

Centron Real Estate and Development

Final Report

Clearwater Park TIA

November 2021





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Alexander Ho, P.Eng., PTOE

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1.0 Study Overview

1.1 Introduction

ISL was retained by Centron Real Estate and Development to undertake a Transportation Impact Assessment (TIA) for the Clearwater Park Area Structure Plan (ASP). The full build-out area of the Clearwater Park ASP is bound by Township Road 243 to the north, Highway 791 to the east, and Highway 1 to the south and west. The location of the ASP is outlined in Figure 1.1 below.

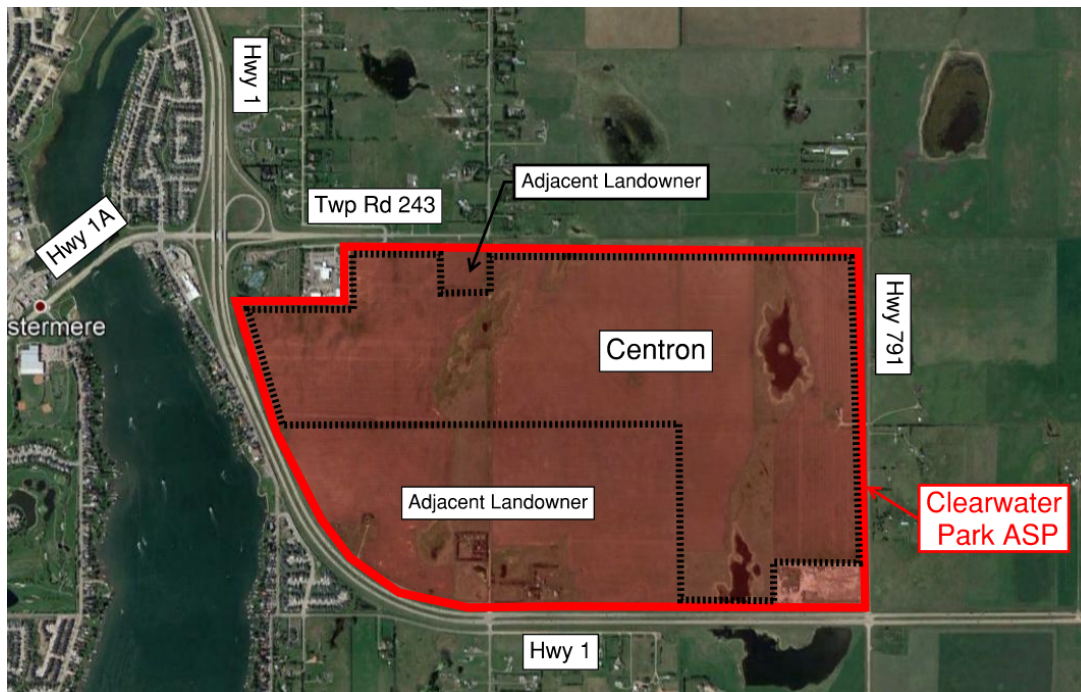


Figure 1.1: Clearwater Park TIA Study Area

The ASP is proposed to be built in 3 build-out stages; the details of the 3 stages are summarized below and shown in Figure 1.2.

- 2023 Build-Out: Stage 1 Phase 1
- 2028 Build-Out: Stage 1 Phases 1+2 / Stage 2
- 2039 Build-Out: Stage 1 Phases 1+2+3 / Stage 2 / Stage 3

The primary purpose of this TIA is to determine the transportation infrastructure required to accommodate the anticipated development the Phase 1 / 2023 Build-Out. As per the TIA scoping by the City of Chestermere, the analysis of the 2028 and 2039 Build-Outs will be undertaken at a later time in conjunction with the applications for those respective build-out areas.

The proposed land uses of the 2023 Build-Out of Clearwater Park is summarized in Table 1.1.

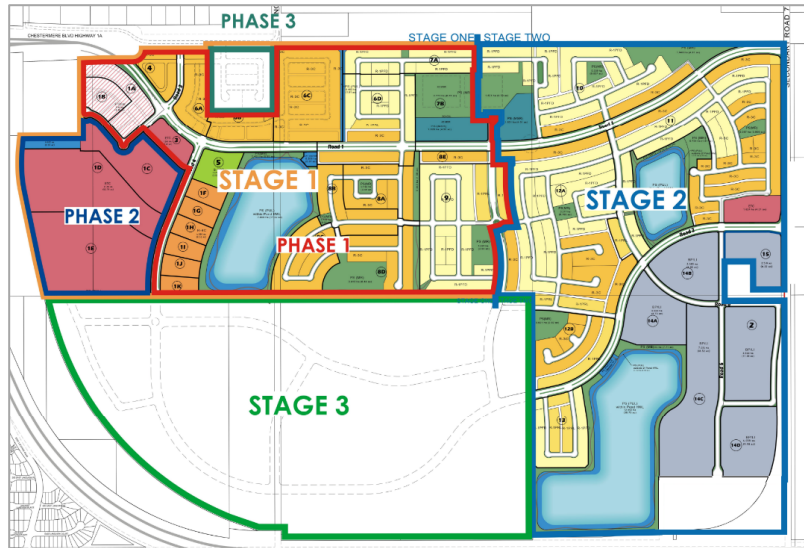


Figure 1.2: Stage and Phase Boundaries

Table 1.1: 2023 Horizon Proposed Build-Out

Stage 1 Phase 1 - Horizon Year: 2023				
Owner	Land Use		#	Unit
Centron	Commercial	Retail	15,600	Sq. Ft
		Gas Station	12	Pumps
		Drive Thru Restaurant	3,000	Sq. Ft
	Multi Family		958	Units
	Single Family		334	Units
	Senior Housing		440	Units
	School (Elementary)		300	Students
	Light Industrial & Warehouse		65,000	Sq. Ft

1.2 Study Methodology

ISL undertook the following methodology, and several adjustments were made after the writing of the original scope. The original scope of work is attached in Appendix A.

- Review background information in the study area;
- Obtain 2018 traffic count estimates at the intersections of Hwy 1 / Hwy 791, Hwy 1 / Hwy 1A, Hwy 1A / East Chestermere Dr, and Hwy 1A / West Chestermere Dr from the AT website;
- Estimate the 5-year (2023) background traffic volumes by applying a growth rate (calculated from the traffic volume history on the AT website) to the 2018 traffic data;
- Generate the 2023 Build-Out trips using the ITE Trip Generation Manual, 10th Edition; distribute trips using the travel patterns of the 2018 traffic counts;
- Add the generated 2023 Build-Out traffic to the 2023 background traffic;
- Analyze the following scenarios at the 2023 horizon:
 - Scenario 1: 2023 background network
 - Scenario 2: 2023 background network with 2023 Build-Out



- Note: It is anticipated two (2) options will be evaluated in Scenario 2: Option 1) existing unsignalized Hwy 1 / Hwy 1A interchange junctions, Option 2) With added signal and dual SBL turn at Hwy 1 / Hwy 1A west junction
- Analyze the following intersections at the 2023 horizon:
 - Hwy 1A / West Chestermere Dr
 - Hwy 1A / East Chestermere Dr
 - Hwy 1 / Hwy 1A
 - Major internal intersections
- Determine, from the analysis, the infrastructure requirements and any needed upgrades for the analyzed intersections;



2.0 Traffic Derivation

2.1 Background Trips

2.1.1 Existing Background

Existing 100th Highest Hour AM and PM peak hour traffic count estimates for the following intersections were obtained from Alberta Transportation's Traffic Mapping website:

- Highway 1A / West Chestermere Drive
- Highway 1A / East Chestermere Drive
- Highway 1 / Highway 1A
- Highway 1 / Highway 791

All counts are from 2018, and are shown in Appendix B.

Per Alberta Transportation's Highway Geometric Design Guide, Section A.4.3 outlines the methodology to calculate traffic growth rates along segments of highway. Historical traffic data obtained from Alberta Transportation was used to calculate the growth rate along Highway 1 between the intersections of Paradise Road and Highway 791. Using data from 2009 to 2018, a growth rate of 0.93% was calculated. Section A.4.3 recommends that if the calculated growth rate is less than 2%, a conservative 2.0% growth rate should be used instead; in this TIA, a 2.0% growth rate is used.

2.1.2 2023 Background

2023 Background trips were based on existing traffic counts with a 2.0% linear growth rate applied. The growth rate was applied to all turning movements at all intersections and represents the overall growth of Chestermere in the background scenario. The background traffic volumes are provided in Exhibit 2.1.

2.2 Trip Generation

The generated trips of Clearwater Park were based on trip generation rates / equations from the ITE Trip Generation Manual, 10th Edition. The trip generation rates / equations were confirmed with Alberta Transportation in the Scope of Work in Appendix A. Table 2.1 summarizes the trip generation rates for each land use. It is noted that the equation rate was used for both the light industrial and warehouse land uses.



Table 2.1: Trip Generation Rates for Clearwater Park

Use	Source	AM Peak			PM Peak		
		Rate	In%	Out%	Rate	In%	Out%
Commercial	ITE 820	0.94	62%	38%	3.81	48%	52%
Multi Family	ITE 221	0.36	26%	74%	0.44	61%	39%
Single Family	ITE 210	0.74	25%	75%	0.99	63%	37%
Light Industrial	ITE 110 (Eq)	EQ	88%	12%	EQ	13%	87%
Warehouse	ITE 150 (Eq)	EQ	77%	23%	EQ	27%	73%
Senior Housing	ITE 252	0.20	35%	65%	0.26	55%	45%
Restaurant with Drive-Thru	ITE 934	40.19	51%	49%	32.67	52%	48%
Gas Station	ITE 945	12.47	51%	49%	13.99	51%	49%
School (Elementary)*	ITE 520	0.67	54%	46%	0.17	48%	52%

Note: 50% of the students from the elementary school was assumed to remain within Clearwater Park, and no external traffic was generated for these students.

2.3 Internal Trips / Pass-By Trips / Mode Split

2.3.1 2023 Horizon Trips

The generated trips from the plan in the 2023 horizon are shown in Table 2.2 below. A 10% internal trip rate reduction was applied to all trips, except for the school; no mode split, or pass-by trip reduction was applied. For the school, only external trips were generated for 50% of the students; the remaining 50% of the students were assumed to remain within Clearwater Park and no external traffic was generated for these students. Trips generated are from Stage 1 Phase 1 of Clearwater Park only.

Table 2.2: 2023 Build-Out Generated Trips for Clearwater Park

Stage 1 Phase 1 Land Use	AM			PM		
	Total Trips	In	Out	Total Trips	In	Out
Commercial	13	8	5	54	26	28
Gas Station	135	69	66	151	77	74
Drive Thru Restaurant	109	55	53	88	46	42
Multi Family	311	81	230	379	231	148
Single Family	222	56	167	298	187	110
Senior Housing	79	28	51	103	57	46
School (Elementary)*	90	49	42	23	11	12
Light Industrial & Warehouse	44	36	8	44	11	34
Total	1,014	386	627	1,142	647	496

Note: 50% of the students from the elementary school was assumed to remain within Clearwater Park, and no external traffic was generated for these students.



2.4 2023 Build-Out Trip Distribution / Final Traffic

Trip distribution values for the 2023 horizon were calculated based on existing travel patterns. The distribution percentages used in this study are shown in Table 2.3 below. It is noted that in 2023, there is no connection to Highway 791, thus site generated trips traveling to/from Highway 1 east were assigned to the Highway 1 / Highway 1A interchange. It is noted that these vehicles were assigned as EBT and WBT traffic respectively at the Highway 1 / Highway 791 intersection.

Table 2.3: 2023 Horizon Trip Distribution

Origin / Destination	AM	PM
Highway 1A West	27%	20%
Highway 1 West	45%	44%
Highway 1 East	28%	36%
Total	100%	100%

Trips generated for the 2023 horizon were combined with trip distribution values in Table 2.3 to determine final traffic volumes for the 2023 horizon, shown in Exhibit 2.2.

Note: The 2023 volumes in Exhibit 2.2 are based on a previous version of the 2023 Build-Out site plan. In comparison, the land use generated 10% more traffic than the previous plan. Per the meeting with the City on May 18, 2021, a 10-15% increase in trips was considered acceptable, thus no update to the 2023 Build-Out exhibits and analysis was required.

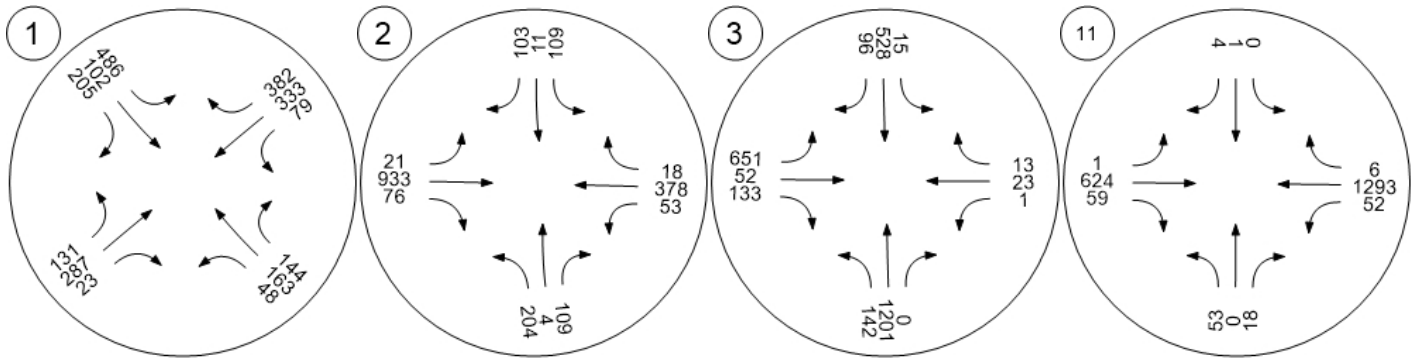
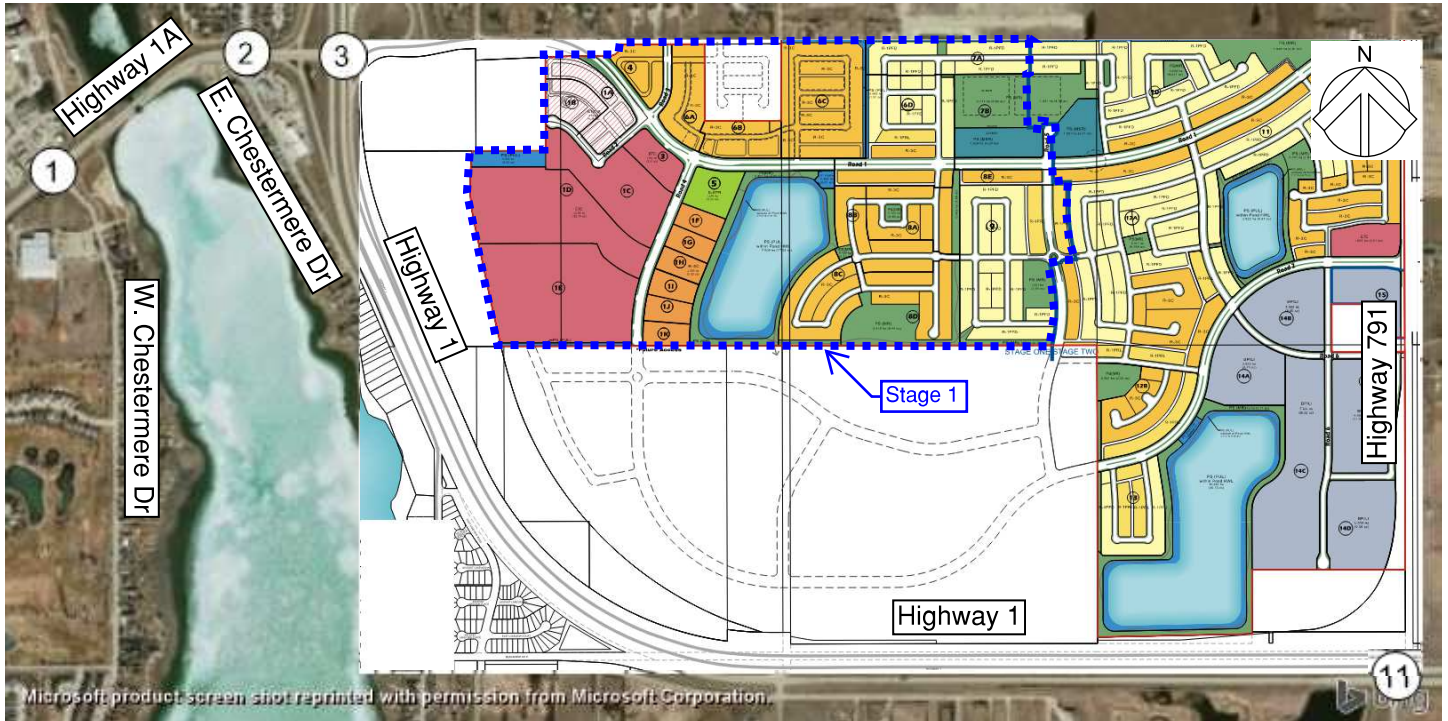
2.5 2028 and 2039 Build-Out

The traffic volume generation and analyses of the 2028 and 2039 Build-Out will be undertaken at the time of the application of these two build-out stages.

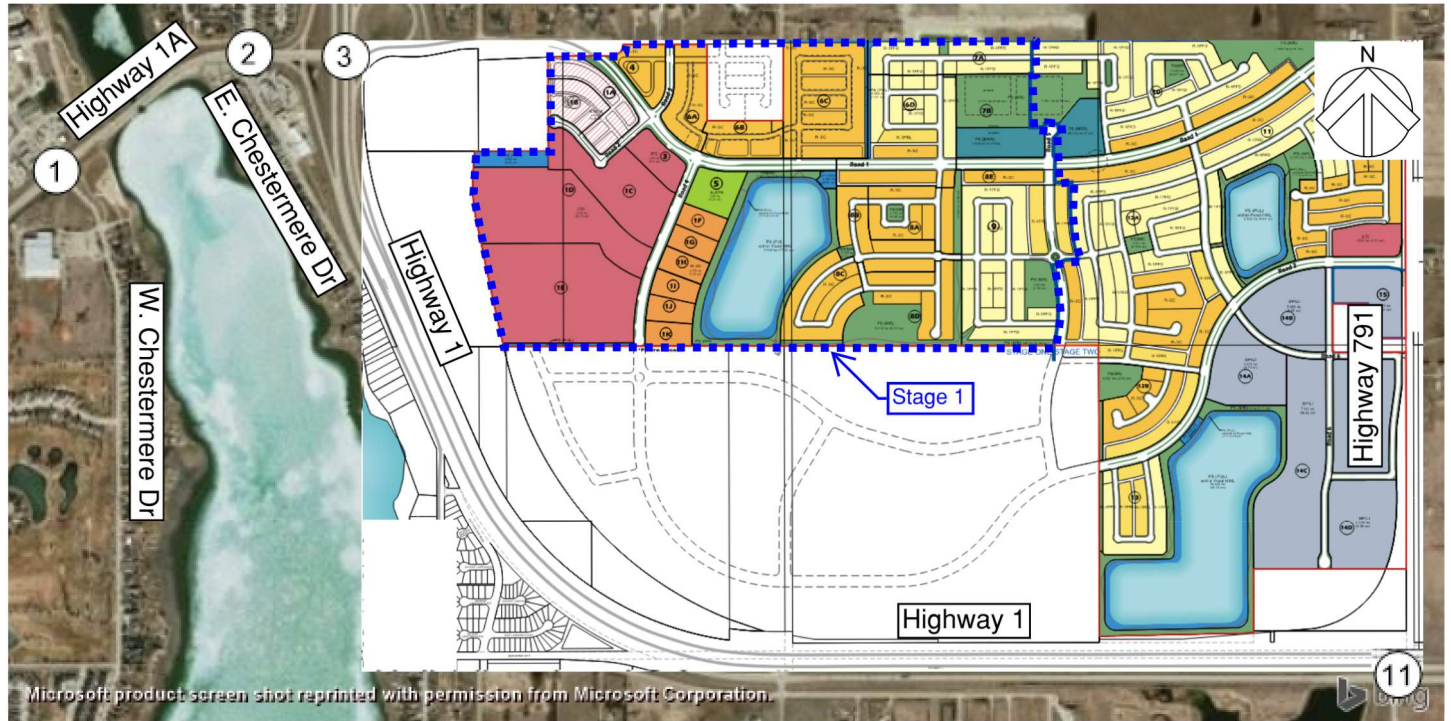
Additional policies to the Municipal Development Plan (MDP) and Area Structure Plan (ASP) were added to ensure that a TIA update will be undertaken. The policies had been accepted by City Administration and Clearwater Park has been permitted to move forward with the MDP and ASP application. The additional policies for the MDP and ASP are as follows:

- Section 4.3.1 General Transportation Policy (Page 56) of MDP:
 - 4.3.1.8: Any proposed roadway intersection with Highway 791 / Range Road 280 shall require an updated Transportation Impact Assessment. The Transportation Impact Assessment shall consider, but not be limited to, the continued viability of the Highway 791 / 1 intersection. The Transportation Impact Assessment shall be reviewed and approved by the City of Chestermere and Alberta Transportation.
- Section 6.0 Transportation (page 38) of the ASP
 - All financing and cost sharing for Transportation Improvements required for the ASP shall be negotiated and reviewed by the City of Chestermere prior to Outline Plan. All improvements associated with the Provincial highways shall be reviewed and approved by Alberta Transportation.

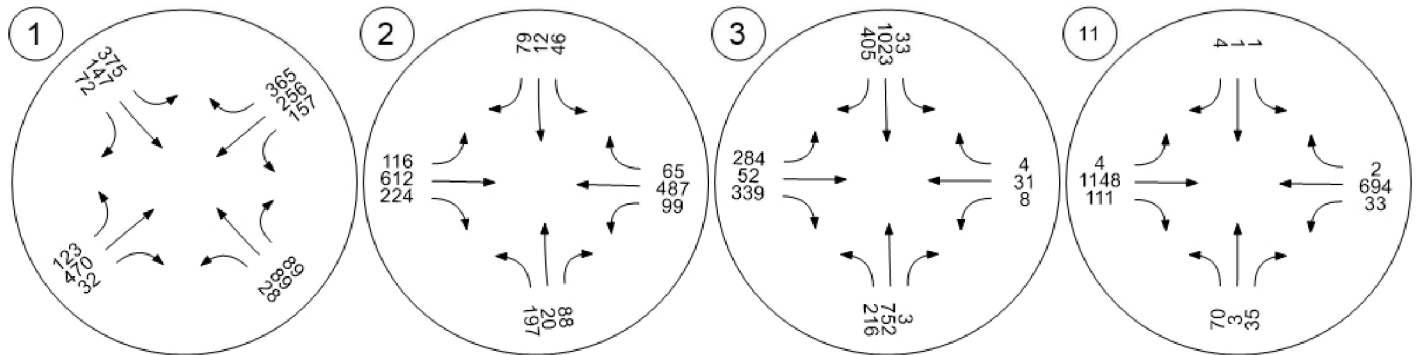
Traffic Volume - Base Volume



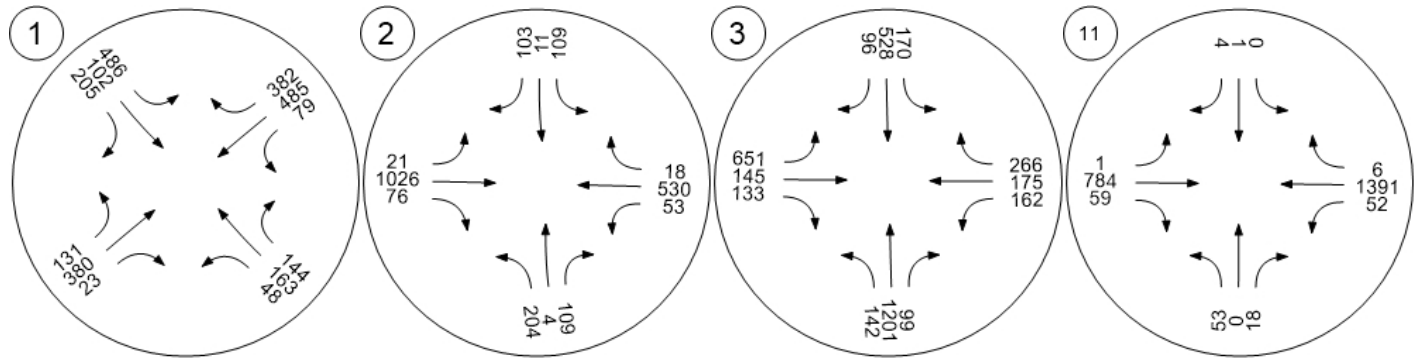
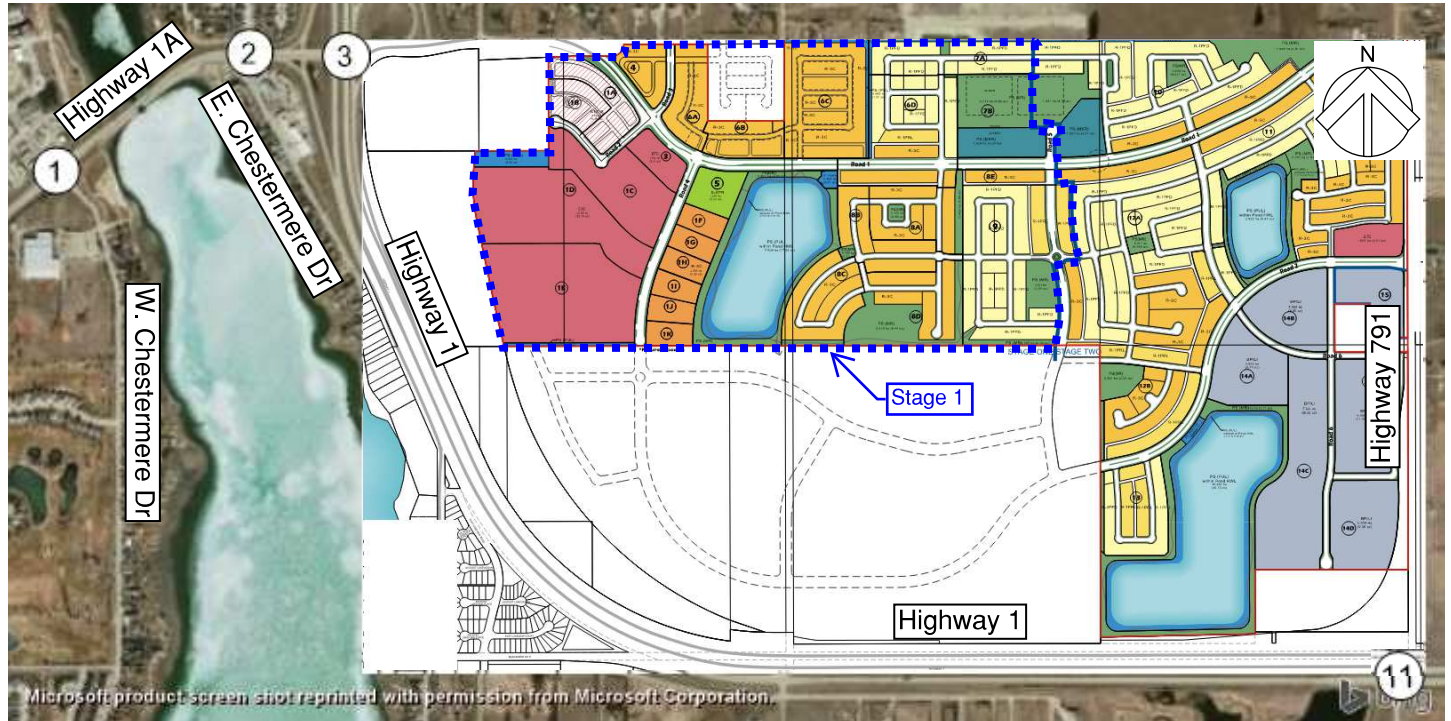
Traffic Volume - Base Volume



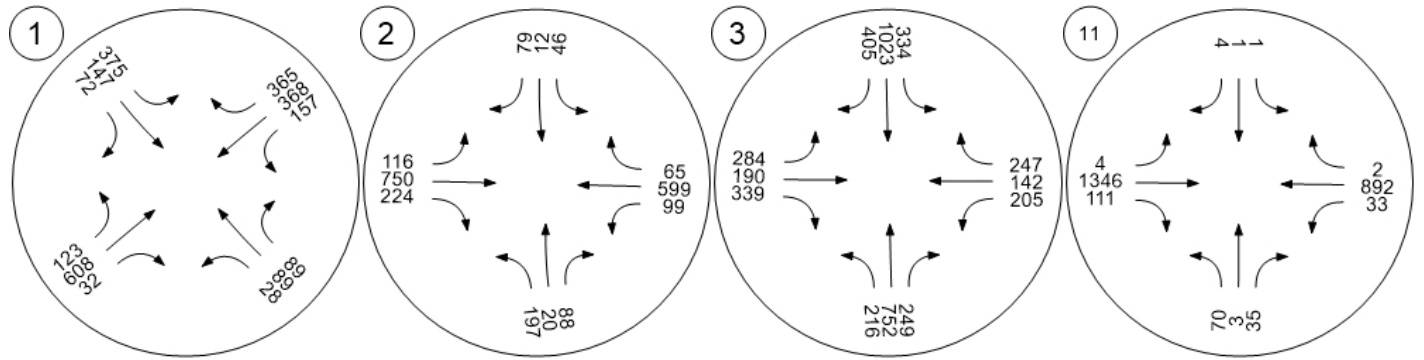
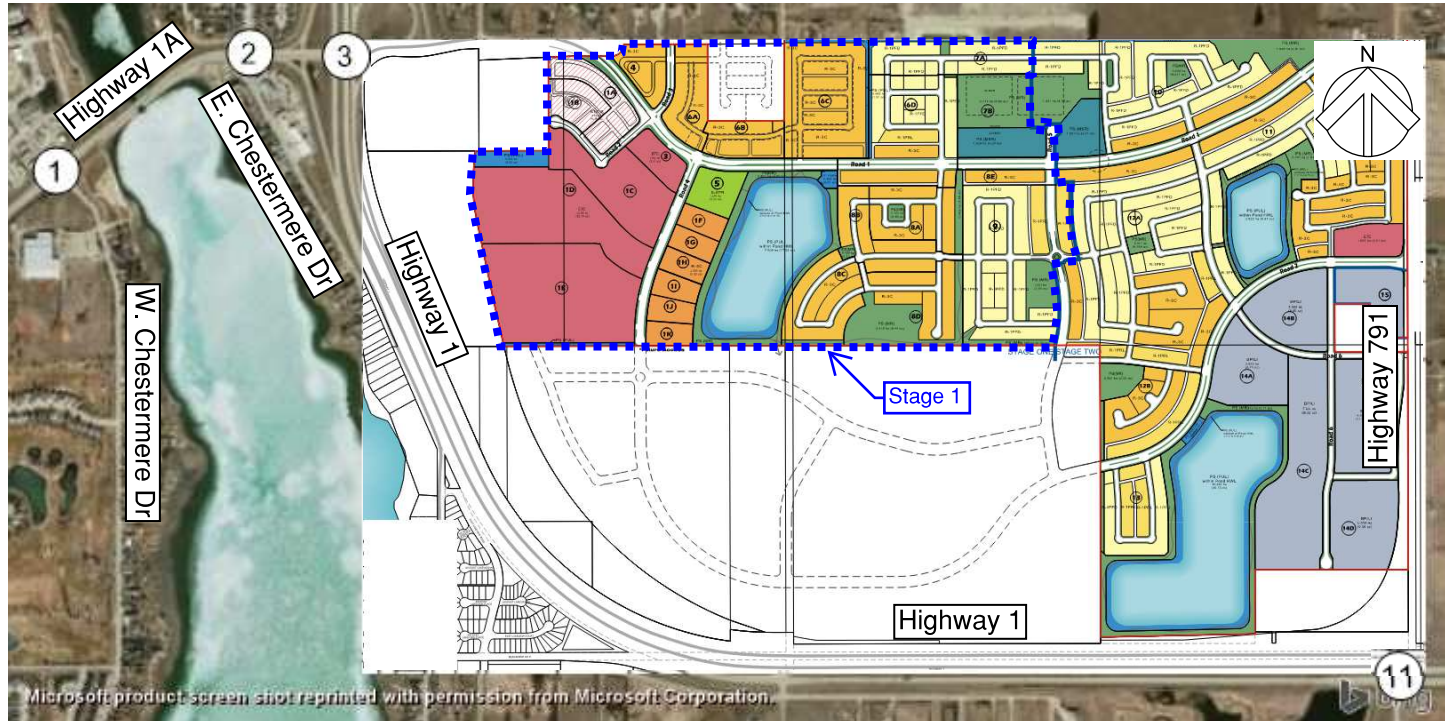
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Traffic Volume - Future Total Volume



Traffic Volume - Future Total Volume



3.0 Traffic Analysis

3.1 Synchro Analysis

The Synchro 9.2 computer analysis package was used to analyze the operational characteristics of the intersections. A Level of Operating Service (LOS) A represents the highest level of service or generally “free flowing conditions” while a LOS F generally represents a “breakdown” or “gridlock” condition in vehicular flow. There are varying degrees of delay and congestion introduced at the intersection LOS B, C, D, and E levels. LOS D is representative of “normal” peak hour congestion, while LOS E is representation of an intersection nearing its capacity. Typically, LOS E or better is the accepted standard for peak hour operations in urban areas, with LOS F accepted where limited to certain movements. From the Alberta Transportation Highway Geometric Design Guide’s (HGDG) Table A-6-1a, the maximum tolerable LOS target for a Level 4 highway in a rural or urban context is LOS D. For a Level 1 highway in a rural context, LOS B is the target LOS. LOS criteria for intersections are based on average delay per vehicle and are existing operations is summarized in Table 3.1 below.

Synchro also calculates each movement’s volume to capacity ratio (v/c). A v/c ratio of 1.0 represents an intersection or movement at full capacity with no ability to facilitate extra vehicles. Typically, a v/c ratio of 0.90 or better for all intersection movements is the accepted standard for peak hour operations in urban areas, with v/c 1.0 accepted where limited to certain movements.

Finally, Synchro also calculates the 95th percentile vehicle queue length for each intersection movement, which provides the criteria for left and right turn storage requirements. This queue length is exceeded 5% of the time, which is accepted practice for normal peak hour operation.

3.2 Existing Traffic

Existing traffic counts obtained from Alberta Transportation were analyzed using existing lane configurations. Synchro results for existing operations are shown in Table 3.1 below.

The current lane configurations are as follows and are shown in Exhibit 3.1:

- Highway 1A / West Chestermere Drive: Signalized intersection with two core lanes, with auxiliary turning lanes on the eastbound and westbound movements. Dedicated NBL and SBL with shared through-rights on both the north and south legs.
- Highway 1A / East Chestermere Drive: Signalized intersection with four core lanes, with auxiliary turning lanes on the eastbound and westbound movements. Dedicated NBL and SBR with shared thru-rights on the south leg and shared thru-left on the north leg.
- Highway 1A / Highway 1 West Junction: Stop controlled intersection with four core lanes. Channelized EBR, and SBR, with a dedicated WBL turning lane.
- Highway 1A / Highway 1 East Junction: Stop controlled intersection with four core lanes. Channelized WBR, with a dedicated EBL turning lane.
- Highway 1 / Highway 791: Stop controlled intersection with four core lanes. Dedicated EBL, EBR, and WBL turning lanes.

The existing traffic volumes were analyzed with the current lane configurations. The detailed Synchro results are summarized in Table 3.1 and shown in Appendix C. From the analyses, all movements operate within accepted guidelines.



Table 3.1: Existing Synchro Results

Intersection		AM Peak			PM Peak		
Name	Movement	v/c Ratio	LOS	Queue 95th (m)	v/c Ratio	LOS	Queue 95th (m)
Hwy 1A / W Chestermere Dr (Signalized)	EBL	0.50	C	29	0.25	B	19
	EBT	0.50	C	49	0.59	B	66
	EBR	0.04	A	0	0.04	A	0
	WBL	0.26	C	17	0.52	C	30
	WBT	0.57	C	58	0.32	B	34
	WBR	0.51	A	17	0.41	A	13
	NBL	0.21	C	12	0.11	C	8
	NBT/R	0.71	C	48	0.43	B	26
	SBL	0.80	C	66	0.65	B	49
	SBT/R	0.32	A	16	0.30	B	26
Hwy 1A / E Chestermere Dr (Signalized)	EBL	0.04	A	4	0.22	A	15
	EBT/T	0.54	B	51	0.29	A	29
	EBR	0.09	A	6	0.22	A	9
	WBL	0.22	B	10	0.21	A	14
	WBT/T	0.22	A	19	0.23	A	23
	WBR	0.02	A	1	0.07	A	5
	NBL	0.57	C	31	0.51	B	29
	NBT/R	0.22	A	11	0.20	A	9
	SBL/T	0.34	B	19	0.16	B	10
SBR	0.20	A	8	0.16	A	7	
Hwy 1A / Hwy 1 West Junction (Stop Control)	EBT/T/R	0.27	A	0	0.25	A	0
	WBL	0.00	A	0	0.01	A	0
	WBT/T	0.05	A	0	0.07	A	0
	SBL	0.10	A	2	0.42	B	16
	SBR	0.10	A	2	0.42	B	16
Hwy 1A / Hwy 1 East Junction (Stop Control)	EBL	0.40	A	15	0.14	A	5
	EBT/T	0.02	A	0	0.02	A	0
	WBT/T/R	0.01	A	0	0.01	A	0
Hwy 1 / Hwy 791 (Stop Control)	EBL	0.00	B	0	0.00	A	0
	EBT/T	0.18	A	0	0.32	A	0
	EBR	0.03	A	0	0.06	A	0
	WBL	0.05	A	1	0.06	B	1
	WBT/T/R	0.49	A	0	0.26	A	0
	NBL/T/R	0.19	C	5	0.39	D	13
	SBL/T/R	0.01	C	0	0.01	B	0

3.3 2023 Horizon

3.3.1 2023 Background

For the 2023 horizon, the existing 2018 Background traffic was grown at a linear rate of 2% for 5 years. The existing dedicated NBL and shared through/right lane at the intersection of Highway 1A / West Chestermere Drive was changed to a shared through/left lane and dedicated NBR lane. This adjustment was made to accommodate the higher right turning volumes at the intersection.

No other changes were made to the network for this scenario. Synchro results for 2023 Background is summarized in Table 3.2 below and shown in Appendix C. All intersections operate within guidelines.

Table 3.2: 2023 Background Synchro Results

Intersection		AM Peak			PM Peak		
Name	Movement	v/c Ratio	LOS	Queue 95 th (m)	v/c Ratio	LOS	Queue 95 th (m)
Hwy 1A / West Chestermere Drive (Signalized)	EBL	0.42	B	25	0.27	B	23
	EBT	0.56	C	68	0.90	D	134
	EBR	0.04	A	0	0.06	A	0
	WBL	0.21	B	16	0.62	C	33
	WBT	0.71	D	81	0.45	C	58
	WBR	0.56	A	20	0.50	A	19
	NBL/T	0.77	D	63	0.50	D	33
	NBR	0.36	A	14	0.28	A	9
	SBL	0.86	C	97	0.62	B	61
	SBT/R	0.38	A	32	0.30	B	32
Hwy 1A / East Chestermere Drive (Signalized)	EBL	0.05	A	4	0.29	B	18
	EBT/T	0.59	B	55	0.38	A	34
	EBR	0.10	A	5	0.27	A	9
	WBL	0.27	B	11	0.29	B	16
	WBT/T	0.24	A	20	0.30	A	26
	WBR	0.02	A	1	0.08	A	5
	NBL	0.61	C	36	0.56	C	32
	NBT/R	0.24	A	13	0.22	A	10
	SBL/T	0.36	B	22	0.16	B	11
	SBR	0.21	A	8	0.17	A	7
Hwy 1A / Hwy 1 West Junction (Stop Control)	EBT/T	0.22	A	0	0.10	A	0
	EBR	0.08	A	0	0.21	A	0
	WBL	0.00	A	0	0.01	A	0
	WBT/T	0.05	A	0	0.08	A	0
	SBL	0.11	A	3	0.47	B	20
	SBR	0.11	A	3	0.47	B	20
Hwy 1A / Hwy 1 East Junction (Stop Control)	EBL	0.44	A	17	0.19	A	5
	EBT/T	0.02	A	0	0.03	A	0
	WBT/T/R	0.01	A	0	0.02	A	0



Intersection		AM Peak			PM Peak		
Name	Movement	v/c Ratio	LOS	Queue 95 th (m)	v/c Ratio	LOS	Queue 95 th (m)
Hwy 1 / Hwy 791 (Stop Control)	EBL	0.00	A	0	0.00	A	0
	EBT/T	0.20	A	0	0.36	A	0
	EBR	0.04	A	0	0.07	A	0
	WBL	0.06	A	2	0.07	B	2
	WBT/T/R	0.54	A	0	0.29	A	0
	NBL/T/R	0.22	C	6	0.49	D	19
	SBL/T/R	0.02	C	0	0.02	B	0

3.3.2 2023 Background + Development

In this scenario, the generated trips of the 2023 Build-Out were added to the 2023 background volumes.

Intersection upgrades at Highway 1A / Highway 1 West Junction are necessary due to the increased SBL traffic travelling to Clearwater Park, particularly during the AM Peak. Synchro results for existing configuration exceeds thresholds, thus signalization and a dual SBL left are recommended.

The 2023 recommended lane configuration is provided in Exhibit 3.2. The Synchro results of the 2023 Background + Development scenario are summarized in Table 3.3 below and shown in Appendix C.

Note: The analysis relates to the previous version of the site plan. As noted in Section 2.4, the change in generated traffic of the latest site plan were considered within acceptable range, thus no update to the analysis was warranted.

Table 3.3: 2023 Background + Development Synchro Results

Intersection		AM Peak			PM Peak		
Name	Movement	v/c Ratio	LOS	Queue 95 th (m)	v/c Ratio	LOS	Queue 95 th (m)
Hwy 1A / W Chestermere Dr (Signalized)	EBL	0.64	D	35	0.30	B	22
	EBT	0.63	D	112	0.89	D	166
	EBR	0.04	A	0	0.05	A	0
	WBL	0.26	C	20	0.74	C	44
	WBT	0.87	D	151	0.54	C	85
	WBR	0.52	A	20	0.45	A	17
	NBL/T	0.83	E	88	0.17	D	14
	NBR	0.38	A	17	0.67	D	53
	SBL	0.84	C	138	0.79	D	95
	SBT/R	0.38	B	52	0.33	C	51
Hwy 1A / E Chestermere Dr (Signalized)	EBL	0.05	A	4	0.28	B	18
	EBT/T	0.63	B	61	0.40	A	40
	EBR	0.10	A	5	0.24	A	9
	WBL	0.30	B	11	0.30	B	17
	WBT/T	0.32	A	28	0.32	A	31
	WBR	0.02	A	2	0.07	A	5
	NBL	0.60	C	36	0.54	B	27
	NBT/R	0.24	A	14	0.22	A	9
SBL/T	0.36	B	22	0.16	B	9	

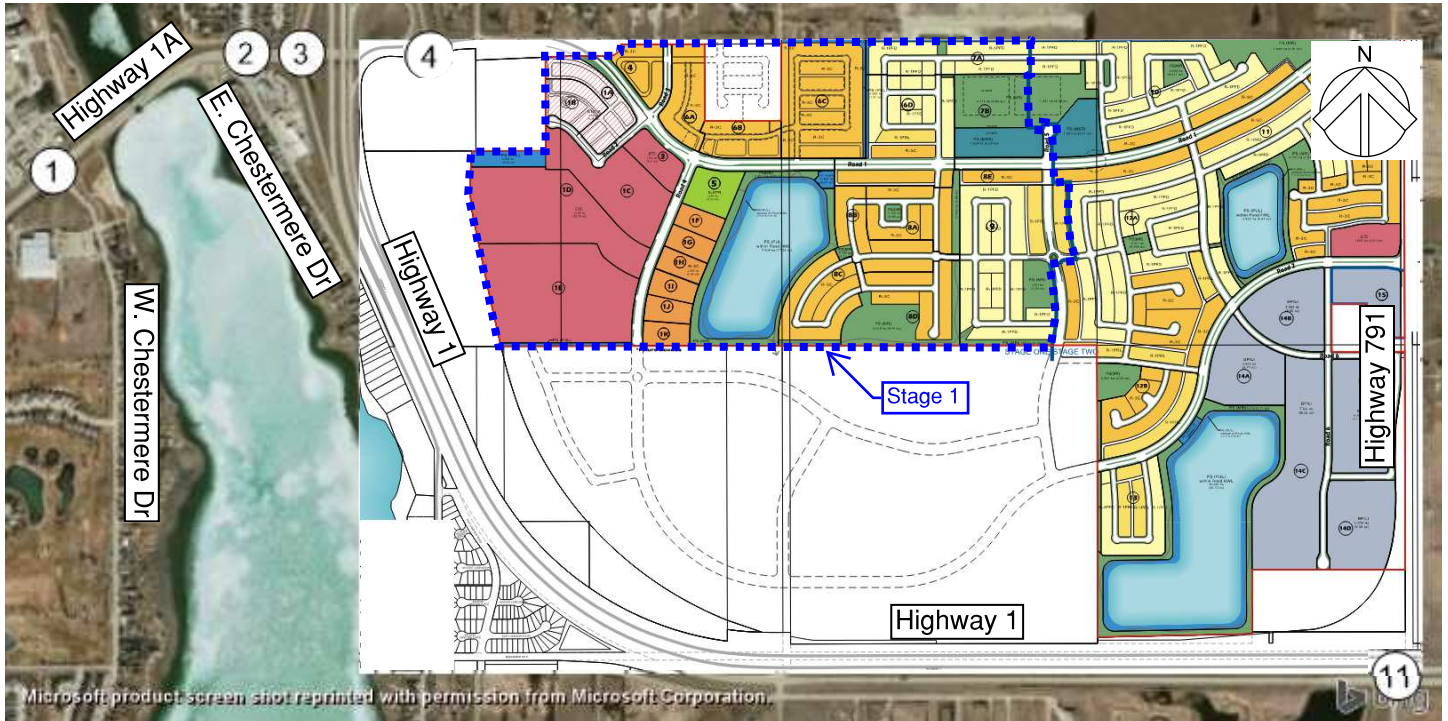
Intersection		AM Peak			PM Peak		
Name	Movement	v/c Ratio	LOS	Queue 95 th (m)	v/c Ratio	LOS	Queue 95 th (m)
Hwy 1A / Hwy 1 West Junction (Signalized)	SBR	0.21	A	8	0.16	A	6
	EBT/T	0.47	B	47	0.38	B	31
	EBR	0.16	A	8	0.44	A	14
	WBL	0.32	A	9	0.36	A	18
	WBT/T	0.14	A	10	0.19	A	15
	SBL/L	0.25	B	14	0.48	C	25
	SBR	0.24	A	9	0.63	A	18
Hwy 1A / Hwy 1 East Junction (Stop Control)	EBL	0.58	B	30	0.25	A	8
	EBT/T	0.10	A	0	0.16	A	0
	WBT/T/R	0.24	A	0	0.22	A	0
Hwy 1 / Hwy 791 (Stop Control)	EBL	0.00	B	0	0.01	A	0
	EBT/T	0.25	A	0	0.42	A	0
	EBR	0.04	A	0	0.07	A	0
	WBL	0.07	B	2	0.08	B	2
	WBT/T/R	0.58	A	0	0.37	A	0
	NBL/T/R	0.26	C	8	0.65	F	28
	SBL/T/R	0.02	C	0	0.02	C	1

From Table 3.3, all movements operate within guidelines with the exception of the northbound Highway 791 movement at Highway 1 / Highway 791. As outlined in Section 2.4, there is no traffic from Clearwater Park traveling to or added on Highway 791 as there is no connectivity within the subject lands to Highway 791; only eastbound and westbound through traffic is added onto Highway 1. A signal warrant analysis was completed (see Section 4.1) to determine the need for signalization of the intersection, which concluded that the signal is not warranted. We also note that, while the delays are at LOS F, the volume to capacity ratio and traffic queues are not critical at this location.

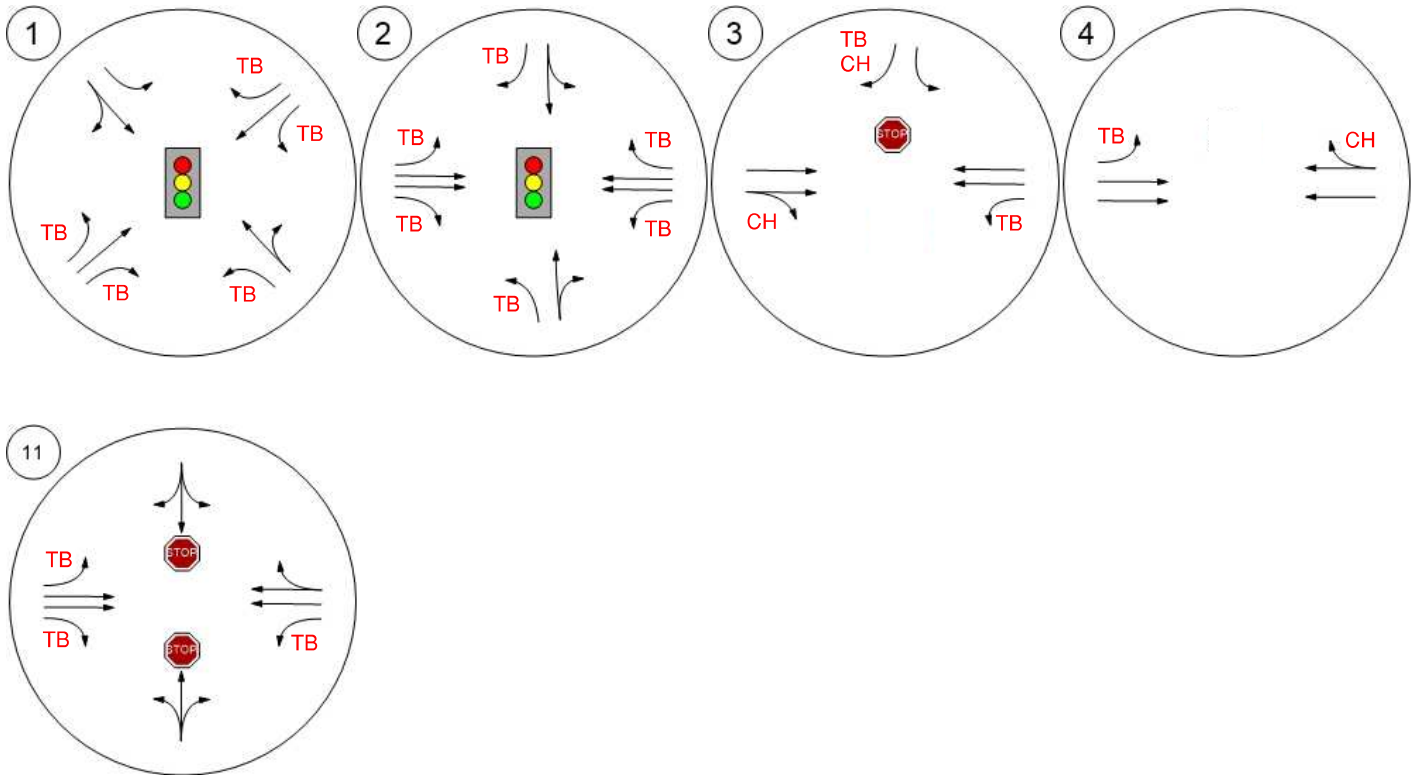
3.4 2028 and 2039 Build-Out

The analyses of the 2028 and 2039 Build-Out will be undertaken at the time of the application of these two build-out stages. Additional policies have been added to the MDP and ASP (see Section 2.4) to ensure that a TIA update will be undertaken.

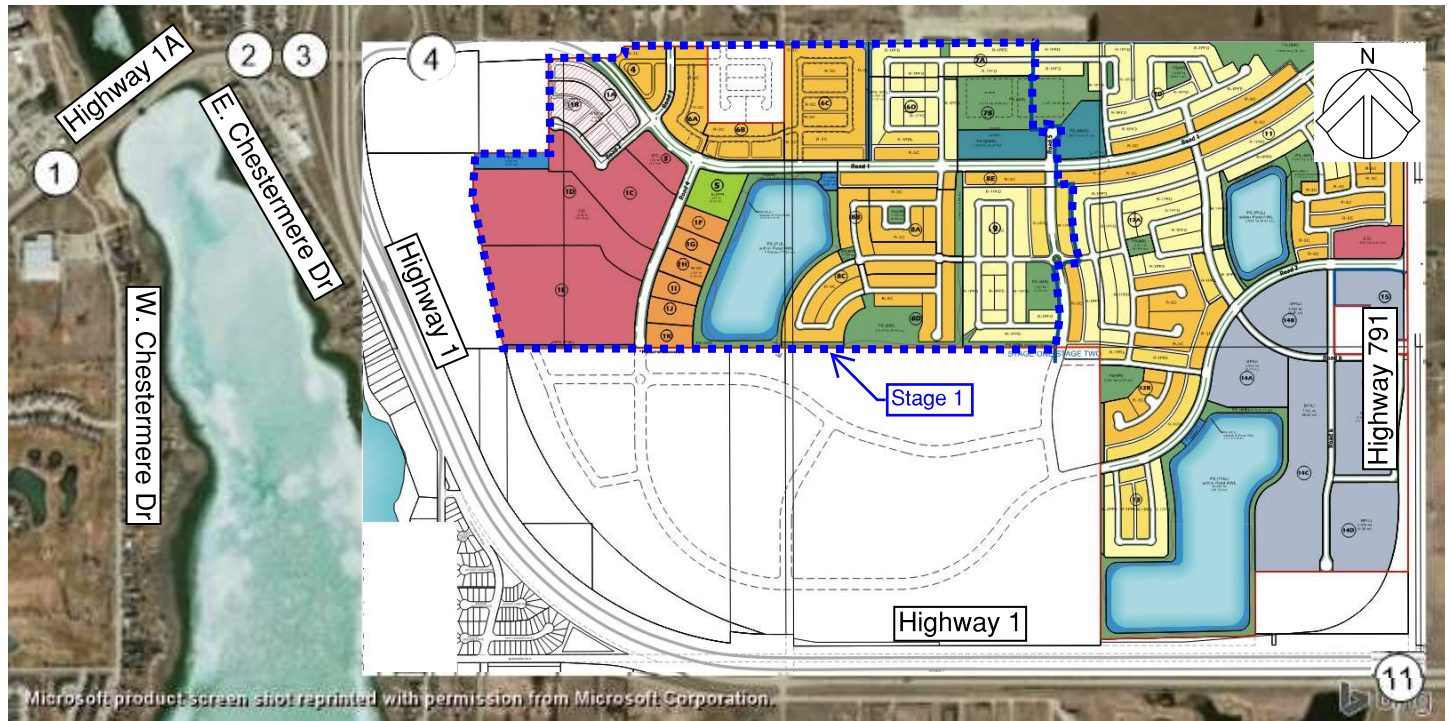
Lane Configuration and Traffic Control



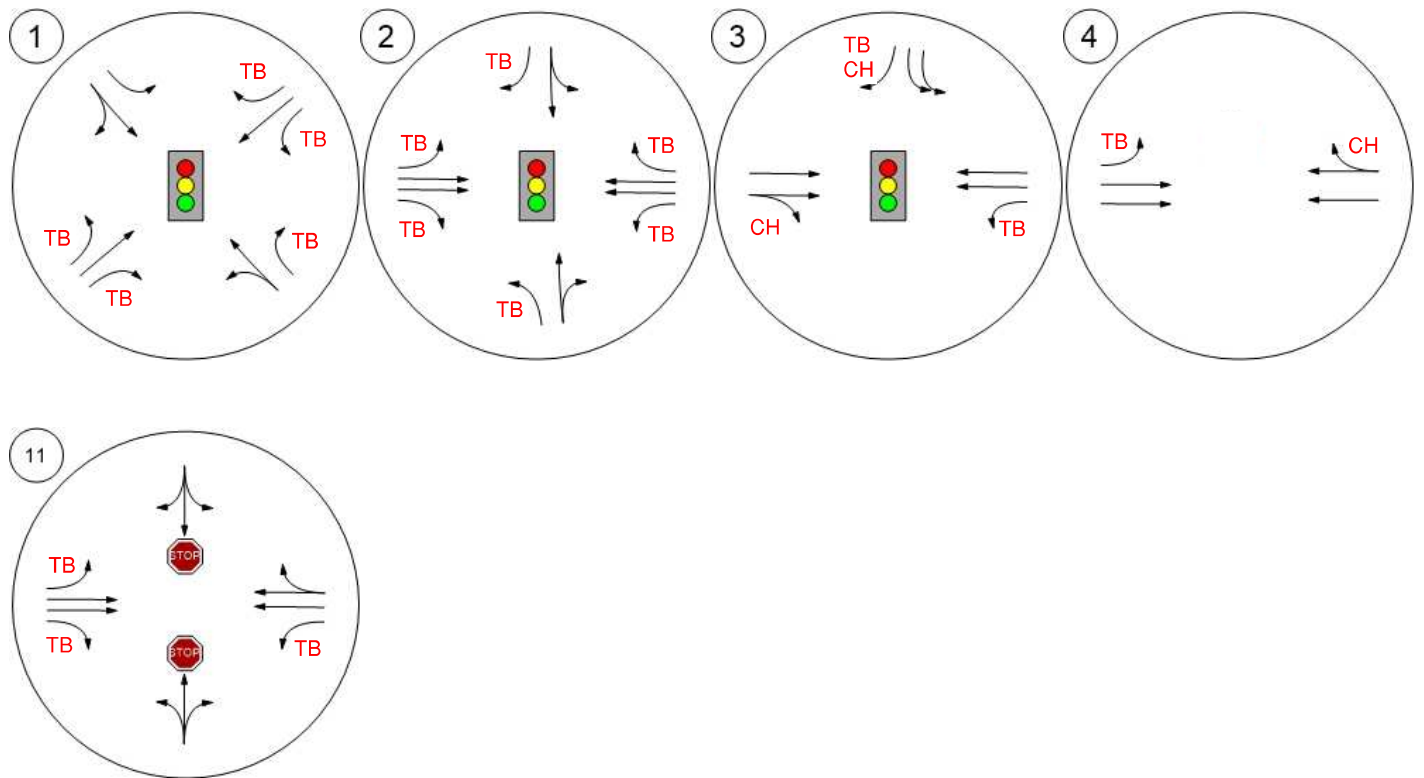
TB - Turn Bay
CH - Channelized



Lane Configuration and Traffic Control



TB - Turn Bay
CH - Channelized





■ 4.0 Signal Warrants

4.1 2023 Horizon

The Traffic Signal and Pedestrian Signal Head Warrant from Transportation Association of Canada (TAC) was used to check if a traffic signal is warranted at the intersection of Highway 1 / Highway 791 in the 2023 horizon. In the warrant, a factor of 2.61 was applied to convert the AM and PM peak volumes to 6-hour peak traffic. Using the 2023 Background + Development traffic volumes and the existing lane configurations, a warrant score of 75 was calculated, thus a signal is not warranted in this time horizon. Note: The 2023 Background scenario was not checked as the traffic volumes are lower than 2023 Background + Development.

The detailed 2023 Background + Development signal warrant is provided in Appendix D.

Note: The warrant relates to the previous version of the site plan. As noted in Section 2.4, the change in generated traffic of the latest site plan were considered within acceptable range, thus no update to the warrant was required.

5.0 Conclusions

The Clearwater Park Transportation Impact Assessment (TIA) has been undertaken for the proposed Area Structure Plan for Centron Real Estate and Development. The following provides a brief summary of the Transportation Impact Assessment completed for the development.

5.1 2023 Horizon

The 2023 Build-Out generates a total of 1,014 trips in the AM Peak and 1,142 trips in the PM Peak.

From the 2023 Background + Development scenario, the following infrastructure is required to accommodate the land use.

- Highway 1 / Highway 1A West Junction: Signalization of the intersection and the implementation of dual southbound left turn lanes.
- Highway 1 / West Chestermere Drive: Convert the northbound left to shared thru left, to accommodate high northbound right turning vehicles.

Note: The analysis of the 2023 Build-Out is based on a previous version of the 2023 Build-Out site plan. As the generated traffic volumes of the latest site plan are similar to the previous site plan, the 2023 traffic analysis do not require any update.

5.2 2028 and 2039 Build-Out

The analyses of the 2028 and 2039 Build-Out will be undertaken at the time of the application of these two build-out stages. Additional policies to the Municipal Development Plan (MDP) and Area Structure Plan (ASP) were added to ensure that a TIA update will be undertaken. The policies had been accepted by City Administration and Clearwater Park has been permitted to move forward with the MDP and ASP application. The additional policies for the MDP and ASP are as follows:

- Section 4.3.1 General Transportation Policy (Page 56) of MDP:
 - 4.3.1.8: Any proposed roadway intersection with Highway 791 / Range Road 280 shall require an updated Transportation Impact Assessment. The Transportation Impact Assessment shall consider, but not be limited to, to the continued viability of the Highway 791 / 1 intersection. The Transportation Impact Assessment shall be reviewed and approved by the City of Chestermere and Alberta Transportation.
- Section 6.0 Transportation (page 38) of the ASP
 - All financing and cost sharing for Transportation Improvements required for the ASP shall be negotiated and reviewed by the City of Chestermere prior to Outline Plan. All improvements associated with the Provincial highways shall be reviewed and approved by Alberta Transportation.



■ 6.0 Closure

ISL Engineering and Land Services Ltd. has prepared this report entitled “Clearwater Park Transportation Impact Assessment” for Centron Real Estate and Development to support the proposed Clearwater Park Area Structure Plan. The material contained herein reflects ISL’s best judgment in light of the information available at the time of the study and the level of detail normally expected at the preliminary planning stage.

Any use which a third party makes of this report or reliance on this report or decision made based on this report are the sole responsibility of such third parties. ISL accepts no responsibility for damages, if any suffered by a third party as a result of decisions made, or actions taken, based on this report.



APPENDIX
Scope of Work

A

Alan Kuan

From: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>
Sent: December 3, 2019 9:11 AM
To: Alex Ho
Cc: Alan Kuan
Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA
Attachments: Hwy 1 1A Functional Plans.zip; Hwy 791.zip

Hi Alex, I do have drawings.

Hope this works.

Trevor Richelhof, C.E.T.

Development / Planning Technologist
Construction & Maintenance, Southern Region
Alberta Transportation
Government of Alberta

Willowglen Business Park
2nd Floor, 803 Manning Road NE
Calgary AB T2E 7M8

Tel 403-297-7652
Cell 403-660-3106
Fax 403-297-7682

Trevor.Richelhof@gov.ab.ca

Applications/referrals: TransDevelopmentCalgary@gov.ab.ca

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From: Alex Ho <aho@islengineering.com>
Sent: Monday, December 02, 2019 4:24 PM
To: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>
Cc: Alan Kuan <AKuan@islengineering.com>
Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA

Hi Trevor,

Do you have the CAD plans of both the Hwy 1 / 1A interchange and Hwy 1 / 791 interchange?

Thanks,

Alex Ho, P.Eng., PTOE | Manager, Traffic Engineering
ISL Engineering and Land Services Ltd.

From: Alex Ho
Sent: June 5, 2019 5:05 PM
To: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>
Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA

Thanks Trevor, got the files.

Alex Ho, P.Eng., PTOE | *Manager, Traffic Engineering*
ISL Engineering and Land Services Ltd.

From: Alex Ho
Sent: June 5, 2019 4:07 PM
To: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>; psaik@chestermere.ca
Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA

Hi Trevor,

Yes, please send over the reports.
You can use our ftp site: <https://isl.wetransfer.com/>

Paul, any comments?

Thanks,

Alex Ho, P.Eng., PTOE | *Manager, Traffic Engineering*
ISL Engineering and Land Services Ltd.

From: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>
Sent: June 5, 2019 8:50 AM
To: Alex Ho <aho@islengineering.com>; psaik@chestermere.ca
Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA

Hi Alex

I would add in a review of the Highway 791 Functional Planning Study (completed in 2009) and the Highway 1 / 1A (Chestermere Boulevard) Functional Planning Study (2011)

I can provide copies of both studies if required. (~200mb)

Trevor Richelhof

Development / Planning Technologist
Delivery Services, Southern Region
Alberta Transportation
Government of Alberta

Willowglen Business Park
2nd Floor, 803 Manning Road NE
Calgary AB T2E 7M8

Tel 403-297-7652

Cell 403-660-3106

Fax 403-297-7682

Trevor.Richelhof@gov.ab.ca

Applications/referrals: TransDevelopmentCalgary@gov.ab.ca

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From: Alex Ho <aho@islengineering.com>

Sent: Monday, May 27, 2019 1:59 PM

To: Trevor Richelhof <Trevor.Richelhof@gov.ab.ca>; psaik@chestermere.ca

Subject: RE: Centron TIA Inquiry Regarding June 2009 Bayfield TIA

Trevor / Paul

ISL has been retained by Centron to update the Chestermere Business Park (CBP) TIA. Centron's land is 740 acres and is shown in the image below.

The original TIA was undertaken by ISL in 2009 to support of the Mountain View Conceptual Scheme (originally adopted by Rocky View County in 2007) and was later adopted by the City of Chestermere in 2010 when the City annexed the lands.

The TIA and TIA Review Responses letter can be downloaded here: <https://we.tl/t-uRI5kbKxBR> (please note the link expires in 7 days)

We would like to update the 2009 TIA in the following steps:

- Review background information in the study area.
- Obtain 2018 traffic counts at the intersections of Hwy 1 / Hwy 791, Hwy 1 / Hwy 1A, Hwy 1A / East Chestermere Dr, Hwy 1A / West Chestermere Dr from the AT website
- Estimate the 5-year (2023) background traffic volumes by applying a growth rate (calculated from the traffic volume history on the AT website) to the 2018 traffic data
- Generate Stage 1 trips using ITE Trip Generation Manual, 10th Edition; distribute trips using the travel patterns of the 2018 traffic counts
- Add the generated Stage 1 traffic to the 2023 background traffic
- Stage 1 is anticipated on the west side of the lands, with access off Hwy 1 / Hwy 1A
- Analyze the following scenarios in 2023:
 - Scenario 1: 2023 background network.
 - Scenario 2: 2023 background network with Stage 1 of the CBPB
- Analyze the following intersections in 2023:
 - Hwy 1 / Hwy 1A
 - Hwy 1A / East Chestermere Dr
 - Hwy 1A / West Chestermere Dr
 - Hwy 1A / Bayfield Road
 - Major internal intersections
- Obtain the future traffic volume and Select Zone Analysis of the subject lands from the City's TMP in the 2039 horizon
- Back-out the traffic of Centron's land to obtain the 2039 background traffic
- The full build-out of Centron's lands (740 acres) is anticipated in 2039
- Analyze the following scenarios in 2039:

- Scenario 3: 2039 background network.
- Scenario 4: 2039 background network with entire Chestermere Business Park
- Analyze the following intersections in 2023:
 - Hwy 1 / Hwy 1A
 - Hwy 1A / East Chestermere Dr
 - Hwy 1A / West Chestermere Dr
 - Hwy 1 / Hwy 791
 - Hwy 791 / Bayfield Blvd
 - Hwy 791 / Bayfield Dr
 - Major internal intersections
- Determine, from the analysis, the capacity requirements and configuration for the analyzed intersections.
- Confirm internal road classifications based on projected daily traffic volumes and environmental capacity guidelines.



Alex Ho, P.Eng., PTOE | Manager, Traffic Engineering
ISL Engineering and Land Services Ltd.
 4015 - 7 Street SE
 Calgary, AB T2G 2Y9
 T: 403.254.0544 F: 403.254.9186 C: 403.605.5531
aho@islengineering.com islengineering.com

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APPENDIX
2018 Alberta Transportation Count Data

B

Turning Movement Summary Diagram

Reference No.: 85212

Intersection of:

1A & W CHESTRMERE DR 15-24-28-403500200

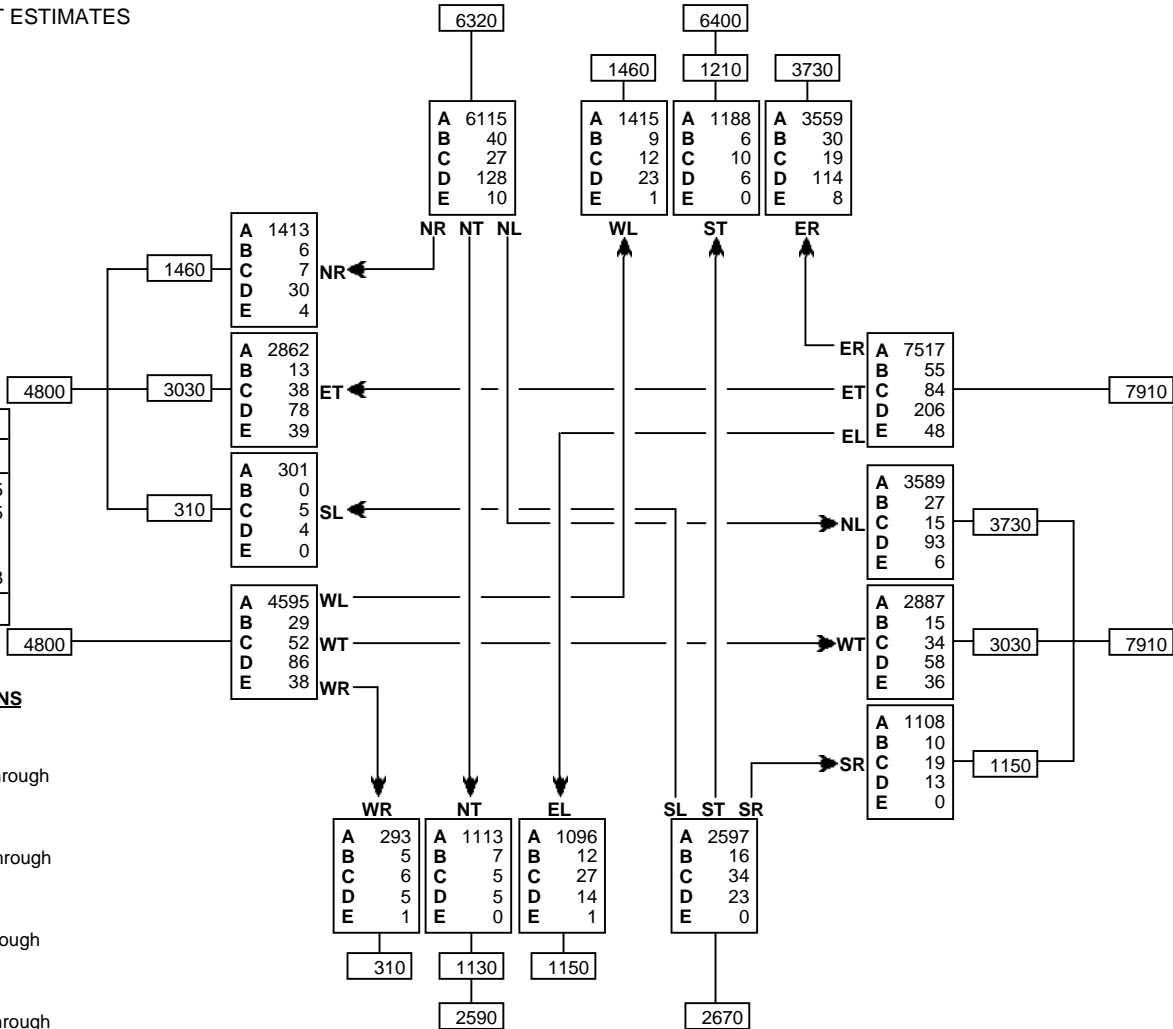
2018 AADT / ASDT ESTIMATES

North On WndmrBlvd		
Vehicle Type	Vol	%
A: Passenger Vehicle	12277	96.5
B: Recreational Vehicle	85	0.7
C: Bus	68	0.5
D: Single Unit Truck	271	2.1
E: Tractor Trailer Unit	19	0.1
ASDT	13140	AAADT 12720

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	9171	95.5
B: Recreational Vehicle	48	0.5
C: Bus	102	1.1
D: Single Unit Truck	198	2.1
E: Tractor Trailer Unit	81	0.8
ASDT	9920	AAADT 9600

East On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	15101	95.5
B: Recreational Vehicle	107	0.7
C: Bus	152	1.0
D: Single Unit Truck	370	2.3
E: Tractor Trailer Unit	90	0.6
ASDT	16340	AAADT 15820

South On Chstrmr Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	5099	96.9
B: Recreational Vehicle	40	0.8
C: Bus	72	1.4
D: Single Unit Truck	47	0.9
E: Tractor Trailer Unit	2	0.0
ASDT	5430	AAADT 5260



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

- AAADT: Annual Average Daily Traffic
Average daily traffic expressed as vehicles per day for period of January 1 to December 31 (365 days)
- ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day for period of May 1 to September 30 (153 days)

Turning Movement Summary Diagram

Reference No.: 85212

Intersection of:

1A & W CHESTRMERE DR 15-24-28-403500200

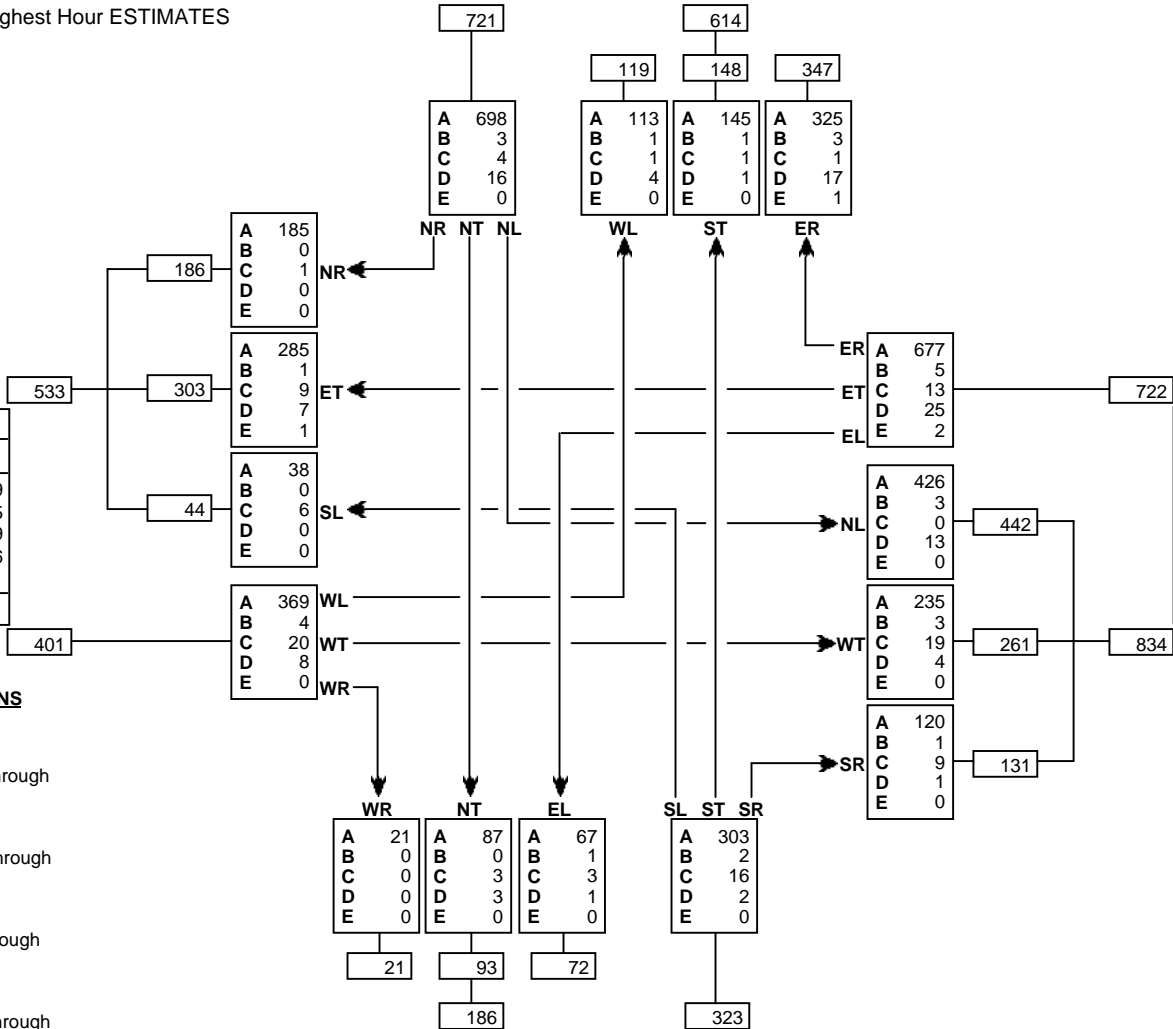
2018 a.m. 100th Highest Hour ESTIMATES

North On WndmrBlvd		
Vehicle Type	Vol	%
A: Passenger Vehicle	1281	96.0
B: Recreational Vehicle	8	0.6
C: Bus	7	0.5
D: Single Unit Truck	38	2.8
E: Tractor Trailer Unit	1	0.1
Total	1335	

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	877	93.9
B: Recreational Vehicle	5	0.5
C: Bus	36	3.9
D: Single Unit Truck	15	1.6
E: Tractor Trailer Unit	1	0.1
Total	934	

East On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1458	93.7
B: Recreational Vehicle	12	0.8
C: Bus	41	2.6
D: Single Unit Truck	43	2.8
E: Tractor Trailer Unit	2	0.1
Total	1556	

South On Chstrmr Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	478	93.9
B: Recreational Vehicle	3	0.6
C: Bus	22	4.3
D: Single Unit Truck	6	1.2
E: Tractor Trailer Unit	0	0.0
Total	509	



TURNING MOVEMENT ABBREVIATIONS

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- 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 Summary Diagram

Reference No.: 85212

Intersection of:

1A & W CHESTRMERE DR 15-24-28-403500200

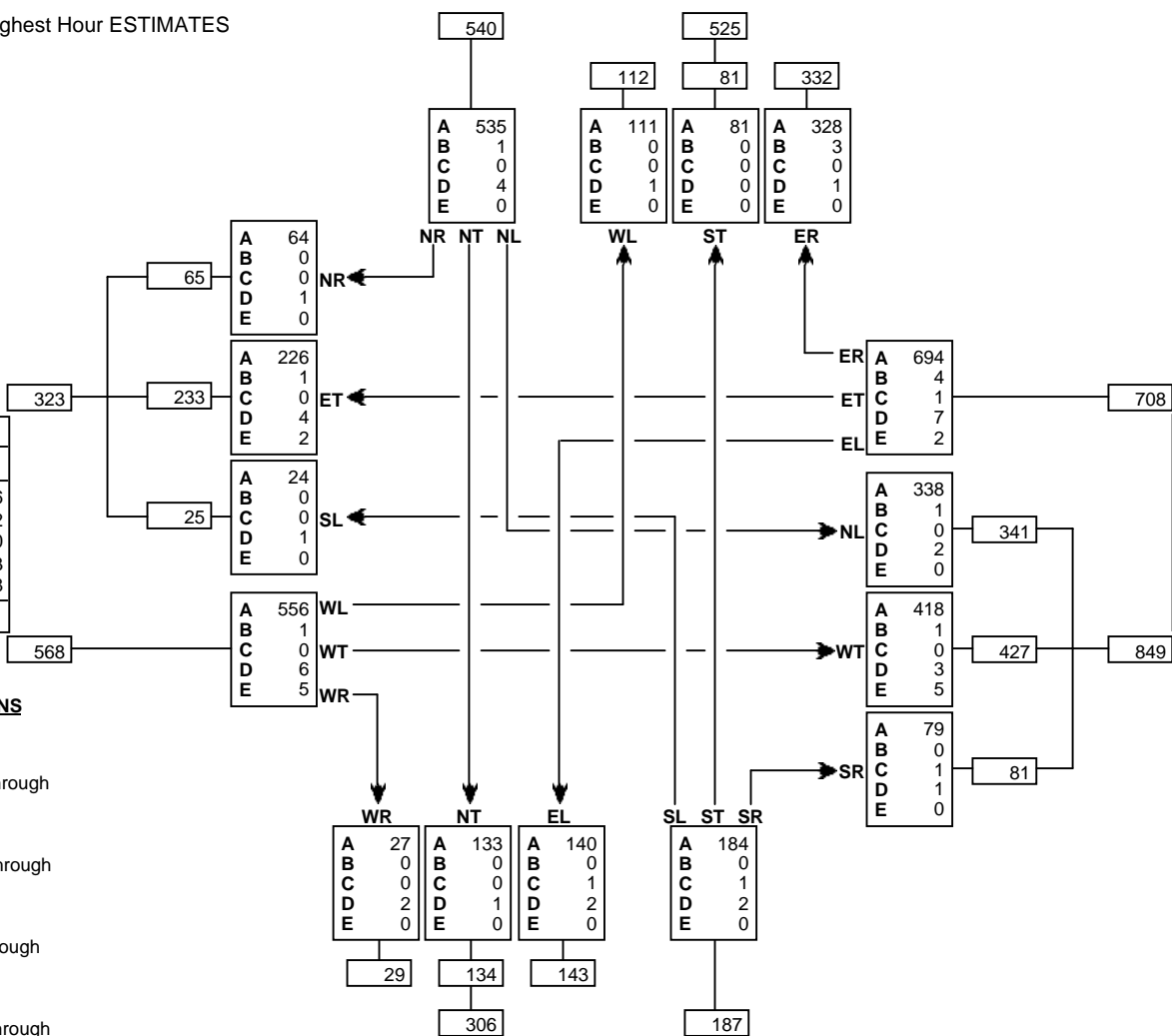
2018 p.m. 100th Highest Hour ESTIMATES

North On Wndmr Blvd		
Vehicle Type	Vol	%
A: Passenger Vehicle	1055	99.1
B: Recreational Vehicle	4	0.4
C: Bus	0	0.0
D: Single Unit Truck	6	0.6
E: Tractor Trailer Unit	0	0.0
Total	1065	

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	870	97.6
B: Recreational Vehicle	2	0.2
C: Bus	0	0.0
D: Single Unit Truck	12	1.3
E: Tractor Trailer Unit	7	0.8
Total	891	

East On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1529	98.2
B: Recreational Vehicle	6	0.4
C: Bus	2	0.1
D: Single Unit Truck	13	0.8
E: Tractor Trailer Unit	7	0.4
Total	1557	

South On Chstrmr Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	484	98.2
B: Recreational Vehicle	0	0.0
C: Bus	2	0.4
D: Single Unit Truck	7	1.4
E: Tractor Trailer Unit	0	0.0
Total	493	



TURNING MOVEMENT ABBREVIATIONS

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- 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 Summary Diagram

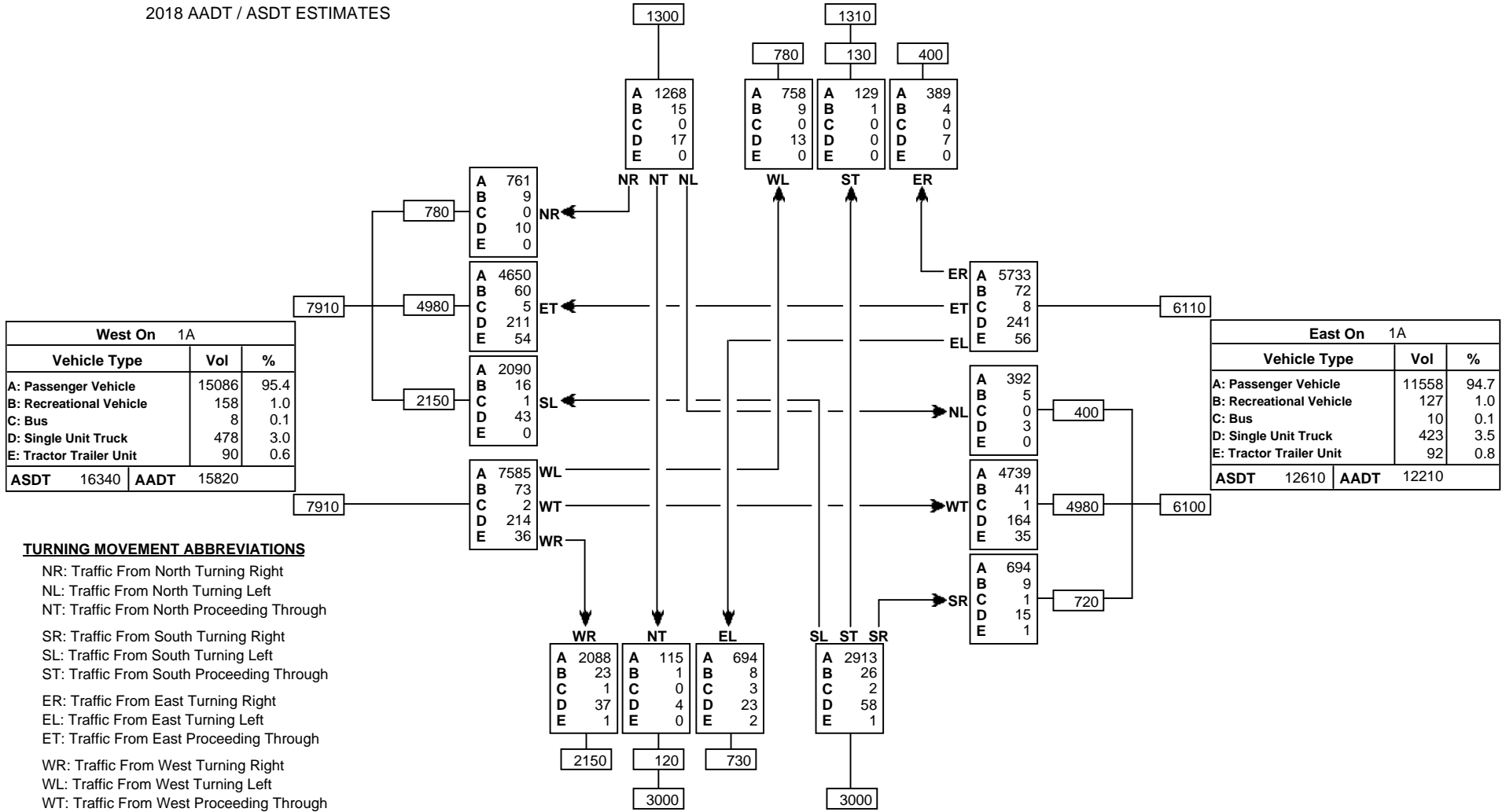
Reference No.: 86217

Intersection of:

1A & E CHESTERMERE DR 14-24-28-415500000

2018 AADT / ASDT ESTIMATES

North On Cove Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	2544	97.5
B: Recreational Vehicle	29	1.1
C: Bus	0	0.0
D: Single Unit Truck	37	1.4
E: Tractor Trailer Unit	0	0.0
ASDT	2700	AAADT
		2610



TURNING MOVEMENT ABBREVIATIONS

- NR: Traffic From North Turning Right
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- 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

- AAADT: Annual Average Daily Traffic
Average daily traffic expressed as vehicles per day for period of January 1 to December 31 (365 days)
- ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day for period of May 1 to September 30 (153 days)

South On EChstrmDr		
Vehicle Type	Vol	%
A: Passenger Vehicle	5810	96.8
B: Recreational Vehicle	58	1.0
C: Bus	6	0.1
D: Single Unit Truck	122	2.0
E: Tractor Trailer Unit	4	0.1
ASDT	6200	AAADT
		6000

Turning Movement Summary Diagram

Reference No.: 86217

Intersection of:

1A & E CHESTERMERE DR 14-24-28-415500000

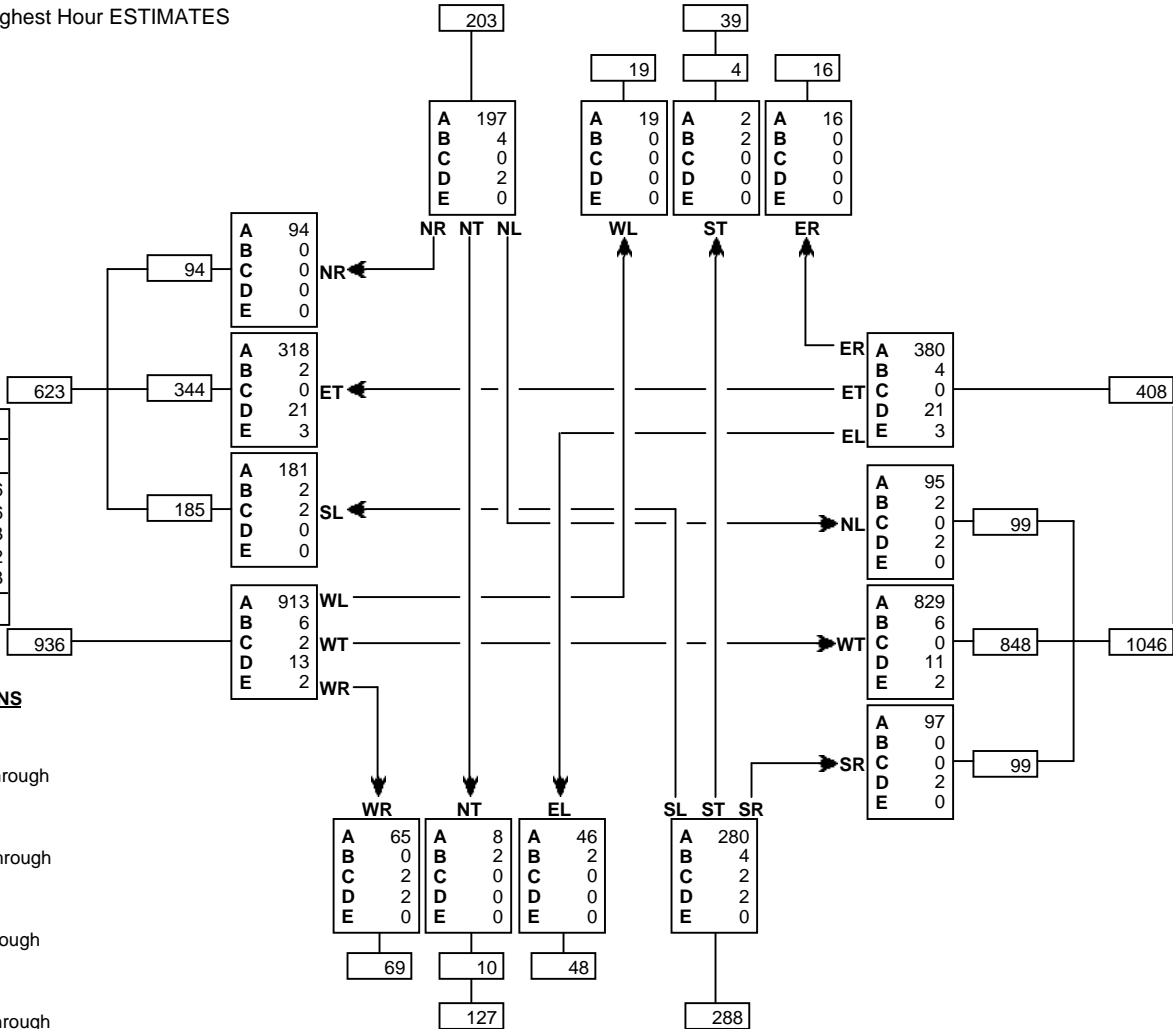
2018 a.m. 100th Highest Hour ESTIMATES

North On Cove Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	234	96.7
B: Recreational Vehicle	6	2.5
C: Bus	0	0.0
D: Single Unit Truck	2	0.8
E: Tractor Trailer Unit	0	0.0
Total	242	

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1506	96.6
B: Recreational Vehicle	10	0.6
C: Bus	4	0.3
D: Single Unit Truck	34	2.2
E: Tractor Trailer Unit	5	0.3
Total	1559	

East On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1401	96.4
B: Recreational Vehicle	12	0.8
C: Bus	0	0.0
D: Single Unit Truck	36	2.5
E: Tractor Trailer Unit	5	0.3
Total	1454	

South On EChstrmrDr		
Vehicle Type	Vol	%
A: Passenger Vehicle	399	96.1
B: Recreational Vehicle	8	1.9
C: Bus	4	1.0
D: Single Unit Truck	4	1.0
E: Tractor Trailer Unit	0	0.0
Total	415	



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 Summary Diagram

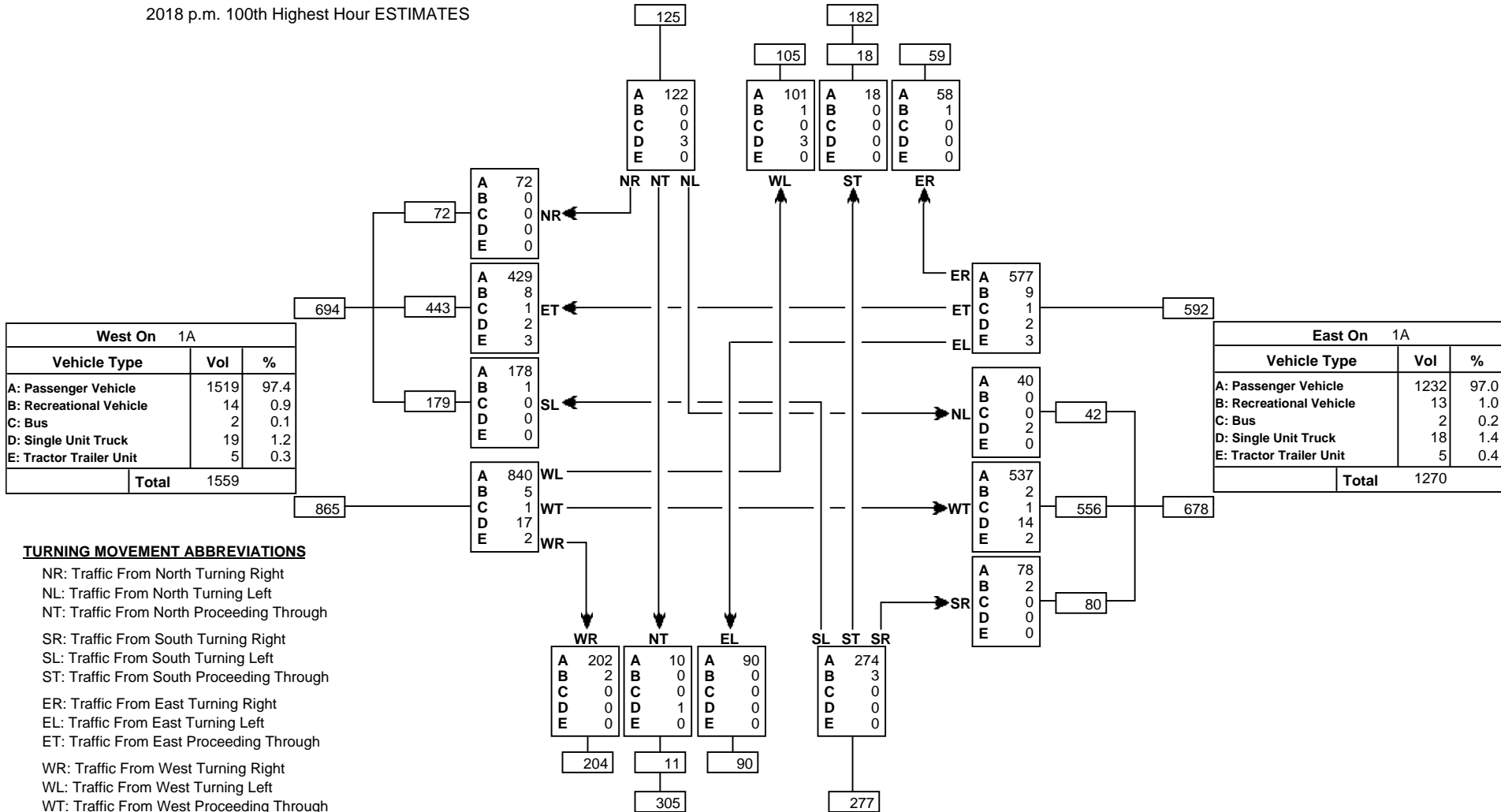
Reference No.: 86217

Intersection of:

1A & E CHESTERMERE DR 14-24-28-415500000

2018 p.m. 100th Highest Hour ESTIMATES

North On Cove Dr		
Vehicle Type	Vol	%
A: Passenger Vehicle	299	97.4
B: Recreational Vehicle	2	0.7
C: Bus	0	0.0
D: Single Unit Truck	6	2.0
E: Tractor Trailer Unit	0	0.0
Total	307	



TURNING MOVEMENT ABBREVIATIONS

- NR: Traffic From North Turning Right
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- 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

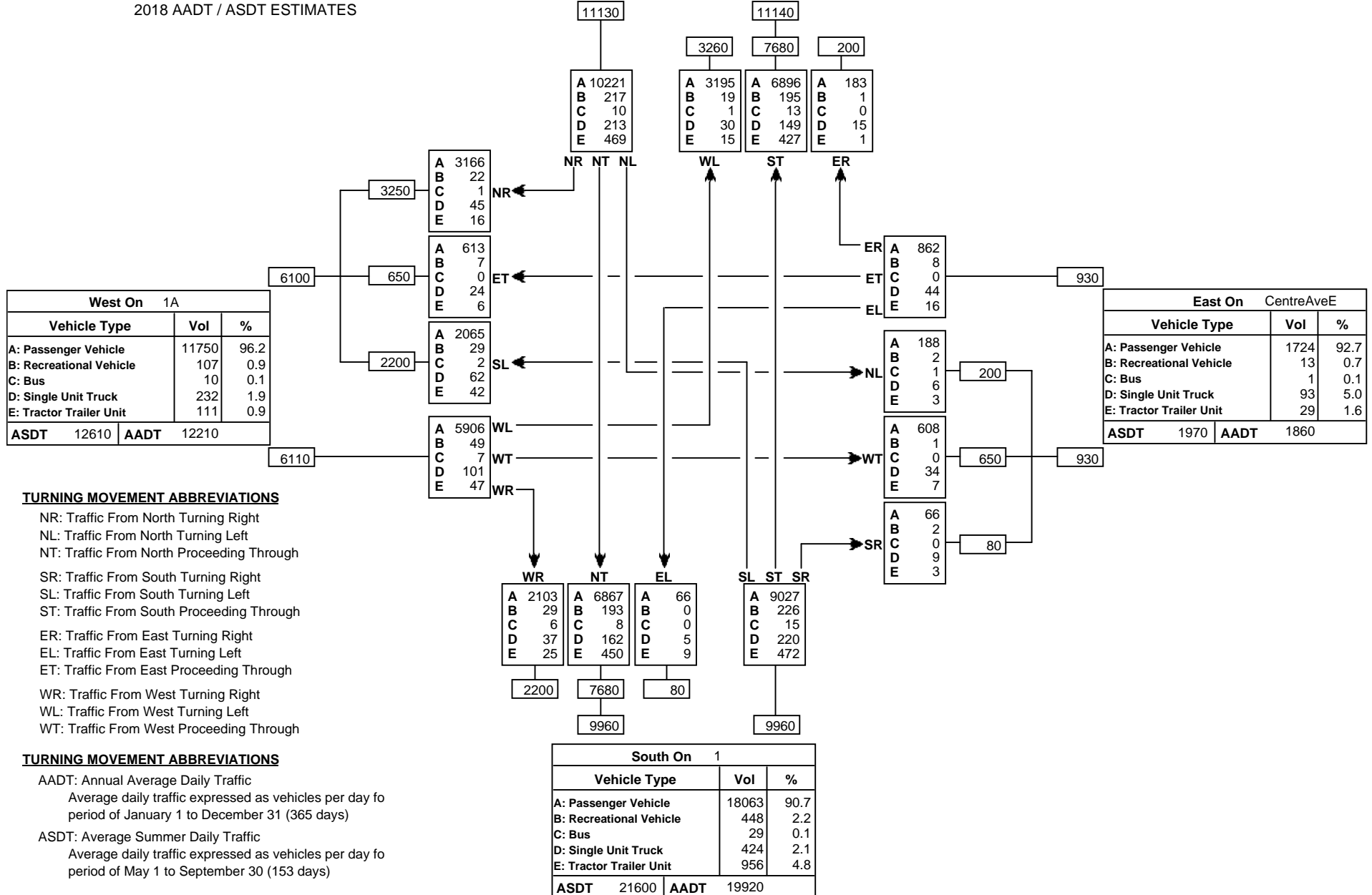
South On EChstrmDr		
Vehicle Type	Vol	%
A: Passenger Vehicle	576	99.0
B: Recreational Vehicle	5	0.9
C: Bus	0	0.0
D: Single Unit Truck	1	0.2
E: Tractor Trailer Unit	0	0.0
Total	582	

Turning Movement Summary Diagram

Reference No.: 86210
 Intersection of:
 1 & 1A E OF CALGARY

2018 AADT / ASDT ESTIMATES

North On 1			
Vehicle Type	Vol	%	
A: Passenger Vehicle	20495	92.0	
B: Recreational Vehicle	432	1.9	
C: Bus	24	0.1	
D: Single Unit Truck	407	1.8	
E: Tractor Trailer Unit	912	4.1	
ASDT	24140	AAADT	22270



Turning Movement Summary Diagram

Reference No.: 86210
 Intersection of:
 1 & 1A E OF CALGARY

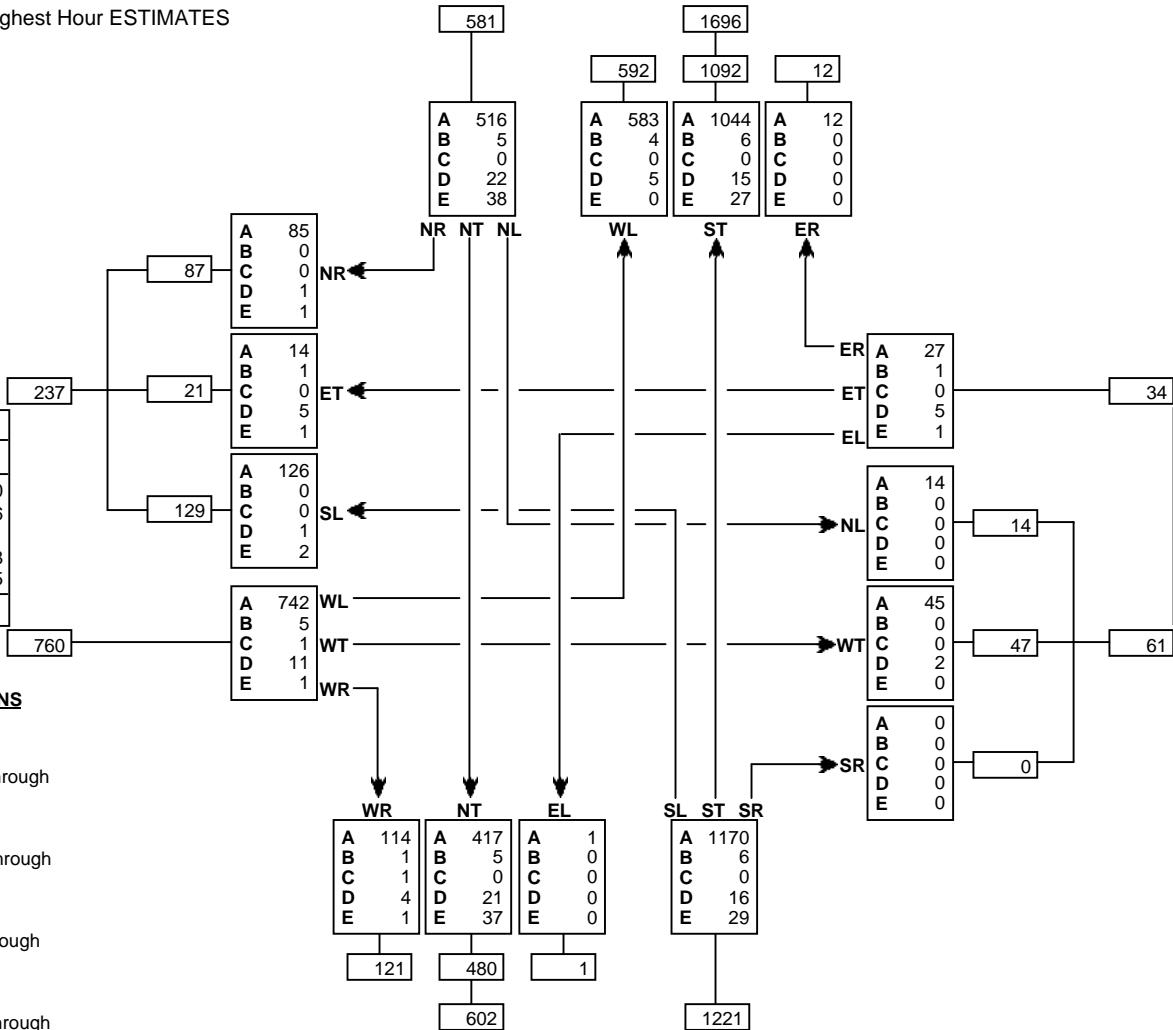
2018 a.m. 100th Highest Hour ESTIMATES

North On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	2155	94.6
B: Recreational Vehicle	15	0.7
C: Bus	0	0.0
D: Single Unit Truck	42	1.8
E: Tractor Trailer Unit	65	2.9
Total	2277	

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	967	97.0
B: Recreational Vehicle	6	0.6
C: Bus	1	0.1
D: Single Unit Truck	18	1.8
E: Tractor Trailer Unit	5	0.5
Total	997	

East On CentreAveE		
Vehicle Type	Vol	%
A: Passenger Vehicle	86	90.5
B: Recreational Vehicle	1	1.1
C: Bus	0	0.0
D: Single Unit Truck	7	7.4
E: Tractor Trailer Unit	1	1.1
Total	95	

South On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	1702	93.4
B: Recreational Vehicle	12	0.7
C: Bus	1	0.1
D: Single Unit Truck	41	2.2
E: Tractor Trailer Unit	67	3.7
Total	1823	



TURNING MOVEMENT ABBREVIATIONS

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- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
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- 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 Summary Diagram

Reference No.: 86210
 Intersection of:
 1 & 1A E OF CALGARY

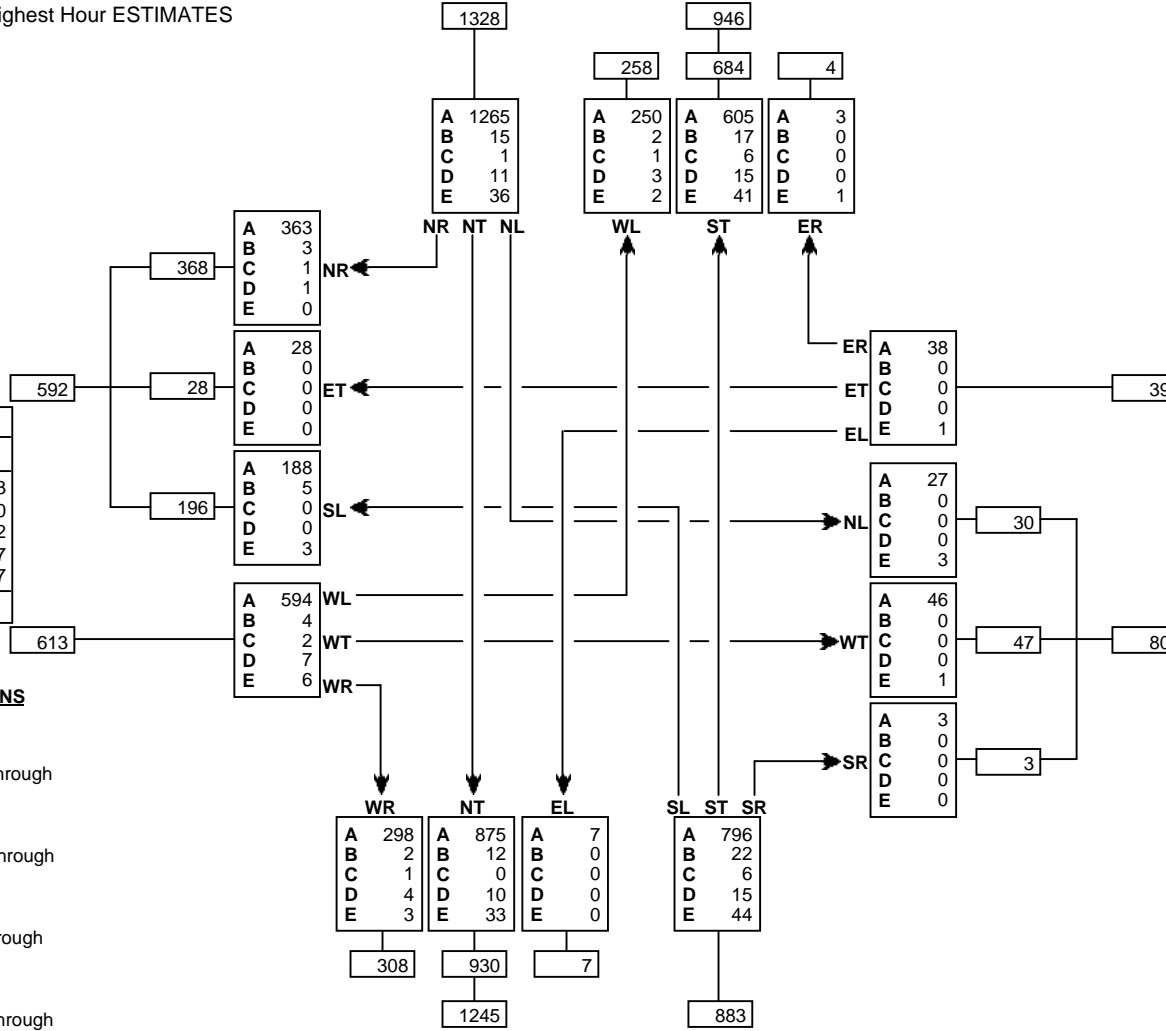
2018 p.m. 100th Highest Hour ESTIMATES

North On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	2123	93.4
B: Recreational Vehicle	34	1.5
C: Bus	8	0.4
D: Single Unit Truck	29	1.3
E: Tractor Trailer Unit	80	3.5
Total	2274	

West On 1A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1173	97.3
B: Recreational Vehicle	12	1.0
C: Bus	3	0.2
D: Single Unit Truck	8	0.7
E: Tractor Trailer Unit	9	0.7
Total	1205	

East On CentreAveE		
Vehicle Type	Vol	%
A: Passenger Vehicle	114	95.8
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	5	4.2
Total	119	

South On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	1976	92.9
B: Recreational Vehicle	36	1.7
C: Bus	7	0.3
D: Single Unit Truck	29	1.4
E: Tractor Trailer Unit	80	3.8
Total	2128	



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 Summary Diagram

Reference No.: 89200

Intersection of:
1 & 791 S OF DELACOUR

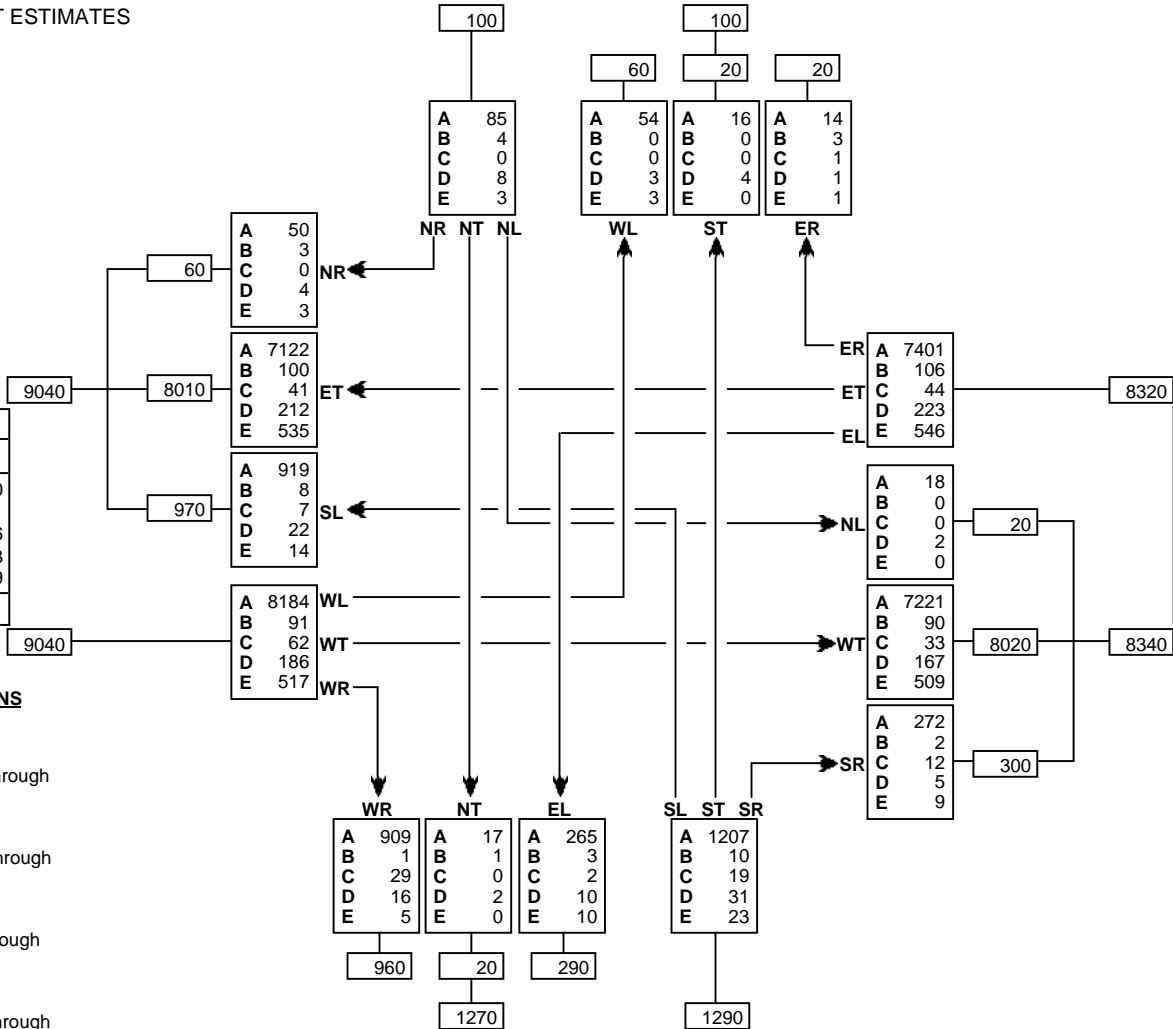
2018 AADT / ASDT ESTIMATES

North On 791		
Vehicle Type	Vol	%
A: Passenger Vehicle	169	84.5
B: Recreational Vehicle	7	3.5
C: Bus	1	0.5
D: Single Unit Truck	16	8.0
E: Tractor Trailer Unit	7	3.5
ASDT	220	AADT
		200

West On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	16275	90.0
B: Recreational Vehicle	202	1.1
C: Bus	110	0.6
D: Single Unit Truck	424	2.3
E: Tractor Trailer Unit	1069	5.9
ASDT	19600	AADT
		18080

East On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	14912	89.5
B: Recreational Vehicle	198	1.2
C: Bus	89	0.5
D: Single Unit Truck	397	2.4
E: Tractor Trailer Unit	1064	6.4
ASDT	18060	AADT
		16660

South On 791		
Vehicle Type	Vol	%
A: Passenger Vehicle	2398	93.7
B: Recreational Vehicle	15	0.6
C: Bus	50	2.0
D: Single Unit Truck	59	2.3
E: Tractor Trailer Unit	38	1.5
ASDT	2780	AADT
		2560



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: Annual Average Daily Traffic
Average daily traffic expressed as vehicles per day for period of January 1 to December 31 (365 days)
- ASDT: Average Summer Daily Traffic
Average daily traffic expressed as vehicles per day for period of May 1 to September 30 (153 days)

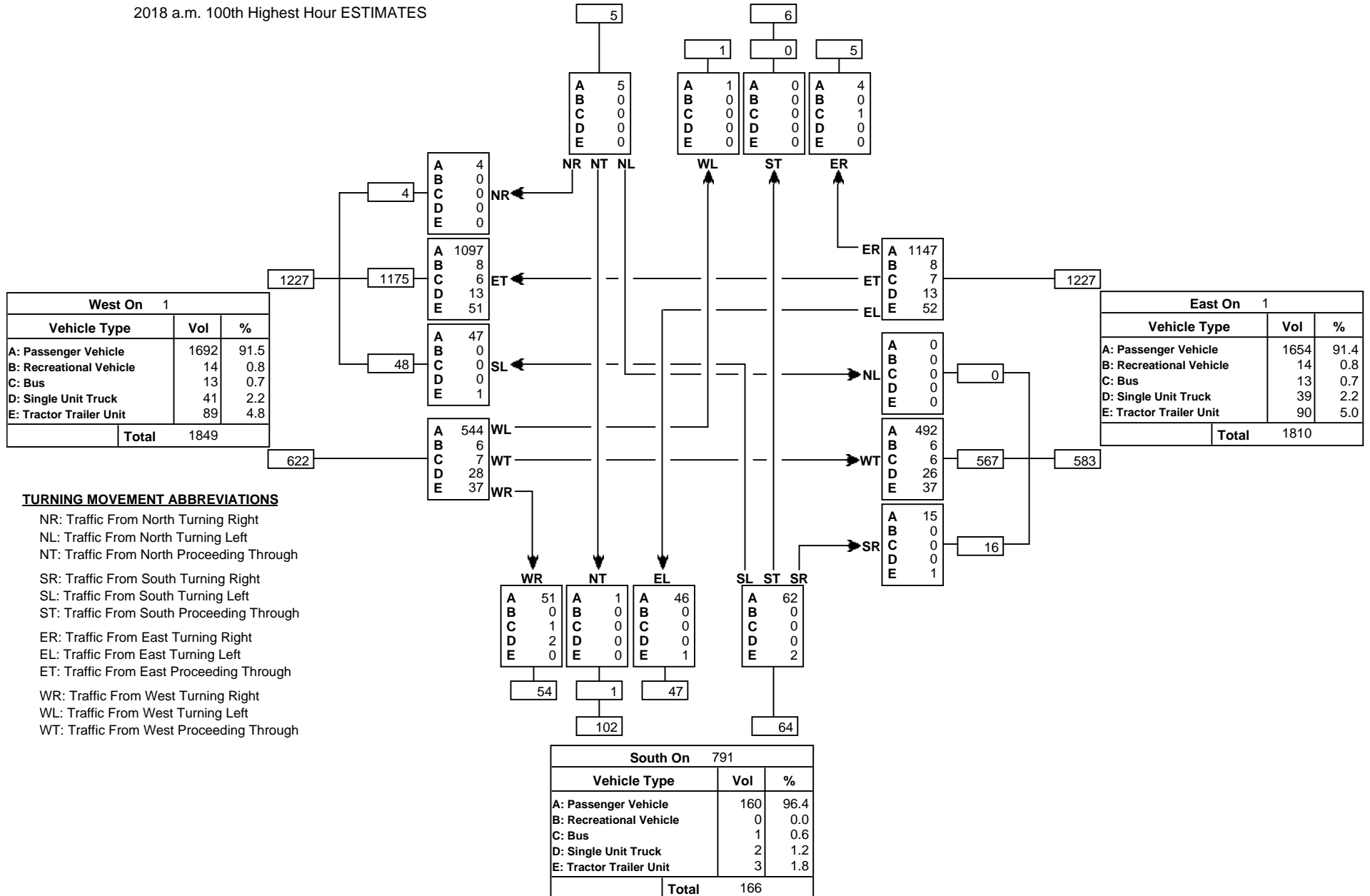
Turning Movement Summary Diagram

Reference No.: 89200

Intersection of:
1 & 791 S OF DELACOUR

2018 a.m. 100th Highest Hour ESTIMATES

North On 791		
Vehicle Type	Vol	%
A: Passenger Vehicle	10	90.9
B: Recreational Vehicle	0	0.0
C: Bus	1	9.1
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
Total	11	



Turning Movement Summary Diagram

Reference No.: 89200
 Intersection of:
 1 & 791 S OF DELACOUR

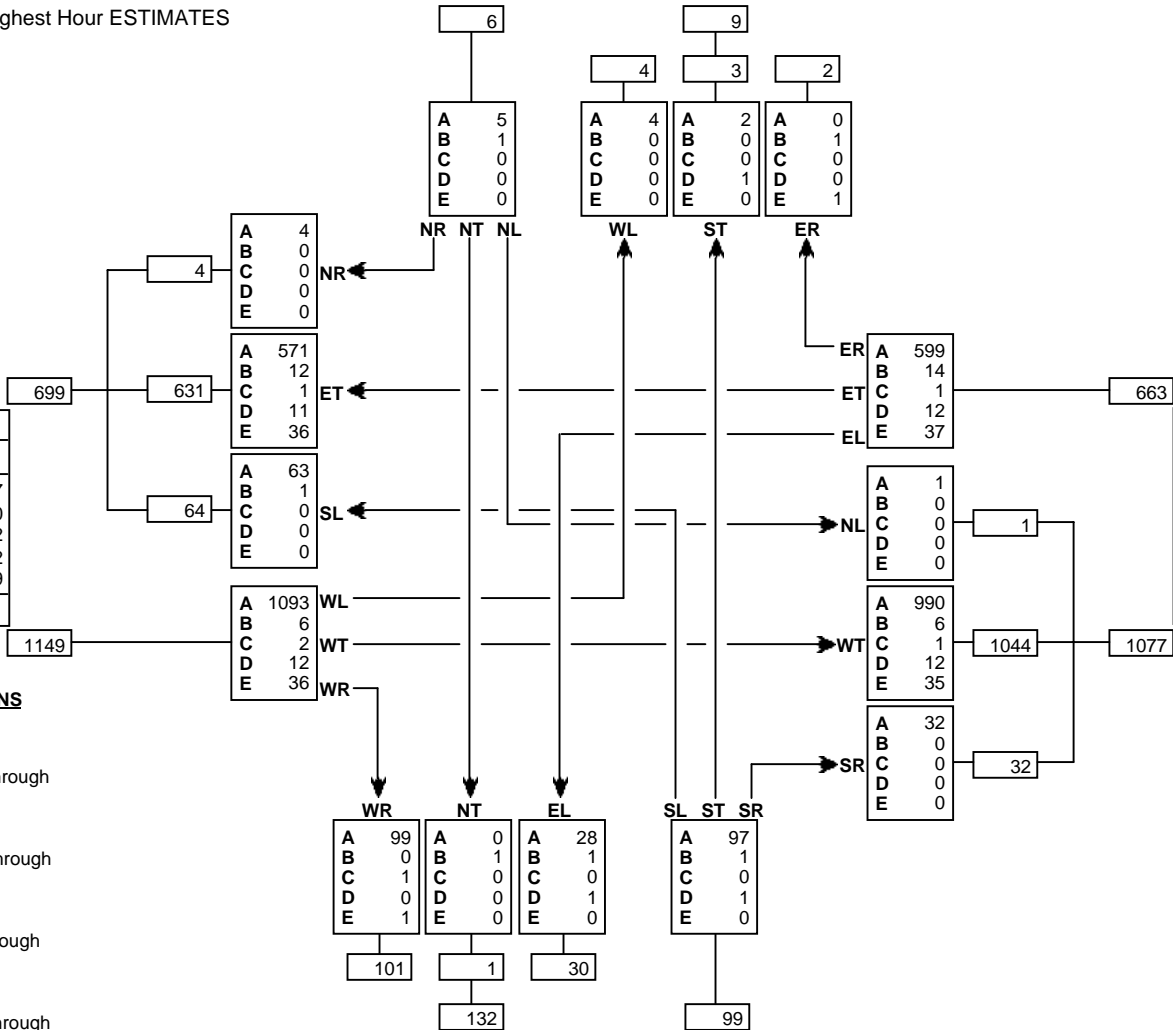
2018 p.m. 100th Highest Hour ESTIMATES

North On 791		
Vehicle Type	Vol	%
A: Passenger Vehicle	11	73.3
B: Recreational Vehicle	2	13.3
C: Bus	0	0.0
D: Single Unit Truck	1	6.7
E: Tractor Trailer Unit	1	6.7
Total	15	

West On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	1731	93.7
B: Recreational Vehicle	19	1.0
C: Bus	3	0.2
D: Single Unit Truck	23	1.2
E: Tractor Trailer Unit	72	3.9
Total	1848	

East On 1		
Vehicle Type	Vol	%
A: Passenger Vehicle	1622	93.2
B: Recreational Vehicle	20	1.1
C: Bus	2	0.1
D: Single Unit Truck	24	1.4
E: Tractor Trailer Unit	72	4.1
Total	1740	

South On 791		
Vehicle Type	Vol	%
A: Passenger Vehicle	224	97.0
B: Recreational Vehicle	3	1.3
C: Bus	1	0.4
D: Single Unit Truck	2	0.9
E: Tractor Trailer Unit	1	0.4
Total	231	



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



APPENDIX
Synchro Results

C

Lanes, Volumes, Timings

1: W Chestermere Dr/Windermere Blvd & Hwy 1A

Existing AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	261	21	72	303	347	44	148	131	442	93	186
Future Volume (vph)	119	261	21	72	303	347	44	148	131	442	93	186
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	110.0		110.0	70.0		85.0	50.0		0.0	0.0		0.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	25.0			25.0			25.0			25.0		
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			0.850			0.850		0.930			0.900	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1765	1500	1676	1641	0	1709	1619	0
Flt Permitted	0.457			0.520			0.579			0.338		
Satd. Flow (perm)	806	1765	1500	918	1765	1500	1022	1641	0	608	1619	0
Right Turn on Red			Yes			Yes		Yes				Yes
Satd. Flow (RTOR)			90			369		65				198
Link Speed (k/h)		50			50			50				50
Link Distance (m)		222.2			154.7			131.0				133.7
Travel Time (s)		16.0			11.1			9.4				9.6
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	4%	4%	4%
Adj. Flow (vph)	127	278	22	77	322	369	47	157	139	470	99	198
Shared Lane Traffic (%)												
Lane Group Flow (vph)	127	278	22	77	322	369	47	296	0	470	297	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			3.7			3.7				3.7
Link Offset(m)		0.0			0.0			0.0				0.0
Crosswalk Width(m)		1.6			1.6			1.6				1.6
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	30		25	30		25	30		25	30		25
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	pm+pt	NA		
Protected Phases		2			6			8		7	4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	2	2	2	6	6	6	8	8		7	4	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0		7.0	10.0	
Minimum Split (s)	25.5	25.5	25.5	25.5	25.5	25.5	23.5	23.5		10.0	23.5	
Total Split (s)	25.5	25.5	25.5	25.5	25.5	25.5	23.5	23.5		18.0	40.5	
Total Split (%)	38.1%	38.1%	38.1%	38.1%	38.1%	38.1%	35.1%	35.1%		26.9%	60.4%	
Maximum Green (s)	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0		15.0	35.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		2.9	3.5	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		0.1	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	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5		3.0	5.5	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min	Min	None	None		None	None	

Lanes, Volumes, Timings

1: W Chestermere Dr/Windermere Blvd & Hwy 1A

Existing AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0				7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0				11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0				0
Act Effect Green (s)	20.1	20.1	20.1	20.1	20.1	20.1	14.1	14.1		34.4	31.9	
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.32	0.32	0.22	0.22		0.55	0.51	
v/c Ratio	0.50	0.50	0.04	0.26	0.57	0.51	0.21	0.71		0.80	0.32	
Control Delay	26.8	22.0	0.1	20.3	23.7	5.1	21.9	27.5		21.3	4.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	26.8	22.0	0.1	20.3	23.7	5.1	21.9	27.5		21.3	4.1	
LOS	C	C	A	C	C	A	C	C		C	A	
Approach Delay		22.3			14.4			26.7			14.7	
Approach LOS		C			B			C			B	
Queue Length 50th (m)	11.9	26.0	0.0	6.6	31.0	0.0	4.5	24.6		30.8	5.6	
Queue Length 95th (m)	29.0	49.4	0.0	17.4	57.8	16.8	12.0	47.6		#66.2	16.2	
Internal Link Dist (m)		198.2			130.7			107.0			109.7	
Turn Bay Length (m)	110.0		110.0	70.0		85.0	50.0					
Base Capacity (vph)	256	561	538	292	561	729	292	516		594	1012	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.50	0.50	0.04	0.26	0.57	0.51	0.16	0.57		0.79	0.29	

Intersection Summary

Area Type: Other
 Cycle Length: 67
 Actuated Cycle Length: 63
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 17.8 Intersection LOS: B
 Intersection Capacity Utilization 91.8% 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.

Splits and Phases: 1: W Chestermere Dr/Windermere Blvd & Hwy 1A



HCM Unsignalized Intersection Capacity Analysis
 3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A

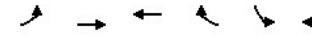
Existing AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↓	↑↑					↓		↑
Traffic Volume (veh/h)	0	639	121	1	150	0	0	0	0	14	0	87
Future Volume (Veh/h)	0	639	121	1	150	0	0	0	0	14	0	87
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	680	129	1	160	0	0	0	0	15	0	93
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												7
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		143										
pX, platoon unblocked				0.91		0.91	0.91	0.91	0.91	0.91	0.91	
vC, conflicting volume	160			680		826	906	404	502	842		80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	160			444		605	693	140	248	622		80
tC, single (s)	4.1			4.1		7.5	6.5	6.9	7.5	6.5		6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2		3.5	4.0	3.3	3.5	4.0		3.3
p0 queue free %	100			100		100	100	100	98	100		90
cM capacity (veh/h)	1417			1010		313	331	801	622	364		964
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1						
Volume Total	453	356	1	80	80	108						
Volume Left	0	0	1	0	0	15						
Volume Right	0	129	0	0	0	93						
cSH	1700	1700	1010	1700	1700	1120						
Volume to Capacity	0.27	0.21	0.00	0.05	0.05	0.10						
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	2.4						
Control Delay (s)	0.0	0.0	8.6	0.0	0.0	9.4						
Lane LOS			A			A						
Approach Delay (s)	0.0		0.1			9.4						
Approach LOS						A						
Intersection Summary												
Average Delay			0.9									
Intersection Capacity Utilization			32.1%			ICU Level of Service			A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 4: Hwy 1A & Hwy 1 NB On Ramp

Existing AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	592	61	22	12	0	0
Future Volume (Veh/h)	592	61	22	12	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	630	65	23	13	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	23			1322	18	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	23			1322	18	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	60			100	100	
cM capacity (veh/h)	1591			89	1056	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	630	32	32	15	21	
Volume Left	630	0	0	0	0	
Volume Right	0	0	0	0	13	
cSH	1591	1700	1700	1700	1700	
Volume to Capacity	0.40	0.02	0.02	0.01	0.01	
Queue Length 95th (m)	14.7	0.0	0.0	0.0	0.0	
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	7.9			0.0		
Approach LOS						
Intersection Summary						
Average Delay			7.5			
Intersection Capacity Utilization			43.5%		ICU Level of Service	A
Analysis Period (min)			15			

Lanes, Volumes, Timings

2: E Chestermere Dr/Cove Dr & Hwy 1A

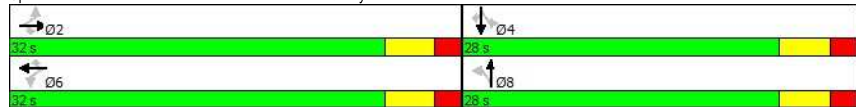
Existing PM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Act Effect Green (s)	25.8	25.8	25.8	25.8	25.8	25.8	12.5	12.5			12.5	12.5
Actuated g/C Ratio	0.58	0.58	0.58	0.58	0.58	0.58	0.28	0.28			0.28	0.28
v/c Ratio	0.22	0.29	0.22	0.21	0.23	0.07	0.51	0.20			0.16	0.16
Control Delay	9.6	7.9	2.3	9.7	7.6	3.0	19.2	6.0			13.5	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay	9.6	7.9	2.3	9.7	7.6	3.0	19.2	6.0			13.5	4.8
LOS	A	A	A	A	A	A	B	A			B	A
Approach Delay		6.8			7.4			14.5			8.5	
Approach LOS		A			A			B			A	
Queue Length 50th (m)	4.3	12.5	0.0	3.7	9.6	0.0	11.5	1.0			3.1	0.0
Queue Length 95th (m)	15.4	28.7	8.7	13.9	22.6	4.7	29.0	9.1			10.3	6.7
Internal Link Dist (m)		181.4			119.4			237.8			191.5	
Turn Bay Length (m)	60.0		50.0	75.0		20.0	60.0					40.0
Base Capacity (vph)	589	2311	1105	524	2311	1054	679	870			654	824
Starvation Cap Reductn	0	0	0	0	0	0	0	0			0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0			0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0			0	0
Reduced v/c Ratio	0.19	0.25	0.19	0.18	0.20	0.06	0.28	0.12			0.09	0.09

Intersection Summary

Area Type:	Other
Cycle Length:	60
Actuated Cycle Length:	44.8
Natural Cycle:	50
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.51
Intersection Signal Delay:	8.3
Intersection LOS:	A
Intersection Capacity Utilization:	63.9%
ICU Level of Service:	B
Analysis Period (min):	15

Splits and Phases: 2: E Chestermere Dr/Cove Dr & Hwy 1A



HCM Unsignalized Intersection Capacity Analysis

3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A

Existing PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↓	↑↑					↓		↑
Traffic Volume (veh/h)	0	305	308	7	224	0	0	0	0	30	0	368
Future Volume (Veh/h)	0	305	308	7	224	0	0	0	0	30	0	368
Sign Control		Free			Free			Stop				Stop
Grade		0%			0%			0%				0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	321	324	7	236	0	0	0	0	32	0	387
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												7
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		143										
pX, platoon unblocked				0.96			0.96	0.96	0.96	0.96	0.96	
vC, conflicting volume	236			321			615	733	322	410	571	118
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	236			214			520	643	216	307	474	118
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	100	95	100	58
cM capacity (veh/h)	1328			1301			242	373	758	596	466	912

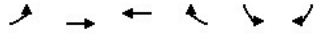
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	214	431	7	118	118	419
Volume Left	0	0	7	0	0	32
Volume Right	0	324	0	0	0	387
cSH	1700	1700	1301	1700	1700	987
Volume to Capacity	0.13	0.25	0.01	0.07	0.07	0.42
Queue Length 95th (m)	0.0	0.0	0.1	0.0	0.0	16.3
Control Delay (s)	0.0	0.0	7.8	0.0	0.0	11.8
Lane LOS			A			B
Approach Delay (s)	0.0		0.2			11.8
Approach LOS			B			B

Intersection Summary						
Average Delay		3.8				
Intersection Capacity Utilization		36.4%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

4: Hwy 1A & Hwy 1 NB On Ramp

Existing PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕			
Traffic Volume (veh/h)	258	77	35	4	0	0
Future Volume (Veh/h)	258	77	35	4	0	0
Sign Control	Free		Free	Stop		
Grade	0%		0%	0%		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	272	81	37	4	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None				
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	37				624	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	37				624	20
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	83				100	100
cM capacity (veh/h)	1572				345	1052
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	272	40	40	25	16	
Volume Left	272	0	0	0	0	
Volume Right	0	0	0	0	4	
cSH	1572	1700	1700	1700	1700	
Volume to Capacity	0.17	0.02	0.02	0.01	0.01	
Queue Length 95th (m)	4.8	0.0	0.0	0.0	0.0	
Control Delay (s)	7.8	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	6.0		0.0			
Approach LOS	A					
Intersection Summary						
Average Delay	5.4					
Intersection Capacity Utilization	24.7%		ICU Level of Service			A
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

11: Hwy 1 & Hwy 791

Existing PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕	↔	↕	↕	↔	↕	↕
Traffic Volume (veh/h)	4	1044	101	30	631	2	64	3	32	1	1	4
Future Volume (Veh/h)	4	1044	101	30	631	2	64	3	32	1	1	4
Sign Control	Free		Free		Free		Stop		Stop			
Grade	0%		0%		0%		0%		0%			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	4	1099	106	32	664	2	67	3	34	1	1	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	Raised			Raised								
Median storage (veh)	3			3								
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	666		1205			1508		1837	550	1322	1942	333
vC1, stage 1 conf vol												
vC2, stage 2 conf vol	400		730		593		1213					
vCu, unblocked vol	666		1205			1508		1837	550	1322	1942	333
tC, single (s)	4.1		4.1			7.5		6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2		2.2			3.5		4.0	3.3	3.5	4.0	3.3
p0 queue free %	100		94			69		99	93	100	100	99
cM capacity (veh/h)	919		575			219		256	479	302	209	663
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1			
Volume Total	4	550	550	106	32	443	223	104	6			
Volume Left	4	0	0	0	32	0	0	67	1			
Volume Right	0	0	0	106	0	0	2	34	4			
cSH	919	1700	1700	1700	575	1700	1700	267	425			
Volume to Capacity	0.00	0.32	0.32	0.06	0.06	0.26	0.13	0.39	0.01			
Queue Length 95th (m)	0.1	0.0	0.0	0.0	1.3	0.0	0.0	13.4	0.3			
Control Delay (s)	8.9	0.0	0.0	0.0	11.6	0.0	0.0	26.8	13.6			
Lane LOS	A		B			D		B				
Approach Delay (s)	0.0		0.5			26.8		13.6				
Approach LOS	A		B			D		B				
Intersection Summary												
Average Delay	1.6											
Intersection Capacity Utilization	48.8%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A

2023 Background AM Peak

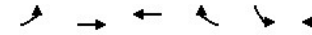


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↑	↑↑					↓		↑
Traffic Volume (veh/h)	0	702	133	1	165	0	0	0	0	15	0	95
Future Volume (Veh/h)	0	702	133	1	165	0	0	0	0	15	0	95
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	0	747	141	1	176	0	0	0	0	16	0	101
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												7
Median type		None			None							
Median storage (veh)												
Upstream signal (m)		143										
pX, platoon unblocked				0.97		0.97	0.97	0.97	0.97	0.97	0.97	
vC, conflicting volume	176			747		837	925	374	552	925	88	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	176			685		777	868	301	484	868	88	
tC, single (s)	4.1			4.1		7.5	6.5	6.9	7.5	6.5	6.9	
tC, 2 stage (s)												
tF (s)	2.2			2.2		3.5	4.0	3.3	3.5	4.0	3.3	
p0 queue free %	100			100		100	100	100	96	100	89	
cM capacity (veh/h)	1398			880		249	281	677	453	281	953	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1					
Volume Total	374	374	141	1	88	88	117					
Volume Left	0	0	0	1	0	0	16					
Volume Right	0	0	141	0	0	0	101					
cSH	1700	1700	1700	880	1700	1700	1104					
Volume to Capacity	0.22	0.22	0.08	0.00	0.05	0.05	0.11					
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	2.7					
Control Delay (s)	0.0	0.0	0.0	9.1	0.0	0.0	9.8					
Lane LOS				A			A					
Approach Delay (s)	0.0			0.1			9.8					
Approach LOS							A					
Intersection Summary												
Average Delay			1.0									
Intersection Capacity Utilization			29.9%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

4: Hwy 1A & Hwy 1 NB On Ramp

2023 Background AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↓	↑↑	↑			
Traffic Volume (veh/h)	651	67	24	13	0	0
Future Volume (Veh/h)	651	67	24	13	0	0
Sign Control		Free	Free	Stop		
Grade		0%	0%	0%		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	693	71	26	14	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	26			1454	20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26			1454	20	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	56			100	100	
cM capacity (veh/h)	1587			68	1053	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	693	36	36	17	23	
Volume Left	693	0	0	0	0	
Volume Right	0	0	0	0	14	
cSH	1587	1700	1700	1700	1700	
Volume to Capacity	0.44	0.02	0.02	0.01	0.01	
Queue Length 95th (m)	17.3	0.0	0.0	0.0	0.0	
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	8.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay			7.8			
Intersection Capacity Utilization			45.4%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings

2: E Chestermere Dr/Cove Dr & Hwy 1A

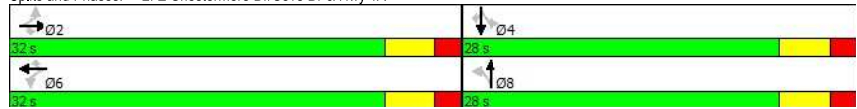
2023 Background PM Peak

	↖	→	↘	↙	←	↖	↙	↘	↗	↖	↘	↙
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	11.0	11.0	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	0	0
Act Effct Green (s)	23.3	23.3	23.3	23.3	23.3	23.3	13.2	13.2			13.2	13.2
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.49	0.49	0.28	0.28			0.28	0.28
v/c Ratio	0.29	0.38	0.27	0.29	0.30	0.08	0.56	0.22			0.16	0.17
Control Delay	11.1	9.2	2.5	11.4	8.6	3.2	20.8	5.8			13.4	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay	11.1	9.2	2.5	11.4	8.6	3.2	20.8	5.8			13.4	4.6
LOS	B	A	A	B	A	A	C	A			B	A
Approach Delay	7.8			8.5			15.5			8.4		
Approach LOS	A			A			B			A		
Queue Length 50th (m)	5.0	14.6	0.0	4.3	11.2	0.0	12.9	1.1			3.4	0.0
Queue Length 95th (m)	18.0	33.5	9.4	16.2	26.3	5.2	32.0	9.6			10.9	7.0
Internal Link Dist (m)	181.4		119.4		237.8		191.5		40.0			
Turn Bay Length (m)	60.0	2008	998	429	2008	927	630	819			642	791
Base Capacity (vph)	489	2008	998	429	2008	927	630	819			642	791
Starvation Cap Reductn	0	0	0	0	0	0	0	0			0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0			0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0			0	0
Reduced v/c Ratio	0.25	0.32	0.24	0.24	0.26	0.07	0.33	0.14			0.10	0.10

Intersection Summary

Area Type:	Other	
Cycle Length:	60	
Actuated Cycle Length:	47.7	
Natural Cycle:	50	
Control Type:	Actuated-Uncoordinated	
Maximum v/c Ratio:	0.56	
Intersection Signal Delay:	9.2	Intersection LOS: A
Intersection Capacity Utilization:	65.6%	ICU Level of Service C
Analysis Period (min):	15	

Splits and Phases: 2: E Chestermere Dr/Cove Dr & Hwy 1A



HCM Unsignalized Intersection Capacity Analysis

3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A

2023 Background PM Peak

	↖	→	↘	↙	←	↖	↙	↘	↗	↖	↘	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↓	↑↑					↓		↑
Traffic Volume (veh/h)	0	335	338	7	246	0	0	0	0	33	0	404
Future Volume (Veh/h)	0	335	338	7	246	0	0	0	0	33	0	404
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	353	356	7	259	0	0	0	0	35	0	425
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)	7											
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	143											
pX, platoon unblocked												
vC, conflicting volume	259	353			496	626	176	450	626	130		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	259	353			496	626	176	450	626	130		
tC, single (s)	4.1	4.1			7.5	6.5	6.9	7.5	6.5	6.9		
tC, 2 stage (s)												
tF (s)	2.2	2.2			3.5	4.0	3.3	3.5	4.0	3.3		
p0 queue free %	100	99			100	100	100	93	100	53		
cM capacity (veh/h)	1303	1202			239	397	836	491	397	896		

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	176	176	356	7	130	130	460
Volume Left	0	0	0	7	0	0	35
Volume Right	0	0	356	0	0	0	425
cSH	1700	1700	1700	1202	1700	1700	970
Volume to Capacity	0.10	0.10	0.21	0.01	0.08	0.08	0.47
Queue Length 95th (m)	0.0	0.0	0.0	0.1	0.0	0.0	19.8
Control Delay (s)	0.0	0.0	0.0	8.0	0.0	0.0	12.6
Lane LOS	A			B			
Approach Delay (s)	0.0			0.2			12.6
Approach LOS	A			B			

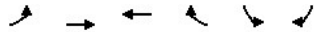
Intersection Summary

Average Delay	4.1	
Intersection Capacity Utilization	39.3%	ICU Level of Service A
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis

4: Hwy 1A & Hwy 1 NB On Ramp

2023 Background PM Peak

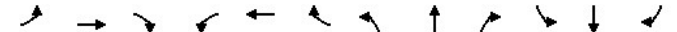


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕			
Traffic Volume (veh/h)	283	84	38	4	0	0
Future Volume (Veh/h)	283	84	38	4	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	298	88	40	4	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	40				682	22
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	40				682	22
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	81				100	100
cM capacity (veh/h)	1568				311	1050
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	298	44	44	27	17	
Volume Left	298	0	0	0	0	
Volume Right	0	0	0	0	4	
cSH	1568	1700	1700	1700	1700	
Volume to Capacity	0.19	0.03	0.03	0.02	0.01	
Queue Length 95th (m)	5.3	0.0	0.0	0.0	0.0	
Control Delay (s)	7.8	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	6.0			0.0		
Approach LOS						
Intersection Summary						
Average Delay	5.4					
Intersection Capacity Utilization	26.1%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

11: Highway 791 & Highway 1

2023 Background PM Peak

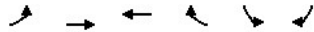


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕						
Traffic Volume (veh/h)	4	1148	111	33	694	2	70	3	35	1	1	4
Future Volume (Veh/h)	4	1148	111	33	694	2	70	3	35	1	1	4
Sign Control		Free			Free			Stop				Stop
Grade		0%			0%			0%				0%
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	4	1208	117	35	731	2	74	3	37	1	1	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type			Raised		Raised							
Median storage (veh)			3		3							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume		733		1325			1656	2019	604	1452	2135	366
vC1, stage 1 conf vol							1216	1216		802	802	
vC2, stage 2 conf vol							440	803		650	1333	
vCu, unblocked vol		733		1325			1656	2019	604	1452	2135	366
tC, single (s)		4.1		4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)		2.2		2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %		100		93			61	99	92	100	99	99
cM capacity (veh/h)		868		517			188	227	441	267	177	630
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1			
Volume Total	4	604	604	117	35	487	246	114	6			
Volume Left	4	0	0	0	35	0	0	74	1			
Volume Right	0	0	0	117	0	0	2	37	4			
cSH	868	1700	1700	1700	517	1700	1700	232	382			
Volume to Capacity	0.00	0.36	0.36	0.07	0.07	0.29	0.14	0.49	0.02			
Queue Length 95th (m)	0.1	0.0	0.0	0.0	1.6	0.0	0.0	18.9	0.4			
Control Delay (s)	9.2	0.0	0.0	0.0	12.5	0.0	0.0	34.6	14.6			
Lane LOS	A				B			D	B			
Approach Delay (s)	0.0				0.6			34.6	14.6			
Approach LOS								D	B			
Intersection Summary												
Average Delay	2.0											
Intersection Capacity Utilization	52.3%			ICU Level of Service		A						
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

4: Hwy 1A & Hwy 1 NB On Ramp

2023 Background + Development AM Peak

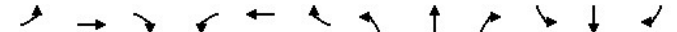


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕			
Traffic Volume (veh/h)	651	315	336	265	0	0
Future Volume (Veh/h)	651	315	336	265	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	693	335	357	282	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		336				
pX, platoon unblocked						
vC, conflicting volume	357				2052	320
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	357				2052	320
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	42				100	100
cM capacity (veh/h)	1198				20	676
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	693	168	168	238	401	
Volume Left	693	0	0	0	0	
Volume Right	0	0	0	0	282	
cSH	1198	1700	1700	1700	1700	
Volume to Capacity	0.58	0.10	0.10	0.14	0.24	
Queue Length 95th (m)	29.5	0.0	0.0	0.0	0.0	
Control Delay (s)	12.0	0.0	0.0	0.0	0.0	
Lane LOS	B					
Approach Delay (s)	8.1			0.0		
Approach LOS						
Intersection Summary						
Average Delay			5.0			
Intersection Capacity Utilization			62.0%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

11: Highway 791 & Highway 1

2023 Background + Development AM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕						
Traffic Volume (veh/h)	1	784	59	51	1391	5	52	0	17	0	1	4
Future Volume (Veh/h)	1	784	59	51	1391	5	52	0	17	0	1	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1	834	63	54	1480	5	55	0	18	0	1	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type					Raised			Raised				
Median storage (veh)					3			3				
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1485			897			1688	2429	417	2028	2490	742
vC1, stage 1 conf vol							836	836		1590	1590	
vC2, stage 2 conf vol							852	1593		437	899	
vCu, unblocked vol	1485			897			1688	2429	417	2028	2490	742
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			93			77	100	97	100	99	99
cM capacity (veh/h)	449			753			243	148	585	103	146	358
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1			
Volume Total	1	417	417	63	54	987	498	73	5			
Volume Left	1	0	0	0	54	0	0	55	0			
Volume Right	0	0	0	63	0	0	5	18	4			
cSH	449	1700	1700	1700	753	1700	1700	284	277			
Volume to Capacity	0.00	0.25	0.25	0.04	0.07	0.58	0.29	0.26	0.02			
Queue Length 95th (m)	0.1	0.0	0.0	0.0	1.8	0.0	0.0	7.6	0.4			
Control Delay (s)	13.0	0.0	0.0	0.0	10.2	0.0	0.0	22.0	18.2			
Lane LOS	B				B			C	C			
Approach Delay (s)	0.0				0.4			22.0	18.2			
Approach LOS								C	C			
Intersection Summary												
Average Delay				0.9								
Intersection Capacity Utilization				60.9%		ICU Level of Service				B		
Analysis Period (min)				15								

Lanes, Volumes, Timings

3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A 2023 Background + Development PM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑	↓	↑↑					↓	↓	↓
Traffic Volume (vph)	0	474	338	205	357	0	0	0	0	334	0	404
Future Volume (vph)	0	474	338	205	357	0	0	0	0	334	0	404
Ideal Flow (vphpl)	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850	1850
Storage Length (m)	0.0		60.0	40.0		0.0	0.0			0.0		50.0
Storage Lanes	0		1	1		0	0			2		1
Taper Length (m)	25.0			25.0		25.0				25.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Fr	0.850									0.850		
Flt Protected					0.950				0.950			
Satd. Flow (prot)	0	3484	1559	1742	3484	0	0	0	0	3380	0	1559
Flt Permitted	0.950											
Satd. Flow (perm)	0	3484	1559	745	3484	0	0	0	0	3380	0	1559
Right Turn on Red	Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)	356									425		
Link Speed (k/h)	50				50				50			
Link Distance (m)	143.4		217.4				322.0		267.3			
Travel Time (s)	10.3		15.7				23.2		19.2			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	499	356	216	376	0	0	0	0	352	0	425
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	499	356	216	376	0	0	0	0	352	0	425
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	3.7		3.7				7.4		7.4			
Link Offset(m)	0.0				0.0				0.0			
Crosswalk Width(m)	1.6			1.6			1.6			1.6		
Two way Left Turn Lane												
Headway Factor	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
Turning Speed (k/h)	30		25	30		25	30		25	30		25
Turn Type		NA	Perm	pm+pt	NA					Prot		Perm
Protected Phases	2		1		6		7					
Permitted Phases	2			6		4						
Detector Phase	2		1		6		7					
Switch Phase												
Minimum Initial (s)	20.0		20.0		5.0		20.0		10.0		10.0	
Minimum Split (s)	25.5		25.5		10.5		25.5		15.5		23.5	
Total Split (s)	26.0		26.0		10.5		36.5		23.5		23.5	
Total Split (%)	43.3%		43.3%		17.5%		60.8%		39.2%		39.2%	
Maximum Green (s)	20.5		20.5		7.5		31.0		18.0		18.0	
Yellow Time (s)	3.5		3.5		2.9		3.5		3.5		3.5	
All-Red Time (s)	2.0		2.0		0.1		2.0		2.0		2.0	
Lost Time Adjust (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Total Lost Time (s)	5.5		5.5		3.0		5.5		5.5		5.5	
Lead/Lag	Lag		Lag		Lead							
Lead-Lag Optimize?	Yes		Yes		Yes							
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.0		3.0	
Recall Mode	Min		Min		None		Min		None		None	
Walk Time (s)	7.0		7.0		7.0							

Clearwater Park
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Synchro 9 Report

Lanes, Volumes, Timings

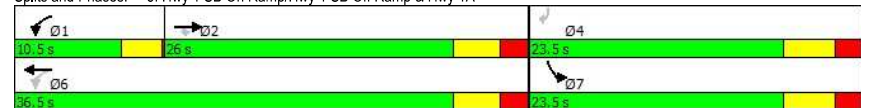
3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A 2023 Background + Development PM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Flash Dont Walk (s)	11.0	11.0		11.0								11.0
Pedestrian Calls (#/hr)	0											
Act Effct Green (s)	20.1	20.1	32.8	30.3						11.5		11.5
Actuated g/C Ratio	0.38	0.38	0.62	0.57						0.22		0.22
v/c Ratio	0.38	0.44	0.36	0.19						0.48		0.63
Control Delay	13.3	3.7	6.5	6.0						20.5		7.1
Queue Delay	0.0	0.0	0.0	0.0						0.0		0.0
Total Delay	13.3	3.7	6.5	6.0						20.5		7.1
LOS	B		A		A		A		C		A	
Approach Delay	9.3			6.2				13.2				
Approach LOS	A			A				B				
Queue Length 50th (m)	16.8		0.0		6.9		7.3		15.2		0.0	
Queue Length 95th (m)	30.6		13.8		17.5		15.3		25.0		17.5	
Internal Link Dist (m)	119.4			193.4				298.0		243.3		
Turn Bay Length (m)			60.0		40.0							
Base Capacity (vph)	1354		823		605		2048		1153		811	
Starvation Cap Reductn	0		0		0		0		0		0	
Spillback Cap Reductn	0		0		0		0		0		0	
Storage Cap Reductn	0		0		0		0		0		0	
Reduced v/c Ratio	0.37		0.43		0.36		0.18		0.31		0.52	

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 52.8
 Natural Cycle: 60
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 9.8
 Intersection Capacity Utilization 51.5%
 Analysis Period (min) 15
 Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 3: Hwy 1 SB On Ramp/Hwy 1 SB Off Ramp & Hwy 1A



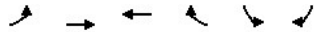
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Synchro 9 Report

HCM Unsignalized Intersection Capacity Analysis

4: Hwy 1A & Hwy 1 NB On Ramp

2023 Background + Development PM Peak

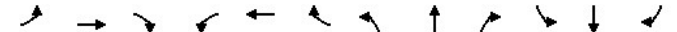


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↔	↕	↕			
Traffic Volume (veh/h)	283	524	347	246	0	0
Future Volume (Veh/h)	283	524	347	246	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	298	552	365	259	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		336				
pX, platoon unblocked						
vC, conflicting volume	365				1366	312
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	365				1366	312
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	75				100	100
cM capacity (veh/h)	1190				104	684
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	
Volume Total	298	276	276	243	381	
Volume Left	298	0	0	0	0	
Volume Right	0	0	0	0	259	
cSH	1190	1700	1700	1700	1700	
Volume to Capacity	0.25	0.16	0.16	0.14	0.22	
Queue Length 95th (m)	7.5	0.0	0.0	0.0	0.0	
Control Delay (s)	9.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	3.2			0.0		
Approach LOS						
Intersection Summary						
Average Delay	1.8					
Intersection Capacity Utilization	40.7%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

11: Highway 791 & Highway 1

2023 Background + Development PM Peak



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↕	↔	↕	↕						
Traffic Volume (veh/h)	4	1345	111	33	891	2	70	3	35	1	1	4
Future Volume (Veh/h)	4	1345	111	33	891	2	70	3	35	1	1	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	4	1416	117	35	938	2	74	3	37	1	1	4
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		Raised			Raised							
Median storage (veh)		3			3							
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	940			1533			1968	2434	708	1764	2550	470
vC1, stage 1 conf vol							1424	1424		1009	1009	
vC2, stage 2 conf vol							544	1010		754	1541	
vCu, unblocked vol	940			1533			1968	2434	708	1764	2550	470
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)							6.5	5.5		6.5	5.5	
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			92			47	98	90	100	99	99
cM capacity (veh/h)	725			430			139	177	377	203	133	540
Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	NB 1	SB 1			
Volume Total	4	708	708	117	35	625	315	114	6			
Volume Left	4	0	0	0	35	0	0	74	1			
Volume Right	0	0	0	117	0	0	2	37	4			
cSH	725	1700	1700	1700	430	1700	1700	177	302			
Volume to Capacity	0.01	0.42	0.42	0.07	0.08	0.37	0.19	0.65	0.02			
Queue Length 95th (m)	0.1	0.0	0.0	0.0	2.0	0.0	0.0	28.2	0.5			
Control Delay (s)	10.0	0.0	0.0	0.0	14.1	0.0	0.0	56.5	17.2			
Lane LOS	A				B			F	C			
Approach Delay (s)	0.0				0.5			56.5	17.2			
Approach LOS								F	C			
Intersection Summary												
Average Delay	2.7											
Intersection Capacity Utilization	57.9%			ICU Level of Service			B					
Analysis Period (min)	15											



APPENDIX
Signal Warrant Analysis

D



Alberta Transportation - Traffic Signal & Pedestrian Signal Head Warrant Analysis

Main Street (name)	Hwy 1	Direction (EW or NS)	EW	Road Authority:	Alberta Transportation
Side Street (name)	Hwy 791	Direction (EW or NS)	NS	City:	Chestermere
Quadrant / Int #		Comments Future(2023) Traffic Note: The 6-hour traffic is calculated by (AM+PM) x 2.61 Existing Configuration		Analysis Date:	2020 Jan 09, Thu
CHECK SHEET				Count Date:	2023 Estimated
for Warrant Calculation Results, please hit 'Page Down'		Date Entry Format:	(yyyy-mm-dd)		

Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	RT Channelization (y/n)	Lip Stream Signal (m)	# of Thru Lanes	LT Phase Type	RTOR Allowed (y/n)	Actuated Thru Phase
Hwy 1 WB		1		1		1			5,000	2			
Hwy 1 EB		1		2		1			5,000	3			
Hwy 791 NB					1				5,000	1			
Hwy 791 SB					1				5,000	1			

Saturation Flow Rates (if not default) (vphpl)	Default Saturation Flow Rates (vphpl)
Left Turn	1,650
Through	1,800
Right Turn	1,500

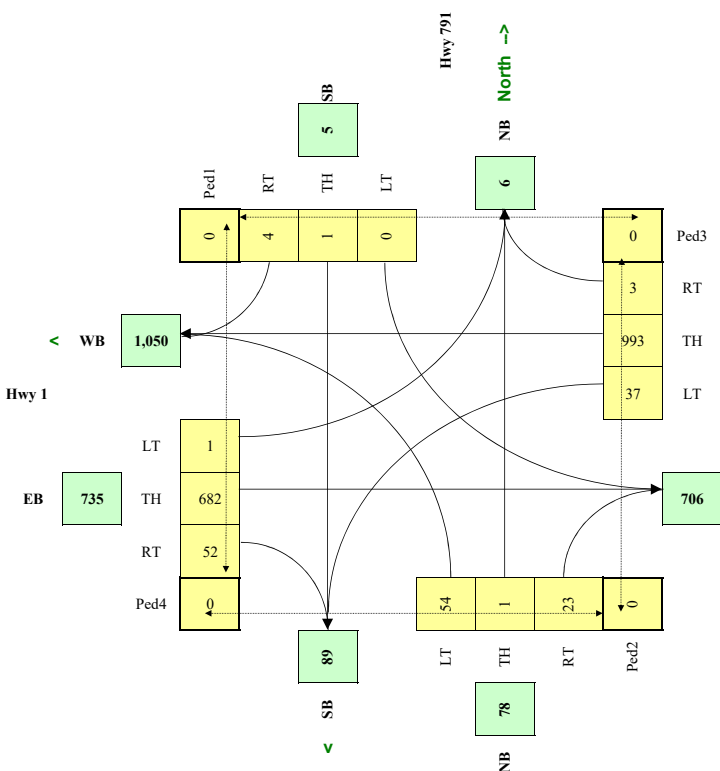
Are the Hwy 791 NB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 791 SB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 1 WB right turns significantly impeded by through movements? (y/n)	n
Are the Hwy 1 EB right turns significantly impeded by through movements? (y/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	(#)	20,000
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Hwy 1	EW	80	7.0%	n	0.0
Hwy 791	NS		5.0%	n	0.0

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
press 'Set Peak Hours' Button to set the peak hour periods																
	322	9	138	3	6	23	221	5,958	20	6	4,094	310				
Total (6-hour peak)	322	9	138	3	6	23	221	5,958	20	6	4,094	310	0	0	0	0
Average (6-hour peak)	54	1	23	0	1	4	37	993	3	1	682	52	0	0	0	0

Average 6-hour Peak Turning Movements



$$W_{SIG} = [C_{bt}(X_{v-v}) / K_1 + (F(X_{v-p})L) / K_2] \times C_i$$

W =	75	75	0
		Veh	Ped

NOT Warranted

RESET SHEET

$$W_{PED} = [F((X_{ped_m})d_m/K_2) + (X_{ped_s})d_s/K_3]$$

W =	0
------------	----------

Warranted - Complex Intersection



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