost effects or soil moisture changes.

Where the drilling operation might affect the concrete in an adjacent pile (i.e., where pile spacing is less than approximately three diameters) drilling should not be carried out before the previously poured pile concrete has set for at least 24 hours.

Where a group of four or more piles are used the allowable working load on the piles may need to be modified to allow for group effects.

Piles should be spaced no closer than 2.5 times the pile shaft diameter, measured centre-to-centre. Strict control of pile location and verticality should be exercised to provide accurate locations and spacings of piles. In general, piles should be constructed within a tolerance of 75 mm plan distance in any direction and within a verticality of 1%.

A detailed record should be kept of pile construction; the following information should be included, pile number, shaft/base diameter, date and time bored, date and time concreted, elevation of piling platform, depths (from piling platform level) to pile base and to concrete cut off level, length of casing used, details of reinforcement, details of any obstructions, details of any groundwater inflows, brief description of soils encountered in the bore and details of any unusual occurrences during construction.

If a large number of piles are to be installed, it may be possible to optimize the design on the basis of pile load tests or conducting high strain dynamic pile testing.

CONSTRUCTION GUIDELINES

Revision No: 02 | Last Revised: March 31, 2016

FLOOR SLABS-ON-GRADE

All soft, loose or organic material should be removed from beneath slab areas. If any local 'hard spots' such as old basement walls or abandoned pile foundation are revealed beneath the slab area, these should be over-excavated and removed to not less than 0.9 m below underside of slab level. The exposed soil should be proof-rolled and the final grade restored by engineered fill placement. If proof-rolling reveals any soft or loose spots, these should be excavated and the desired grade restored by engineered fill placement. The subgrade should be compacted to a depth of not less than 0.3 m to a density of not less than 98 percent Standard Proctor Maximum Dry Density (ASTM Test Method D698).

If, for economic reasons, it is considered desirable to leave low quality material in-place, such as existing fills, beneath a slab-on-grade, special ground treatment procedures may be considered, Tetra Tech could provide additional advice on this aspect if required.

A levelling course of well graded granular fill (with maximum size of 20 mm), at least 150 mm in compacted thickness, is recommended directly beneath all slabs-on-grade. The type of granular fill should be selected based on the design floor loadings. Alternatively a minimum thickness of 150 mm of 80 mm pit-run gravel overlain by a minimum thickness of 50 mm of 20 mm crushed gravel may be used. Coarse gravel particles larger than 25 mm diameter should be avoided directly beneath the slab-on-grade to limit potential stress concentrations within the slab. All levelling courses directly under floor slabs should be compacted to 100 percent of Standard Proctor Maximum Dry Density (ASTM Test Method D698).

Engineered fill, pit-run gravel and crushed gravel are defined under the heading 'Backfill Materials and Compaction' elsewhere in this Appendix.

The excavated subgrade beneath slabs-on-grade should be protected at all times from rain, snow, freezing temperatures, excessive drying and the ingress of free water. This applies before, during, and after the construction period.

CONSTRUCTION EXCAVATIONS

Construction should be in accordance with good practice and comply with the requirements of the responsible regulatory agencies.

All excavations greater than 1.5 m deep should be sloped or shored for worker protection.

Shallow excavations up to about 3 m depth may use temporary sideslopes of 1H:1V. A flatter slope of 2H:1V should be used if groundwater is encountered. Localized sloughing can be expected from these slopes.

Deep excavations or trenches may require temporary support if space limitations or economic considerations preclude the use of sloped excavations.

For excavations greater than 3 m depth, temporary support should be designed by a qualified geotechnical engineer. The design and proposed installation and construction procedures should be submitted to Tetra Tech for review.

The construction of a temporary support system should be monitored. Detailed records should be taken of installation methods, materials, in situ conditions and the movement of the system. If anchors are used, they should be load tested. Tetra Tech can provide further information on monitoring and testing procedures if required.

Attention should be paid to structures or buried service lines close to the excavation. For structures, a general guideline is that if a line projected down, at 45 degrees from the horizontal from the base of foundations of adjacent structures intersects the extent of the proposed excavation, these structures may require underpinning or special shoring techniques to avoid damaging earth movements. The need for any underpinning or special shoring techniques and the scope of monitoring required can be determined when details of the service ducts and vaults, foundation configuration of existing buildings and final design excavation levels are known.

No surface surcharges should be placed closer to the edge of the excavation than a distance equal to the depth of the excavation, unless the excavation support system has been designed to accommodate such surcharge.

BACKFILL MATERIALS AND COMPACTION (GENERAL)

1.0 DEFINITIONS

“Landscape fill” is typically used in areas such as berms and grassed areas where settlement of the fill and noticeable surface subsidence can be tolerated. “Landscape fill” may comprise soils without regard to engineering quality.

“General engineered fill” is typically used in areas where a moderate potential for subgrade movement is tolerable, such as asphalt (i.e., flexible) pavement areas. “General engineered fill” should comprise clean, granular or clay soils.

“Select engineered fill” is typically used below slabs-on-grade or where high volumetric stability is desired, such as within the footprint of a building. “Select engineered fill” should comprise clean, well-graded granular soils or inorganic low to medium plastic clay soils.

“Structural engineered fill” is used for supporting structural loads in conjunction with shallow foundations. “Structural engineered fill” should comprise clean, well-graded granular soils.

“Lean-mix concrete” is typically used to protect a subgrade from weather effects including excessive drying or wetting. “Lean-mix concrete” can also be used to provide a stable working platform over weak subgrades. “Lean-mix concrete” should be low strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

Standard Proctor Density (SPD) as used herein means Standard Proctor Maximum Dry Density (ASTM Test Method D698). Optimum moisture content is defined in ASTM Test Method D698.

2.0 GENERAL BACKFILL AND COMPACTION RECOMMENDATIONS

Exterior backfill adjacent to abutment walls, basement walls, grade beams, pile caps and above footings, and below highway, street, or parking lot pavement sections should comprise “general engineered fill” materials as defined above.

Exterior backfill adjacent to footings, foundation walls, grade beams and pile caps and within 600 mm of final grade should comprise inorganic, cohesive “general engineered fill”. Such backfill should provide a relatively impervious surficial zone to reduce seepage into the subsoil against the structure.

Backfill should not be placed against a foundation structure until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction. During compaction, careful observation of the foundation wall for deflection should be carried out continuously. Where deflections are apparent, the compactive effort should be reduced accordingly.

In order to reduce potential compaction induced stresses, only hand-held compaction equipment should be used in the compaction of fill within 1 m of retaining walls or basement walls. If compacted fill is to be placed on both sides of the wall, they should be filled together so that the level on either side is within 0.5 m of each other.

All lumps of materials should be broken down during placement. Backfill materials should not be placed in a frozen state, or placed on a frozen subgrade.

Where the maximum-sized particles in any backfill material exceed 50% of the minimum dimension of the cross-section to be backfilled (e.g., lift thickness), such particles should be removed and placed at other more suitable locations on site or screened off prior to delivery to site.

Excavation and construction operations expose materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration of performance. Unless otherwise specifically indicated in this report, the walls and floors of excavations, and stockpiles, must be protected from the elements, particularly moisture, desiccation, frost, and construction activities. Should desiccation occur, bonding should be provided between backfill lifts. For fine-grained materials the previous lift should be scarified to the base of the desiccated layer, moisture-conditioned, and recompacted and bonded thoroughly to the succeeding lift. For granular materials, the surface of the previous lift should be scarified to about a 75 mm depth followed by proper moisture-conditioning and recompaction.

3.0 COMPACTION AND MOISTURE CONDITIONING

“Landscape fill” material should be placed in compacted lifts not exceeding 300 mm and compacted to a density of not less than 90% of SPD unless a higher percentage is specified by the jurisdiction.

“General engineered fill” and “select engineered fill” materials should be placed in layers of 150 mm compacted thickness and should be compacted to not less than 98% of SPD. Note that the contract may specify higher compaction levels within 300 mm of the design elevation. Cohesive materials placed as “general engineered fill” or “select engineered fill” should be compacted at 0 to 2% above the optimum moisture content. Note that there are some silty soils which can become quite unstable when compacted above optimum moisture content. Granular materials placed as “general engineered fill” or “select engineered fill” should be compacted at slightly below (0 to 2%) the optimum moisture content.

“Structural engineered fill” material should be placed in compacted lifts not exceeding 150 mm in thickness and compacted to not less than 100% of SPD at slightly below (0 to 2%) the optimum moisture content.

4.0 “GENERAL ENGINEERED FILL”

Cohesive or granular soils are considered acceptable for use as “general engineered fill,” providing the soils are inorganic and free of deleterious materials.

5.0 “SELECT ENGINEERED FILL”

Low to medium plastic clay with the following range of plasticity properties is generally considered suitable for use as “select engineered fill”:

Liquid Limit	= 20 to 40%
Plastic Limit	= 10 to 20%
Plasticity Index	= 10 to 30%

Test results should be considered on a case-by-case basis.

“Pit-run gravel” and “fill sand” are generally considered acceptable for use as “select engineered fill.” See exact project or jurisdiction for specifications.

The “pit-run gravel” should be free of any form of coating and any gravel or sand containing clay, loam or other deleterious materials should be rejected. No material oversize of the specified maximum sieve size should be tolerated. This material would typically have a fines content of less than 10%.

The materials above are also suitable for use as “general engineered fill.”

6.0 “STRUCTURAL ENGINEERED FILL”

Crushed gravel used as “structural engineered fill” should be hard, clean, well graded, crushed aggregate, free of organics, coal, clay lumps, coatings of clay, silt, and other deleterious materials. The aggregates should conform to the requirement when tested in accordance with ASTM C136 and C117. See exact project or jurisdiction for specifications. This material would typically have a fines content of less than 10%.

In addition to the above, further specification criteria identified below should be met:

“Structural Engineered Fill” – Additional Material Properties

Material Type	Percentage of Material Retained on 5 mm Sieve having Two or More Fractured Faces	Plasticity Index (<400 μm)	L.A. Abrasion Loss (percent Mass)
Various sized Crushed Gravels	See exact project or jurisdiction for specifications	See exact project or jurisdiction for specifications	See exact project or jurisdiction for specifications

Materials that meet the grading limits and material property criteria are also suitable for use as “select engineered fill.”

7.0 DRAINAGE MATERIALS

“Coarse gravel” for drainage or weeping tile bedding should be free draining. Free-draining gravel or crushed rock generally containing no more than 5% fine-grained soil (particles passing No. 200 sieve) based on the fraction passing the 3/4-inch sieve or material with sand equivalent of at least 30.

“Coarse sand” for drainage should conform to the following grading limits:

“Coarse Sand” Drainage Material – Percent Passing by Weight

Sieve Size	Coarse Sand*
10 mm	100
5 mm	95 – 100
2.5 mm	80 – 100
1.25 mm	50 – 90
630 μm	25 – 65
315 μm	10 – 35
160 μm	2 – 10
80 μm	0 – 3

* From CSA A23.1-09, Table 10, “Grading Limits for Fine Aggregate”, Class FA1

Note that the “coarse sand” above is also suitable for use as pipe bedding material. See exact project or jurisdiction for specifications.

8.0 BEDDING MATERIALS

The “Coarse Sand “gradation presented above in Section 7.0 is suitable for use as pipe bedding and as backfill within the pipe embedment zone, however see exact project or jurisdiction for specifications.

APPENDIX D

Phase I Environmental Site Assessment
Chinook Industrial Park ASP
Portions of West ½ Section 10 TWP 9 RGE 21 W4M
Lethbridge County, Alberta

PRESENTED TO

Sumus Property Group Ltd.

FEBRUARY 28, 2023
ISSUED FOR USE
FILE: ENG.LGEO04625-01.002

Tetra Tech Canada Inc.
442 – 10 Street North
Lethbridge, AB T1H 2C7 CANADA
Tel 403.329.9009 Fax 403.328.8817

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EXECUTIVE SUMMARY

Foreword

Sumus Property Group Ltd., care of MSK Developments, retained Tetra Tech Canada Inc. (Tetra Tech) to conduct a Phase I environmental site assessment (ESA) on the Chinook Industrial Park, located within the west half of Section 10, Township 9, Range 21, West of the Fourth Meridian (W1/2 10-009-21 W4M).

Tetra Tech understands this Phase I ESA is being conducted for due diligence in support of an area structure plan (ASP) for the Chinook Industrial Park (Phase 2 and Phase 3). Phase 2 and Phase 3 of the ASP are adjacent to the north of Phase 1A and 1B of the ASP. The proposed land consists of two legal properties: Plan 1113171, Block 1, Lot 5, and Plan 0013201, Block 1, Lot 1.

The objective of the Phase I ESA is to comment on whether any past or present land use, either offsite or onsite, may have a potential to cause environmental impairment to the site.

The Phase I ESA was completed in general accordance with the Alberta Environment and Parks Alberta Environmental Site Assessment Standard and with the methods outlined in the document titled "*Canadian Standards Association Standard (CSA) Z768-01 Phase I ESA*", published by the CSA (reaffirmed 2022).

Findings and Conclusions

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential contamination from on-site land use. This would include potential accidental spills or site practices that may contaminate the property directly. The second type of risk is from contamination caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater, or in overland runoff onto the site.

Potential for Impairment from On-Site Source(s)

There were no on-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

Potential for Impairment from Off-Site Source(s)

There were no off-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

Further Action/Rendering an Opinion

Based on the present study, Tetra Tech recommends that no further environmental investigation is required at this time.

Tetra Tech recommends the following for consideration:

- If buried debris or staining are encountered during future investigation or ground disturbance, a qualified environmental professional should be contacted.
- If soils containing organics are encountered during future investigation or ground disturbance, they should be removed from building footprints and not be reburied; a qualified environmental professional should be contacted.

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LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Sumus Property Group Ltd. and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Sumus Property Group Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

1.1 General

Sumus Property Group Ltd. care of MSK Developments retained Tetra Tech Canada Inc. (Tetra Tech) to conduct a Phase I environmental site assessment (ESA) for the Chinook Industrial Park, located within the west half of Section 10, Township 9, Range 21, West of the Fourth Meridian (W1/2 10-009-21 W4M).

Tetra Tech understands this Phase I ESA is being conducted for due diligence in support of an area structure plan (ASP) for the Chinook Industrial Park (Phase 2 and Phase 3). Phase 2 and Phase 3 of the ASP are adjacent and to the north of Phase 1A and 1B of the ASP. The proposed land consists of two legal properties: Plan 1113171, Block 1, Lot 5, and Plan 0013201, Block 1, Lot 1.

The objective of the Phase I ESA is to comment on whether any past or present land use, either offsite or onsite, may have a potential to cause environmental impairment to the site.

The Phase I ESA was completed in general accordance with the 2016 Alberta Environment and Parks Alberta Environmental Site Assessment Standard and with the methods outlined in the document titled "*Canadian Standards Association Standard (CSA) Z768-01 Phase I ESA*", published by the CSA (reaffirmed 2022).

1.2 Authorization

Michael Kelly of MSK Developments provided written authorization to proceed with the present study to Tetra Tech on January 23, 2023.

1.3 Scope of Work

Tetra Tech conducted the following scope of work for the Phase I ESA:

- Conducted a records review for the site and surrounding properties, for a minimum search distance of 100 m. The records review included the following current and historical information searches:
  - Provincial regulatory information including the Alberta Safety Codes Authority (ASCA); Alberta Energy Regulator (AER) via Abacus Datagraphics Database (AbaData); Alberta Environment and Protected Areas (AEPA) ESA Repository (ESAR), Online Water Well Database, Authorization Viewer; Historical Environmental Enforcement Search; and the Alberta Land Titles Spatial Information System (SPIN2).
  - Regional and municipal regulatory information, including Lethbridge County.
  - Historical information sources including business directories, fire insurance plans, land titles, and historical aerial photographs.
  - Geological and hydrogeological information including published topographic, geologic, soil, and groundwater maps and reports.
- Conducted a site visit to evaluate the extent and manner that current and historical surrounding activities may impact upon the site and the environment. Sampling was not included as part of the Phase I ESA scope of work.
- Conducted interviews with persons familiar with the site and surrounding properties.
- Evaluated the results and prepared this report discussing the site history and identified any potential for environmental concerns resulting from past or present land use on site and in the surrounding area.

1.4 Qualifications of Assessors

Jaymes Going, B.Sc., EP, conducted the site visit, historical review, and wrote this report. Jaymes is an Environmental Scientist with Tetra Tech's Environment and Water Practice and has over 15 years of experience in the environmental industry.

Henri Carriere, P.Eng., M.N.R.M., provided the senior review of this report. Henri is a Senior Project Engineer with Tetra Tech's Environment and Water Practice in Calgary, Alberta. He has more than 30 years of experience in the environmental industry.

1.5 General Site Details

The irregular shaped site consists of two legal properties and is approximately 60.12 hectares (ha) in size. The site is located adjacent to the east municipal boundary of the City of Lethbridge, within Lethbridge County. The site consists of cultivated agricultural cropland with the exception of a small building/structure located on the northern portion of the site that houses a water fill station. The water fill station is within one of the two legal properties (Plan 0013201, Block 1, Lot 1). An electrical transmission line is also present on the west site boundary.

The site is bound to the north by Township Road 92 (TWP RD 92), to the east by a St. Mary River Irrigation District (SMRID) irrigation canal, to the south by Phase 1A and Phase 1B of the Chinook Industrial Park and to the west by 43 Street North.

Adjacent to the north of the site beyond TWP RD 92 is a rural property with miscellaneous storage (irrigation pipes and various equipment), to the northeast by a rural residence and to the northwest by Pratt & Whitney. Beyond the SMRID canal to the east is agricultural land and a farm operation including numerous corrals. South of the site within Phase 1A and Phase 1B of the Chinook Industrial Park are Southland International Trucks and trailer storage and a stormwater retention pond. West of the site is the Churchill Industrial Park located within the City of Lethbridge. Adjacent commercial/industrial properties to the west of the site include the City of Lethbridge Animal Services, Haul-All Equipment Ltd., Peterbilt Lethbridge, Southland Trailer Corp., and miscellaneous storage associated with the industrial businesses.

Figure 1 shows the site location plan and Figure 2 shows the detailed site plan showing surrounding land use. Photographs of the site are provided in Appendix B.

2.0 RECORDS REVIEW

The results of regulatory searches are provided in Appendix C. Records were reviewed for the site and for adjacent properties within a minimum distance of 100 m from the site boundary.

2.1 Location, Size, and Ownership

The site is located in Lethbridge County, Alberta. The legal description, legal land description, size, and ownership are summarized in Table A.

Table A: Legal Description, Legal Land Description, Size, and Ownership

Legal Description	Legal Land Description	Size (ha)*	Ownership*
Plan 1113171, Block 1, Lot 5	W 10-009-21 W4M	59.56	1000824 Alberta Ltd.
Plan 0013201, Block 1, Lot 1	NW 10-009-21 W4M	0.56	Lethbridge Regional Water Services Commission

* Size and ownership were obtained from the current land title.

2.2 Historical Records Review

A historical records review was undertaken for the site. The review dates were based on available records.

2.2.1 Historical Land Title Records

A historical and current land title search was initiated for the site. The results of the historical land title search had not been received at the time of report issuance. Should the review of the historical land tiles change the findings, an addendum letter will be issued. The current land titles are included in Appendix C.

Table B: Land Titles Summary

Year(s) of Ownership	Owner(s)	Tetra Tech Evaluation
Plan 1113171, Block 1, Lot 5		
2011 to present	1000824 Alberta Ltd.	Based on the name, there is no obvious potential for environmental concern.
Plan 0013201, Block 1, Lot 1		
2002 to present	Lethbridge Regional Water Services Commission	Based on the name, there is no obvious potential for environmental concern.

2.2.2 Aerial Photographs

Aerial photographs provide visual evidence of site occupancy, operational activities, and general site details. Aerial photographs capture a view of the site and the surrounding areas at a given time. The results of the aerial photograph review are summarized in Table C.

Table C: Historical Aerial Photo Summary

Year	Scale	Observations
1950	1:40,000	**On-site:** Site appears as agricultural cropland.
		Off-site: The surrounding land is predominantly agricultural cropland. Linear features are visible to the west (43 Street North), north (TWP RD 92), and east (SMRID canal). Structures are also visible to the east at the location of the farm operation.
1961	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1970	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1979	1:31,680	**On-site:** Similar to the previous aerial photograph.
		Off-site: Generally similar to the previous aerial photograph although corrals have been constructed to the east at the farm operation location and a building has been constructed to the west (current Haul-All Equipment Ltd.). Outdoor storage is also visible to the north of Haul-All Equipment Ltd.
1991	1:30,000	**On-site:** Similar to the previous aerial photograph.
		Off-site: Similar to the previous aerial photograph.
1999	1:30,000	**On-site:** Similar to the previous aerial photograph.
		Off-site: Additional structures have been constructed to the west of the site at the current location of Southland Trailer Corp. Additional outside storage is visible to the west of the site.

Table C: Historical Aerial Photo Summary

Year	Scale	Observations
2011	*	**On-site:** Similar to the previous aerial photograph although the building and access for the water fill station has been constructed on the northern portion of the site.
		Off-Site: Additional structures have been constructed to the west of the site at the current location of Peterbilt and the Lethbridge Animal Services.
2022	*	**On-site:** Similar to the previous aerial imagery.
		Off-Site: South of the site a building has been constructed (Southland International Trucks) and trailer storage is visible. The stormwater retention pond has also been constructed south of the site.

Notes:
To be read in conjunction with the accompanying report.
The aerial photographs are enlarged (where possible) for the review.
* Aerial photograph was obtained from Google Earth’s satellite image archive.

Based on the aerial photograph review, the site has been agricultural land since 1950 with the only change being the construction of the water fill station between 1999 and 2011.

The surrounding area has also been predominantly agricultural land since 1950 with development occurring to the west of the site within the City of Lethbridge since 1979 and most recently with the development to the south of the site with Phase 1A and Phase 1B of the ASP prior to 2022.

2.2.3 Museum Archives

Tetra Tech inquired with the Galt Museum and Archives for indications of historical land use at the site and the surrounding area. Museum personnel indicated that there was no information specific to the site.

2.2.4 Business Directories

No business directories were available for Tetra Tech to review for the site.

2.2.5 Fire Insurance Plans

No fire insurance plans were available for Tetra Tech to review for the site.

2.2.6 Other Archival Records

No additional archival records were reviewed by Tetra Tech for the site.

2.3 Provincial Regulatory Information

This section describes the results of provincial regulatory searches. Copies of the search results and correspondence are provided in Appendix C.

2.3.1 Alberta Safety Codes Authority

Tetra Tech contacted the Alberta Safety Codes Authority (ASCA) regarding the potential for registered petroleum storage tanks (PSTs) at the site (Plan 1113171, Block 1, Lot 5 and W1/2 10-009-21 W4M and Plan 0013201, Block 1, Lot 1 and NW 10-009-21 W4M) and at the location of Haul-All Equipment Ltd. (4115 – 18 Avenue North; NE 09-009-21 W4M) due to the age of this property dating to the late 1970s.

The ASCA indicated that no records exist for the site or for the location of Haul-All Equipment Ltd.

The ASCA requires that all underground storage tanks (USTs) be registered; however, only above-ground storage tanks (ASTs) with a capacity greater than 2,500 L require registration. The database is based on a limited survey conducted in 1992 and voluntary information submitted thereafter; therefore, it is not considered a comprehensive inventory of PSTs in Alberta.

2.3.2 Alberta Energy Regulator

2.3.2.1 AbaData Database

Tetra Tech acquires AER database information through AbaData. The AbaData database was searched to determine if oil/gas wells and/or pipelines exist or have existed at the site and on the surrounding properties. The information provided by the AER indicated that there are available records for two high pressure gas lines owned and operated by ATCO Gas and Pipelines Ltd. (one active and one to be constructed) near the western and eastern site boundaries.

The operating high pressure gas line (natural gas) is oriented north to south along 43 Street North and the yet to be constructed high pressure gas line is proposed to the east of the SMRID canal.

No other records for oil/gas wells and/or pipelines and spills/complaints were identified within 100 m of the site boundaries. AbaData also shows a buried cable right-of-way (ROW) transecting the approximate middle of the site in a diagonal direction. No additional information on the ROW was available.

Several low-pressure gas lines (owned by ATCO Gas) are identified offsite and within 100 m of the site boundaries to the north and east that service rural properties.

High-pressure pipeline and well information provided by AbaData is current to January 1, 2023 and information on low-pressure pipelines is current to December 20, 2022.

The Coal Mine Atlas was reviewed, and it was determined that no abandoned or active coal mines are present at the site or within 100 m of the site.

2.3.3 Alberta Environment and Parks

2.3.3.1 Environmental Site Assessment Repository

The AEP ESAR is an online, searchable database that provides scientific and technical information about assessed sites throughout Alberta. The search of ESAR indicated that there were no records available for the site or within 100 m from the site boundary. Several records were available greater than 100 m to the east and west of the site.

2.3.3.2 Online Authorization Viewer

The AEP Online Authorization Viewer allows the public to view approvals, licenses, registrations and permits issued under the Water Act and EPEA. There were no records available for the site by the legal description (Plan 1113171, Block 1, Lot 5 or Plan 0013201, Block 1, Lot 1), however, six records were available for the section in which the site is located (10-009-21 W4M). The available records are for the Lethbridge Regional Water Distribution System, the Rave Industrial Area Storm Drainage System, and for the Coaldale/Management/Lethbridge County (stormwater drainage).

2.3.3.3 Water Well Information Database

The AEP Water Well Database was searched to view records of water wells within the site or within an approximate 1,000 m radius from the approximate centre of the site. The search identified no records of water wells located on or offsite within a 1,000 m radius.

2.3.4 Alberta Government – Alberta Land Titles Spatial Information System

The SPIN2 website map for the site and surrounding area shows the legal property boundaries for the site and surrounding area including the ROW for the SMRID irrigation canal adjacent to the east of the site. The SPIN2 map also shows a buried cable ROW transecting the approximate middle of the site.

2.3.5 Historical Environmental Enforcement Search

The historical environmental enforcement search provides records taken against a company or individual related to AEP's legislation. The search was conducted for each of the current site owners as per the land title records listed in Section 2.2.1. The search resulted in no records for the individuals or companies listed.

2.4 Regional and Municipal Regulatory Information

This section describes the results of regional and municipal regulatory searches. Copies of the search results and correspondence are provided in Appendix C.

2.4.1 Lethbridge County

Tetra Tech requested a site inquiry with Lethbridge County for information on the site (W1/2 10-009-21 W4M). The response indicated that there are no records of storage tanks, chemical storage, spills, fires or landfills for the site including Phase 1A and Phase 1B of the ASP (located within the W1/2 10-009-21 W4M). It was also indicated that existing development approvals for the area exist.

A copy of the letter from Lethbridge County is presented in Appendix C.

2.5 Land Forms and Geology

2.5.1 Topography

Surface topography can influence the direction of migration of contaminants at the soil surface. The local topography is the topography at the site, whereas regional topography is the overall expression of the surface in a given region. The local topography of the site was generally flat with no overall surface drainage pattern observed. Regional topography in the area is generally flat to undulating, and slopes northerly towards the Oldman River valley.

2.5.2 Surficial and Bedrock Geology

The surficial geology in the area is characterized by moraine till deposits with sporadic lenses of gravel, sand, and silt (Shetsen 1981).

The stratigraphy of the Lethbridge area is generally comprised of 65 m to 70 m of surficial deposits overlying bedrock. Bedrock in the Lethbridge area consists of strata from the upper Oldman Formation and the lower Bearpaw Formation, both of the late Cretaceous Age (Tokarsky 1974). The bedrock has a relatively flat surface dipping slightly to the northwest and is locally encountered at about geodetic elevation 843 m. The bedrock strata consist of thin beds of predominantly weak mudstones, siltstones, and sandstones with occasional bentonite and coal seams.

2.5.3 Hydrogeology

Groundwater has the potential to be of significance as a means of contaminant transport. Regional groundwater flow is the overall direction of groundwater flow in a given region. Groundwater in a local area within the region, may travel in a different direction from the regional flow, due to influence by local topography and/or subsurface soil conditions.

There are currently no surface water bodies located at the site. The nearest surface water body is the SMRID canal adjacent to the east of the site. There is also a stormwater retention pond approximately 100 m south of the site (within Phase 1B of the ASP) and a dugout located east of the SMRID canal at the farm operation. The Oldman River is located approximately 6 km northwest of the site.

Regional groundwater flow is expected to be northerly toward the Oldman River. Perched groundwater tables are common and have been encountered in many areas of southern Alberta. The depth to these perched tables can vary from approximately 2 m below ground level to considerable depths within gravel, sand, and/or silt seams. The flow of these perched tables can differ from regional flow direction, or be relatively stagnant, depending on the geometry and the extent of the sand and/or silt seams.

It should be noted that topography, geologic materials, land development (including the irrigation canal), and soil disturbances can also cause localized variances in groundwater movement and pattern. Also, groundwater levels will fluctuate seasonally and in response to climatic conditions.

2.6 Previous Reports

No previous environmental reports were available to review for the site.

2.7 Other Information Sources

There were no other information sources reviewed for the site.

3.0 SITE VISIT

Jaymes Going, of Tetra Tech, visited the site on February 14, 2023. Full access to all outdoor areas of the site was granted, however, the water fill station building was not accessed. Weather conditions were favorable (i.e., no snow cover) and the site was walked over with visual observations made of adjacent properties from the site boundaries.

3.1 Building Details and Site Servicing

There is currently one building on the site. The building is for the water fill station and was constructed between 1999 and 2011.

The following table describes the site servicing.

Table D: Site Servicing

Item	Present	Type	Comments
Water Supply	Yes	Potable	The water fill station building owned and operated by the Lethbridge Regional Water Services Commission provides a source of potable water.
Storm Sewer	No	Not applicable	Overland surface drainage would follow the local topography; however, no specific site drainage patterns were observed.
Sanitary Sewer	No	None	There was no indication of sanitary sewer services located at the site.
Other Storage	No	Not applicable	No storage areas were observed at the site.
Pits	No	Not applicable	No pits were observed on the site.
Lagoons	No	Not applicable	No lagoons were observed on the site.

3.2 Special Attention Items

Some construction materials contain compounds that may be hazardous to building occupants or users of the site. The following table summarizes these special attention items; further background information on these materials is provided in Appendix D.

Table E: Special Attention Items

Item	Presence/ Potential	Comments
Asbestos	Low	Based on age of the building at the site (after 1999), there is a low potential that the building contains asbestos and/or lead.
Lead	Low	
Urea Formaldehyde Foam Insulation (UFFI)	Low	No indication of UFFI at the site was observed. If this type of insulation was used, the fugitive emissions were likely the most harmful within two years of installation.
Ozone-depleting Substances (ODS)	Low	Based on the nature of the site building, it is unlikely that ODS are located at the site.
Polychlorinated Biphenyls (PCBs)	Low	Pole mounted transformers were observed at the site near the water fill station. Transformers are owned and maintained by the utility company.
Radon	Moderate to High	There was no radon gas testing reported for the site; however, natural radon concentrations are considered moderate to high in Alberta. A radon test was not completed by Tetra Tech as part of this investigation. There were no anthropogenic sources of radon gas identified.
Methane	Low	There was no methane gas testing reported for the site. Based upon information collected during this investigation (i.e., aerial photograph review, site reconnaissance), there is no evidence of deposits of buried organics at the site that could produce methane. Refer to Section 3.3.5 regarding potential fill areas.
Electromagnetic (EM)	Low	A high voltage transmission line is present on the west site boundary which could generate EMFs. No EMF assessment was completed by Tetra Tech for the site.
Noise and Vibration	Low	There were no major sources of noise or vibration on or adjacent to the site during the site visit.

The above evaluation is based on building age and basic site observations. Intrusive investigation and sampling are not within the scope of a Phase I ESA.

3.3 Site Observations

This section describes observations made of the site during the site visit on February 14, 2023.

3.3.1 Surficial Stains

There were no surficial stains observed during the site visit.

3.3.2 Vegetation

Vegetation at the site was predominantly agricultural cropland with some weedy species expected in disturbed areas such as near the SMRID canal and near adjacent roadways. There was no evidence of stressed vegetation at the site, however, the site visit was conducted outside the growing season when vegetation was dormant.

3.3.3 Ponding of Water

There was no ponded water observed on the site at the time of the site visit.

3.3.4 Washouts and Erosion

There were no washouts or indications of erosion observed.

3.3.5 Fill Areas and Soil Conditions

There was no evidence of fill materials having been brought to the site. The potential for methane generation is described in Section 3.2.

Further information on soil conditions are presented in the geotechnical evaluation report completed at the site by Tetra Tech (Tetra Tech 2023, currently not issued).

3.3.6 Oil/Gas Wells and Pipelines

There were no well sites observed at the time of the site visit.

Refer to Section 2.3.2 for AER information.

3.3.7 Chemical Storage

There were no hazardous chemicals or large drums observed at the site during the site visit.

3.3.8 Transformers

There was a pole-mounted electrical transformer observed near the water fill station. Generally, pole-mounted transformers are owned and maintained by the utility companies.

3.3.9 Hydraulic Elevators and Hoists

There were no hydraulic elevators or hoists observed at the site visit.

3.3.10 Vent Pipes and Underground Storage Tanks

There were no vent pipes or USTs identified during the site visit.

3.3.11 Above-Ground Storage Tanks and Drum Storage

No ASTs or drum storage were present at the site during the site visit.

3.3.12 Waste Storage

No waste storage areas were observed at the site during the site visit.

3.3.13 General Housekeeping

The general housekeeping of the site was in good condition and no obvious evidence of negligent acts or illegal dumping were observed during the site visit.

3.4 Off-Site Observations

The following table summarizes the surrounding land use.

Table F: Surrounding Land Use

Direction	Zoning*	Observations	Tetra Tech Evaluation
North	Lethbridge Urban Fringe	Agricultural land	No obvious concerns which may cause environmental impairment to the site were identified.
East		SMRID canal, agricultural land, and farm operation	
South		Southland International Trucks and trailer storage and stormwater retention pond	
West	General Industrial	Various commercial and industrial properties	

*Land use obtained from Lethbridge County (Lethbridge County - Online Maps (lethcounty.ca)) and the City of Lethbridge (Property Information WebMAP (lethbridge.ca)).

The surrounding land is primarily agricultural with commercial and industrial properties to the west within the City of Lethbridge. Key surrounding land use is indicated on Figure 2.

4.0 PERSONNEL INTERVIEWS

Due to the land use being primarily agricultural from 1950 to current, no personnel interviews were conducted.

5.0 DISCUSSION AND CONCLUSIONS

5.1 General

In general terms, there are two distinct types of potential environmental risk to any property. The first type of risk is from potential contamination from on-site land use. This would include potential accidental spills or site practices that may contaminate the property directly. The second type of risk is from contamination caused by adjacent property owners, which might then be transported through the subsurface soils by groundwater, or in overland runoff onto the site.

5.2 Potential for Impairment from On-Site Source(s)

There were no on-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

5.3 Potential for Impairment from Off-Site Source(s)

There were no off-site sources that might have a potential to cause environmental impairment to the site through historical and/or current land use.

6.0 FURTHER ACTION/RENDERING AN OPINION

Based on the present study, Tetra Tech recommends that no further environmental investigation is required at this time.

Tetra Tech recommends the following for consideration:

- If buried debris or staining are encountered during future investigation or ground disturbance a qualified environmental professional should be contacted.
- If soils containing organics are encountered during future investigation or ground disturbance, they should be removed from building footprints and not be reburied; a qualified environmental professional should be contacted.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

Prepared by:
Jaymes Going, B.Sc., EP
Environmental Scientist
Environment & Water Practice
Direct Line: 403.308.4293
Jaymes.Going@tetratech.com

Reviewed by:
Henri Carriere, P.Eng., M.N.R.M.
Senior Project Engineer
Environment & Water Practice
Direct Line: 403.993.4176
Henri.Carriere@tetratech.com

/jmt

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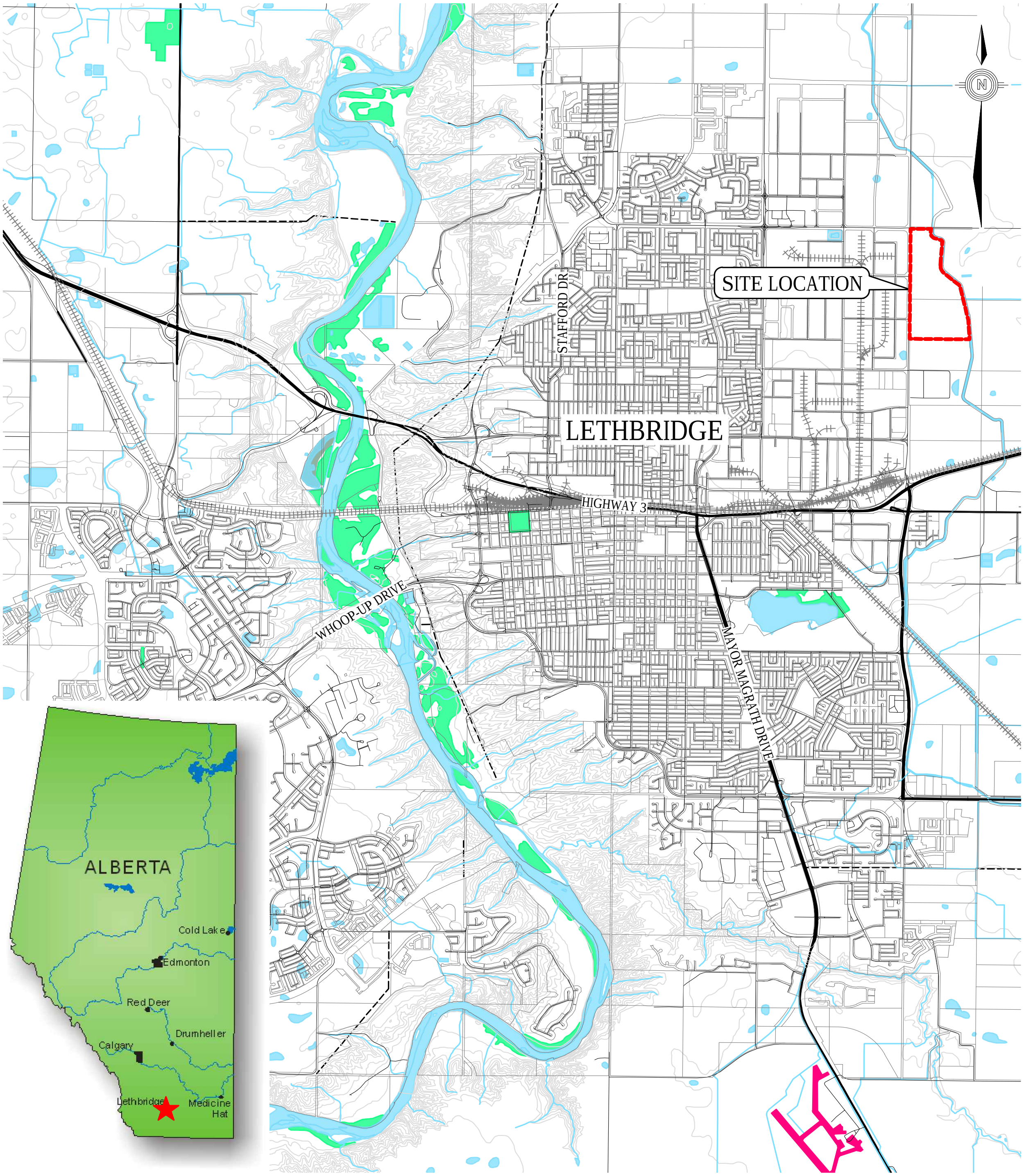
FIGURES



NOTES
DRAWING PROVIDED BY "© Department of Natural Resources Canada. All rights reserved."

0 3,000m
Scale: 1:60,000 @ 8.5"x11"

CLIENT
Sumus Property Group Ltd.

TETRA TECH

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

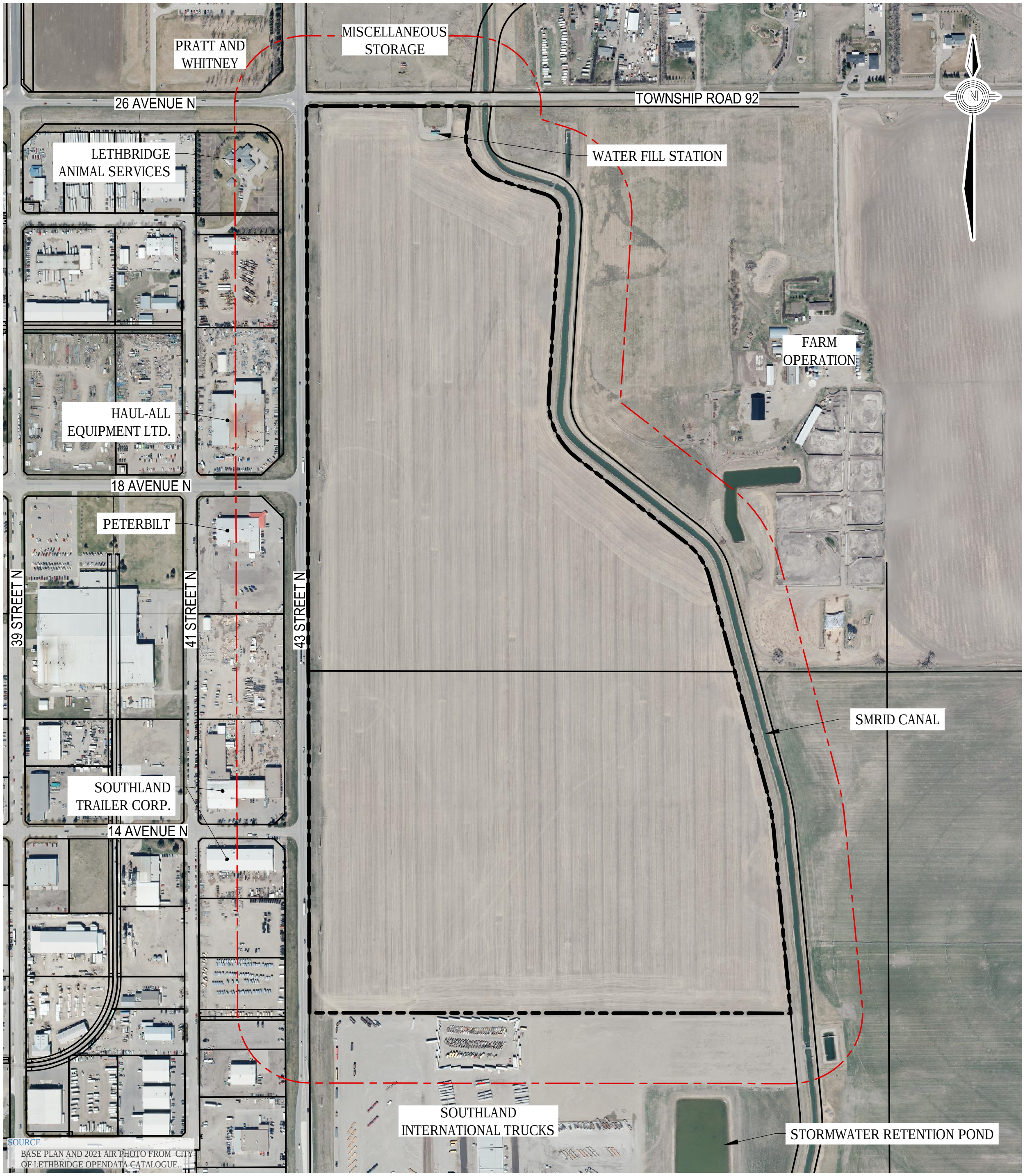
SITE LOCATION PLAN

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-002	LCH	JG	0

OFFICE	DATE
Tt Leth	February 2023

Figure 1

C:\Lethbridge\Drafting\ENG.LGEO.LGEO04625\002\CAD\LGEO04625-01-002 Figure 1.dwg [FIGURE 1] February 06, 2023 - 1:40:12 pm (BY: HUGHES, LEANNE)



SOURCE
BASE PLAN AND 2021 AIR PHOTO FROM CITY OF LETHBRIDGE OPENDATA CATALOGUE.

LEGEND

▬ ▬ ▬ SITE BOUNDARY

— · — 100 m BOUNDARY

0 250m

Scale: 1:7,500 @ 8.5"x11"

CLIENT

Sumus Property Group Ltd.

TETRA TECH

PHASE I ENVIRONMENTAL SITE ASSESSMENT
CHINOOK INDUSTRIAL PARK ASP
W1/2 10-009-21 W4M LETHBRIDGE COUNTY

DETAILED SITE PLAN SHOWING
SURROUNDING LAND USE

PROJECT NO.	DWN	CKD	REV
LGEO04625-01-002	LCH	JG	0

OFFICE	DATE
Tt Leth	February 2023

Figure 2

C:\Lethbridge\Drafting\ENG.LGEO.LGEO04625\002\CAD\LGEO04625-01-002 Figure 2.dwg [FIGURE 2] February 21, 2023 - 1:55:10 pm (BY: HUGHES, LEANNE)

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

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Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

SITE PHOTOGRAPHS

Photo 1: View looking west at the approximate south site boundary.

Photo 2: View looking northwest at the site from the approximate southeast corner of the site.

Photo 3: View looking southwest at the site from near the middle of the east site boundary.

Photo 4: View looking south at the site from near the northeast corner of the site. The SMRID canal and access road are visible.

Photo 5: View looking west at water fill station located on the northern portion of the site.

Photo 6: View of adjacent property to the north beyond Township Road 92.

Photo 7: View of adjacent property to the east beyond the SMRID canal.

Photo 8: View of adjacent land use to the south; stormwater retention pond located within Phase 1B of the ASP.

Photo 9: View of one of the commercial/industrial businesses (Haul-All Equipment Ltd.) to the west of the site beyond 43 Street North.

Photo 10: View of one of the commercial/industrial businesses (Southland Trailer Corp.) to the west of the site beyond 43 Street North.

APPENDIX C

REGULATORY SEARCHES AND RESPONSES

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0034 989 632	1113171;1;5	111 286 315 +1

LEGAL DESCRIPTION
PLAN 1113171
BLOCK 1
LOT 5
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 59.56 HECTARES (147.18 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;21;9;10;W

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 091 136 885 +3
091 136 885 +2

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
111 286 315	03/11/2011	SUBDIVISION PLAN		

OWNERS

1000824 ALBERTA LTD.
OF 2365 ASPEN DRIVE
COALDALE
ALBERTA T1M 0E6
(DATA UPDATED BY: CHANGE OF ADDRESS 231007775)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1049KD .	05/02/1968	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PORTION DESCRIBED"
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
881 219 612	01/12/1988	UTILITY RIGHT OF WAY GRANTEE - ALBERTA GOVERNMENT TELEPHONES. AS TO PORTION OR PLAN:8810684 "TAKES PRIORITY OF CAVEAT 871131928 REGISTERED 27/07/1987"
991 249 227	30/08/1999	IRRIGATION DISTRICT RESOLUTION PART OF AN IRRIGABLE UNIT " AFFECTS PART OF THIS TITLE "
081 230 993	02/07/2008	MORTGAGE MORTGAGEE - ROYAL BANK OF CANADA. 180 WELLINGTON STREET WEST, 5TH FLOOR TORONTO ONTARIO M5J1J1 ORIGINAL PRINCIPAL AMOUNT: $1,150,000

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF FEBRUARY, 2023 AT 08:57 A.M.

ORDER NUMBER: 46536252

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

GOVERNMENT OF THE PROVINCE OF ALBERTA

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0028 725 811	0013201;1;1	021 267 993

LEGAL DESCRIPTION

PLAN 0013201
BLOCK 1
LOT 1
CONTAINING 0.559 HECTARES (1.38 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES	(ACRES)	MORE OR LESS
ROAD	0110313	0.054	0.13	

EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;21;9;10;NW
ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 011 025 754 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
021 267 993	01/08/2002	TRANSFER OF LAND	$212,000	$1

OWNERS

LETHBRIDGE REGIONAL WATER SERVICES COMMISSION.
OF 100,905-4 AVE. SOUTH
LETHBRIDGE
ALBERTA T1J 4E4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
359EM .	31/01/1934	EASEMENT "(SUBJECT TO) IN FAVOUR OF NE 1/4 OF SECTION 10, PORTION LSD 6, ALL OF LSD 7 & 8"

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

PAGE 2
021 267 993

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1049KD .	05/02/1968	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PORTION DESCRIBED"
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT

TOTAL INSTRUMENTS: 003

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 21 DAY OF FEBRUARY, 2023 AT 08:57 A.M.

ORDER NUMBER: 46536252

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

Safety
Codes
Council
Alberta Safety Codes Authority

February 13, 2023

Jaymes M Going
Tetra Tech
442-10 Street North
Lethbridge, AB T1H 2C7

Email: jaymes.going@tetratech.com

Re: ASCA Storage Tank Search Request- Your File ENG.LGEO04625-01.002

Dear Jaymes M Going ,

As per As per your search requests received February 13, 2023 , Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following address:

1. Lethbridge County | Lot 111317 Block 1 Plan 5 | 10-9-21-W4
2. Lethbridge County | Lot 001320 Block 1 Plan 1 |NW- 10-9-21-W4

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

Amanda McIntyre (she/her)
ASCA Tanks
Alberta Safety Codes Authority
Safety Codes Council | safetycodes.ab.ca
Tel. 780.392-1551 | Toll-Free 1-888-413-0099

Safety
Codes
Council
Alberta Safety Codes Authority

February 24, 2023

Jaymes M Going
Tetra Tech
442-10 Street North
Lethbridge, Alberta T1H 2C7

Email: jaymes.going@tetratech.com

Re: ASCA Storage Tank Search Request

Dear Melody Crozier-Smith,

As per As per your search requests received February 23, 2023 , Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following address:

1. 4115 18 Ave N Lethbridge| Lot 1 Block 5 Plan 7710884 | NE-9-9-21-W4

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

Amanda McIntyre (she/her)
ASCA Tanks
Alberta Safety Codes Authority
Safety Codes Council | safetycodes.ab.ca
Tel. 780.392-1551 | Toll-Free 1-888-413-0099

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Monday, February 13, 2023

1:14,237

0 170 340 680 m

AbaData

Pipeline Information

ATCO GAS AND PIPELINES LTD. | AB00002185 - 11

Government Pipeline Data Current to January 1, 2023

Permit Date:	April 30, 2008	**License Date:**	
From Location:	9-16-9-21 W4M PL	**To Location:**	1-9-9-21 W4M PL
Length:	2.5 kms | 1.56 mi	**Status:**	O
Substance:	NG	**H_2S:**	0 mol/kmol | 0 ppm
Outside Diameter:	273.1 mm | 10.75 "	**Wall Thickness:**	6.4 mm | 0.25 "
Material:	S	**Type:**	5L
Grade:	X42	**Max Operating Pressure:**	2380 kPa | 345 psi
Joints:	W	**Internal Coating:**	U
Stress Level:	18 %	**Environment:**	
Original Permit Date:		**Construction Date:**	
Original License/Line No:	0 - 0	**NEB Registration:**	
Last Occurrence Year:	2008	**Abacus No:**	N/A

Pipeline Information

ATCO GAS AND PIPELINES LTD. | AB00002027 - 182

Government Pipeline Data Current to January 1, 2023

Permit Date:	August 10, 2022	**License Date:**	
From Location:	14-27-9-21 W4M PL	**To Location:**	14-3-9-21 W4M PL
Length:	8.13 kms | 5.08 mi	**Status:**	P
Substance:	NG	**H_2S:**	0.01 mol/kmol | 10 ppm
Outside Diameter:	219.1 mm | 8.63 "	**Wall Thickness:**	4.8 mm | 0.19 "
Material:	S	**Type:**	Z245.1
Grade:	3592	**Max Operating Pressure:**	4960 kPa | 719 psi
Joints:	W	**Internal Coating:**	U
Stress Level:	32 %	**Environment:**	
Original Permit Date:	August 10, 2022	**Construction Date:**	
Original License/Line No:	2027 - 182	**NEB Registration:**	
Last Occurrence Year:	2022	**Abacus No:**	N/A

Disposition Information

APPLICATION

ROE580 | RIGHT OF ENTRY AGREEMENT

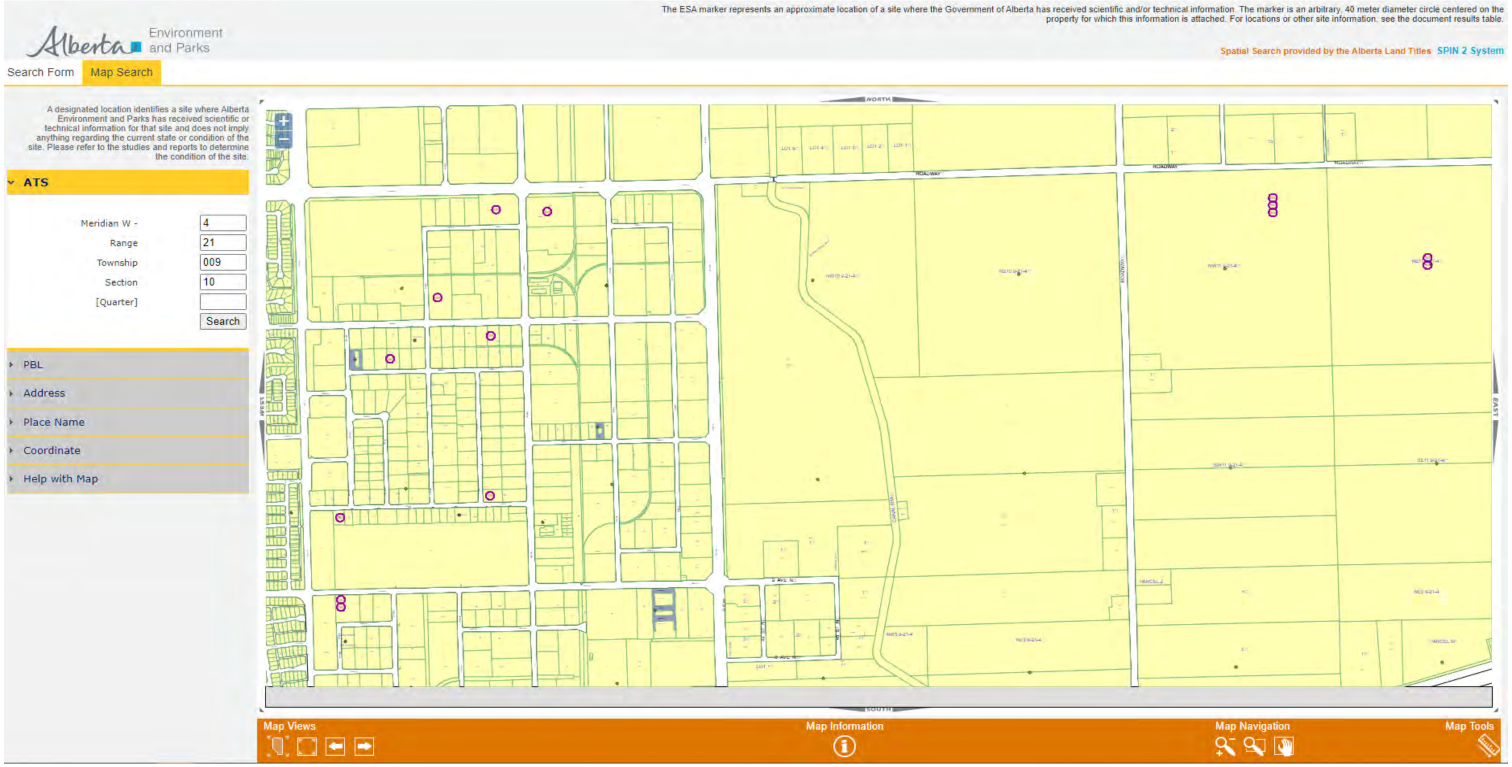
Client:	ATCO GAS AND PIPELINES LTD. (SOUTH)		
Source Document:	Survey	**Version Date:**	December 6, 1989
Discrepancies?	No	**Last Edit Date:**	February 18, 2009
Process Date:	February 2, 2023	**Application Date:**	March 3, 1952
Letter of Authority Date:		**Amendment to Letter of Authority Date:**	
Effective Date:	March 12, 1952	**Amendment Date:**	
Cancellation Date:		**Renewal Date:**	
Expiry Date:	December 31, 2999	**Reinstatement Date:**	
Plan Number:	15225P	**Near Water?**	No
Status:	ACTIVE/DISPOSED		
Purpose:	PIPELINE		
Dimensions:	P/L 16.5FT (W)		
Area (hectares):	0.40	**Area (acres):**	1.00
Restriction:			
Exceptions to Restriction:			

Low Pressure Pipeline Information

NATURAL GAS CO-OPERATIVE CONTACT INFORMATION

Data Current To December 20, 2022

Name: ATCO Natural Gas Distribution Customer Correspondence
Address: PO Box 2409 Edmonton, T5J 2S3
Phone #: 310-5678 **Alternate Phone #:**
Website: http://www.atcogas.com



The ESA marker represents an approximate location of a site where the Government of Alberta has received scientific and/or technical information. The marker is an arbitrary, 40 meter diameter circle centered on the property for which this information is attached. For locations or other site information, see the document results table.

Spatial Search provided by the Alberta Land Titles SPIN 2 System

A designated location identifies a site where Alberta Environment and Parks has received scientific or technical information for that site and does not imply anything regarding the current state or condition of the site. Please refer to the studies and reports to determine the condition of the site.

ATS

Meridian W - 4
Range 21
Township 009
Section 10
[Quarter]

Authorization Viewer - Search Results

For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

The Search Used the Following Values:

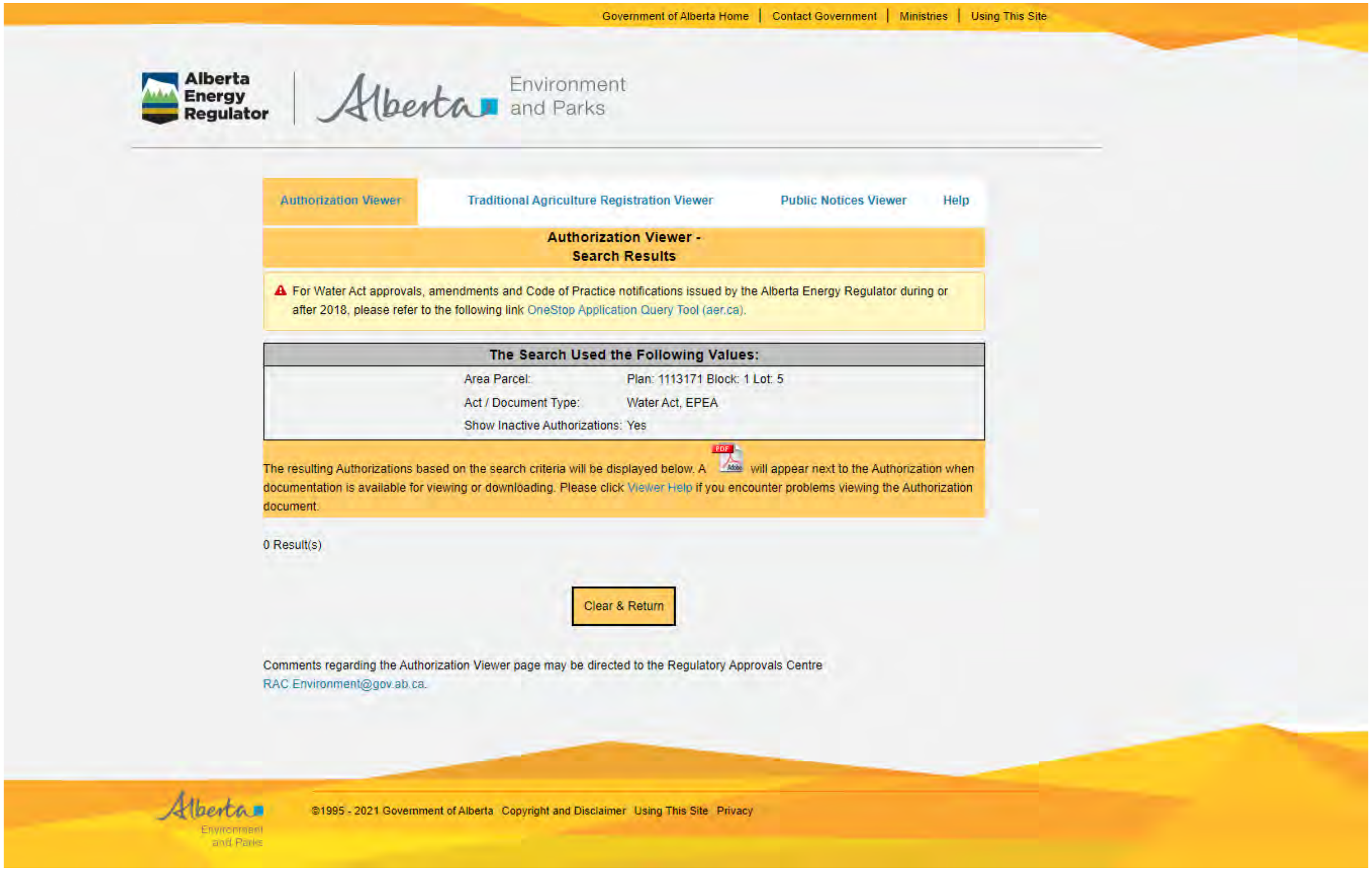
Legal Land Location:	10-009-21-W4
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

6 Result(s)

PDF	Document 00181809-00-00 LETHBRIDGE REGIONAL WATER SERVICES WATERWORKS SYSTEM is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act.* This Approval is currently issued as of Jun. 18, 2002 and does not expire.
PDF	Document 00181809-00-01 LETHBRIDGE REGIONAL WATER SERVICES WATERWORKS SYSTEM - LEGISLATIVE CHANGES is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act.* This Registration is currently renewed.
PDF	Document 00181809-01-00 LETHBRIDGE REGIONAL WATER DISTRIBUTION SYSTEM - CODE OF PRACTICE is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act.* This Registration is currently issued as of Apr. 01, 2005 and does not expire.
PDF	Document 00181809-01-01 LETHBRIDGE REGIONAL WATER DISTRIBUTION SYSTEM - REVISED LEAD MAC NOTICE is held by Lethbridge Regional Water Services Commission, under the provisions of the *Environmental Protection & Enhancement Act.* This Registration is currently issued as of Oct. 30, 2019 and does not expire.
PDF	Document 00335366-00-00 COALDALE/MANAGEMENT/LETHBRIDGE COUNTY - F00335366 is held by Lethbridge County, under the provisions of the *Water Act.* This Approval is currently issued as of Jun. 18, 2020 and expires on Jun. 17, 2045.
PDF	Document 00374661-00-00 RAVE INDUSTRIAL AREA STORM DRAINAGE SYSTEM is held by Lethbridge County, under the provisions of the *Environmental Protection & Enhancement Act.* This Registration is currently issued as of Jul. 24, 2020 and does not expire.

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.



Authorization Viewer -
Search Results

⚠ For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

The Search Used the Following Values:

Area Parcel:	Plan: 1113171 Block: 1 Lot: 5
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF icon will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

0 Result(s)

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.

Authorization Viewer - Search Results

For Water Act approvals, amendments and Code of Practice notifications issued by the Alberta Energy Regulator during or after 2018, please refer to the following link OneStop Application Query Tool (aer.ca).

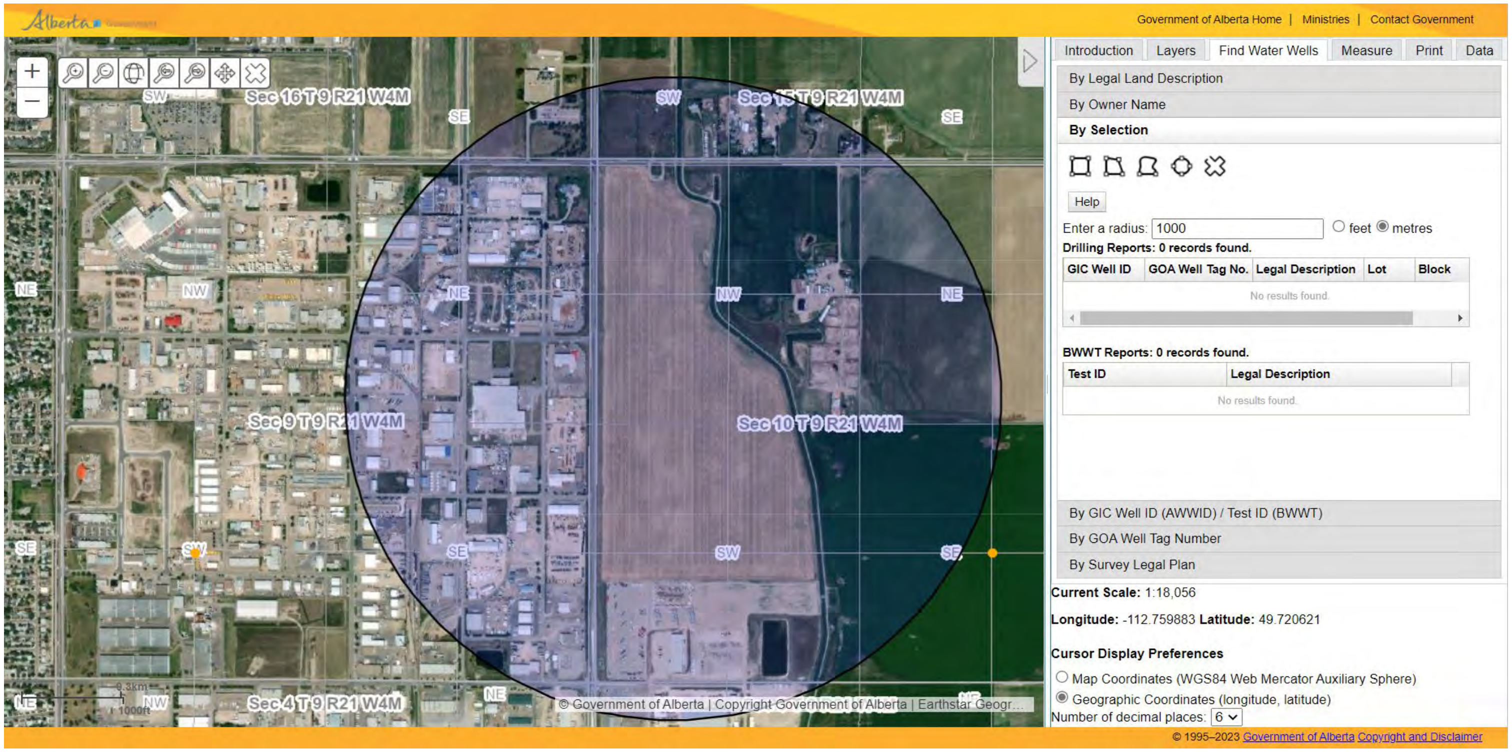
The Search Used the Following Values:

Area Parcel:	Plan: 0013201 Block: 1 Lot: 1
Act / Document Type:	Water Act, EPEA
Show Inactive Authorizations:	Yes

The resulting Authorizations based on the search criteria will be displayed below. A PDF will appear next to the Authorization when documentation is available for viewing or downloading. Please click Viewer Help if you encounter problems viewing the Authorization document.

0 Result(s)

Comments regarding the Authorization Viewer page may be directed to the Regulatory Approvals Centre RAC.Environment@gov.ab.ca.



Enter a radius: 1000 ○ feet ● metres

Drilling Reports: 0 records found.

GIC Well ID	GOA Well Tag No.	Legal Description	Lot	Block
No results found.				

BWWT Reports: 0 records found.

Test ID	Legal Description
No results found.	

Current Scale: 1:18,056

Longitude: -112.759883 **Latitude:** 49.720621

Cursor Display Preferences

○ Map Coordinates (WGS84 Web Mercator Auxiliary Sphere)

● Geographic Coordinates (longitude, latitude)

Number of decimal places: 6

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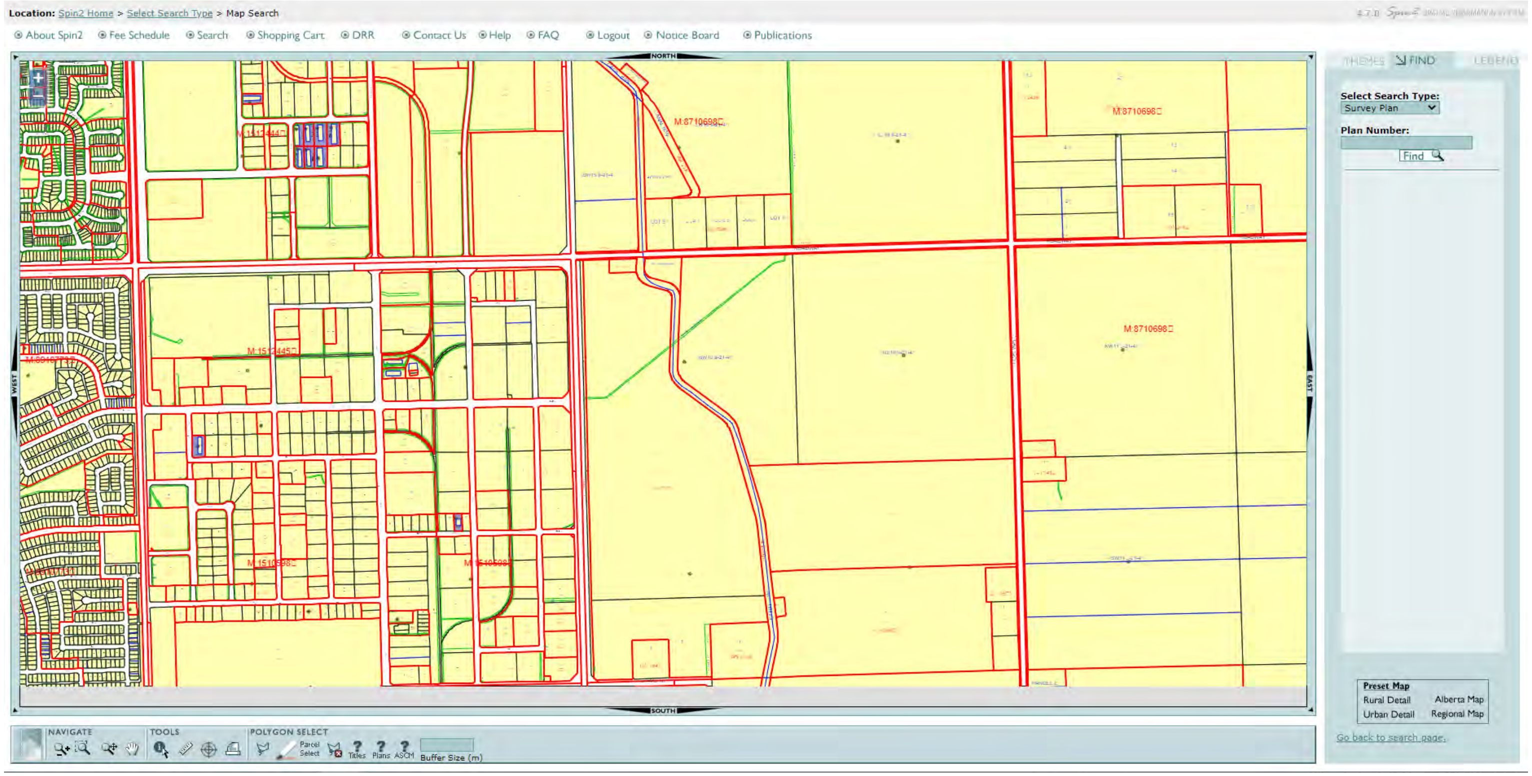

Location: Spin2 Home > Select Search Type > Map Search

Select Search Type: Survey Plan

Plan Number:

LETHBRIDGE COUNTY

#100, 905 - 4th Avenue South, Lethbridge, Alberta T1J 4E4

February 7, 2023

Tetra Tech Canada Inc.
Attn: Jaymes Going
442 – 10 Street N
Lethbridge, AB T1H 2C7

Re: Environmental Record Search: All properties on W1/2 10-9-21-W4M

The following properties were reviewed per your request:

- Plan 0013201; Block 1; Lot 1
- Plan 1113171; Block 1; Lot 4
- Plan 1113171; Block 1; Lot 5
- Plan 1710178; Block 1; Lot 6PUL
- Plan 1911847; Block 1; Lot 7

The following information is the County's response to your inquiry regarding the above-mentioned properties.

A review of the property file was completed and following can be reported:

- There were no environmental reports,
- There were no permits indicating approval for any fuel or chemical storage facilities,
- There was no record of any underground storage tanks,
- There was no record of any historic or potential landfills in the area, and
- There was no record of any spills and/or leaks on the properties or in the area.
  - You may wish to contact the Lethbridge Fire Department to see if they have any records of spills or leaks as this property is within their Fire / Emergency Response Area.
- There are some existing Development Permit approvals for the subject properties. They may be provided upon request.

If you have any other questions regarding this matter please contact Nathan Hill, Development Planner at 403-328-5525.

Regards,

Nathan Hill
Development Planner

APPENDIX D

SPECIAL ATTENTION ITEMS – BACKGROUND INFORMATION

D1 Asbestos

Construction materials used prior to the late 1970s were known to possibly contain asbestos (i.e., ceiling or floor tiles, drywall, and insulation for the walls, boiler, piping, and/or ducts). Asbestos is considered a health hazard if it is friable, airborne, and exposed to humans.

D2 Polychlorinated Biphenyls (PCBs)

The federal Environmental Contaminants Act (1976) has restricted the use and controlled the phase out of polychlorinated biphenyls (PCBs) in Canada. Additionally, the storage and disposal of PCBs is regulated. The Act prohibited the use of PCBs in electrical equipment installed after July 1, 1980. PCBs are commonly found in light ballasts, electrical transformers (pole or ground mounted) and various other types of electrical equipment (i.e., rectifiers) dating back to the early 1980s or earlier.

PCB containing light ballasts/electrical equipment should be disposed of appropriately at the end of their useful life.

D3 Ozone-Depleting Substances (ODS)

In December of 1998, The Government of Canada enacted the Ozone-depleting Substances (ODS) Regulations, which governs the use, handling and release of ODS. ODS may include, but are not limited to, chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl bromide. ODS are usually associated with operations such as: fire extinguishing systems; foam manufacturing; fumigant and pesticide application; prescription metered dose inhalers; refrigeration and air conditioning units; and solvent cleaning and degreasing facilities. ODS are not a health issue for people in the building but are more a maintenance issue to limit or prevent their release. This is accomplished by regular maintenance by trained personnel.

D4 Lead

Lead can be associated with paints, plumbing solder, pipes, and other products such as wall shielding in x-ray rooms. Lead-based paint was withdrawn from the market in the late 1970s. If present, lead-based paint is typically concealed beneath multiple layers of paint applied over the years during renovations. Lead-based paint and plumbing equipment are not a direct health risk when concealed (sealed behind layers of non-lead paint) and/or in good condition. It should, however, be considered when planning future renovations, when particles from lead-based paint could be released and/or ingested in the course of the work.

D5 Urea Formaldehyde Foam Insulation (UFFI)

Insulation materials used during the 1970s and 1980s were known to possibly contain urea formaldehyde foam insulation (UFFI). UFFI was banned in 1980 under the federal Hazardous Products Act.

D6 Radon

Radon gas is a product of the decay series that begins with uranium. Radon is produced directly from radium that is often found in bedrock that contains black shale and/or granite. The gas and its by-products occur naturally everywhere, in soil, water, and air, but usually in concentrations too low to pose a threat. Radon gas can migrate through the ground and enter buildings through porous concrete or fractures. Certain building materials including concrete, and gyprock can also release radon. The potential radon hazard in north-central, central, and southern Alberta is relatively high where it can accumulate in enclosed spaces. In outdoor air, radon gas concentrations are usually well below target limits set for Canada and are not a concern. Potential anthropogenic sources of radon gas should be considered.

D7 Methane

Methane gas is a product of anaerobic decomposition of organic material (e.g., buried fill high in organic material). Methane is also associated with natural gas deposits. Methane gas can migrate through the ground and enter buildings through porous concrete, joints or fractures. Methane presents a potential explosive hazard when it accumulates to concentrations greater than the lower explosive limit (LEL) in the presence of an ignition source.

LETHBRIDGE COUNTY
IN THE PROVINCE OF ALBERTA

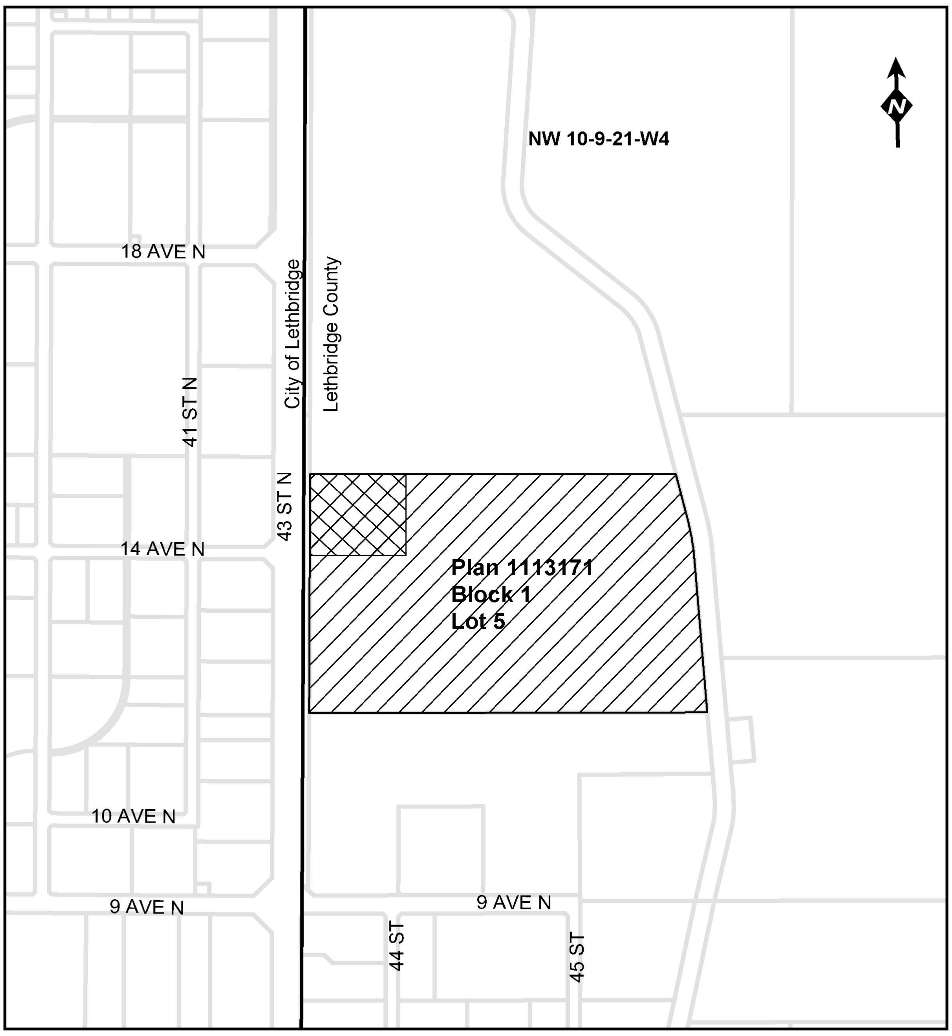
BYLAW NO. 23-009

Bylaw 23-009 of Lethbridge County being a bylaw for the purpose of amending Land Use Bylaw 1404, in accordance with Sections 230, 606 and 692 of the Municipal Government Act, R.S.A. 2000, Chapter M-26.

WHEREAS the purpose of Bylaw 23-009 is to re-designate a portion of Plan 1113171 Block 1 Lot 5 from Lethbridge Urban Fringe (LUF) to Rural General Industrial (RGI) and Business Light Industrial (BLI) as shown below;

AND WHEREAS the re-designation of the lands will allow for future residential subdivision and development of the parcels;

AND WHEREAS the municipality must prepare an amending bylaw and provide for its notification and consideration at a public hearing;



Land Use Redesignation
Bylaw 23-009: Lethbridge Urban Fringe (LUF) to Rural General Industrial (RGI) and Lethbridge Urban Fringe (LUF) to Business Light Industrial (BLI)
Parcels: Portion of NW 10-9-21-W4 (Plan 1113171 Block 1 Lot 5), Approx 59.33 Acres (RGI) and Approx 5.14 Acres (BLI)
▨ Lethbridge Urban Fringe (LUF) to Rural General Industrial (RGI)
▩ Lethbridge Urban Fringe (LUF) to Business Light Industrial (BLI)

AND WHEREAS the re-designation of the lands will allow for future residential subdivision and development of the parcels;

AND WHEREAS the municipality must prepare an amending bylaw and provide for its notification and consideration at a public hearing;

NOW THEREFORE, under the authority of the Municipal Government Act, R.S.A. 2000, C-26, as amended, the Council of Lethbridge County in the Province of Alberta duly assembled does hereby enact the following, with the bylaw only coming into effect upon three successful reading thereof;

GIVEN first reading this 6th day of April 2023.

____
Reeve

____
Chief Administrative Officer

GIVEN second reading this _______ day of ____________________, 20___.

____
Reeve

____
Chief Administrative Officer

GIVEN third reading this _______ day of ____________________, 20_____.

____
Reeve

____
Chief Administrative Officer

1st Reading	April 6, 2023
2nd Reading	
Public Hearing	
3rd Reading	

Form C

LETHBRIDGE COUNTY
APPLICATION FOR A LAND USE BYLAW AMENDMENT
Pursuant to Bylaw No. 1404

OFFICE USE		
Date of Application:	Assigned Bylaw	No.
Date Deemed Complete:	Application & Processing Fee:	$
Redesignation ☐ Text Amendment ☐	Certificate of Title Submitted:	☐ Yes ☐ No

A refusal is **not** appealable and a subsequent application for amendment involving the same lot and/or the same or similar use may not be made for at least 18 months after the date of refusal. (Refer to sections 53(1)

***IMPORTANT NOTE**: Although the Supervisor of Planning and Development is in a position to advise on the principle or details of any proposals, such advice must not be taken in any way as official consent.*

APPLICANT INFORMATION

Name of Applicant: Christina Lombardo

Mailing Address: c/o Stantec Consulting
#200, 325 25 St SE
Calgary, AB

Postal Code: T2A 7H8

Phone: (403) 207-7569

Phone (alternate): (403) 966-7163

Fax:

Is the applicant the owner of the property? ☐ Yes ☒ No

IF "NO" please complete box below

Name of Owner: 1000824 Alberta Ltd.

Mailing Address: PO Box 242
Vauxhall, AB

Postal Code: T0K 2K0

Phone: 403-634-0625

Applicant's interest in the property:
- ☒ Agent
- ☐ Contractor
- ☐ Tenant
- ☐ Other

PROPERTY INFORMATION

Municipal Address:

Legal Description: Lot(s) 5 Block 1 Plan 1113171
OR Quarter SW Section 10 Township 9 Range 21 W4

AMENDMENT INFORMATION

What is the proposed amendment? ☒ Text Amendment ☒ Land Use Redesignation

IF TEXT AMENDMENT:

For text amendments, attach a description including:

- The section to be amended;
- The change(s) to the text; and
- Reasons for the change(s).

IF LAND USE REDESIGNATION:

Current Land Use Designation (zoning): LUF

Proposed Land Use Designation (zoning) (if applicable): BLI, RGI

SITE DESCRIPTION:

Describe the **lot/parcel dimensions** approx 400m x644m and **lot area/parcel acreage** 64.47 acres
Indicate the information on a scaled PLOT or SITE PLAN: (0-4 acres at 1" = 20'; 5-9 acres at 1"= 100'; 10 acres or more at 1"=200')

☒ **Site or Plot Plan Attached**

☒ **Conceptual Design Scheme or Area Structure Plan Attached**

OTHER INFORMATION:

Section 52 of the *Land Use Bylaw* regulates the information required to accompany an application for redesignation. Please **attach a descriptive narrative** detailing:

- The existing and proposed future land use(s) (i.e. details of the proposed development);
- If and how the proposed redesignation is consistent with applicable statutory plans;
- The compatibility of the proposal with surrounding uses and zoning;
- The development suitability or potential of the site, including identification of any constraints and/or hazard areas (e.g. easements, soil conditions, topography, drainage, etc.);
- Availability of facilities and services (sewage disposal, domestic water, gas, electricity, fire protection, schools, etc.) to serve the subject property while maintaining adequate levels of service to existing development; and
- Access and egress from the parcel and any potential impacts on public roads.

In addition to the descriptive narrative, an Area Structure Plan or Conceptual Design Scheme may be required in conjunction with this application where:

- redesignating land to another district;
- multiple parcels of land are involved;
- four or more lots could be created;
- several pieces of fragmented land are adjacent to the proposal;
- new internal public roads would be required;
- municipal services would need to be extended; or
- required by Council, or the Subdivision or Development Authority if applicable.

The applicant may also be required to provide other professional reports, such as a:

- geotechnical report; and/or
- soils analysis; and/or
- evaluation of surface drainage or a detailed storm water management plan;
- and any other information described in section 52(2) or as deemed necessary to make an informed evaluation of the suitability of the site in relation to the proposed use;.

if deemed necessary.

SITE PLAN

Plans and drawings, in sufficient detail to enable adequate consideration of the application, must be submitted in **duplicate** with this application, together with a plan sufficient to identify the land. It is desirable that the plans and drawings should be on a scale appropriate to the development. However, unless otherwise stipulated, it is not necessary for plans and drawings to be professionally prepared. Council may request additional information.

DECLARATION OF APPLICANT/AGENT

The information given on this form is full and complete and is, to the best of my knowledge, a true statement of the facts in relation to the application. I also consent to an authorized person designated by the municipality to enter upon the subject land and buildings for the purpose of an inspection during the processing of this application. *I/We have read and understand the terms noted below and hereby **certify that the registered owner of the land is aware of, and in agreement with this application.***

APPLICANT

REGISTERED OWNER
(if not the same as applicant)

DATE: February 14, 2023

IMPORTANT: This information may also be shared with appropriate government/ other agencies and may also be kept on file by the agencies. This information may also be used by and for any or all municipal programs and services. Information provided in this application may be considered at a public meeting. The application and related file content will become available to the public and are subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIP). If you have any questions about the collection of this information, please contact Lethbridge County.

TERMS

1. Subject to the provisions of the Land Use Bylaw No. 1404 of Lethbridge County, the term "development" includes any change in the use, or intensity of use, of buildings or land.
2. Pursuant to the municipal development plan, an area structure plan or conceptual design scheme may be required by Council before a decision is made.
3. A refusal is not appealable and a subsequent application for redesignation (reclassification) involving the same or similar lot and/or for the same or similar use may not be made for at least 18 months after the date of a refusal.
4. An approved redesignation (reclassification) shall be finalized by amending the land use bylaw map in accordance with section 692 of the Municipal Government Act, Revised Statutes of Alberta 2000, Chapter M-26.

Note: Information provided or generated in this application may be considered at a public meeting.

AGENDA ITEM REPORT

Title: Bylaw 23-013 - Advertising - First Reading
Meeting: Council Meeting - 06 Apr 2023
Department: Community Services
Report Author: Mattie Watson

APPROVAL(S):

Hilary Janzen, Supervisor of Planning & Development	Approved - 20 Mar 2023
Larry Randle, Interim Chief Administrative Officer	Approved - 20 Mar 2023

STRATEGIC ALIGNMENT:

Governance	Relationships	Region	Prosperity
☒	☐	☐	☐

EXECUTIVE SUMMARY:

A bylaw has been drafted to establish methods for advertising public notices in Lethbridge County. The proposed bylaw reflects current practice in the County's advertising and public notifications but there is not currently a bylaw or policy in place to formalize these activities.

RECOMMENDATION:

That Bylaw 23-013 - Advertising be read a first time.

REASON(S) FOR RECOMMENDATION(S):

Formalizing the methods Lethbridge County uses to advertise certain notices is in line with several other municipalities across the province. Having a bylaw in place also provides transparency to citizens, businesses, and stakeholders and gives the County flexibility in advertising public notices if traditional methods are not available.

PREVIOUS COUNCIL DIRECTION / POLICY:

The County does not currently have a Advertising Bylaw

BACKGROUND INFORMATION:

As per the *Municipal Government Act* (MGA), a municipality must use a local newspaper (for two consecutive weeks) or mail notices directly to affected landowners for certain matters ("proposed bylaws, resolutions, meetings, public hearings, and other things" - section 606(1)), unless Council passes a bylaw that allows for these to be advertised by alternative methods (ie. "electronic means").

Currently, Lethbridge County follows the MGA by advertising these matters in the Sunny South News and/or through mailing affected landowners (mainly for planning items), but also uses the County's website, e-news, social media, app, newsletters, and notice boards in the Lethbridge administration office to ensure that the message is distributed to as many people as possible.

Many other municipalities in the province have established public notification/advertising bylaws in recent years. This could be attributed to the fact that there are increasingly more methods in which to reach the public, as well as changing preferences as to how they would like to receive information.

It is not anticipated that current advertising practices will change if the proposed bylaw is adopted, but it gives the County flexibility in advertising public notices, particularly in extenuating circumstances (ie.disruption in mail or newspaper service, etc.)

As per the MGA, section 606.1(4), a public hearing must be held for a proposed bylaw that would allow for alternative advertising methods. It is anticipated that a public hearing will be held in May, if first reading is passed today.

ALTERNATIVES / PROS / CONS:

Alternative: Council could not pass first reading of the proposed bylaw
PRO: None identified.
CON: If alternative methods for advertising cannot be used in place of newspaper ads and/or mailing notices, decisions on matters could be delayed in circumstances beyond the County's control (ie. disruption to mail or newspaper service). Also does not provide transparency or clarity to the public on advertising methods used by Lethbridge County.

FINANCIAL IMPACT:

None - Lethbridge County is currently utilizing the formats prescribed in this proposed bylaw to advertise notices to the public, therefore no financial impact is expected.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

Bylaw 23-013 - Advertising Bylaw_draft

LETHBRIDGE COUNTY
IN THE PROVINCE OF ALBERTA

BYLAW NO. 23-013

Being a bylaw of Lethbridge County in the Province of Alberta to establish methods for advertising for public notices.

WHEREAS, pursuant to section 606(1) of the *Municipal Government Act*, a municipality is required to advertise a bylaw, resolution, meeting, public hearing, or other things by advertising in a newspaper or other publication circulating in the area, mailing or delivering a notice to every residence in the affected area or by another method provided for in a bylaw under section 606.1; and,

WHEREAS, pursuant to section 606.1(1) of the *Municipal Government Act*, a council may by bylaw provide for one or more methods, which may include electronic means, for advertising proposed bylaws, resolutions, meetings, public hearings, and other things referred to in section 606; and

WHEREAS, pursuant to section 606.1(2) of the *Municipal Government Act*, Council is satisfied that the methods set out in this bylaw are likely to bring proposed bylaws, resolutions, meetings, public hearings, and other things advertised by that method to the attention of substantially all residents in the area to which the bylaw, resolution or other thing relates or in which the meeting or hearing is to be held;

THEREFORE, the Council of Lethbridge County, duly assembled, hereby enacts as follows:

PART 1 – TITLE

1. This bylaw may be referred to as the "Advertising Bylaw".

PART 2 – PURPOSE

The purpose of this bylaw is to provide direction on methods for advertising proposed bylaws, resolutions, meetings, public hearings, and other things required to be advertised.

PART 3 - DEFINITIONS

1. "*Act*" means the Municipal Government Act
2. *"County"* means the municipality of Lethbridge County

PART 4 – APPLICATION

1. This bylaw applies to any notice identified in section 606 of the *Act*.
2. This bylaw does not apply to those items addressed in other sections of the *Act* that require alternative forms of advertising such as public auctions as identified in Section 421 of the *Act*.

PART 5 – METHODS OF ADVERTISING

1. Any notice of a bylaw, resolution, meeting, public hearing, or other thing required to be advertised pursuant to section 606 of the *Act* must be given in accordance with the timelines prescribed in subsections 606(3), (4), and (5), and contain the information prescribed in subsection 606(6).
2. The County may choose any of the following methods to advertise notices identified under section 606 of the *Municipal Government Act*:
    a. Published at least once per week for two consecutive weeks in at least one publication circulating in the area to which the proposed bylaw, resolution or other thing relates, or in which the meeting or hearing is to be held;
    b. Electronically by posting the notice prominently on the Lethbridge County website at www.lethcounty.ca;
    c. Electronically by posting to any of the Lethbridge County official social media pages;

d. Electronically through the County's opt-in electronic communications;
e. Mailed or delivered to every residence in the area to which the proposed bylaw, resolution, or other thing relates, or in which the meeting or hearing is to be held;
f. Posting the notice prominently at the County's Lethbridge administration office;
g. Any other method as deemed necessary or appropriate by administration.

PART 6 – SEVERABILITY

1. Should any provision of this bylaw be invalid, then such provisions shall be severed, and the remaining bylaw shall be maintained.

PART 7 – EFFECTIVE DATE

1. The Bylaw shall come into effect upon third and final reading hereof.

GIVEN first reading this 6th day of April 2023.

____
Reeve

____
Chief Administrative Officer

GIVEN second reading this _______ day of ____________________, 20___.

____
Reeve

____
Chief Administrative Officer

GIVEN third reading this _______ day of ____________________, 20_____.

____
Reeve

____
Chief Administrative Officer

1st Reading	April 6, 2023
2nd Reading	
Public Hearing	
3rd Reading	

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AGENDA ITEM REPORT

Title:	Agricultural Services Board Committee Meeting Recommendations - 2023 Level of Service and Terms of Reference
Meeting:	Council Meeting - 06 Apr 2023
Department:	Municipal Services
Report Author:	Jeremy Wickson

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer	Approved - 29 Mar 2023

STRATEGIC ALIGNMENT:

☒	☒	☒	☒
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

The Agricultural Service department has created a Level of Service (LOS) document to formalize the activities performed by the department. The document mirrors our ASB Grant Agreement and sets a baseline for the LOS that is provided through operational activities in conjunction with legislated requirements under the numerous Acts. Each year as the budget is set the LOS document will be brought forward to council with revisions that will adjust the service levels to increase or decrease activities.

A Terms of Reference document was updated to be in accordance with the ASB bylaw that recently was amended to include members of the public.

RECOMMENDATION:

Moved that Council approve the 2023 Agriculture Service Board Level of Service document as recommended by the ASB Committee.

Moved that Council approve the 2023 Agriculture Service Board Terms of Reference document as recommended by the ASB Committee.

REASON(S) FOR RECOMMENDATION(S):

To provide an accurate and measurable LOS that is formed on an approved budget. Administration will work within the budget to deliver the services based on Council priorities and field-level observation of maintenance needs. LOS documents will require flexibility as weather and conditions can be a factor in delivering Agriculture Services programs.

Terms of Reference should be established for all committees of council for governance purposes and proper process.

PREVIOUS COUNCIL DIRECTION / POLICY:

The ASB LOS was adopted at the Agricultural Service Board Committee meeting on March 28, 2023, and moved for it to be forwarded to the regular meeting of Council for approval.

The LOS document amalgamates previous policies approved by Council for ASB requirements, into one overarching document. This will allow a review of all ASB services on an annual basis for approval by Council.

In addition, the ASB Terms of Reference were adopted at the Agricultural Service Board Committee meeting on March 28, 2023, and moved for it to be forwarded to the regular meeting of Council for approval.

BACKGROUND INFORMATION:

The ASB Level of Service (LOS) was adopted by council in September 2021, and revised in 2022.

The recent ASB Committee meeting in March 2023 brought forth revisions to the LOS policy.

An ASB Level of Service document provides a clear and measurable target for ASB activities that will be set annually by Council. Modifications to the document must take into consideration our baseline obligations under the ASB Grant for legislated requirements. This document will be available to the public who will gain a better understanding of the service levels provided and through public engagement will be able to offer input on these levels.

ALTERNATIVES / PROS / CONS:

Council can direct change to the LOS or Terms of Reference to administration to be brought forward for council resolution at a future meeting. This could include increases or decreases in service levels which would be estimated by the administration for proposed budget changes or changes to the structure of ASB committee through the Terms of Reference.

FINANCIAL IMPACT:

The budget for 2023 and beyond is contained in the policy. As the LOS changes through council direction the document will be adopted prior to the funding so an understanding of service costs can be considered prior to the change.

The ASB grants are dependent on an established provision of services. The LOS document further clarifies and details the deliverables expected by the Ministry of Agriculture.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

2023 ASB Terms of Reference
ASB - 2023 LOS

Lethbridge County
Agricultural Service Board
Terms of Reference

Purpose

The purpose of the Agricultural Service Board (hereinafter referred to as the ASB) Committee is to advise and assist County Council on matters that relate to agriculture related activities and regulatory service issues. The ASB was formed as a working group to facilitate decisions and policy making with respect to the administrative and governance opportunities and challenges of the Agriculture Services Department.

The Committee will have the responsibility to provide direction on development of administrative directives, policies and bylaws.

Programs and policies considered by the ASB are designed to support appropriate farming practices and improve the economic welfare and prosperity of the local and regional agriculture industry. The ASB will develop agricultural policies to meet the needs and level of service requirements of Lethbridge County. Administrative staff reviews and provides recommendations to the Agricultural Service Board with respect to agricultural programs and policies. The ASB will, at their discretion, submit program and policy recommendations to County Council for final approval.

Scope

The Agricultural Service Board Act Section 2 provides the legislated authority and roles of ASB's in Alberta, as follows:

- Act as an advisory body, and to assist the council and the Minister of Agriculture and Forestry in matters of mutual concern.
- Advise, direct, and assist with the organization of weed and pest control, and soil and water conservation programs as authorized under Provincial legislation.
- Assist in the control of livestock disease under the Animal Health Act.
- Promote, enhance, and protect practical and sustainable agriculture with a view to improving the economic viability of agricultural producers.
- Develop and promote agricultural policies to meet the needs of the municipality.

The following legislation enables ASB's to carry out the duties described in the ASB Act:

1. Alberta Weed Control Act.
2. Alberta Soil Conservations Act.
3. Alberta Agriculture Pest Act; and
4. Animal Health Act.

Official Formation & Participants

The Committee will be established as per the ASB Act Section 3 in conjunction with the Municipal Government Act stipulation in Section 146. Whereby, the composition of council committees may consist of the entirety of councilors or as determined by Council.

The Committee is comprised of at least four Council members with one alternate and up to three public members. Members of Council will be appointed at the Annual Organizational Meeting. Public members will be appointed by council for a two-year term with the following criteria considered:

A.) Public members must be residents of Lethbridge County.
B.) Council shall advertise for Public Members to apply for appointment on an as-needed basis and appoint to the Board whomever they deem most appropriate.
C.) Public member applicants must not have been employed by Lethbridge County for a minimum of 12 months prior to applying for a Public Member position.

A Committee Chair will be appointed by County Council at the annual organizational meeting. The Vice-Chair is appointed annually by the ASB Committee. All members of the ASB committee are voting members. The County Reeve is an Ex-officio non-voting member. Voting members for Regional and Provincial Resolution balloting purposes will be appointed, along with a designated alternate, at the annual organizational meeting.

The Committee will also include County administrative staff members, as follows:

- The Chief Administrative Officer (CAO)
- The Director of Public Operations
- The Environmental Services Manager, and
- The Supervisor of Agricultural Services (appointed as per Section 8 of the ASB Act)

Administrative staff are non-voting committee members. They are responsible to provide the ASB administrative and technical support, as necessary to meet the Committee's needs.

The Supervisor of Agricultural Services in conjunction with the Executive Assistant to the CAO or delegate are responsible to schedule meetings, prepare agendas and maintain meeting notes or minutes.

Goals and Objectives

The ASB will evaluate current levels of service and recommend applicable service changes for presentation to County council. The objective is to address local and regional challenges, research new opportunities and make recommendations that support the County's Strategic Plan.

The Agriculture Service Departments Mission Statement and Department Core Activities will effectively and efficiently support ASB goals and objectives to meet the needs of its residents and local stakeholders. The ASB will encourage sustainable farming practices while performing mandated duties and responsibilities of an accountable ASB, as authorized by its assigned legislated authority.

Governance

Decisions will be reached by majority vote of ASB Committee members. Voting will be recorded as “Moved” and “Carried” or “Defeated”.

Meetings

The Committee is responsible to Council and will report its deliberations to Council through meeting minutes and, verbally by the Committee Chair, as needed.

Meetings are held regularly, with a minimum of twice per year. Additional meetings will be identified, as required, by the Chair.

Agendas for the meetings will be distributed by email to committee and administrative staff members at least 3 days prior to the meeting date. On the day of the meeting a hard copy will be provided, by request of Committee members, at least 1 day in advance of meeting.

Authority and Responsibilities

The ASB is accountable to Council and is not entitled to sub-delegate all or any of its delegated powers and authorities. The Committee may not implement or authorize any action that is the responsibility of Council.

Quorum

A quorum requires a minimum attendance of four voting Committee members.

Review

The ASB Terms of Reference will be reviewed every five (5) years, from the date of approval.

Agricultural Service Board Level of Service

Created July 2022

Revised January 2023

Table of Contents

1. Purpose, Considerations, and Level of Service

Lethbridge County Agricultural Service Board (hereinafter referred to as ASB) was officially formed in 1958. Operating under the Agricultural Service Board Act, Lethbridge County has always been a strong proponent in administering Provincial Legislation including:

- Alberta Weed Control Act,
- Alberta Soil Conservation Act,
- Alberta Agricultural Pest Act and
- Animal Health Act.

The Agricultural Service Board (ASB) is committed to the promotion of the quality of life in a rural environment. The ASB does this by providing services, information, and new technology in cooperation with other governments, jurisdictions, and agencies. This is achieved by establishing “levels of service” that ensure statutory requirements are met with consideration for the collective interests of residents and clients.

The ASB receives a portion of its funding from the provincial government for implementing the delegated legislation at the ground level. The ASB carries out mowing, spraying, and seeding programs for industry, landholders (i.e., owners and lessees) other County departments and several parks and cemeteries in the County. The County also rents specific equipment to county landholders to help them maintain their obligations under the County’s various legislative responsibilities. The ASB partners with the province and other partners to provides Rural Extension programming aimed at delivering Alberta’s agriculture environmental sustainability initiatives. Vegetation management constitutes a large portion of the ASB duties, including both mowing and spraying activities on all County owned right of way. Other ASB Vegetation Management areas include Cemeteries, Hamlets, Sub-Divisions, and County owned Yards, Grader Camps and Water and Wastewater sites. The Parks department is also an additional service of the ASB.

Lethbridge County actively delivers weed and pest control programs that support agriculture production. Programs are designed to assist producers in both identification and control measures for designated weeds and pests. Weed control efforts give special attention to areas of concern that focusses on:

- lands adjacent to the bed and shores of water resource features,
- haul routes to intensive livestock operations and other agricultural/rural businesses,
- Canadian Pacific Railway right of ways and,
- Recent road construction projects.

Roadside mowing efforts also contribute to the integrated program as ASB staff operate a fleet of mowers and are given the flexibility to control weed infestations occurring outside the first pass.

Scope of Responsibility

Lethbridge County ASB is responsible for Vegetation Management on all County owned right of way and public areas. Herbicide applications are also performed for Alberta Transportation on all Provincial Highways that are within County Municipal Boundaries.

Level of Service (LOS)
It is the expectation of County landholders, citizens, and the agriculture community that the ASB programs maintain a Level of Service that supports agriculture production and rural living. The Level of Service is achieved through funding for a balance between legislated commitments and the needs of our rural population.

2. Delivery/Support of the Weed Control Act

2023 Budget Amount: $292,525

Strategy

To control the spread and establishment of noxious and prohibited weeds in Lethbridge County on both private and public land with guidelines provided under the following guidelines and procedures included in Appendix A; Weed Control and Vegetation Management:

- Weed Notices.
- Weed Extension and Inspections
- Leafy Spurge and Knapweed Vegetation Management
- Prohibited Noxious Weed Control
- Seed Cleaning Plants
- Integrated Weed Management

Level of Service Measures

- Two weed inspectors will be continuously appointed.
- 33% of municipal right of way will be sprayed to control regulated weeds. The 33% rotation is illustrated in the Spraying LOS map.
- All newly seeded roads will be mowed on an as needed basis to control weeds until the grass can withstand a chemical application.
- Revisit the GPS (200+) marked weed sites and hand pull or apply herbicide where necessary.
- Enter into a yearly service agreement with Volker Stevin to provide weed control on Alberta Transportation highways in the County. The contract will provide chemical weed control with allocations used on previously identified weed infestation or hot spots. Funding amounts for this service will depend on the Provincial budget.
- Work with the Planning and Development Department to develop a permitting program/system for Solar and other large industrial developments to include submission of vegetation and pest control plans to ensure compliance with the Weed Control and Pest Control Acts.

3. Delivery/Support of the Agricultural Pests Act

2023 Budget Amount: $76,305

Strategy

To control the spread and establishment of declared pests and nuisances as outlined in the Pest and Nuisance Regulation with guidelines provided under the following guidelines and procedures included in Appendix B Pest Control and Management:

- Surveys
- Norway Rat
- Coyotes
- Skunks
- Live Traps
- Grasshopper Control

Level of Service Measures

- Two (2) pest inspectors are continuously appointed.
- Up to date pest information is available on the County website and in County Newsletters, which are published at least once a year.

Annual Inspections or Trapping Requirements:

- In cooperation with Alberta Agriculture, a total of ten (10) fields are inspected for Clubroot and Virulent Blackleg.
- Two (2) fields will be monitored for Bertha Army Worm.
- Bacterial Ring Rot inspections will take place on potato fields with locations supplied by the Alberta Potato Growers Association.
- Each township in the County will be surveyed for grasshoppers annually.
- A private trapper is hired for 10 days for rabies detection.
- Lethbridge County will have a supply of 20 traps for Magpie and Skunk Control.

4. Delivery/Support of the Soil Conservation Act

2023 Budget Amount: $4,900

Strategy

To prevent or stop soil erosion from occurring as outlined in the Soil Conservation Act with guidelines provided under guidelines and procedures in Appendix C Soil Conservation Management.

Level of Service Measures

- Two (2) soil conservation officers will be appointed.
- All known instances of soil erosion will be inspected.
- Current information on how to control soil erosion will be posted on the County website and will be promoted through the County newsletter and social media.
- Lethbridge County will have available tractors, straw crimper, cultivator with lister shovels and heavy equipment to carry out control measures when necessary.
- Work with the Planning and Development Department to develop a permitting program/system for Solar and other large industrial developments to include submission of soil conservation and plans to ensure compliance with the Soil Conservation Act.

5. Support of the Animal Health Act

2023 Budget Amount: As required.

Strategy

To support the Chief Provincial Veterinarian should a disease outbreak occur in Lethbridge County.

Level of Service Measures

Have staff trained on relevant diseases and how to support an animal disease outbreak situation should one occur. Training is provided during mandatory In-Service Training for Members of the Association of Agricultural Fieldmen or other seminars that may occur.

6. Resource Management/Rural Extension Program

2023 Budget Amount: $163,375

Strategy

To provide rural extension programming that supports rural living and sustainable agricultural practices.

Level of Service Measures

- Collaboration of internal staff to provide Resource Management services and activities.
  - External expertise is leveraged to further support the program, as appropriate.
- Deliver Environmental Farm Plans to County producers.
- Assist producers with Canadian Agricultural Partnership Programs.
- Work with commercial manure haulers to extend Agricultural Operations Practices Act regulations and guidelines regarding appropriate manure management and application.

- Publish three newsletters to support Rural Living and Agricultural Services programs.
- Provide and promote programs to improve Riparian Health in the County
    - Work cooperatively with the four watershed groups.
    - Maintaining open communication with the Oldman Watershed Council, Cows and Fish and other groups and agencies focused on environmental sustainability.

7. Roadside Mowing

2023 Budget Amount: $267,270

Strategy

To maintain a mowing program that is aesthetically pleasing while also providing: weed control, elimination of sightline issues and snow drift prevention with guidelines provided in Appendix D Roadside Mowing.

Level of Service Measures

- Paved roads will be mowed starting in the beginning of June. Mowing will then be treated on an as-needed basis during the growing season.
- All gravel roads will be mowed twice throughout the growing season commencing in mid-June. If re-growth is minimal a second cut may not be required. Mowing LOS map indicates the dryland areas of the County where a second cut is typically not required in dry years.
- A deeper cut into the ditch is made where heavy weed infestations or excess vegetation that may cause snow drift issues are identified.

8. Rental Equipment

2023 Budget Amount: Schedule of Fees Bylaw for Rental Rates

Strategy

To provide a variety of agriculture related equipment to loan or rent to producers with guidelines provide in Appendix E ASB Rental Equipment.

Level of Service Measures

- The following pieces of equipment will be available: Brillion Drills, Plastic Mulcher, Tree Planter, and Chisel Plow with Lister shovels, Plastic Roller, Bale shredder and Straw crimper.
- Yearly rental rates will be set on an annual basis through the Lethbridge County Schedule of Fees Bylaw #20-022.

9. Parks, Cemetery, Hamlet and Subdivision Maintenance

2023 Budget Amount: $153,260

Strategy

To maintain all public areas to a consistent and set standard that Lethbridge County stakeholders can rely on as described in the following Appendix F Parks, Cemetery, Hamlet and Subdivision Maintenance.

- Parks Vegetation Management
- Playgrounds and Trail Inspection

Level of Service Measures

Parks

- Parks are maintained on an as needed basis from May until October. Cycle times for mowing will vary on moisture conditions, cycling from 10-14 days between maintenance.
- Playgrounds are inspected by staff certified in playground inspection every two months, at a minimum.
- Trail Systems are inspected for safety related issues in the Spring and Fall.
- Enhance and renew playground equipment in cooperation with community groups.

Cemetery

- Cemeteries are mowed twice per year, subject to prevailing drought or excess moisture conditions.
- Mowing events are scheduled by the Supervisor of Agriculture on an “as needed” basis.

Hamlets/Subdivisions

- Hamlets are mowed twice a year, or more, depending on moisture conditions.
- Back-alley gravel levelling is completed, as needed, in the Spring and Fall.

10. Brushing/Tree Removal/Pruning Program

2023 Budget Amount: $60,000

Strategy

To maintain all Lethbridge County Roadways, Parks and Environmental Reserve land to address overgrowth and hazards created by trees, brush, and general vegetation.

Level of Service Measures

- Three (3) staff members are available for brushing work during the months of November to March when weather conditions allow.
- Priority brushing is completed where intersection obstruction is noted.
- Brushing will only take place from June to October for downed trees or brush caused by adverse weather conditions.
- Tree maintenance will is performed in Parks and Environmental Reserves on an on an as needed basis.

11. Delay of Maintenance Operations

Vegetation Management on public spaces are impacted by multiple factors that can disrupt services and/or affect maintenance operations timelines, such as:

- Unsuitable or inclement weather.
- Equipment breakdowns.
- Intense farm activity causing safety considerations.
- Manpower shortage due to illness or absenteeism.
- Municipal emergencies.
- Public health emergencies (e.g., pandemic).

12. Conclusion

Lethbridge County ASB activities are a balance between legislated responsibility and levels of service defined by Council as representatives of the public. The ASB Grant, which provides supplemental funding, was renewed for a five-year term in 2020 (i.e., 2020 – 2024), all legislated activity is also set out in this document. The province requires annual reporting on ASB activities to demonstrate that the County's commitments are met for both the Legislative and Resource Management Grant funding streams.

Appendices

Guidelines and Procedures

1. **Weed Control and Vegetation Management**
    - A. Integrated Weed Management
    - B. Weed Extension and Inspections
    - C. Weed Notices
    - D. Leafy Spurge and Knapweed Vegetation Management
    - E. Prohibited Noxious Weed Control

2. **Agricultural Pest Act Polices**
    - A. Surveys
    - B. Live Traps
    - C. Norway Rat
    - D. Coyotes
    - E. Skunks
    - F. Grasshopper Control

3. **Soil Conservation Act**
    - A. Soil Conservation Management

4. **Roadside Mowing**
    - A. Roadside Mowing

5. **Rental Equipment and ASB Schedule of Fees**
    - A. ASB Rental Equipment
    - B. Schedule of Fees/ASB Related Portion of Bylaw #20-022

6. **Parks Polices**
    - A. Parks Vegetation Management
    - B. Playground and Trail Inspection

7. **Maps**
    - A. Roadside Mowing
    - B. Roadside Spray Program

Appendix A – Weed Control and Vegetation Management

Guidelines and Procedures

A. Integrated Weed Management
   i. To control weeds in Lethbridge County on a timely basis; to ensure compliance with the Weed Control Act.
   ii. Paved and oiled roads receive priority.
   iii. Spraying is carried out on a three-year rotation within the County, as follows:
      - Area 1 – All right-of-way west of RR-23-0 north of 519, west of 22-0 south of 519 and west if Highway 4 south of Lethbridge.
      - Area 2 – All right-of-way south and east of the Oldman River and east of Highway 4.
      - Area 3 – All right-of-way east of RR 23-0 north of 519 and south of 519 east of RR 22-0. The areas not scheduled for spraying will receive spot treatment.
   iv. Weeds that are too mature to be effectively controlled with chemicals or that are located too close to sensitive crops are mowed to control the spread of seeds. It is recognized that inclement weather could impede implementation of portions of the LOS.
   v. Only chemicals registered for right-of-way use are employed.
   vi. Spray truck operators will exclude areas such as farmstead frontages and where canals, drainage channels, sloughs, and ponds encroach on the road allowance. Spray booms are also turned off 100 meters on either side of visible beehives.
   vii. Landowners that do not want their road allowances sprayed must visibly post DO NOT SPRAY signage so that operators have sufficient time to react.
   viii. "Do Not Spray" signs are available at the ASB Office in Picture Butte.
      a. Landholders posting "Do Not Spray" must sign a "No Spray Zone" Agreement with Lethbridge County.
   ix. The County's rights-of-way are not considered as a "buffer zone" for organic farming purposes.
   x. Operators will only spray when weather and wind conditions warrant and will keep a daily log of roads sprayed, weather conditions, wind direction and speed and the PCP number of the chemical being applied.
   xi. Difficult to control noxious or prohibited noxious weeds located in rights-of-way in small, contained infestations are mowed, pulled or hand-sprayed with a selective herbicide registered for control of the specific species involved.
   xii. The roadside spraying program is advertised prior to commencement of spray activities.
   xiii. Roadside spraying is coordinated with roadside mowing to avoid duplication.

B. Weed Inspections

   i. The Weed Inspector will enforce the Provincial Weed Control Act during the growing season from May to September.
   ii. The Inspector conducts their duties under the supervision of the Supervisor of Agriculture Services or their designate.

- iii. The Inspector will contact landholders to provide weed control extension materials, where necessary.
- iv. County employees will always exercise suitable public relation skills when engaging landholders by applying a firm but fair approach.

C. Weed Notices

- i. Notices to remedy a weed problem are issued at the discretion of the Supervisor of Agriculture Services or their designate.
- ii. Notices are issued under the provisions outlined in the current Alberta Weed Control Act.
- iii. When a landholder demonstrates non-compliance with a weed notice, remedial work will be implemented by the County, or its agents, and all related costs are applied against the landowner.
- iv. Where payment is not received for remedial work, the amount owing is placed on the tax roll as an additional levy against the affected lands.
- v. In cases of continued non-compliance, the Supervisor of Agriculture Services, or their designate, may determine that prosecution is the only remaining compliance instrument. In such cases, the ASB Committee will review the case and approve or reject initiation of legal action in a Court of Law.

D. Leafy Spurge and Knapweed

- i. During the growing season, the ASB will send operators to systemically survey, map and treat Knapweed and Leafy Spurge within the bed and shore and vacant public lands adjacent to water resource features.
  - a. The County is compensated for costs associated with the water resource protection program through the ASB grant and a grant from Alberta Environment and Protected Areas.
- ii. Landowners adjacent to the bed and shore are encouraged to treat infestations of these weeds on their land. Where necessary, information is provided by the County's Weed Inspector to help landholders achieve effective results.
- iii. If the landowner does not respond to treatment requests for these species, a weed notice will be issued.

E. Prohibited Noxious Weeds

- i. When a prohibited noxious weed infestation is discovered or reported, the County will conduct a thorough inspection to determine the area affected and the number of plants present.
- ii. Where necessary, the affected landholder is issued a Weed Notice, as outlined under the Weed Control Act.
- iii. Where the landholder is provided the option to treat infestations occurring in row cropped fields.
  - a. The landholder is obliged to hand rogue or spot spray, as many times as the Weed Inspector deems necessary, to destroy all prohibited noxious plant material.
  - b. Spot spraying must be with a non-selective herbicide registered for control of the prohibited noxious weed.
  - c. All impacted plant material must be disposed of as directed by the Weed Inspector.

- iv. Where the weed inspector determines that:
  - a. rogueing or spot spraying a prohibited noxious weed occurring in a row crop is not feasible, or
  - b. the noxious weed infestation eradication was not carried out effectively.
  - i. The affected area will, at the discretion of the Supervisor of Agriculture, be the eradicated of all vegetation within the infested area though:
    - a. The application of a non-selective herbicide to the entire infested area or,
    - b. By plowing under the entire infested area.
- v. Harvest of a previously affected row crop field must be supervised by the Weed Inspector to reduce potential cross-contamination risks.
- vi. Eradication methods for prohibited noxious weed infestations identified in non-row cropped areas are determined by the Weed Inspector.
- vii. Persons failing to comply with a noxious weed notification are subject to the provisions set out under the Weed Control Act.

F. Clubroot Inspection and Control

- i. Field Surveys
  - a) Yearly inspections for Clubroot in Canola are completed by Agricultural Services Staff.
  - b) Clubroot survey method, sampling technique, reporting and calculation of disease incidence must follow standard protocols provided by the Alberta Clubroot Management Committee.
  - c) Positive identification of Clubroot in canola shall be confirmed by certified laboratory testing. Submit samples to two independent accredited laboratories. Samples declared positive by both laboratories confirms the presence of Club Root.
- ii. Disease Spread Reduction
  - a) A “Notice to Control Pests” shall be issued to any landowner found to own the land infested with clubroot, pursuant to the Agricultural Pests Act.
  - b) The “Notice to Control Pests” may include any or all the following conditions:
- iii. A four-year prohibition from growing canola, mustard, and brassica crops.
- iv. Following the four (4) year prohibition period, the landholder must notify the Supervisor of Agricultural Services, in writing, of their intent to grow canola variety. Whereby, the canola must be a registered clubroot resistant variety.
- v. An owner or occupant must follow a Clubroot Management Plan, intended to reduce the spread of the disease through movement of soil or equipment[1].
- vi. All other users of the said field(s) must adhere to the same best management practices for Clubroot sanitation.
- vii. Prohibited crops grown within the four-year prohibition period will be destroyed, at the expense of the grower, using any appropriate means.
- viii. All neighboring landowners and all industries having a genuine commercial interest will be notified of the confirmed positive Clubroot incidence and its location.
- ix. Canola growers in high-risk situations/locations should follow traditional Canola rotation recommendations (1 in 4 years) to reduce the risk of Clubroot introduction to clean fields.

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[1] Alberta Agriculture,2014. Clubroot Management Plan. https://open.alberta.ca/publications/7089438.

x. Lethbridge County will review these guidelines and procedures within one year of a positive Clubroot result with the County.

G. Seed Cleaning Plants

i. Seed cleaning plants in the County and City of Lethbridge, or Village or Town whose borders are surrounded by the County will be inspected, as outlined in the Weed Control Act, Seed Cleaning Plant Regulations.

ii. Seed plants are inspected once a year by the Supervisor of Agriculture Services, or their designate.

iii. A minimum of 20 samples per plant will be collected randomly throughout the year.

iv. License issuance is based on test results, in conjunction with the licensing form provided under the Seed Cleaning Regulations of the Weed Control Act.

Appendix B – Pest Control and Management

Guidelines and Procedures

A. Surveys
   i. At the request of senior government, agricultural pest surveys are undertaken by ASB staff for diseases such as the Blackleg and Clubroot in Canola, Ring rot in Potatoes, Fusarium in cereals and the Grasshopper Forecast survey.
   ii. The Supervisor of Agriculture Services will negotiate survey methodology and cost share agreements prior to any survey being undertaken.
   iii. Surveys are completed with consideration to optimum survey timing, accounting for competing county programs and staffing needs.

B. Live Traps
   i. Live traps are available to County landowners or lessees to enable control of Magpies, Raccoons, or Skunks.
   ii. A “Use Agreement”, valid for 30 days, is required to obtain a live trap. The agreement includes the name, address, legal land description, telephone number and signature of the responsible landowner or lessee.
   iii. The landholder is charged for Live Traps in accordance with the Schedule of Fees Bylaw.

C. Norway Rat
   i. All valid, reported sightings of a Norway Rat are investigated immediately.
      a. The validity of Norway rat sightings is determined by the Supervisor of Agriculture Services or their designate.
   ii. Where the investigation identifies a positive sighting, where the animal(s) cannot be readily eradicated, the Provincial Rat Specialist will be contacted for assistance.
   iii. Lethbridge County will contact the individual(s) who originally submitted the sighting to disclose the outcome of the investigation.

D. Coyotes
   i. All complaints involving Coyote predation on domestic livestock will be investigated as soon as feasibly possible.
   ii. The investigating officer, as outlined under the Agricultural Pests Act, will determine the best method for eliminating the predator responsible.
   iii. The appropriate forms must be completed prior to issuance of pest control devices, such as poison or snares.
   iv. In particularly difficult cases the Provincial Predator Control Specialist will be contacted to assist the producer.

E. Skunks
   i. All complaints involving skunks behaving abnormally are dealt with immediately. Residents in rural areas are encouraged to eliminate the skunk immediately, preferably without destroying the head or brain.

- ii. Where the resident is unable, for any reason, to eliminate the animal, the investigating Officer will trap or eliminate any skunk(s) behaving abnormally acting abnormally on behalf of the complainant.
- iii. The Provincial Wildlife Disease Specialist will be contacted to assist with having the animal tested. Results obtained from the Animal Disease Research Institute (ADRI) will be shared with the complainant.
- iv. Where positive results are established, the Provincial Wildlife Disease Specialist will cooperate with Canadian Food Inspection Agency (lead agency), the Supervisor of Agriculture Services and ADRI to organize the necessary control measures.
- v. Live traps are available to residents wishing to remove nuisance skunks from their property. Live traps issuance is provided in accordance with the Schedule of Fees Bylaw.

F. Grasshopper Control

- i. Lethbridge County will cooperate with landholders wishing to control the severity of grasshopper infestations on adjacent County owned rights-of-way.
- ii. Landholders planning to perform grasshopper control on County owned right-of-way must have approval from the Supervisor of Agriculture Services or their designate.
- iii. Grasshopper control methodologies must use procedures that minimize risks to road users/traffic.
- iv. Applicants for grasshopper control on County lands must include a signed waiver agreement prior to execution of county implemented control measures.
- v. Grasshopper control approvals are issued where pest numbers are above the economic threshold, as per provincial guidelines.
- vi. Control methodologies must follow label directions provided for an approved pesticide bran formulation registered for use on grasshoppers.

Appendix C - Soil Conservation Management

Guidelines and Procedures

A. Soil Conservation
  i. Lethbridge County's ASB recognizes the protection of soil quality and integrity is vital to agricultural, environmental, and human sustainability.
    a. Alberta's Soil Conservation Act, its associated regulations, as periodically amended, provide the legislated mandate to prevent loss or deterioration of the soil resource.
    b. The County is authorized by the province to enforce the Soil Conservation Act
  ii. Soil Conservation notices are issued at the discretion of the Supervisor of Agriculture Services or their designate.
  iii. When a notice is issued, non-compliance may result in remedial work, either by the County or a Contractor designated by the County.
  iv. Remedial work may include mitigation work in the affected field(s) or removal of resulting soil deposits in County owned roadways or drainage ditches.
  v. When remediation of County owned/controlled ditches is deemed necessary, the landholder will be notified prior to commencement of the work, including an estimate of cost.
  vi. Costs for the work are calculated using current Alberta Roadbuilders and Heavy Construction Association rates as authorized by the County's Schedule of Fees bylaw.
  vii. Upon completion, costs for the remedial complete by the County or its contractor, the legally titled landholder is issued an invoice.
  viii. Where the invoice is not paid on or before the due date, the amount will be subject to penalties and interest charges.
  ix. All outstanding invoices 120 days or more overdue will be placed on the County tax roll and collected based on County Tax bylaws and policy.
  x. In cases of continued non-compliance, the Supervisor of Agriculture Services. or their designate. may determine that prosecution is the only remaining compliance instrument. In such cases, the ASB Committee will review the case and approve or reject initiation of legal action in a Court of Law.

Appendix D – Roadside Mowing

Guidelines and Procedures

A. Roadside Mowing

- i. This program is developed, planned, and implemented by the Agricultural Department, in conjunction with Public Works operations.
- ii. Paved or oiled roads are mowed beginning in June, on an as-needed basis, during the growing season.
- iii. If necessary, all gravel roads will be mowed twice throughout the growing season, commencing in mid-June.
  - a. Where re-growth is minimal, a second cut may not be required.
  - b. Inclement weather, such as heavy rain events or early winter, could prevent the completion of the program.
- iv. Grader operations are coordinated and implemented in a manner that minimizes interference with and efficiency of mowing operations.
- v. Roadside spraying operations are coordinated and implemented in a manner that minimizes interference with and efficiency of mowing operations.

Appendix E – ASB Rental Equipment

Guidelines and Procedures

A. Rental Equipment

- i. ASB rents equipment for use exclusively on land located within Lethbridge County boundaries.
- ii. A current ASB rental equipment list and fees is advertised annually.
- iii. A chronological applicants list is maintained, and equipment distribution is provided on a first come, first-serve basis, as near as practical.
- iv. County personnel are responsible for moving rental equipment to and between farms.
- v. The applicant is responsible to service, clean and maintain rental equipment, as necessary, before it's returned to the County and/or passed onto the next applicant.
- vi. The applicant will provide suitable equipment and competent personnel to operate County equipment.
- vii. Customers are assessed fees on a per acre or maximum daily charge, as specified by the Schedule of Fees Bylaw, at the discretion of the County.
- viii. The program is evaluated annually to implement necessary LOS or guideline changes.

Appendix F – Parks, Cemetery, Hamlet and Subdivision Maintenance

Guidelines and Procedures

A. Parks

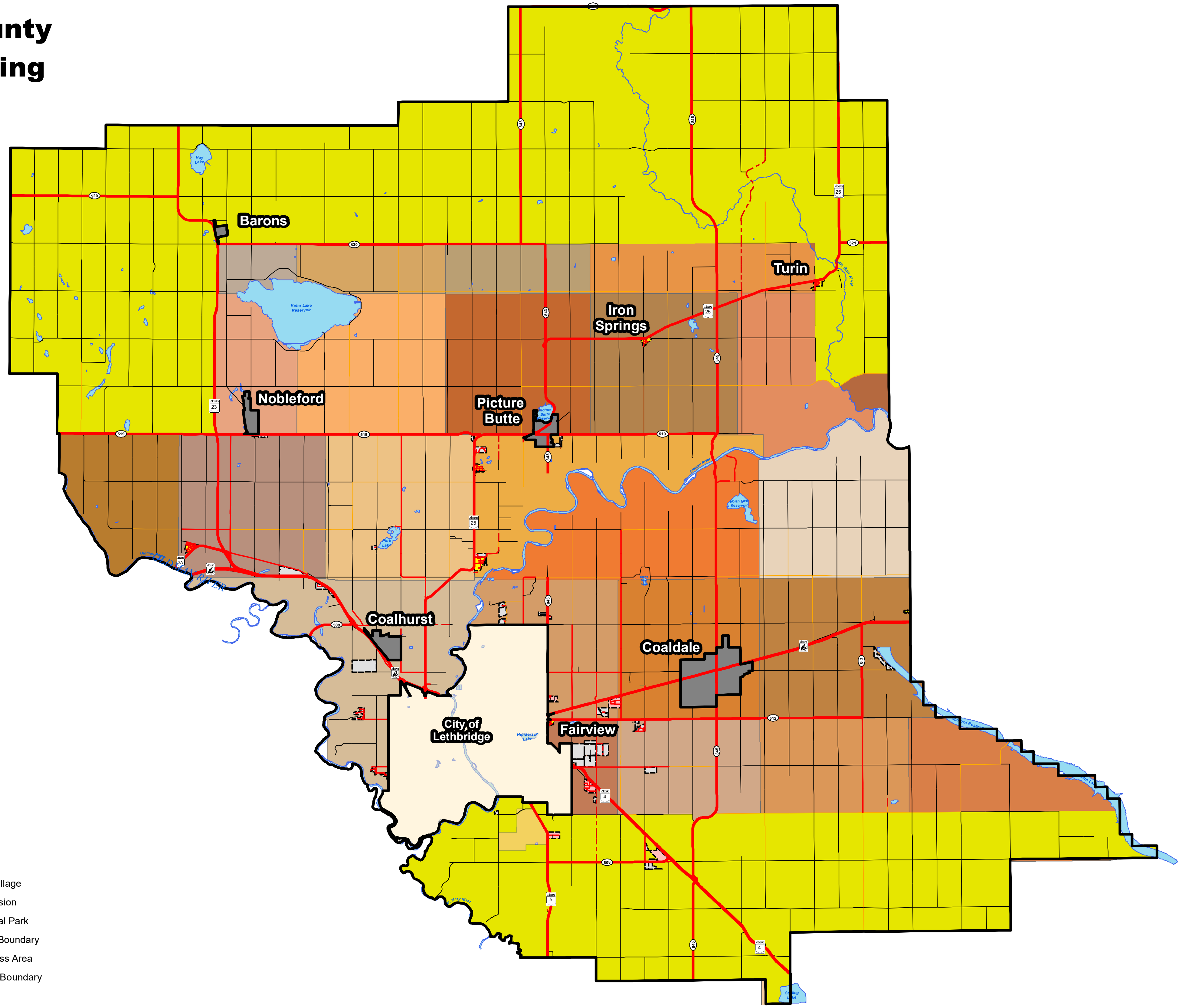
- i. County Parks maintenance is the responsibility of the Agricultural Department.
- ii. The Parks department consists of the following:
  - a. All municipal designated hamlet playgrounds and equipment.
  - b. Municipal designated green space and walking paths.
  - c. Inactive municipal school yards.
  - d. Cemetery maintenance at Elinor, Albion Ridge, White Lake and Barons cemeteries.

Guidelines and Procedures

B. Playground & Trail Inspection

- i. Lethbridge County trail systems are inspected by a qualified designated staff member on a semi-annual basis.
- ii. Inspections are recorded on the appropriate forms, including:
  - a. Hazardous or potentially hazardous conditions.
  - b. Corrective action required or taken to address identified hazards.
  - c. Inspection date and inspector’s signature.
  - d. Inspection forms are submitted to the Supervisor of Agriculture Services for review and coordination of necessary actions.
- iii. Supplemental
  - a. Playground equipment and Trails are also inspected by County crews during maintenance activities.
  - b. All equipment, facility and trail deficiencies identified by County maintenance crews are recorded and, wherever possible, corrected immediately.
  - c. Any debris, broken glass, foreign objects, etc. are removed from the site during inspection or maintenance activities.
  - d. Where identified deficiencies cannot be corrected immediately:
    - i. The inspector or maintenance crew will erect caution tape to isolate the affected area.
    - ii. In such cases, qualified staff will be notified immediately to schedule the necessary corrective action as soon as feasibly possible.

Lethbridge County
Roadside Mowing



Legend

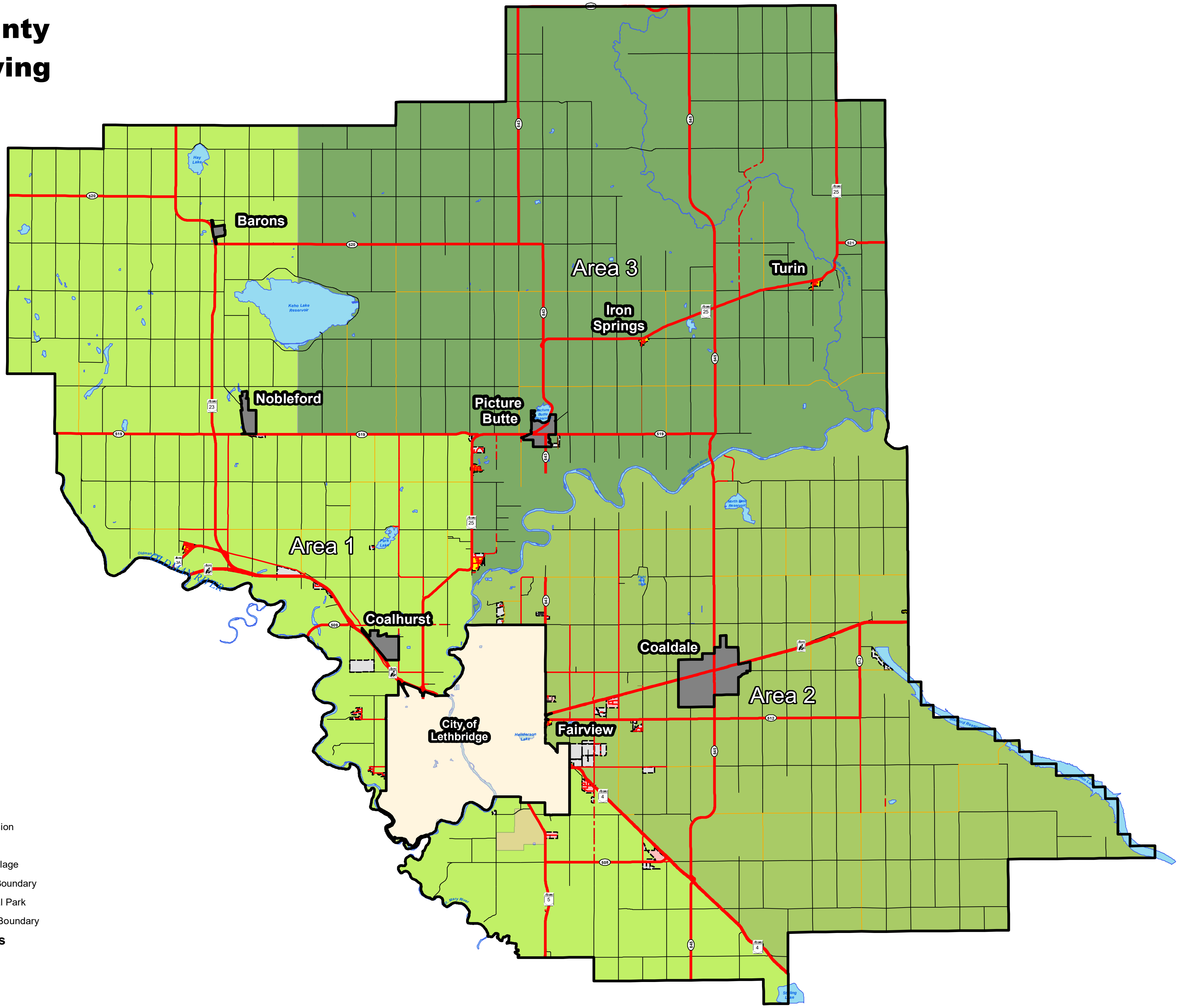
County Roads

- Gravel
- Gravel (Base Stabilized)
- Paved (HMA)
- Paved (CMA)
- Concrete
- Cement Stabilized
- Provincial Highways

- Hamlet
- Town/Village
- Subdivision
- Industrial Park
- Airport Boundary
- One Pass Area
- County Boundary

LETHBRIDGE COUNTY

Lethbridge County Roadside Spraying



Legend

County Roads

- Gravel
- Gravel (Base Stabilized)
- Paved (HMA)
- Paved (CMA)
- Concrete
- Cement Stabilized
- Provincial Highways

- ▨ Subdivision
- 🟨 Hamlet
- ■ Town/Village
- ▨ Airport Boundary
- 🟥 Industrial Park
- ☐ County Boundary

Spray Zones

- 🟩 Area 1
- 🟩 Area 2
- 🟩 Area 3

LETHBRIDGE COUNTY

AGENDA ITEM REPORT

Title: 2023 Capital Purchasing - Reallocation of Funds
Meeting: Council Meeting - 06 Apr 2023
Department: Municipal Services
Report Author: Jeremy Wickson

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer   Approved - 29 Mar 2023

STRATEGIC ALIGNMENT:

☐ **Governance** ☐ **Relationships** ☒ **Region** ☐ **Prosperity**

EXECUTIVE SUMMARY:

During the 2023 budget deliberations, Municipal Services presented a 5-year capital equipment purchasing plan. From further evaluation, a request to Council is being made to reallocate funds previously allotted for the purchase of a work truck to be instead used for purchasing a spray distribution system for base stabilization and to pre-order a sander/plow configuration for our urban service unit.

RECOMMENDATION:

That $100,000 of capital funding approved in the 2023 budget year for an Operations work truck be reallocated to a Base Stabilization Distribution System for a tandem water truck and for Hamlet/Subdivision plow and sander attachments.

REASON(S) FOR RECOMMENDATION(S):

For internal operations within the base stabilization and winter maintenance services, this would sustain continuity with equipment and ensure services are met.

A spray distribution system would ensure accurate volumes of calcium liquid are applied during base stabilization projects. The volume added is closely monitored for service level tracking and optimization of use.

A plow/sander would provide continued services in hamlets and rural subdivisions. This purchase would be in effect for the 2023/24 winter maintenance season.

PREVIOUS COUNCIL DIRECTION / POLICY:

Council previously approved the 5 year capital budget.

BACKGROUND INFORMATION:

The approved capital budget forecasted the purchase of a 3-ton truck and deck for the construction crew. After a review of existing equipment, it was determined that this purchase could be pushed to a future year as higher priority items were identified.

ALTERNATIVES / PROS / CONS:

Maintain the currently approved capital equipment.
PROS - The budget was reviewed and approved, and retains the consistency of approval.
CONS - Identified priority purchases will be delayed which will affect the level of service provided for base stabilization and winter maintenance.

FINANCIAL IMPACT:

The budget for a 3-ton construction truck was estimated to be $100,000.

The spray distribution system has been quoted as $43,000 and the plow/sander is quoted as $41,000. Total expenditure of $84,000.

LEVEL OF PUBLIC PARTICIPATION:

☒ Inform ☐ Consult ☐ Involve ☐ Collaborate ☐ Empower

ATTACHMENTS:

2023 Capital Purchase Allocation
2023-02-27 - Leth County - Retrofit Raven Metering System to existing ta...
2023-02-24 - Leth County - 8' SaltDogg® SS spreader & Western SS 9.5 V-p...

LETHBRIDGE COUNTY
FLEET BUDGET
2023 CAPITAL EQUIPMENT PURCHASES

			SOURCES OF FUNDING					
ID #	**Project Name**	**Budget Request**	**Fleet Equipment Replacement Reserve**	**Public Works Reserve**	**E.S. Contingency Reserve**	**Debentures**	**Proceeds on Sale of Equipment**	**Total**
	SCHEDULED REPLACEMENTS							
23-FLT-	Replacement Divisional Grader MG-037	625,000	495,000	-	-	-	130,000	**$ 625,000**
23-FLT-	Replacement Divisional Grader MG-038	625,000	495,000	-	-	-	130,000	**$ 625,000**
23-FLT-	Replacement of TR-138 Truck & Plow Equipment	325,000	295,000	-	-	-	30,000	**$ 325,000**
23-FLT-	Replacement of LD-111 JD 644K Wheel Loader	500,000	450,000	-	-	-	50,000	**$ 500,000**
23-FLT-	Replacement of 2 X PW/ASB Trucks 3/4 & 1 Tons	140,000	110,000	-	-	-	30,000	**$ 140,000**
23-FLT-	Replacement of 1 X ASB Construction 1 Tons (2022 Purchase)	90,000	75,000	-	-	-	15,000	**$ 90,000**
23-FLT-	Replacement of 1 X PW Construction 3 Ton	100,000	85,000	-	-	-	15,000	**$ 100,000**
23-FLT-	Tow Behind Scissor Man Lift	45,000	44,000	-	-	-	1,000	**$ 45,000**
23-FLT-	Replacement of ASB 10' Disc	65,000	64,000				1,000	**$ 65,000**
23-FLT-	Replacement of Equipment Trailer	25,000	24,000	-	-	-	1,000	**$ 25,000**
23-FLT-	Replacement of ASB Roadside Mower	50,000	40,000	-	-	-	10,000	**$ 50,000**
23-FLT-	Replacement of Small Rock Box - Salt Dawg	25,000	24,000	-	-	-	1,000	**$ 25,000**
23-FLT-	Replacement of Fuel Pumps - PB and Coaldale	40,000	40,000	-	-	-	-	**$ 40,000**
	VEHICLE REPLACEMENT PROGRAM							
23-FLT-	Enterprise Fleet Program - 12 X Crewcab 1/2 ton Truck	600,000	60,000	-	-	-	540,000	**$ 600,000**
23-FLT-	Enterprise Fleet Program - 1 X SUV	55,000	5,000	-	-	-	50,000	**$ 55,000**
23-FLT-	Replacement of Wheel Skid Steer (Trade in EVCON)	75,000	7,000	-	-	-	68,000	**$ 75,000**
23-FLT-	Replacement of Track Skid Steer (Trade in EVCON)	85,000	7,000	-	-	-	78,000	**$ 85,000**
TOTAL CAPITAL EQUIPMENT REQUEST		**$ 3,470,000**	**$ 2,320,000**	**$ -**	**$ -**	**$ -**	**$ 1,150,000**	**$ 3,470,000**
								$ 3,470,000

HoriZon TRUCK & BODY LTD.

1415 - 39th Street N., Lethbridge, AB T1H 7A6
P. 403-381-7929 F. 403-394-0801

Estimate	**3053**
	2/27/2023

GST/HST No. 842078909

Lethbridge County
100, 905 - 4th Ave S.
Lethbridge, AB T1J 4E4

Ship To

Customer Phone # 403-317-6051 AP
Customer Fax # 403-328-5602

Rep:

P/O #

Qty	Item	Description	U/M	Unit Price	Extended Price
		Retrofit Raven Metering System to existing tanker body			
	Misc. Items	2x2x4 Stainless box (installed)		1,750.00	1,750.00
	Misc. Items	Raven system (installed) - GPS & 3 section rear bar		24,602.34	24,602.34
	Misc. Items	Re-work plumbing & relocate pump (installed)		3,500.00	3,500.00
	Misc. Items	Rear 2" Stainless spray bar (installed) - 3 sections c/w swivels		7,555.00	7,555.00
	Misc. Items	Cab mount & interior		2,500.00	2,500.00
	Misc. Items	Two new 3" hoses		1,000.00	1,000.00
	Misc. Items	Ram mount, forward cam lok mounts & misc items (included)		0.00	0.00
	Misc. Items	Rear water gravity spray bar c/w pump option (included)		0.00	0.00
		Installed FOB HoriZon Truck & Body Ltd, Lethbridge, AB Installation TBD @ time of order confirmation PO# required to confirm order Final installed price subject to current material costs & inspection of the supplied chassis			
		GST on sales		5.00%	2,045.37

To confirm your order, please sign and return to HoriZon via fax: 403-394-0801 or email: sales@horizontruckandbody.ca

In the event that a Purchase Order number is required, please write the number clearly in the space provided above.

Signature ______________________________

Subtotal	$40,907.34
5% GST Total	$2,045.37
Total	**$42,952.71**

HoriZon TRUCK & BODY LTD.

1415 - 39th Street N., Lethbridge, AB T1H 7A6
P. 403-381-7929 F. 403-394-0801

Estimate

Estimate	**3050**
	2/23/2023

GST/HST No. 842078909

Lethbridge County
100, 905 - 4th Ave S.
Lethbridge, AB T1J 4E4

Ship To

Customer Phone # 403-317-6051 AP
Customer Fax # 403-328-5602

Rep:
P/O #

Qty	Item	Description	U/M	Unit Price	Extended Price
	SANDER	14708F461211 - SaltDogg® 8 Ft. X 46 In. Gas Chain 304 Stainless Steel Spreader - 3.50 yd³ GAS CONVEYOR CHAIN SPREADER - 10-1/2 HP Briggs and Stratton - Four hinged top screens with 1/4 in. bars included		14,950.00	14,950.00
	SNO.	3045818 - Wireless Controller For Gas Spreaders		627.90	627.90
	SNO.	3008046 - SaltDogg® 200 Pound Vibrator Kit For 1400 Series Spreaders		229.7625	229.77
	STE.	SS channel vibrator mount		200.00	200.00
	SNO.	1491501 - Replacement 8 Foot Tarp Kit For 96 X 47 Inch SCH Hopper For SaltDogg® 1400 Series Spreaders		147.35	147.35
	~Surcharge	brokerage (estimate)		561.96	561.96
	*Freight	freight & brokerage from Buyers to HoriZon (estimate)		1,500.00	1,500.00
10	*General Labour	labour to install spreader (estimate)	hr	125.00	1,250.00
	*Shop Supplies			7.00%	87.50
	ELE.	ELECTRICAL PARTS (as required)		75.00	75.00
		Subtotal of above items			19,629.48
	SNOW	Western 9.5 MVP3 Plow pkg (installed) c/w: - Stainless steel V-plow - Halogen plow lights - removal of existing plow		18,792.22	18,792.22
		Installed FOB HoriZon Truck & Body Ltd, Lethbridge, AB Availability TBD @ time of order confirmation PO# required to confirm order Final installed price subject to current material costs, freight, exchange & inspection of the supplied chassis			

To confirm your order, please sign and return to HoriZon via fax: 403-394-0801 or email: sales@horizontruckandbody.ca

In the event that a Purchase Order number is required, please write the number clearly in the space provided above.

Signature ___________________________________

HoriZon TRUCK & BODY LTD.

1415 - 39th Street N., Lethbridge, AB T1H 7A6
P. 403-381-7929 F. 403-394-0801

Estimate	**3050**
	2/23/2023

GST/HST No. 842078909

Lethbridge County
100, 905 - 4th Ave S.
Lethbridge, AB T1J 4E4

Ship To

Customer Phone # 403-317-6051 AP
Customer Fax # 403-328-5602

Rep:

P/O #

Qty	Item	Description	U/M	Unit Price	Extended Price
		GST on sales		5.00%	1,921.08

To confirm your order, please sign and return to HoriZon via fax: 403-394-0801 or email: sales@horizontruckandbody.ca

In the event that a Purchase Order number is required, please write the number clearly in the space provided above.

Signature ___________________________________

Subtotal	$38,421.70
5% GST Total	$1,921.08
Total	**$40,342.78**

AGENDA ITEM REPORT

Title:	Local Improvement Plans - Township Road 8-2, Range Road 21-5, and Valley View Place
Meeting:	Council Meeting - 06 Apr 2023
Department:	Infrastructure
Report Author:	Devon Thiele

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer	Approved - 24 Mar 2023

STRATEGIC ALIGNMENT:

☒	☐	☐	☐
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

Lethbridge County received two (2) Local Improvement Tax Petition Packages from a group of property owners just south of the City of Lethbridge. These two petition packages are for the following:

Petition 1: Paving of Township Road 8-2
Petition 2: Paving of Range Road 21-5 and Valley View Place

Upon confirmation that the petitions were sufficient, administration developed a Local Improvement Plan for both petitions. These plans indicate who will be liable to pay the tax, and how much they will be paying. For both plans, the estimated costs of the project have been divided equally between the County and the benefiting landowners. However, as per Policy 356, "the proportion of the costs that the County and benefitting owners will contribute will be determined by Council."

RECOMMENDATION:

That the distribution of the Local Improvement Plan for the benefitting landowners for the paving of Township Road 8-2, be approved.

That the distribution of the Local Improvement Plan for the benefitting landowners for the paving of Range Road 21-5 and Valley View Place, be approved.

REASON(S) FOR RECOMMENDATION(S):

This is in alignment with Policy 356 - Local Improvement Tax

PREVIOUS COUNCIL DIRECTION / POLICY:

Policy 356 - Local Improvement Tax

BACKGROUND INFORMATION:

As the distribution of the Local Improvement Plan is mandated in the MGA, administration must send out the notices. Council can at their sole discretion, modify how the costs are split between the County and owners. Council is also the authority in regards to determining who a "benefitting owner" is, so Council may also modify who the benefiting owners are.

ALTERNATIVES / PROS / CONS:

None

FINANCIAL IMPACT:

There are no financial impacts at this time. However, if a counter petition is not received and council chooses to proceed with these projects, the County would be liable to pay $1,331,104 for both projects based on the proposed funding split.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

LIT - Rge Rd 21-5 & Valley View Pl
LIT - Twp Rd 8-2

LETHBRIDGE
COUNTY

April __, 2023

(owner name)
(owner address)
(owner address)

Re: Notice of Proposed Local Area Improvement – Range Road 21-5 & Valley View Place Paving Project

Dear Sir or Madam,

Lethbridge County is hereby sending you this formal Notice of the proposed Local Area Improvement and summary of the information included in the Local Improvement Plan. You are being sent this Notice because you will be responsible to pay the local improvement tax should the project proceed.

If a petition objecting to the local improvement is filed with the Chief Administrative Officer (CAO) within 30 days from the date of this letter and the CAO declares the petition to be sufficient, the council must not proceed with the local improvement.

If a sufficient petition objecting to the local improvement is not filed with the CAO within 30 days from the date of this Notice, the council may undertake the local improvement and impose the local improvement tax at any time in the 3 years following the sending of the Notices. This means that __(day)_____, (month), 2023 at 4:30 p.m. is the deadline for submitting a petition objecting to the local improvement.

Best regards,

Devon Thiele, Director of Infrastructure
dthiele@lethcounty.ca
403-328-5525

Encl.

#100, 905- 4th Avenue South, Lethbridge, Alberta, T1J 4E4
Tel: (403) 328-5525 E-Mail: mailbox@lethcounty.ca Fax: (403) 328-5602

LOCAL IMPROVEMENT PLAN

Range Road 21-5 & Valley View Pl. Paving Project

Lethbridge County received a citizen initiated Local Improvement Petition Package. This means that a group of residents signed a petition to upgrade the below noted roads to an asphalt pavement standard. This petition was reviewed by Lethbridge County which confirmed it met the thresholds for sufficiency as determined by the Municipal Government Act (MGA). The MGA requires Lethbridge County to create a Local Improvement Plan and distribute it to all benefiting landowners.

Proposed local improvement and its location:
The proposed improvements include asphalt paving of Range Road 21-5 from Township Road 8-2 north to the end of the existing road, and Valley View Place from Range Road 21-5 west to the end of the existing road. This work generally includes preparation of the existing road for the placement of asphalt pavement.

The specific roadway(s) included in this project are:

- Range Road 21-5
- Valley View Place

The parcels of land in respect of which the local improvement tax will be imposed:
There are Twelve (12) benefitting parcels of land - please see attached schedule.

The person liable to pay the local improvement tax:
Pursuant to Section 400 of the *Municipal Government Act (MGA)*, the person liable to pay the tax imposed in accordance with a local improvement tax bylaw is the owner of the parcel of land in respect of which the tax is imposed.

The tax rate will be based on:
Lethbridge County desires to have a uniform tax rate based on **each parcel** of land. Each individual parcel of land, regardless of size or length of frontage, will be liable to pay the same amount. For clarification, a benefiting parcel of land is a parcel of land that may benefit from this project.

The estimated cost of the Project:
The total cost of this project is estimated to be $554,700 (does not include GST).

The portion of the estimated cost of the local improvement proposed to be paid by:

Benefiting Parcels (revenues raised by local improvement tax)	$ 277,350 (50%)
Lethbridge County	$ 277,350 (50%)

The period over which the cost of the local improvement will be spread:
The cost of the local improvement can be paid for up front, or will be spread over Twenty (20) years.

__Financial information__:
Payment Options (these calculations are based on Twelve (12) benefitting parcels).

- The estimated prepaid local improvement tax amount will be **$23,112.50** per parcel.

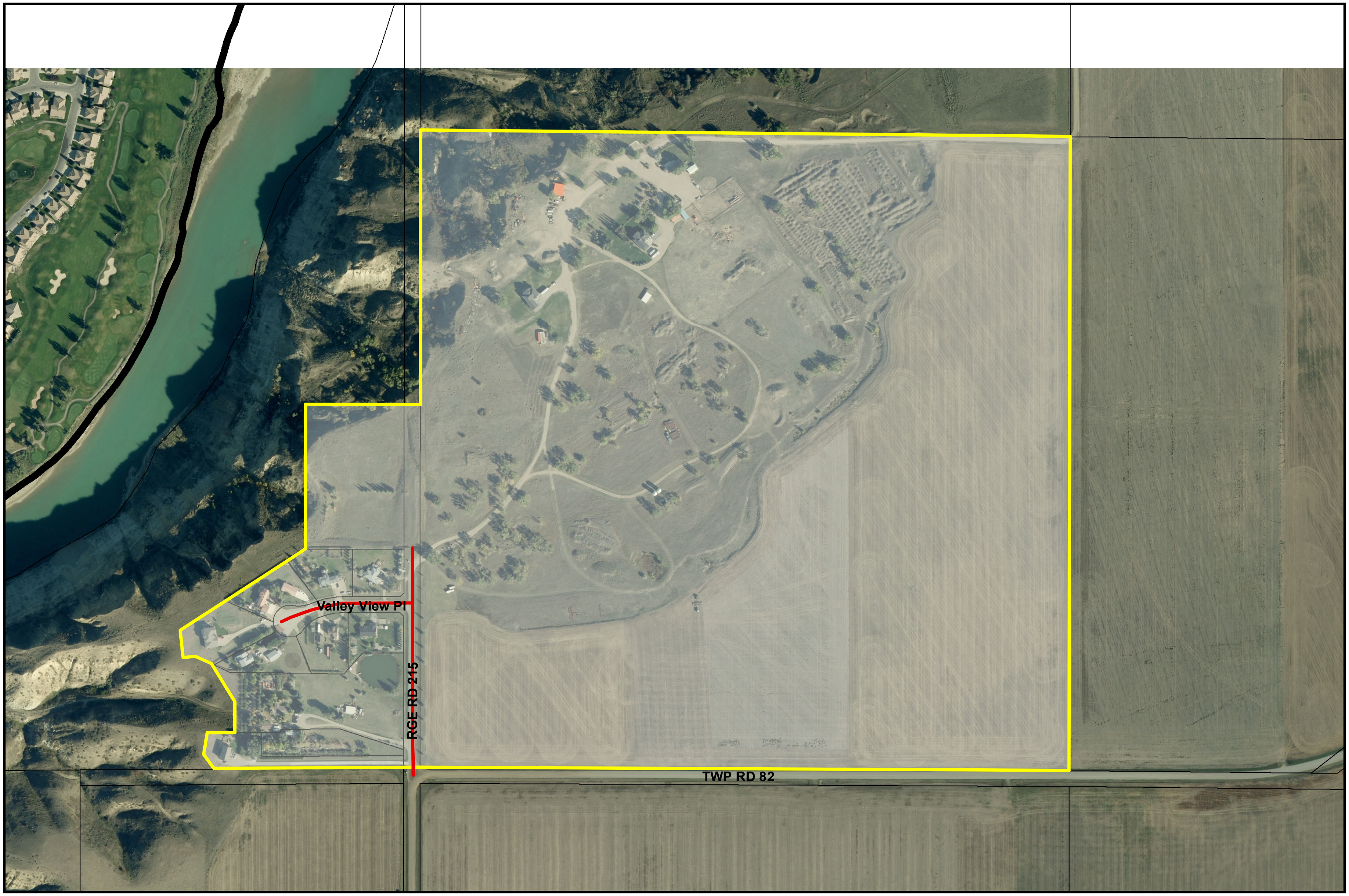
OR

- The estimated annual local improvement tax will be collected for Twenty (20) years and the total estimated amount to be levied annually against the benefiting owners is **$1,883.54** per parcel. This amount includes a current interest rate of 5.27% which will be applied annually if you elect to pay over 20 years.

Interest rates are based on the Alberta Capital Finance Authority (ACFA) and are subject to change depending on when the debenture is taken. Lethbridge County does not add any additional interest charges to these loans.

The estimated project value may change based on final project costs once completed. The total Local Improvement Tax levied to each benefiting owner will be **based on the final project costs, not the estimate** in this plan. The actual final project costs may be higher or lower than the estimated amount.

Schedule A



Local Improvement Plan: Rge Rd 21-5 and Valley View Place Local Improvement Paving Project

🟨 Local Improvement Tax Area

🟥 Proposed Roadway Upgrades

LETHBRIDGE
COUNTY

April __, 2023

(owner name)
(owner address)
(owner address)

Re: Notice of Proposed Local Area Improvement – Township Road 8-2 Paving Project

---

Dear Sir or Madam,

Lethbridge County is hereby sending you this formal Notice of the proposed Local Area Improvement and summary of the information included in the Local Improvement Plan. You are being sent this Notice because you will be responsible to pay the local improvement tax should the project proceed.

If a petition objecting to the local improvement is filed with the Chief Administrative Officer (CAO) within 30 days from the date of this letter and the CAO declares the petition to be sufficient, the council must not proceed with the local improvement.

If a sufficient petition objecting to the local improvement is not filed with the CAO within 30 days from the date of this Notice, the council may undertake the local improvement and impose the local improvement tax at any time in the 3 years following the sending of the Notices. This means that __(day)_____, (month), 2023 at 4:30 p.m. is the deadline for submitting a petition objecting to the local improvement.

Best regards,

Devon Thiele

Devon Thiele, Director of Infrastructure
dthiele@lethcounty.ca
403-328-5525

Encl.

LOCAL IMPROVEMENT PLAN

Township Road 8-2 Paving Project

Lethbridge County received a citizen initiated Local Improvement Petition Package. This means that a group of residents signed a petition to upgrade the below noted road(s) to an asphalt pavement standard. This petition was reviewed by Lethbridge County which confirmed it met the thresholds for sufficiency as determined by the Municipal Government Act (MGA). The MGA requires Lethbridge County to create a Local Improvement Plan and distribute it to all benefiting landowners.

Proposed local improvement and its location:
The proposed improvements include asphalt paving of Township Road 8-2 from Highway 5 to Range Road 21-5. This work generally includes preparation of the existing road for the placement of asphalt pavement.

The specific roadway(s) included in this project are:

- Township Road 8-2

The parcels of land in respect of which the local improvement tax will be imposed:
There are Eighteen (18) benefitting parcels of land - please see attached schedule.

The person liable to pay the local improvement tax:
Pursuant to Section 400 of the *Municipal Government Act (MGA)*, the person liable to pay the tax imposed in accordance with a local improvement tax bylaw is the owner of the parcel of land in respect of which the tax is imposed.

The tax rate will be based on:
Lethbridge County desires to have a uniform tax rate based on **each parcel** of land. Each individual parcel of land, regardless of size or length of frontage, will be liable to pay the same amount. For clarification, a benefiting parcel of land is a parcel of land that may benefit from this project.

The estimated cost of the Project:
The total cost of this project is estimated to be $ 2,107,507 (does not include GST).

The portion of the estimated cost of the local improvement proposed to be paid by:

Benefiting Parcels (revenues raised by local improvement tax):	$ 1,053,754 (50%)
Lethbridge County	$ 1,053,754 (50%)

The period over which the cost of the local improvement will be spread:
The cost of the local improvement can be paid for up front, or will be spread over Twenty (20) years.

__Financial information__:
Payment Options (these calculations are based on Eighteen (18) benefitting parcels).

- The estimated prepaid local improvement tax amount will be **$58,541.86** per parcel.

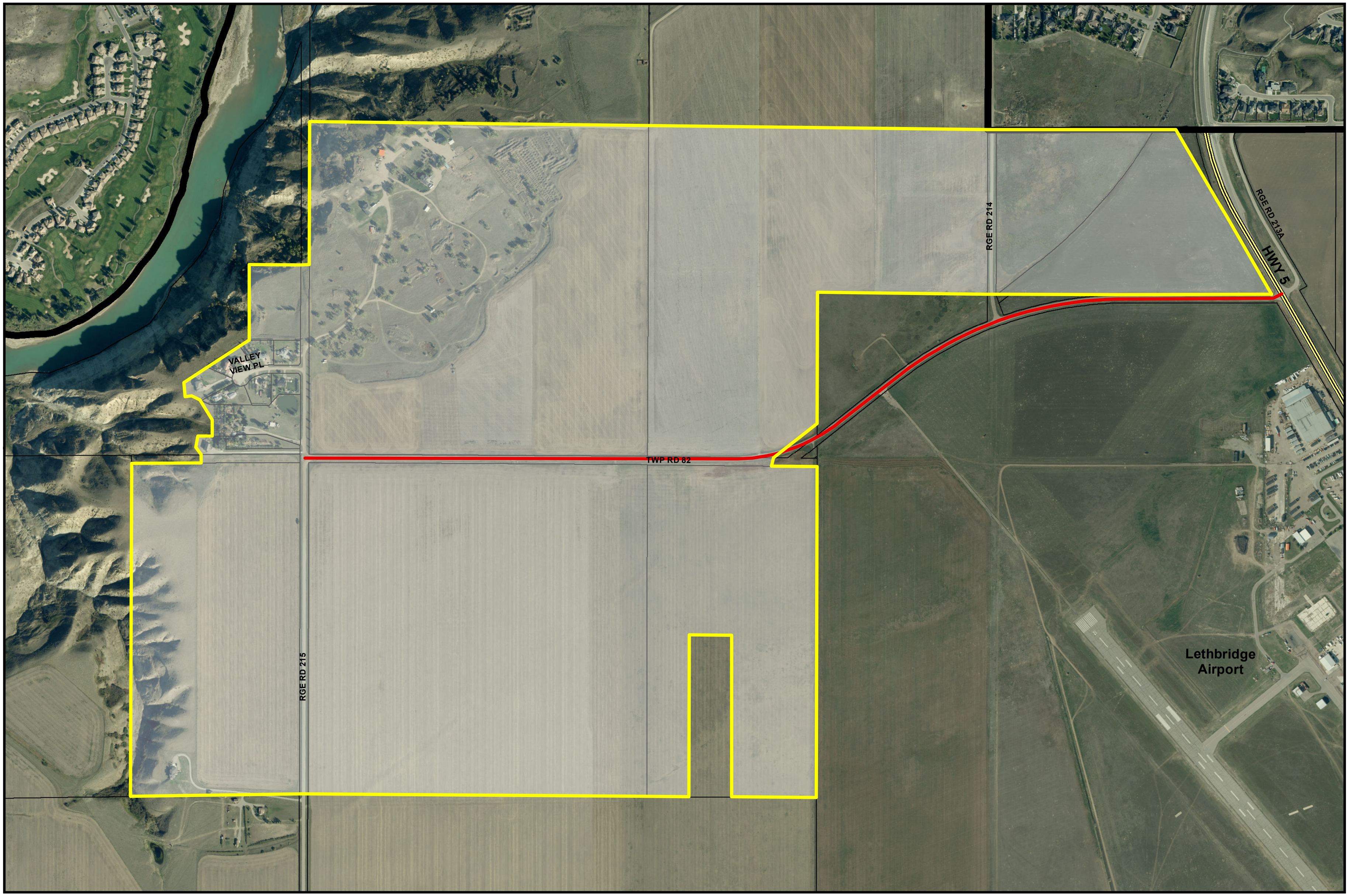
OR

- The estimated annual local improvement tax will be collected for Twenty (20) years and the total amount to be levied annually against the benefiting owners is **$4,770.84** per parcel. This amount includes a current interest rate of 5.27% which will be applied annually if you elect to pay over 20 years.

Interest rates are based on the Alberta Capital Finance Authority (ACFA) and are subject to change depending on when the debenture is taken. Lethbridge County does not add any additional interest charges to these loans.

The estimated project value may change based on final project costs once completed. The total Local Improvement Tax levied to each benefiting owner will be **based on the final project costs, not the estimate** in this plan. The actual final project costs may be higher or lower than the estimated amount.

Schedule A



Local Improvement Plan: Twp Rd 8-2 Local Improvement Paving Project

🟨 Local Improvement Tax Area

🟥 Proposed Roadway Upgrades

AGENDA ITEM REPORT

Title: 2023 Business Tax Rate Bylaw #23-011 - Third Reading
Meeting: Council Meeting - 06 Apr 2023
Department: Corporate Services
Report Author: Jennifer Place

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer — Approved - 21 Mar 2023

STRATEGIC ALIGNMENT:

☒ **Governance** ☐ **Relationships** ☐ **Region** ☐ **Prosperity**

EXECUTIVE SUMMARY:

Administration is bringing back Business Tax Rate Bylaw #23-011 (with no changes) for Council review and consideration, as the Business Tax Bylaw #23-010 was passed at the March 16th meeting. As per the *Municipal Government Act (MGA)*, a Business Tax Rate Bylaw must be passed annually following approval of the budget and the passing of a Business Tax Bylaw, which identifies the purpose and details of the business tax and the authority to levy the tax.

The Business Tax Rate Bylaw has been prepared for 2023 with no changes in content from 2022, with the exception of the year and applicable dates. Administration is submitting Bylaw #23-011 to Council for consideration of third reading. Without the passing of Bylaw #23-011, a business tax rate would not be established and therefore a business tax levy could not be applied.

RECOMMENDATION:

That Business Tax Rate Bylaw #23-011 be read a third time.

REASON(S) FOR RECOMMENDATION(S):

Council has approved the 2023 Budget which includes provisions and projections for the business tax and falls in line with the passing of the 2023 Business Tax Bylaw #23-010 passed on March 16, 2023, establishing the authority to collect a business tax.

PREVIOUS COUNCIL DIRECTION / POLICY:

The County's first Business Tax and Business Tax Rate Bylaws were passed in 2017 and have been passed on an annual basis since. The 2023 Business Tax revenues are projected to be $1.5 million as per the 2023 budget which was approved on December 15, 2022.

Council passed first and second reading of the bylaw at the March 16, 2023 Council meeting.

Consideration of third reading was defeated per the motion below.

Res. 84-2023 Councillor VanderVeen MOVED that Council consider third reading of Bylaw 23-011 being the 2023 Business Tax Rate Bylaw. DEFEATED

BACKGROUND INFORMATION:

The *Municipal Government Act (MGA)* gives municipalities the option to levy a business tax.

The following MGA sections apply:

- Section 247 – adopt the annual operating and capital budgets prior to adopting the annual business tax bylaw - *2023 Operating and Capital Budget has been passed.*
- Section 371 – pass a business tax bylaw prior to May 1st– *passed at the March 16, 2023 Council Meeting;*
- *Section 377(1) - Each Council that has passed a Business Tax Bylaw must pass a Business Tax Rate bylaw annually.*
- *Section 377(2) - The Business Tax Rate Bylaw must set the business tax rate - request to be passed at the April 6, 2023 Council Meeting;*

The 2023 Capital Budget includes business tax as a municipal revenue source and establishes the revenue requirement from business tax. The Business Tax Bylaw provides the authority for business taxes to be collected from businesses operating within Lethbridge County. The Business Tax Rate Bylaw establishes the rate at which the business tax will be levied.

The proposed 2023 Business Tax Rate Bylaw# 23-011 mirrors the 2022 Business Tax Rate Bylaw #22-005 and has been updated for the current year. If the 2023 Business Tax Rate Bylaw is approved, the 2023 Business Tax notices will be prepared and mailed out no later than June 1, 2023.

ALTERNATIVES / PROS / CONS:

Council can choose to change the business tax rate amount from $2.50 per animal unit to any denomination they are comfortable with.

PRO - If reduced, applicable businesses could receive a reduced business tax levy for 2023.

CON - If the rate is increased it would increase the 2023 Business Tax Levy amounts issued. Either option would set a precedent for the business tax rate moving forward. If reduced, amendments to the 2023 Budget would be required to determine new funding sources and/or cancel anticipated projects. As well, a funding source for the 2023 Market Access Network debenture payments would be required.

Council can choose to not approve the attached bylaw:

PRO - There would be no business tax levy issued to applicable businesses.

CON - Amendments to the 2023 Budget would be required to determine new funding sources and/or cancel anticipated projects. As well a funding source for the 2023 Market Access Network debenture payments would be required.

FINANCIAL IMPACT:

Business tax revenues are a source of funding for current and future capital fiscal plans and are specifically allocated to the maintenance and improvement of the County's paved roads and bridges.

Funds have been approved in the 2023 Capital and Operating Budgets for the Market Access Network in the amount of $2.15 million. The 2023 business tax budgeted revenue has been allocated at $1.5 million.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

Bylaw 23-011 - 2023 Business Tax Rate Bylaw

BYLAW NO. 23-011

Deleted: 22-005

OF LETHBRIDGE COUNTY
IN THE PROVINCE OF ALBERTA

2023 BUSINESS TAX RATE BYLAW

Deleted: 2

BEING A BYLAW OF LETHBRIDGE COUNTY
FOR A 2023 BUSINESS TAX RATE.

Deleted: 2

THE COUNCIL OF LETHBRIDGE COUNTY ENACTS AS FOLLOWS:

Short Title

1. This Bylaw may be cited as the “2023 Business Tax Rate Bylaw”.

Deleted: 2

Purpose

2. The purpose of the Bylaw is to provide a business tax rate for each class of business for 2023.

Deleted: 2

Business Tax Rate

3. The business tax rate for 2023 shall be as follows:

Deleted: 2

Class of Business	Dollar Rate per Unit of Storage Capacity or Floor Space
Confined feeding operations on each premises	$2.50 per animal unit
Condominium grain storage operations	$0.15 per ton
Ranch operations	$2.50 per animal unit
Dog kennels	$0.10 per square feet of floor space
Aqua Culture Operations	$100.00 per acre of ponds
Mushroom Barns	$0.10 per square feet of floor space
Apiaries	$0.10 per hive

Coming Into Force

4. This Bylaw shall come into force and effect on the date it is passed.

GIVEN first reading this ____ day of __________, 2023.

Deleted: 7th

Deleted: April

Deleted: 2

____
Reeve

____
Chief Administrative Officer

GIVEN second reading this _____ day of _______, 2023.

Deleted: 7th
Deleted: April
Deleted: 2

____
Reeve

____
Chief Administrative Officer

GIVEN third reading this ______ day of __________, 2023.

Deleted: 7th
Deleted: April
Deleted: 2

____
Reeve

____
Chief Administrative Officer

AGENDA ITEM REPORT

Title:	County Council 5 Year Donation History
Meeting:	Council Meeting - 06 Apr 2023
Department:	Administration
Report Author:	Jennifer Place

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer	Approved - 14 Mar 2023

STRATEGIC ALIGNMENT:

☒	☒	☒	☒
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

Administration has prepared a 5 year history of funding and donation requests made to and provided by Council as per council's request made at the March 2, 2023 Council Meeting.

RECOMMENDATION:

N/A

REASON(S) FOR RECOMMENDATION(S):

N/A

PREVIOUS COUNCIL DIRECTION / POLICY:

RES #53-2023 - MOVED to direct administration to bring back a report highlighting Council's donations history over the last five years.

BACKGROUND INFORMATION:

The attached list provides a 5 year history of funding/donations made by Council to community groups and individuals.

The top portion of the list includes funding items that are considered by Council on an annual basis and are included within the annual budget. As noted on the attached document, the annual contribution made to Community Centres within the County began in 2020. Prior to 2020 the Community Centre Associations could apply for project specific funds through the former Land Trust Reserve.

The bottom portion of the list are individual requests that have been approved by Council, with the majority of the funding from the Council Discretionary Reserve, when budget is not otherwise available.

ALTERNATIVES / PROS / CONS:

The attached document is for Council information only.

FINANCIAL IMPACT:

N/A

LEVEL OF PUBLIC PARTICIPATION:

☒ Inform ☐ Consult ☐ Involve ☐ Collaborate ☐ Empower

ATTACHMENTS:

5 Year Donation History
161 Donations to Community Organizations REVISED 2021

5 YEAR COUNCIL DONATION/FUNDING CONTRIBUTION HISTORY

BUDGETED	**2022**	**2021**	**2020**	**2019**	**2018**
Community Centre Annual Contribution	80,000.00	80,000.00	80,000.00		
Bursary Annual Contribution	2,000.00	2,000.00	2,000.00		
Alberta Conservation Association - 5 year commitment	1,000.00	1,000.00	1,000.00		
Picture Butte Rural Crime Watch - 5 year commitment	1,000.00	1,000.00			
Oldman Watershed Council	4,866.00	4,866.00		4,865.91	3,105.90
	88,866.00	**88,866.00**	**83,000.00**	**4,865.91**	**3,105.90**
REQUESTS					
Lethbridge & District Exhibition - Contribution toward new facility	2,000,000.00				
Community Planning - Conference Sponsorship	1,700.00	1,000.00	1,700.00	1,250.00	1,250.00
Public School Betterment Society Picture Butte - Harvest Dinner	200.00				
Picture Butte & Area Growing Project - Fundraiser Donation		500.00			
Coaldale-Lethbridge Community Growing Project - Growing Project Donation		500.00		500.00	500.00
Readymade Community Association - Indigenous Cultural Event		1,050.00			
Southern Alberta Chinese Association - Chinese New Year Sponsorship			600.00		
Lethbridge & District Exhibition - 2020 Ag Scholarship Dinner			500.00		
University of Lethbridge Agriculture Student Society - Gala Sponsorship			500.00		
Sarah Sansom-Donation to Jacob Sansom Go Fund Me			500.00		
Alberta NWT Command - Advertisement	595.24	542.86	542.86	542.86	542.86
Canadian Fallen Heros - Donation	1,000.00	1,000.00	500.00	500.00	
Lethbridge United Services Institute - Legacy of Alberta Bronze Monument				5,000.00	
Town of Coaldale - Centennial Home Coming Book				800.00	
Picture Butte Minor Hockey Association - Donation				500.00	
McNally Community Association - Citizens on Patrol					500.00
U16 Soccer Team Donation					200.00
Southern Alberta Fire Department Donation					200.00
	2,003,495	**4,593**	**4,843**	**9,093**	**3,193**
	2,092,361	**93,459**	**87,843**	**13,959**	**6,299**

NOTE - PRIOR TO 2020 COMMUNITY ASSOCIATIONS APPLIED FOR PROJECT SPECIFIC FUNDING THROUGH THE FORMER LAND TRUST GRANT

Lethbridge County Policy Handbook

EFFECTIVE: **August 1, 2013** **SECTION: 100 NO. 161 Page 1 of 7**

APPROVED BY: **County Council** **SUBJECT: Donations to Community Organizations, Programs, Events & Activities**

REVISED DATE: **September 2, 2021**

Purpose

- To establish consistent guidelines for Council to donate financial resources or provide in-kind support to community programs, organizations, events & activities.
- To provide the authority to the Chief Administrative Officer (CAO) regarding requests for donations up to a value of $200.
- To provide clear procedures for Administration and Council to provide and respond to requests for donations.

Policy Statement

Lethbridge County appreciates the positive contributions that community organizations make to the quality of life in the County, and recognizes that municipal government support may be required to help further the goals of community programs, organizations, events and activities.

Policy Guidelines and Procedures

1. Eligibility
   a. Consideration of providing support of community programs, organizations, events and activities through donations shall be limited to those that demonstrate any of the following:

      (i) a need for financial support or specific in-kind from the County;
      (ii) are held for the enjoyment and benefit of the general public;
      (iii) are hosted on a yearly basis or recognize significant milestones events; and/or
      (iv) take place within the County boundaries.

   b. The following are not eligible for support under this policy

      (i) private functions;
      (ii) capital facilities and equipment including requests for gravel donations;

(iii) youth and adult sports teams and associated programs/events, activities and school reunions; and

(iv) programs, organizations, events and activities that receive support from the County through other programs or policies.

(v) major County and inter-County events (eg. Lethbridge International Air Show).

2. Donations

a. Donations may be cash or in-kind contributions
b. In-kind contributions are donations that do not involve a direct cash contribution but instead might include providing promotional items or County services or other materials or supplies.

3. Criteria

a. In evaluating each application, decisions will be based on merit with consideration being given to the following:

(i) evidence for the need;
(ii) number of local residents served;
(iii) quality of management (established track record, proposal well thought out, etc.);
(iv) number of local volunteers;

(v) mitigation of barriers to services for people with mental and physical disabilities and minority groups;
(vi) level of involvement with other community partners;
(vii) agreement to acknowledge the County's contribution in all publicity related events or activities relating to the event.

4. Funding Allotment & Allocation
   a. The County shall support this based on the following:

      (i) Applicants are able to request a maximum amount of $500 or up to $1,000 for in-kind donations.
      No gravel will be granted. The funds will be provided from the Donations Reserve. Any donations exceeding the policy limits will be allocated from Councillor's Discretionary Reserve funds.

5. Grant Applications
   a. Applications must be completed in full and contain the following:

      (i) name, address and contact information for the organization;
      (ii) the amount of financial support being requested;
      (iii) a description of the program, event or activity and associated dates and timelines;
      (iv) a budget identifying the proposed revenue and expenditure pertinent to the request;
      (v) an explanation of how the County's support will be recognized during the program, event or activity.

(vi) completed application forms must be submitted to the County. If the application is not properly filled-out, the grant application will not be considered.
(vii) must be received at least 30 days before the date of the need for support.

b. County Council shall be the deciding authority on all applications, except for donation requests of $200 or less, which the CAO will have the authority to approve.

6. Accountability of Funds

a. Applicants will be notified in writing once a final decision on their application has been made.

b. Applicants who are provided with support pursuant to this policy shall be accountable for the expenditures of funds provided.

c. The entire amount of financial support provided must be used exclusively for the program, organization, event or activity identified in the application.

d. The community programs, activities and events must be conducted within six months of the date the donation is approved.

e. If the community programs, activities or events do not occur within the allotted time, a written letter of request for an extension must be submitted. If an extension is not received, or if an extension is not granted, the community organization or group shall return all the funds provided by the County.

f. The County's support must be recognized during the program, event or activity in the manner described in the application.

---

g. Organizations, programs, events and actives receiving support pursuant to this policy must be conducted in accordance with all applicable laws, statutes, and regulations.

7. <u>Door Prizes</u>

   a. If the request is for a door prize, silent auction item or other similar promotional item, a written request is required. Funds for door prizes, silent auctions items or promotional items of a value of a $200 or less shall be decided upon by the CAO.

--- DONATION REQUEST APPLICATION ---

Community Organization:____

Name:
____

Address: ____

Phone Number/Cell Number: _____________________________________

Board of Directors (Names & Positions): ______________________________
____
____
____

Amount of Funding Requested or Description of In-Kind Donation Requested:
$ ____

Description of Request including Timelines:
____
____
____
____

Other sources of funding: ____

Total cost of program, event or activity: $ _____________________________

Total Budget:
____
____

Description of how Lethbridge County's contribution may be recognized:

____

Other supporting information (Please attach separate sheet if necessary):

____

____

____

Name (please print)

____

Signature on behalf of Community Organization

____

Date

Phone Number: ___________________________

Email: ___________________________________

Address: ____

***** Donations made by Lethbridge County are not to be regarded as a commitment by the County to continue such donations in the future.**

AGENDA ITEM REPORT

Title: Link Pathway Committee Representation
Meeting: Council Meeting - 06 Apr 2023
Department: Administration
Report Author: Larry Randle

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer Approved - 22 Mar 2023

STRATEGIC ALIGNMENT:

☐	☒	☐	☐
Governance	**Relationships**	**Region**	**Prosperity**

EXECUTIVE SUMMARY:

The Link Pathway Committee has extended an invitation to have representation from Lethbridge County sit on the committee.

RECOMMENDATION:

That two members of Council be appointed to the Link Pathway Committee.

REASON(S) FOR RECOMMENDATION(S):

To maintain the working relationship with the Link Pathway Committee and have continued input on the link pathway project.

PREVIOUS COUNCIL DIRECTION / POLICY:

At the March 16 Council meeting the following resolution was passed by Council:

87-2023	Councillor Van Essen	MOVED to direct administration to reach out to the Link Pathway Committee to request that two Councillors sit on the committee and that administration bring back further information to the next Council meeting. CARRIED

BACKGROUND INFORMATION:

At the March 16 Council meeting a letter from the Link Pathway Committee was reviewed and further information was requested by Council.

Administration reached out to the Link Pathway Committee to determine if two members could be appointed. The Link Pathway Committee indicated they would be open to more than one member sitting on the committee and that members are added by a majority vote of the committee.

The committee meetings are typically held from 3:00 p.m. - 4:30 p.m. at Al Fritz's office at the Norland Manor on the first or second Tuesday of each month. They also allow for hybrid attendance via zoom.

ALTERNATIVES / PROS / CONS:

Alternatives:

- Council could appoint one or more members to the Link Pathway Committee.
- Council could not appoint anyone to the Link Pathway Committee.

FINANCIAL IMPACT:

No financial impact in appointing a member to the Link Pathway Committee.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

Link Pathway Committee Invitation

LINK PATHWAY

Lethbridge County Council
#100, 905 4 Ave S
Lethbridge, AB

March 8, 2023

Dear Lethbridge County Reeve & Council,

On behalf of the Link Pathway Committee, I would like to extend an invitation to Lethbridge County Council to have a representative sit on the committee. The Link Pathway Committee meets once per month. You are free to send a representative of your choosing, from council or from staff.

We hope you consider our invitation, and we look forward to working with you on the Link Pathway project.

Sincerely,

Henry Doeve
Chair
Link Pathway Committee

C/O Alvin Reinhard Fritz Architect Inc.
10 - 90001 Range Road 212 Lethbridge County,
Alberta, Canada T1J 5N9

AGENDA ITEM REPORT

LETHBRIDGE COUNTY

Title: Transmark - Request for Letter of Support
Meeting: Council Meeting - 06 Apr 2023
Department: Administration
Report Author: Larry Randle

APPROVAL(S):

Larry Randle, Interim Chief Administrative Officer — Approved - 30 Mar 2023

STRATEGIC ALIGNMENT:

Governance	Relationships	Region	Prosperity
☒	☒	☐	☐

EXECUTIVE SUMMARY:

Transmark has requested a letter of support for their Transport Canada's National Trade Corridors Fund application for their Digitization Enhancement Project which aims to enhance Transmark's inventory system and install sensors to monitor inbound and outbound rail traffic.

RECOMMENDATION:

That Lethbridge County provide a letter of support to Transmark for their Transport Canada's National Trade Corridors Fund application for their Digitization Enhancement Project.

REASON(S) FOR RECOMMENDATION(S):

Supporting this project is an opportunity to support rural Alberta's economic development and will have a significant impact on enhancing the transportation system's performance, leading to more local rural opportunities.

PREVIOUS COUNCIL DIRECTION / POLICY:

No previous direction has been provided by Council.

BACKGROUND INFORMATION:

Transmark is submitting an application to the Transport Canada National Trade Corridors Fund to enhance inventory systems and install sensors to monitor inbound and outbound rail traffic which will not only increase the efficiency of Transmark's operations but also allow Transmark to share data and insights with stakeholders. Numerous businesses, such as Canary Biofuels, Caltrax and Procor, rely on Transmark for their operations. By improving their railcar traffic insights, these customers will be better equipped to plan and schedule their operations, including truck traffic on Lethbridge County roads.

This project will improve the efficient exchange of products and create rail supply chain efficiencies at Transmark's location in Lethbridge County. As a major rail terminal and employment center strategically located in southern Alberta, Transmark plays a crucial role in the regional transportation network. The project is expected to scale with Transmark's continued growth and provide benefits to the overall rail supply chain by offering a platform to share valuable data insights, improving access to railcar storage and repair services, increasing logistics flexibility, and minimizing supply chain disruptions for the local major rail provider, CP Rail.

The grant is a small grant for digital upgrades, and Transmark hopes to apply for a larger grant from Transport Canada National Trade Corridors Fund for infrastructure in the near future.

ALTERNATIVES / PROS / CONS:

By itself, sending a general letter of support poses little risk/exposure for Lethbridge County.

Alternative:
Do not provide a letter of support to Transmark.

FINANCIAL IMPACT:

There are no direct financial implications to sending a letter of support.

LEVEL OF PUBLIC PARTICIPATION:

☒ **Inform** ☐ **Consult** ☐ **Involve** ☐ **Collaborate** ☐ **Empower**

ATTACHMENTS:

Transmark Draft Letter of Support

LETHBRIDGE COUNTY

April 6, 2023

To: Transport Canada, Ottawa

Re: Letter of Support for the Transmark Digitization Enhancement Project

Lethbridge County understands that Transmark has submitted an application under the National Trade Corridors Fund (NTCF) to obtain funding for its Digitization Enhancement Project. We believe that this project will improve the efficient exchange of products and create rail supply chain efficiencies at Transmark's location in Lethbridge County. As a major rail terminal and employment center strategically located in southern Alberta, Transmark plays a crucial role in the regional transportation network. The project is expected to scale with Transmark's continued growth and provide benefits to the overall rail supply chain by offering a platform to share valuable data insights, improving access to railcar storage and repair services, increasing logistics flexibility, and minimizing supply chain disruptions for the local major rail provider, CP Rail.

Lethbridge County believes that this project is an opportunity to support rural Alberta's economic development and will have a significant impact on enhancing the transportation system's performance, leading to more local rural opportunities. Accordingly, Lethbridge County is pleased to provide this letter of support for NTCF funding initiatives and the corresponding efforts of Transmark.

Sincerely,

____

Tory Campbell, Reeve

#100, 905- 4th Avenue South, Lethbridge, Alberta, T1J 4E4
Tel: (403) 328-5525 E-Mail: mailbox@lethcounty.ca Fax: (403) 328-5602

SCHIZOPHRENIA SOCIETY OF ALBERTA

March 27, 2023

Dear SSA Supporter,

The Schizophrenia Society of Alberta (SSA) is hosting our Annual **Strides of Hope walk on Wednesday May 24, 2023 from 12:30 pm to 1:30 pm**, in recognition of World Schizophrenia Day! We invite you to participate, to represent your constituents, and to acknowledge the need for services that support Albertans affected by schizophrenia and other severe mental illness.

SSA hosts our Strides of Hope walk in six cities across the province where our branches are located (Calgary, Camrose, Edmonton, Lethbridge, Medicine Hat, and Red Deer). Please find the attached walking route and meeting location for the Strides of Hope walk happening nearest you.

We hope that you are available to walk with us, however if you are unable to join us in person, you can still participate! Simply wear purple, snap a picture, and share it on your social media using the hashtags #WorldSchizophreniaDay and #SSAStridesofHope. Let others know you support the SSA, and feel free to add a fact or two from the list below to help us raise awareness and reduce stigma.

Schizophrenia facts:

- 1 in 100 people live with schizophrenia worldwide.
- Approximately 170,000 Albertans are affected by schizophrenia, and are parents, children, family, or friends of someone living with schizophrenia.
- 96% of individuals living with schizophrenia report experiencing discrimination in their community.
- Schizophrenia is a treatable brain disorder that is just as common as Type One Diabetes.
- The common age for schizophrenia onset is between 15 and 25. With proper medical care, understanding and support from a caring community, recovery is possible!

Be sure to tag us on social media!

- Twitter - @SchizophreniaAB
- Facebook - @SchizophreniaSocietyofAlberta
- Instagram - @Schizophrenia.Society.Alberta

With your help, we can reduce stigma, raise awareness, and show our support for Albertans who are affected by schizophrenia! Please contact Ciara Williams at (403) 986-9440 or info@schizophrenia.ab.ca to confirm your attendance or for additional information.

Warm Regards,

R. Rice

Rubyann Rice
Provincial Executive Director
Schizophrenia Society of Alberta

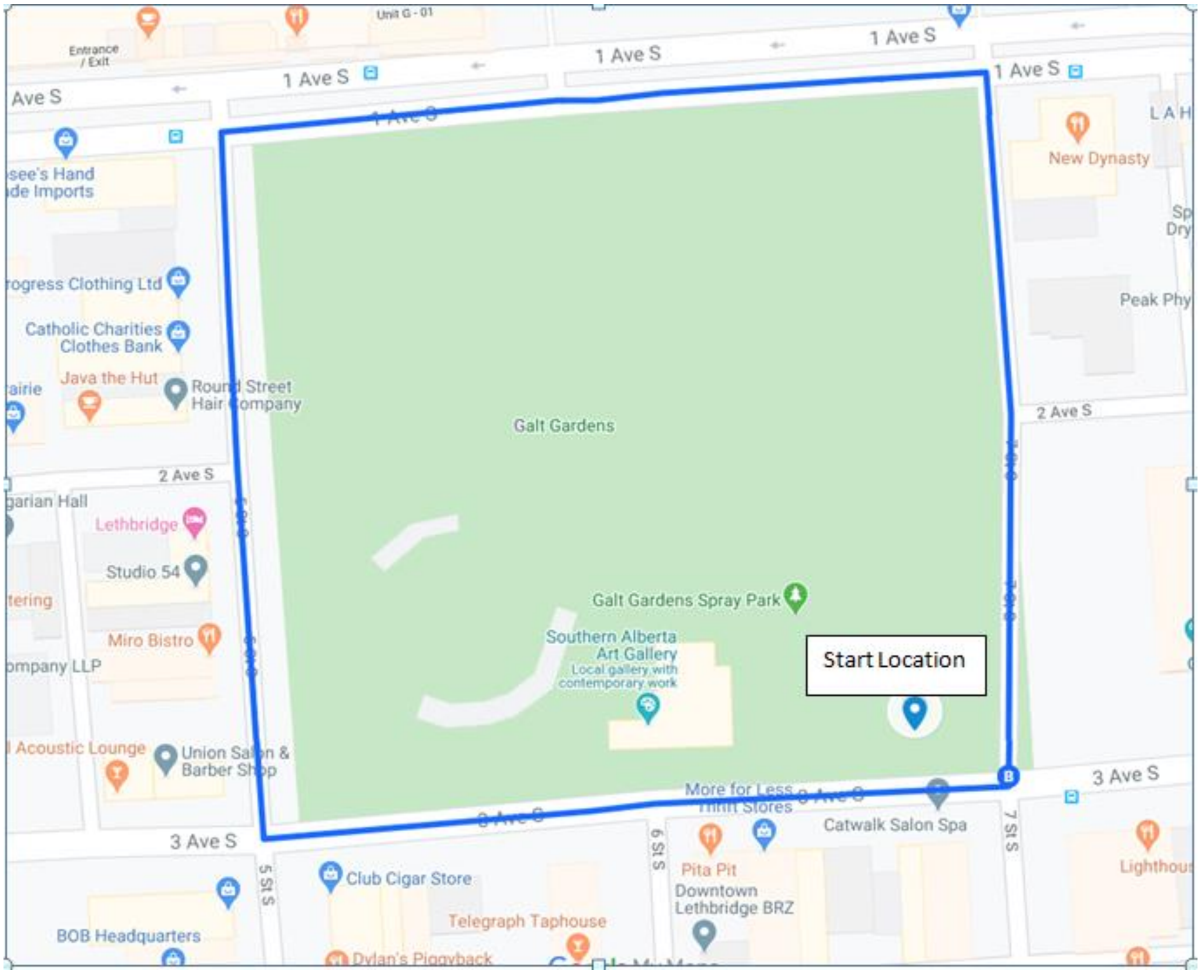
Provincial Office 4809 – 48 Avenue • Red Deer, AB • T4N 3T2
Phone (403) 986.9440 **Fax** (403) 986.9442 **Charitable Registration** 13048-5816RR0001

SSA has branches in Edmonton, Calgary, Red Deer, Camrose, Medicine Hat and Lethbridge.To get involved, volunteer or become a donor please go to **www.schizophrenia.ab.ca**

Lethbridge Strides of Hope Walk meeting location:

Galt Gardens, 601 3 Ave S, Lethbridge, AB, T1J 0H4

Walk route:



COUNCIL TO COUNCIL MEET & GREET

Come out to the Town of Picture Butte to mingle with other Councils to discuss issues in the area and how we can all work together.

WEDNESDAY, APRIL 26, 2023 AT 6:00 P.M.
607 HIGHWAY AVENUE
PICTURE BUTTE COMMUNITY CENTRE

Appetizers and beverages will be served

RSVP by April 19 to Chantel at 403-732-4555 or admin@picturebutte.ca

PICTURE BUTTE
ALBERTA

TOWN OF
BARRHEAD
ALBERTA

OFFICE OF THE MAYOR

April 3, 2023

Office of the Minister
Environment & Protected Areas
224 Legislature Building
10800 – 97 Avenue
Edmonton, AB T5K 2B6

RE: Exemption of Newspaper Media from EPR Program Revisions

Dear Minister Savage,

On March 14, Council heard from Evan Jamieson, President, Alberta Weekly Newspapers Association. Mr. Jamieson highlighted what impact changes to the EPR program would have on newspaper media.

The newspaper industry is already under extreme financial pressure due to increased costs of materials and inflation coupled with the decline in advertising spend and subscriptions. It might seem simple to discontinue physical publications in a digital world; however, digital excludes entire demographics of individuals who cannot access the internet. Newspapers serve as a source of information for those who still operate in an analogue world. A newspaper closing its doors due to additional expenses, will cut an entire demographic off from access to local, national, and international news.

We urge the UPC to follow in the footsteps of jurisdictions such as Great Britain and Ontario where newspapers have become exempt from similar EPR programs. Newspapers have multiple uses, offering a secondary purpose aside from providing information about the world. Among other uses, they are conducive as insulation for temperature sensitive products during transport and protect precious family heirlooms during a move. We urge you to recognize the importance of local papers and the impact the potential closure newspaper businesses would have on the social fabric of the communities they serve. Consider the challenges already faced. Follow in the footsteps of the Ontario government, and please exempt newspapers from the revised EPR program.

Regards,

Dave McKenzie
Mayor

cc:	Glen van Dijken, MLA Westlock-Peace River
Alberta Municipalities
All Alberta Municipalities