

B&A Studios

UFA Mountain View County Bulk Fuel and Cardlock Facility

2026-046

TRANSPORTATION IMPACT ASSESSMENT



CIMA+ project number: A0003605
16-July-2026 - Final





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Register of issues			
Issue N°	Reviewed by	Date	Description of the review
01	M. Sydenham	2026-06-25	Review of initial draft
02	M. Sydenham	2026-06-26	Review of second draft
03	Client	2026-07-15	Client review of final draft

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Table of contents

1.	Introduction.....	1
1.1	Background	1
1.2	Scope of Work.....	2
2.	Existing Conditions	3
2.1	Existing Road Network	3
2.2	Study Intersection	3
2.3	Existing Intersection Volumes	4
2.4	Intersection Performance Evaluation Criteria	4
2.5	Existing Operating Conditions.....	5
2.6	Opening Year Background Volumes	6
2.7	Opening Year Background Operating Conditions	6
2.8	10-Year and 20-Year Background Traffic Volumes	7
3.	Proposed Development	9
3.1	Development Trip Generation and Distribution.....	9
4.	Post Development Conditions	11
4.1	Post Development Operating Conditions.....	11
4.2	10-Year Horizon Volumes	12
4.3	10-Year Horizon Operating Conditions	13
4.4	20-Year Horizon Volumes	14
4.5	20-Year Horizon Operating Conditions	15
5.	Intersection Treatment Warrant	15
6.	TAC Signal Warrant Analysis	16
7.	Illumination Warrant	17
8.	Conclusions	17

List of Tables

Table 1: Intersection Level of Service Criteria	5
Table 2: Existing Operating Conditions	5
Table 3: Opening Year Operating Conditions	7
Table 4: Trip Generation	9
Table 5: Post Development Operating Conditions	12
Table 6: 10-Year Horizon Post Development Operating Conditions	13
Table 7: 20-Year Horizon Post Development Operating Conditions	15

List of Figures

Figure 1: Site Context	1
Figure 2: Existing Lane Configuration and Intersection Control	3
Figure 4: Opening Year Background Volumes	6
Figure 5: 10-Year Background Traffic Volumes	8
Figure 6: 20-Year Background Traffic Volumes	8
Figure 7: Trip Distribution pattern	10
Figure 8: Site Generated Traffic Volumes	11
Figure 9: Post Development Traffic Volumes	12
Figure 10: Post-Development Traffic Volumes (10-Year Horizon)	13
Figure 11: 20-Year Horizon Volumes	14

List of Appendices

- Appendix A** Scope of Work
- Appendix B** Count Data
- Appendix C** Capacity Analysis Reports
- Appendix D** Facility Traffic Data
- Appendix E** Warrant Analysis

1. Introduction

1.1 Background

CIMA Canada Inc. (CIMA+) was retained by B&A Studios on behalf of UFA to prepare a Transportation Impact Assessment (TIA) in support of a proposed bulk fuel and cardlock facility east of Carstairs, south of Highway 581. The facility is proposed on the west side of Range Road 12, across from Mountain View Seed Cleaning, as shown in **Figure 1**. The area currently has an unsignalized intersection that serves the surrounding rural land uses.

The purpose of this TIA is to assess the impact of the proposed bulk fuel and cardlock facility on the surrounding transportation network, to determine the most appropriate intersection design for this area.



Figure 1: Site Context

1.2 Scope of Work

The scope of work for this TIA was confirmed with TEC and is available in **Appendix A: Scope of Work**. The scope for this study is to include the following:

- Trip generation for the proposed development based on anticipated facility use, as provided by the owner based on similar facilities. Distribution will be based upon engineering judgement, considering likely origin/destination paths.
- Traffic Analysis at the intersection for the following horizons:
 - Existing conditions
 - Opening year
 - 10-year horizon from opening year
 - 20-year horizon from opening year
- Traffic Signal Warrant
 - A warrant analysis will be undertaken following the TAC methodology, for all horizons.
- Intersection Treatment Warrant
 - A warrant analysis will be undertaken based upon the TEC Highway Geometric Design Guide (HGDG) and related bulletins.
- Illumination Warrant Analysis, as per the TEC TIA guidelines.

2. Existing Conditions

2.1 Existing Road Network

The site is located east of Carstairs, at the intersection of Highway 581 and Range Road 12. The key road network in the area of the proposed development is outlined as follows:

- **Highway 581** is a Level 3 service classification highway, intended to accommodate the movement of people, goods, and services intra-provincially. At this location, the highway has a typical rural two-lane undivided cross-section, with one travel lane in each direction and a posted speed limit of 100 km/h.
- **Range Road 12** is a two-lane undivided local rural roadway with a posted speed limit of 80 km/h, providing access to the surrounding agricultural land uses.

2.2 Study Intersection

One intersection is included as part of this study. A detailed description is provided below, with **Figure 2** showing the existing intersection control and lane configuration.

- **Highway 581 and Range Road 12** is a four-legged, unsignalized intersection with stop control for the north and south legs. Range Road 12 is a two-lane undivided roadway with shared left-turn / through / right-turn lanes for all directions. Highway 581 is a two-lane undivided highway with a shared left-turn/through lane and a dedicated right-turn lane in each direction. **Figure 2** shows the existing intersection control and lane configuration.

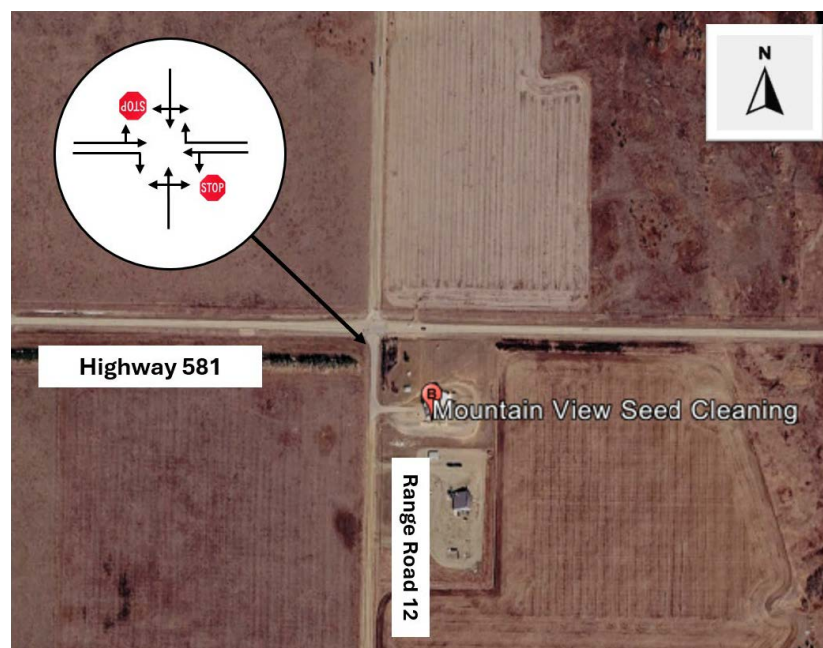


Figure 2: Existing Lane Configuration and Intersection Control

2.3 Existing Intersection Volumes

Turning movement counts were conducted at intersection Highway 581 and Range Road 12 during the AM, Midday and PM peak periods on Tuesday, June 9, 2026.

The resulting existing AM, Midday, and PM peak hour volumes for the study intersection are shown in **Figure 3**. The complete traffic count data is available in **Appendix B: Traffic Count Data**.

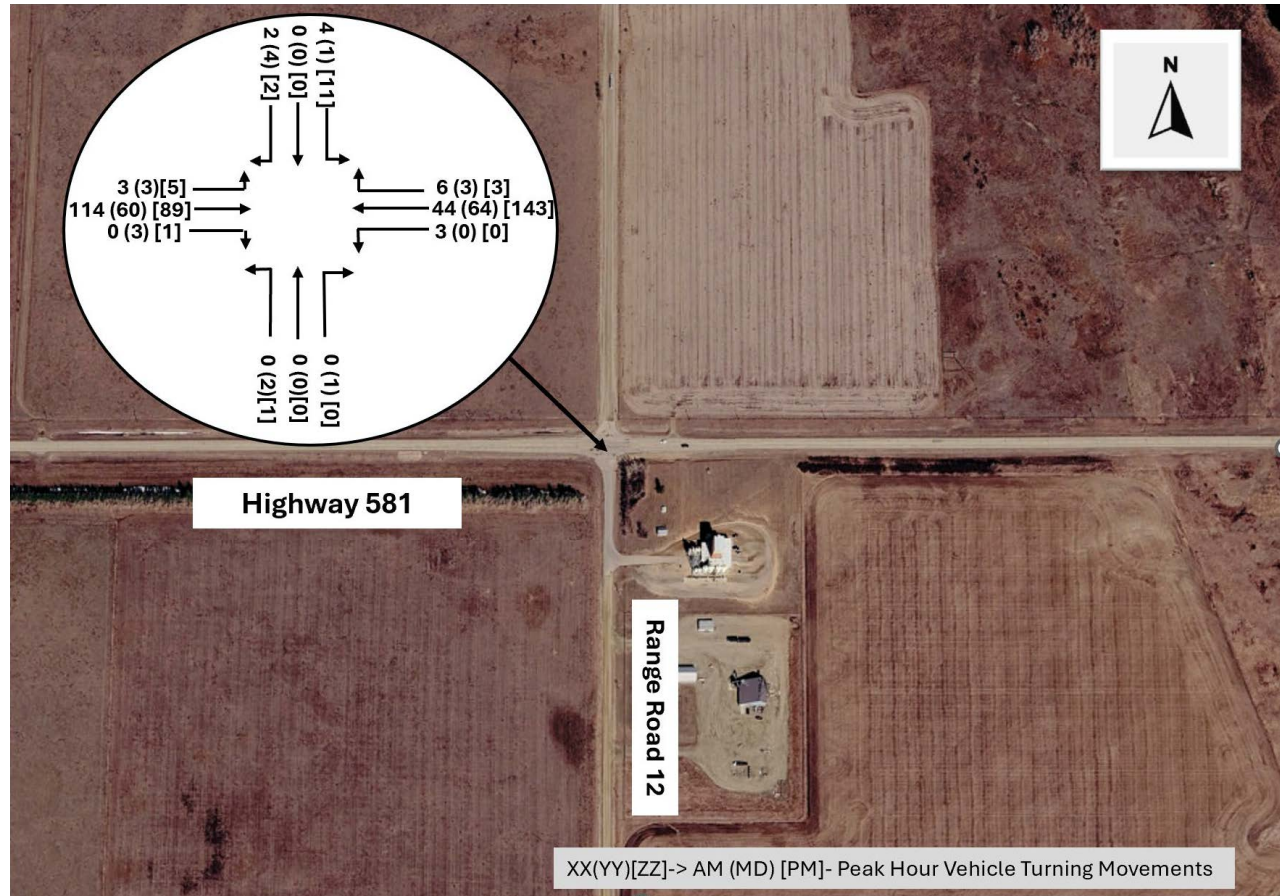


Figure 3: Existing Traffic Volumes

2.4 Intersection Performance Evaluation Criteria

The intersection operations were assessed using the Synchro/SimTraffic 11 software which utilizes the Highway Capacity Manual (HCM) 2000 methodology published by the Transportation Research Board National Research Council. Synchro 11 can analyze both signalized and unsignalized intersections in a road corridor or network considering the spacing, interaction, queues, and operations between intersections. Intersection operations performance metrics are reported in terms of Level of Service (LOS), volume to capacity (v/c) ratios.

Level of Service is a measure based on the average control delay per vehicle for a given movement. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between 'A' and 'F', with 'F' being the longest delay.

Table 1 summarizes the LOS criteria for signalized and unsignalized intersections.

Table 1: Intersection Level of Service Criteria

LOS	Average Control Delay per Vehicle (second/vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	≤10	≤10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

2.5 Existing Operating Conditions

The existing operating conditions were assessed using the Synchro software package. The existing volumes shown in **Figure 3** were assessed on the road network outlined in **Figure 2**. The detailed Synchro reports can be found in **Appendix C: Capacity Analysis Reports**, with the results summarized in **Table 2**.

Table 2: Existing Operating Conditions

Intersection/ Movemen			AM PEAK HOUR				Midday PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)
Highway 581 and Range Road 12 (Unsignalized)	EB	Left/Through	0	A	0.2	0	0	A	0.4	0.1	0	A	0.4	0.1
		Right	0	A	-	-	0	A	0	0	0	A	0	0
	WB	Left/Through	0	A	0.4	0	0	A	0	0	0	A	0	0
		Right	0	A	0	0	0	A	0	0	0	A	0	0
	NB	Left/Through/Right	-	-	-	-	0	A	9.3	0.1	0	B	10.5	0
	SB	Left/Through/Right	0.01	A	9.3	0.2	0.01	A	8.8	0.2	0.02	B	10.4	0.5
	Intersection Summary		-	A	0.5	-	-	A	0.6	-	-	A	0.7	-

As shown in **Table 2**, the intersection operates very well in its existing configuration during all three Peak Hour. The LOS for all movements and for the overall intersection is LOS A during the AM and midday peak periods. In the PM peak period, the intersection also operates well, with LOS A on the eastbound and westbound approaches and LOS B on the northbound and southbound approaches. The intersection has low volume-to-capacity ratios and minimal queuing on the stop-controlled approach.

2.6 Opening Year Background Volumes

The proposed facility is anticipated to open in September 2027, approximately one year from the date of the existing traffic counts. To determine the opening year background traffic volumes on Highway 581 and Range Road 12, a 2% annual growth rate was applied to the existing traffic volumes, consistent with TEC TIA guidelines. This growth rate was applied to all turning movements at the intersection of Highway 581 and Range Road 12. The resulting opening year background volumes are shown in **Figure 4**.

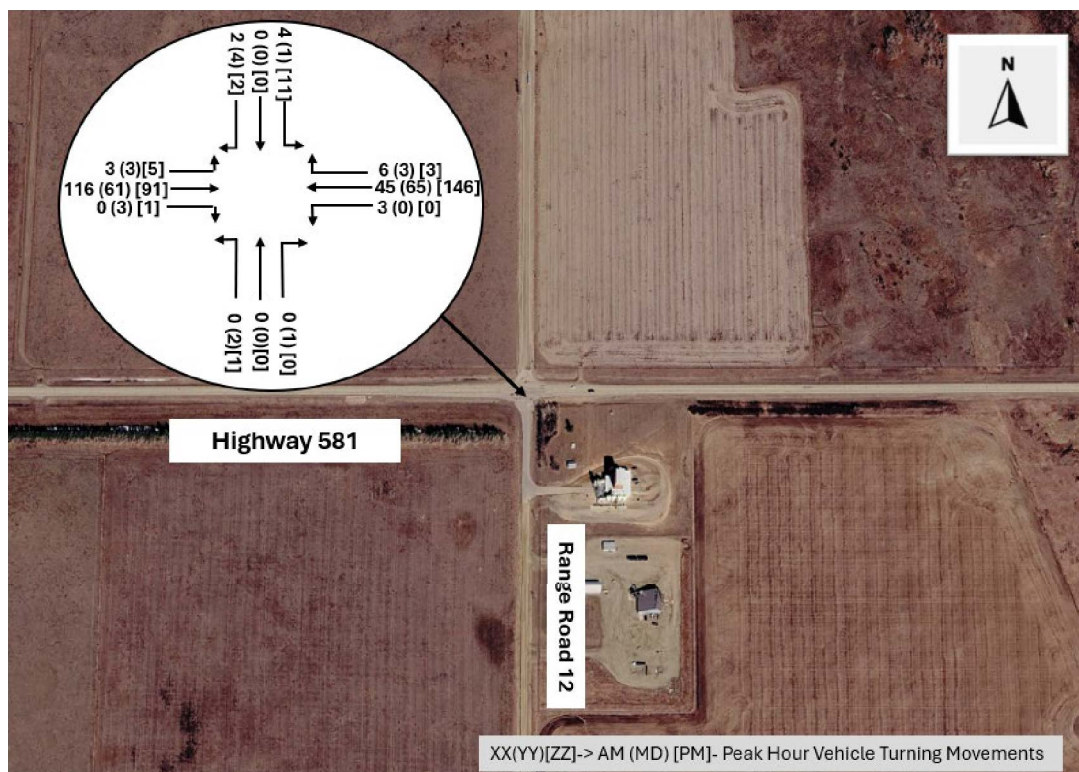


Figure 4: Opening Year Background Volumes

2.7 Opening Year Background Operating Conditions

The opening year background operating conditions were assessed using the Synchro software package. The opening year background volumes shown in **Figure 4** were assessed on the road network outlined in **Figure 2**. The detailed Synchro reports can be found in **Appendix C: Capacity Analysis Reports**, with the results summarized in **Table 3**.

Table 3: Opening Year Operating Conditions

Intersection/ Movemen			AM PEAK HOUR				Midday PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)
Highway 581 and Range Road 12 (Unsignalized)	EB	Left/Through	0	A	0.2	0	0	A	0.4	0.1	0	A	0.4	0.1
		Right	0	A	-	-	0	A	0	0	0	A	0	0
	WB	Left/Through	0	A	0.4	0	0	A	0	0	0	A	0	0
		Right	0	A	0	0	0	A	0	0	0	A	0	0
	NB	Left/Through/Right	-	-	-	-	0	A	9.3	0.1	0	B	10.5	0
	SB	Left/Through/Right	0.01	A	9.3	0.2	0.01	A	8.8	0.2	0.02	B	10.4	0.5
	Intersection Summary		-	A	0.5	-	-	A	0.6	-	-	A	0.7	-

As shown in **Table 3**, the intersection continues to operate at the same level of service as the existing condition at the opening year horizon. The marginal increase in traffic volumes resulting from the application of the 2% annual growth rate over a single year produces no change in intersection performance, with all movements maintaining LOS A during the AM and midday peak hours and LOS A and LOS B on the eastbound/westbound and northbound/southbound approaches respectively during the PM peak hour. Volume-to-capacity ratios remain low across all movements, with minimal queuing on the stop-controlled legs.

2.8 10-Year and 20-Year Background Traffic Volumes

To determine the future background traffic volumes on Highway 581 and Range Road 12, a 2% annual growth rate was applied to the existing traffic volumes, consistent with TEC TIA guidelines. The resulting 10-year and 20-year background volumes are shown in **Figure 5** and **Figure 6** respectively.

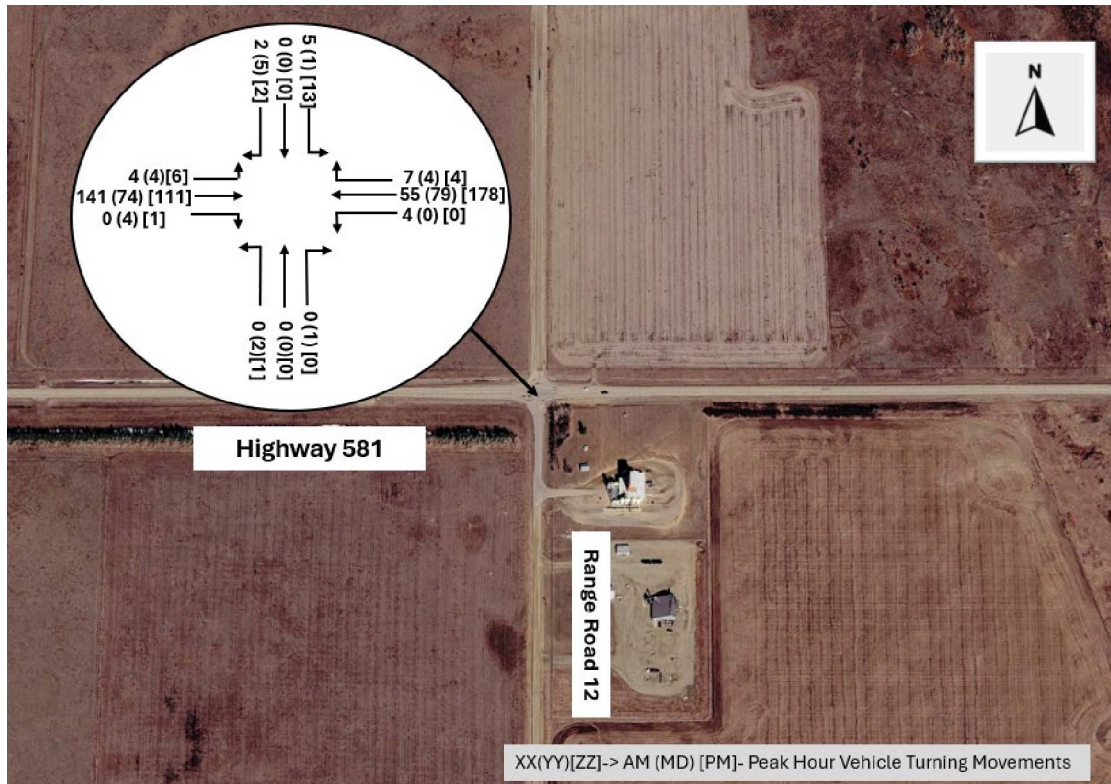


Figure 5: 10-Year Background Traffic Volumes

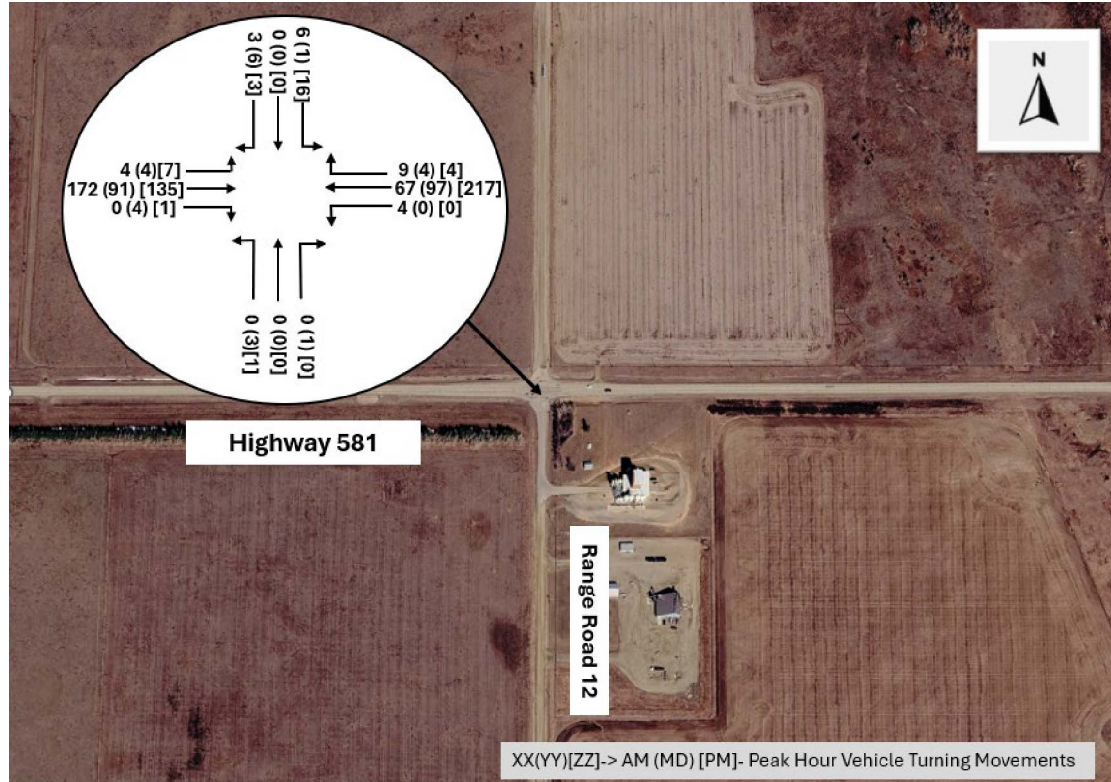


Figure 6: 20-Year Background Traffic Volumes

3. Proposed Development

The proposed development is a bulk fuel and cardlock facility, intended to serve agricultural operators, commercial customers, and members in the Carstairs and Mountain View County area. The facility will operate with office hours of 8:00 AM to 5:00 PM Monday to Friday, while the cardlock will be available to members 24 hours a day, seven days a week. Bulk fuel deliveries will typically be scheduled during office hours; however after-hours loading may occur during peak operational periods.

3.1 Development Trip Generation and Distribution

Anticipated traffic for the facility has been provided by the owner based on operations at similar facilities and is included in **Appendix D: Facility Traffic Data**. The facility generates a mix of vehicle types including heavy fuel tanker trucks, agency delivery trucks, fuel carrier deliveries, passenger vehicles, and employee vehicles. Seasonal fluctuations in traffic are anticipated, with increased volumes during farming cycles such as seeding and harvest periods. The peak hour generation has been assumed based on the owner comments, as shown in **Table 4**.

Table 4: Trip Generation

Vehicle Mode	Vehicles Accessing Site	
	Max Daily	Peak Hour
Heavy trucks	30	10
passenger vehicles	80	25
Employee Vehicles	3	3

Site generated traffic was assigned to the surrounding road network based on engineering judgement, considering the likely origin and destination paths for each vehicle type. As confirmed by the owner, 80% of heavy trucks are anticipated to originate from the Highway 2 corridor, travelling westbound along Highway 581 to access the facility and returning eastbound upon departure. The remaining 20% of heavy truck trips are anticipated to originate from Carstairs to the west, with a 50/50 split between vehicles returning to Carstairs and those continuing eastbound on Highway 581 upon departure. Passenger vehicles were distributed based upon the existing traffic volume pattern at the intersection of Highway 581 and Range Road 12, consistent with the opening year traffic distribution. Employee vehicles are anticipated to access the site during the AM peak hour and depart during the PM peak hour and have been assigned accordingly as inbound trips in the AM peak and outbound trips in the PM peak. Agency delivery trucks and fuel carrier deliveries are anticipated to operate primarily during off-peak hours and have therefore not been included in the peak hour analysis. **Figure 7** shows the trip distribution pattern with **Figure 8** showing the site generated traffic volumes.

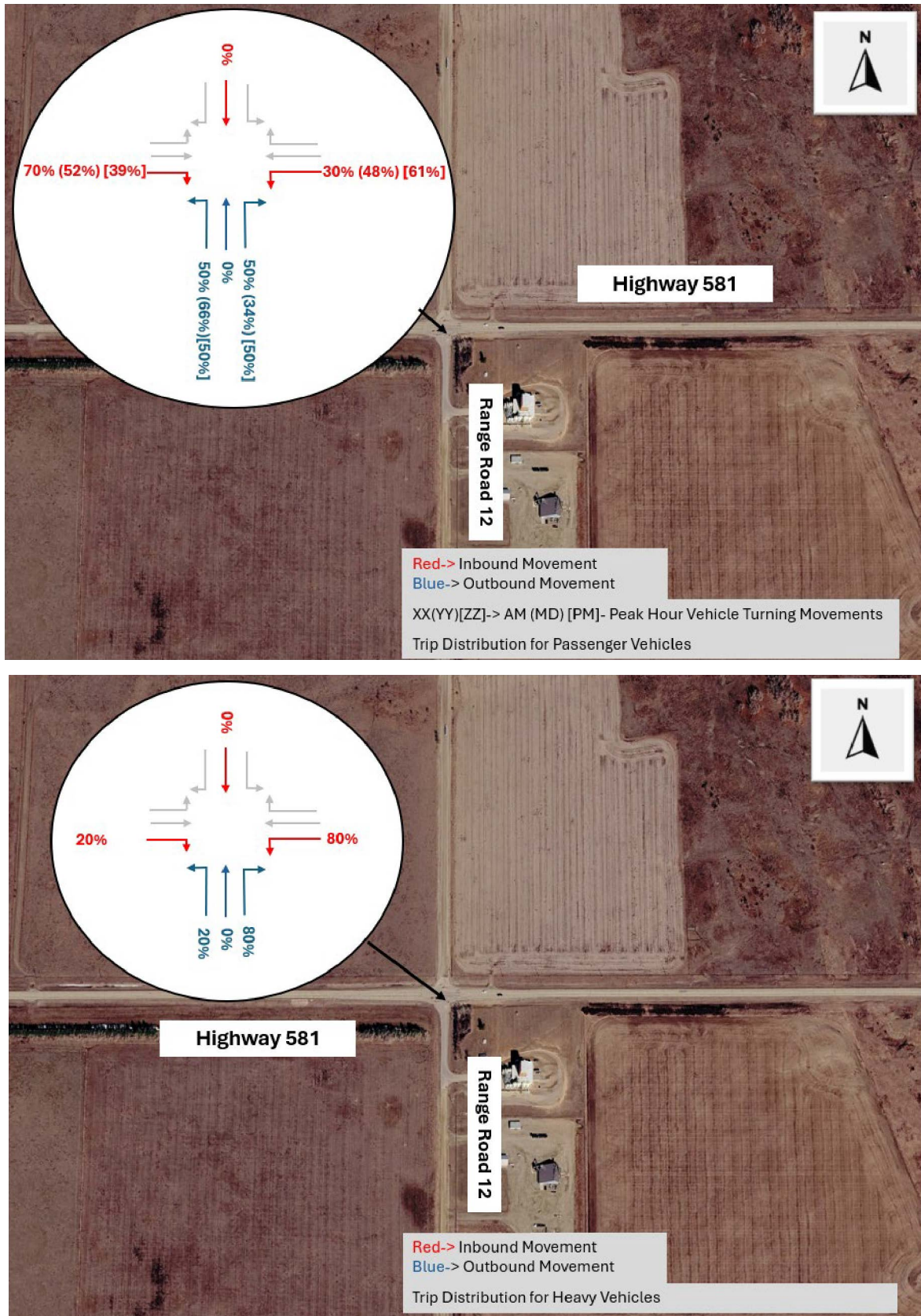


Figure 7: Trip Distribution pattern

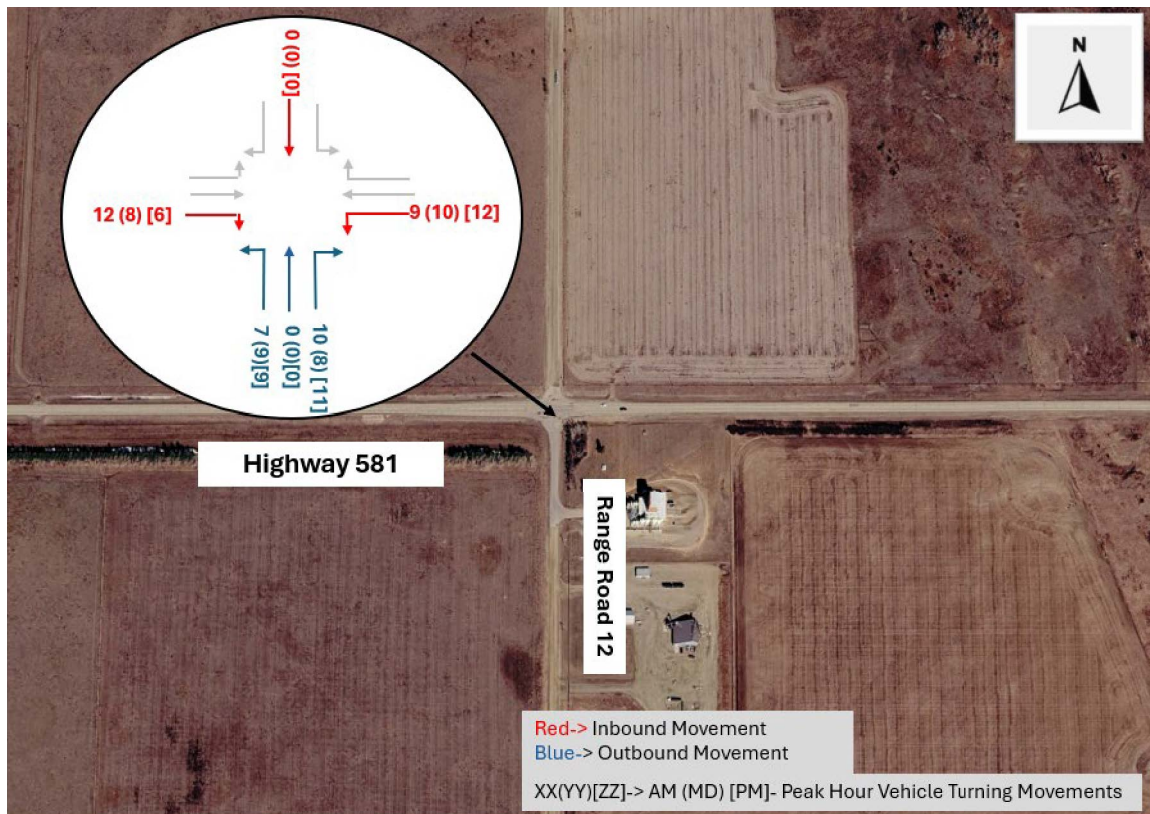


Figure 8: Site Generated Traffic Volumes

4. Post Development Conditions

4.1 Post Development Operating Conditions

The post-development operating conditions were assessed using the Synchro software package. The post-development volumes were derived by adding the site generated volumes in **Figure 8** to the opening year background volumes in **Figure 4**. The resulting post development volumes are shown in **Figure 9** and were assessed on the road network outlined in **Figure 2**. The detailed Synchro reports can be found in **Appendix C: Capacity Analysis Reports**, with the results summarized in **Table 5**.

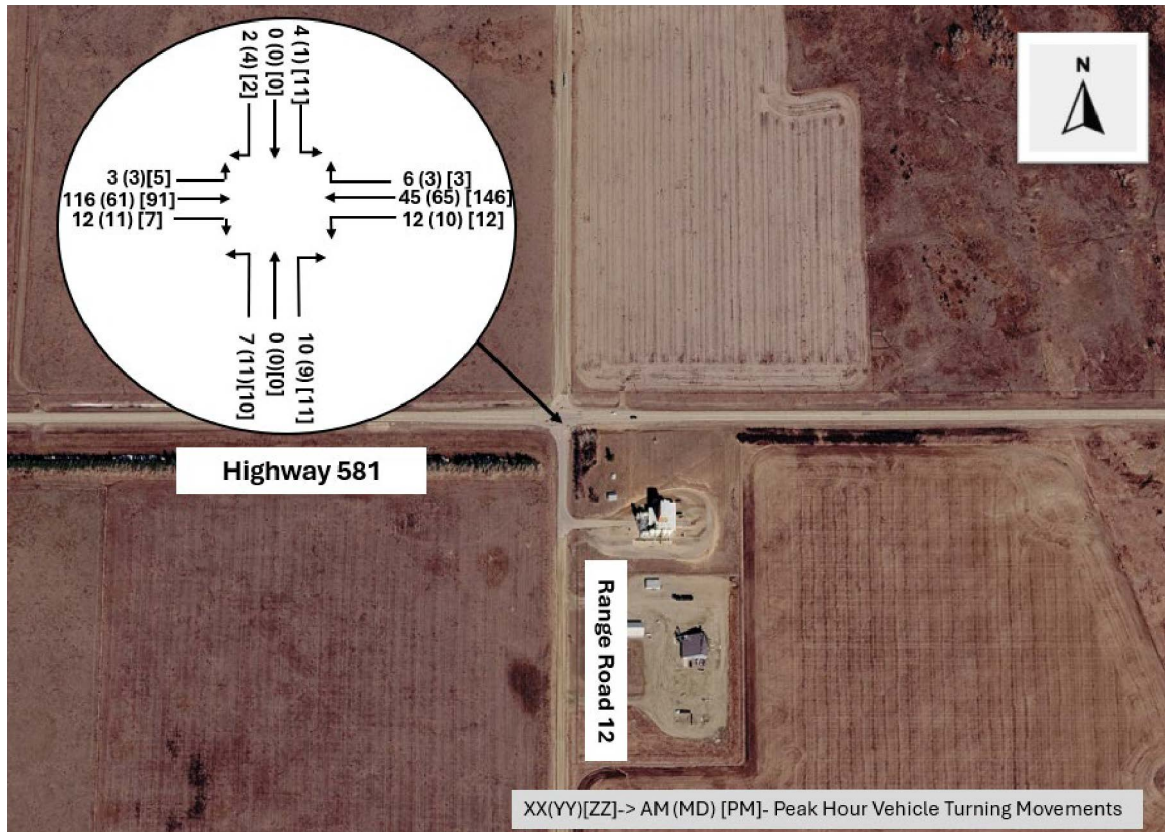


Figure 9: Post Development Traffic Volumes

Table 4: Post Development Operating Conditions

Intersection/ Movement			AM PEAK HOUR				Midday PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)
Highway 581 and Range Road 12 (Unsignalized)	EB	Left/Through	0	A	0.2	0	0	A	0.4	0.1	0	A	0.4	0.1
		Right	0.01	A	0	0	0.01	A	0	0	0	A	0	0
	WB	Left/Through	0.01	A	1.6	0.2	0.01	A	1	0.2	0.01	A	0.6	0.2
		Right	0	A	0	0	0	A	0	0	0	A	0	0
	NB	Left/Through/Right	0.02	A	9.4	0.6	0.03	A	9.4	0.7	0.03	A	9.9	0.8
	SB	Left/Through/Right	0.01	A	9.6	0.2	0.01	A	8.9	0.2	0.02	B	10.8	0.6
Intersection Summary			-	A	1.5	-	-	A	1.9	-	-	A	1.6	-

As shown in **Table 5**, the intersection operates very well at the post-development horizon during the Peak Hours. The LOS of the northbound, westbound and eastbound movements, as well as the intersection overall, is A. The southbound movements operate with an LOS of B. All movements have low volume-to-capacity ratios, with minimal queuing on the stop-controlled legs.

4.2 10-Year Horizon Volumes

To assess the post-development operating conditions of the surrounding road network, the site-generated traffic, as shown in **Figure 8**, was added to the 10-year horizon background volumes as shown in **Figure 5**. **Figure 10** shows the post-development traffic volumes anticipated on the road network for 10-year horizon.

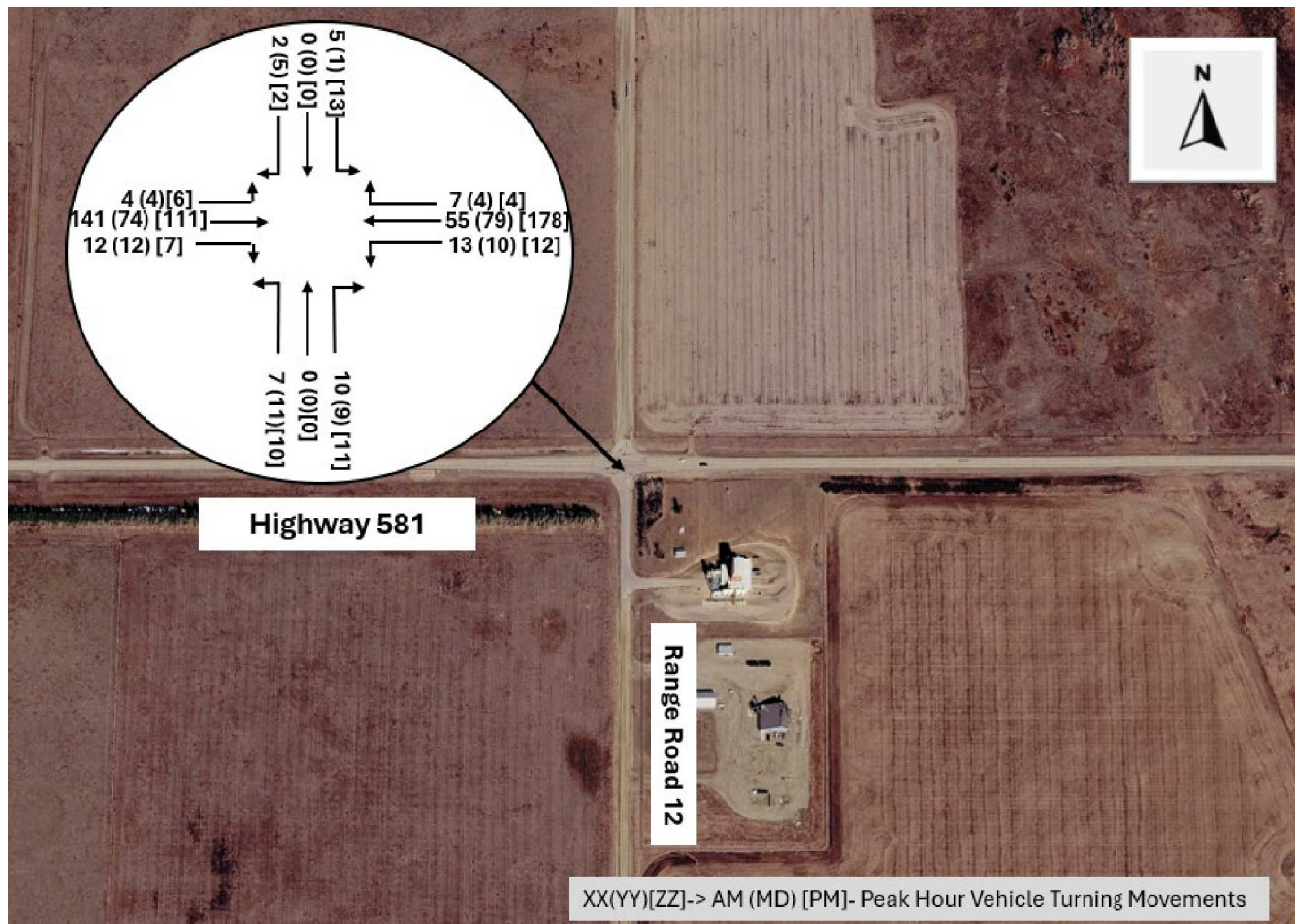


Figure 10: Post-Development Traffic Volumes (10-Year Horizon)

4.3 10-Year Horizon Operating Conditions

The 10-year horizon post development operating conditions were assessed using the Synchro software package. The 10-year horizon volumes shown in **Figure 10** were assessed on the road network outlined in **Figure 2**. The detailed Synchro reports can be found in **Appendix C: Capacity Analysis Reports**, with the results summarized in **Table 6**.

Table 5: 10-Year Horizon Post Development Operating Conditions

Intersection/ Movemen			AM PEAK HOUR				Midday PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)
Highway 581 and Range Road 12 (Unsignalized)	EB	Left/Through	0	A	0.2	0.1	0	A	0.4	0.1	0.01	A	0.4	0.1
		Right	0.01	A	0	0	0.01	A	0	0	0	A	0	0
	WB	Left/Through	0.01	A	1.5	0.2	0.01	A	0.9	0.2	0.01	A	0.5	0.2
		Right	0	A	0	0	0	A	0	0	0	A	0	0
	NB	Left/Through/Right	0.02	A	9.7	0.6	0.03	A	9.6	0.8	0.04	B	10.3	0.9
	SB	Left/Through/Right	0.01	A	10	0.3	0.01	A	9	0.2	0.03	B	11.5	0.7
Intersection Summary			-	A	1.4	-	-	A	1.7	-	-	A	1.5	-

As shown in **Table 6**, the intersection operates very well at the 10-year horizon during all peak hours. The LOS for all movements and for the overall intersection is LOS A during the AM and midday peak periods. In the PM peak period, the intersection also operates well, with LOS A on the eastbound and westbound approaches and LOS B on the northbound and southbound approaches. The intersection has low volume-to-capacity ratios and minimal queuing on the stop-controlled approach.

4.4 20-Year Horizon Volumes

To assess the post development operating conditions at the 20-year horizon, the site-generated traffic as shown in **Figure 8** was added to the 20-year horizon background volumes as shown in **Figure 6**. **Figure 11** shows the post-development traffic volumes anticipated on the road network at the 20-year horizon.

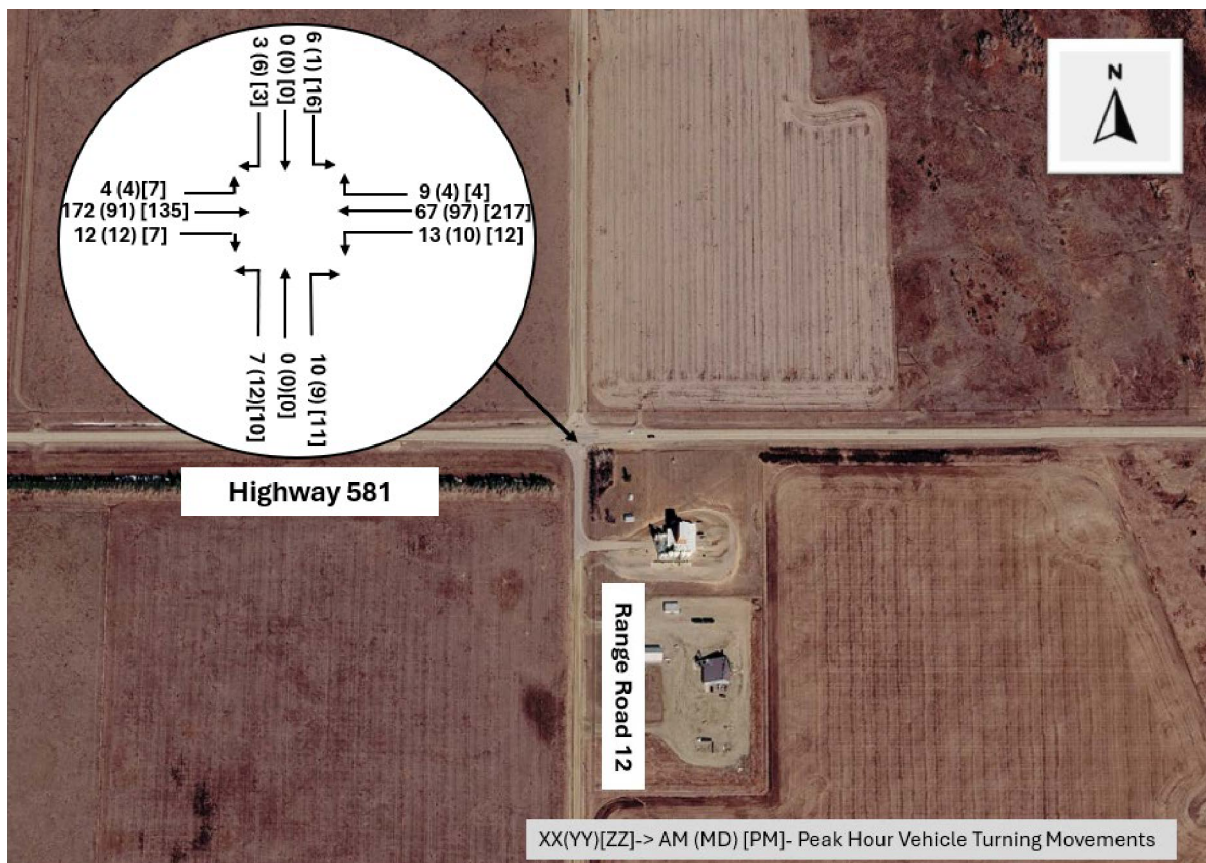


Figure 11: 20-Year Horizon Volumes

4.5 20-Year Horizon Operating Conditions

The 20-year horizon post development operating conditions were assessed using the Synchro software package. The 20-year horizon volumes shown in **Figure 11** were assessed on the road network outlined in **Figure 2**. The detailed Synchro reports can be found in **Appendix C: Capacity Analysis Reports**, with the results summarized in **Table 7**.

Table 6: 20-Year Horizon Post Development Operating Conditions

Intersection/ Movement			AM PEAK HOUR				Midday PEAK HOUR				PM PEAK HOUR			
			v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)	v/c Ratio	LOS	Delays(s)	Queue(m)
Highway 581 and Range Road 12 (Unsignalized)	EB	Left/Through	0	A	0.2	0.1	0	A	0.3	0.1	0.01	A	0.4	0.1
		Right	0.01	A	0	0	0.01	A	0	0	0	A	0	0
	WB	Left/Through	0.01	A	1.3	0.2	0.01	A	0.7	0.2	0.01	A	0.5	0.2
		Right	0.01	A	0	0	0	A	0	0	0	A	0	0
	NB	Left/Through/Right	0.03	A	9.9	0.6	0.03	A	9.9	0.9	0.04	B	10.8	1
	SB	Left/Through/Right	0.01	B	10.2	0.3	0.01	A	9.1	0.2	0.04	B	12.2	1.1
	Intersection Summary		-	A	1.3	-	-	A	1.6	-	-	A	1.5	-

As shown in **Table 7**, the intersection continues to operate well at the 20-year post-development horizon during all peak periods. During the AM peak hour, all movements including the overall intersection operate at LOS A, with the exception of the southbound approach which operates at LOS B. During the midday peak hour, all movements and the overall intersection operate at LOS A. During the PM peak hour, the eastbound and westbound approaches continue to operate at LOS A, while the northbound and southbound stop-controlled approaches operate at LOS B. Volume-to-capacity ratios remain low across all movements, with minimal queuing on the stop-controlled legs.

5. Intersection Treatment Warrant

Based on the existing volumes and opening year background volumes, Figure D-7.4 of the Alberta Highway Geometric Design Guide (HGDG) recommends a detailed analysis. Per the HGDG, detailed analysis is required whenever the design AADT exceeds 1,800 on the main road and 100 on the intersecting road. When post-development volumes are included at the opening year, 10-year, and 20-year horizons, the detailed analysis requirement remains applicable at all post-development horizons.

The existing intersection of Highway 581 and Range Road 12 currently operates as a Type IIc treatment, with a taper and approached right-turn lanes on both the eastbound and westbound approaches of Highway 581.

According to the corresponding left turn warrant Figure D-7.6-7a, undertaken as part of the detailed analysis, a Type II treatment is warranted. At the 20-year post-development horizon, the plotted values approach the Type III boundary. A right turn lane warrant was also assessed, and a dedicated right turn lane is not warranted at any of the assessed horizons.

The existing Type IIc intersection treatment is therefore appropriate for this location, with a recommendation to consider a Type III treatment at the 20-year post-development horizon.

The TAC warrant calculations can be found in **Appendix E: Warrant Analysis**.

6. TAC Signal Warrant Analysis

As per the scope of work, TEC requested that a signal warrant analysis be conducted at the intersection of Highway 581 and Range Road 12. A TAC signal warrant analysis is a procedure developed by the Transportation Association of Canada (TAC) to objectively determine if a traffic signal is justified at an intersection by calculating a cumulative point score. The process involves collecting data on vehicular and pedestrian volumes, roadway characteristics, and other factors, assigning points for each, with a threshold of 100 points required to warrant a signal.

The TAC warrant analysis requires 6 hours of data, with 2 hours in the AM peak, 2 hours of midday traffic, and 2 hours of PM peak. For the purposes of this analysis, the peak hour volumes were used to represent each respective 2-hour period. The signal warrant analysis was conducted for the following horizons:

- Post-development opening year (2027)
- 10-year horizon from opening year (2037)
- 20-year horizon from opening year (2047)

The results of the TAC signal warrant analysis are summarized below. In all cases, the scores obtained are well below the TAC threshold of 100 points required to justify signalization, confirming that a traffic signal is not warranted at this intersection at any of the assessed horizons.

- At the post-development opening year (2027), a total warrant score of 4 was obtained.
- At the 10-year horizon (2037), a total warrant score of 6 was obtained.
- At the 20-year horizon (2047), a total warrant score of 7 was obtained.

The signalization warrant calculations can be found in **Appendix E: Warrant Analysis**.

7. Illumination Warrant

An illumination warrant has been undertaken, following the Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting. 120 points or greater is required for consideration of partial and/or delineation lighting, while 240 points or signalization is required to warrant full illumination. The intersection scored 71 warrant points for the 2027 post-development horizon, increasing to 81 points for both the 2037 and 2047 horizons, indicating intersection lighting is not required. The Illumination Warrant can be found in **Appendix E: Warrant Analysis**.

8. Conclusions

Based upon the results of the study, the following conclusions can be made:

■ Intersection Performance

- The intersection of Highway 581 and Range Road 12 operates well under existing and opening year background conditions. During the AM and midday peak periods, all movements and the overall intersection operate at LOS A. During the PM peak period, the eastbound and westbound approaches continue to operate at LOS A, while the stop-controlled northbound and southbound approaches operate at LOS B. Volume-to-capacity ratios are low across all movements, with minimal queuing on the stop-controlled legs.
- The intersection continues to operate efficiently at all post-development horizons, with the same level of service maintained at the opening year, 10-year, and 20-year post-development horizons. The addition of site-generated traffic does not have a material impact on intersection performance at any of the assessed horizons.

■ Intersection Treatment

The existing intersection of Highway 581 and Range Road 12 currently operates as a Type IIc treatment and no upgrade is required at the existing, opening year, and 10-year post-development horizons.

- A detailed analysis was undertaken using Figure D-7.4 and Figure D-7.6-7a of the Alberta Highway Geometric Design Guide, confirming that a Type II treatment is warranted at all horizons.
- The existing Type IIc treatment, with a taper and approached right-turn lanes on both the eastbound and westbound approaches of Highway 581, satisfies the warrant requirements at all horizons.
- A dedicated right turn lane is not warranted at any of the assessed horizons and the existing approached right-turn lanes are therefore sufficient.
- At the 20-year post-development horizon, the plotted values approach the Type III boundary, and a Type III intersection treatment could be considered at that time.

■ Signal Warrant

A traffic signal is not warranted at the intersection of Highway 581 and Range Road 12 at any of the assessed horizons.

- At the post-development opening year (2027), a total TAC warrant score of 4 was obtained, well below the threshold of 100 points.
- At the 10-year horizon (2037), a total score of 6 was obtained.
- At the 20-year horizon (2047), a total score of 7 was obtained.

■ Illumination Warrant

Intersection illumination is not warranted at any of the assessed horizons.

- The intersection scored 71 warrant points at the 2027 post-development horizon and 81 points at both the 2037 and 2047 horizons, below the threshold of 120 points required for consideration of partial or delineation lighting.

A

Appendix A Scope of Work



B

Appendix B Traffic Count Data



C

Appendix C Capacity Analysis Reports

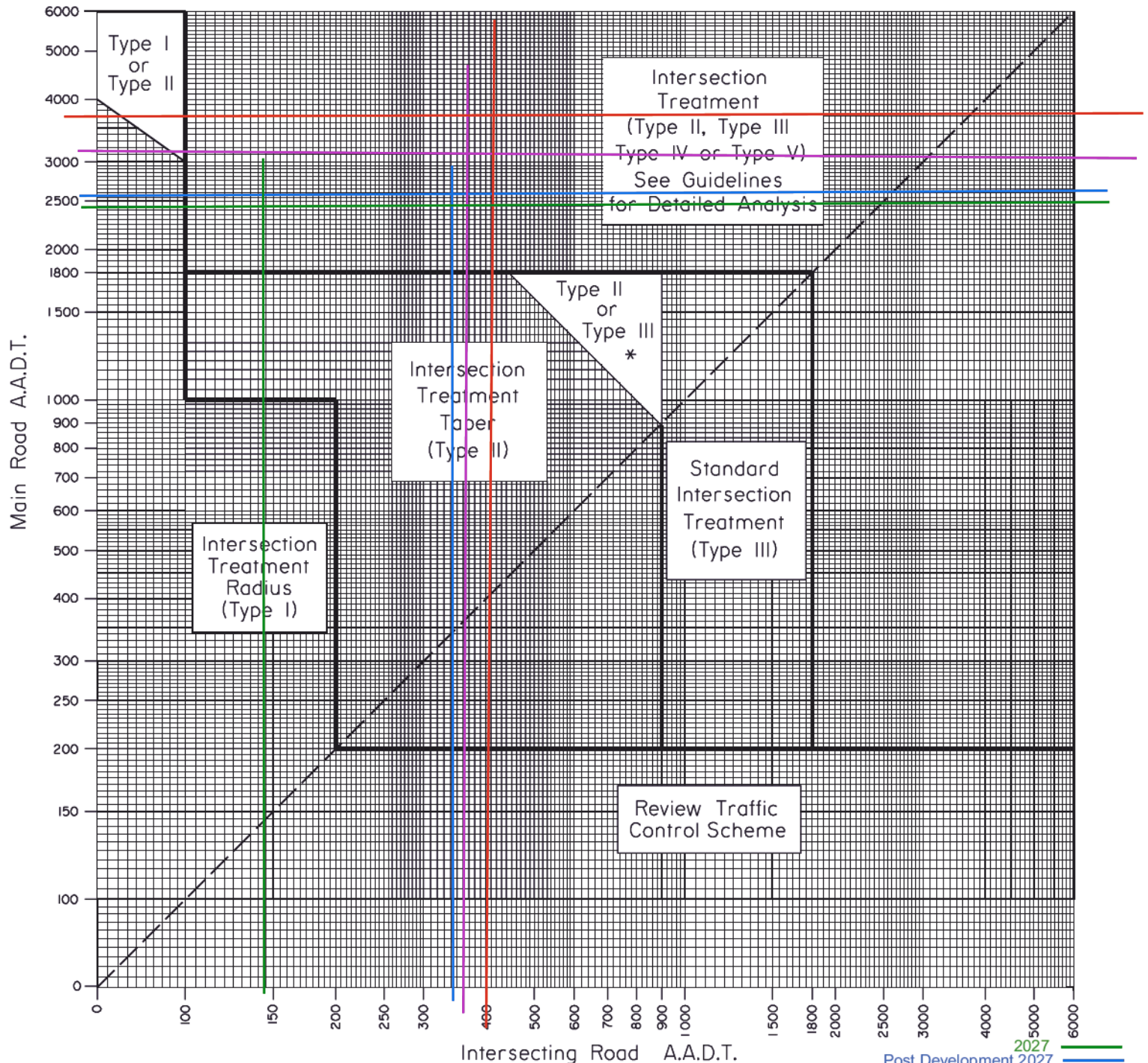
D

Appendix D Facility Traffic Data

E

Appendix E Illumination Warrant

FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE
INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS
(DESIGN SPEEDS 100, 110, 120 km/h)

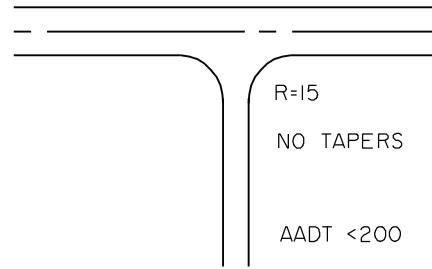


Notes:

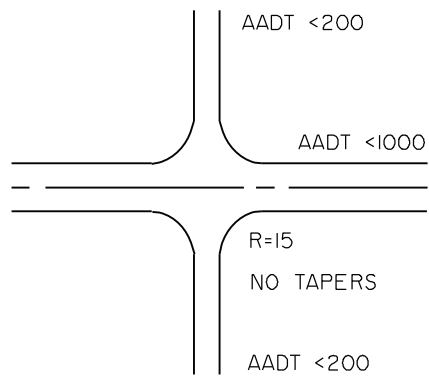
1. If main road, or intersecting road, is <100 AADT provide Type I Intersection Treatment (15m radius), except as shown for the higher volume main roads on this chart (Type I or II zone) where engineering judgement may be used to select the appropriate treatment.
2. If main road is >4000 AADT Review Access Management
 - - - If Intersecting Road AADT is > Main Road AADT: Review Traffic Control Scheme
3. Use projected traffic volumes for design
 Sloping line is defined by Main Road AADT x Intersecting Road AADT = 800,000

TYPE I's

AADT <1000

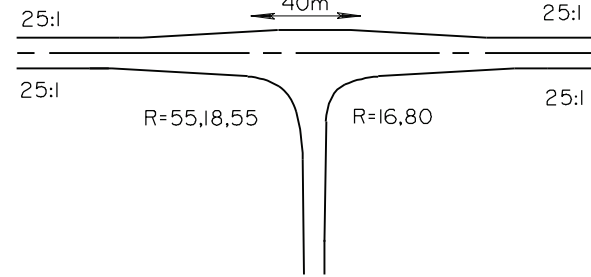


TYPE Ia

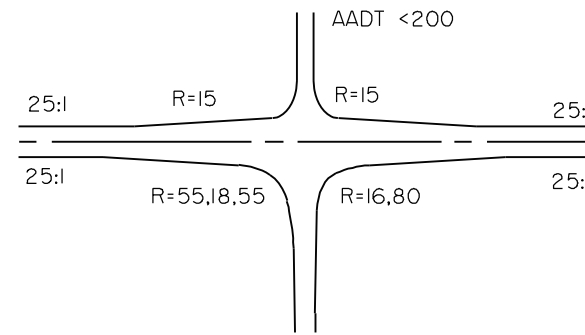


TYPE Ib

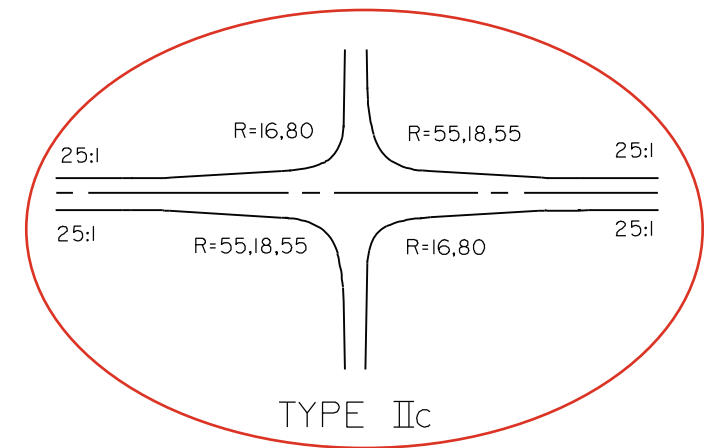
TYPE II's



TYPE IIa

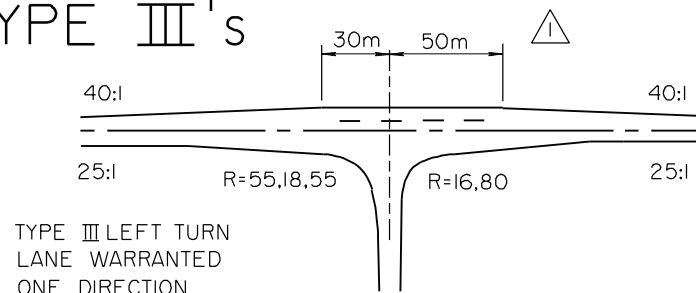


TYPE IIb

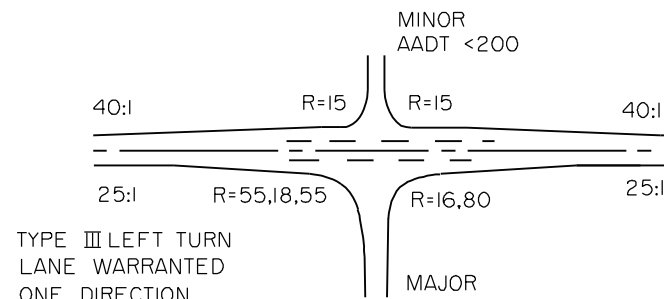


TYPE IIc

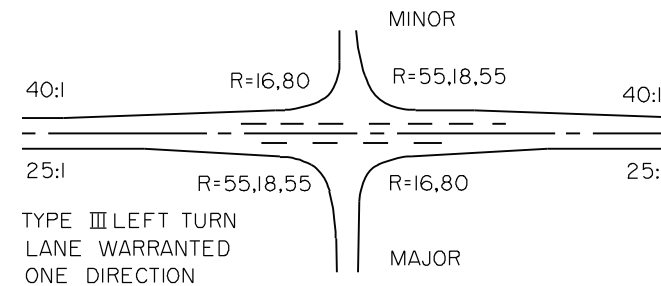
TYPE III's



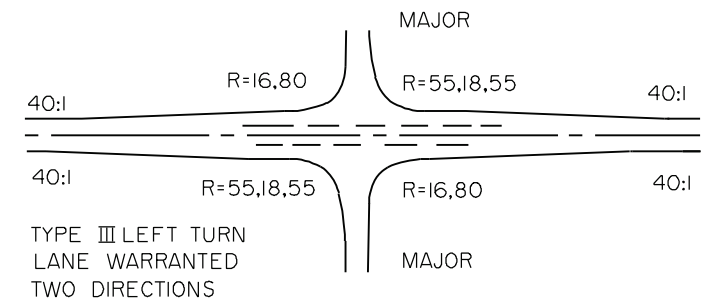
TYPE IIIa



TYPE IIIb

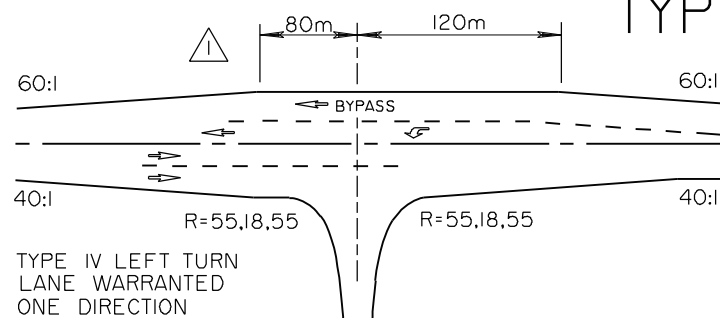


TYPE IIIc

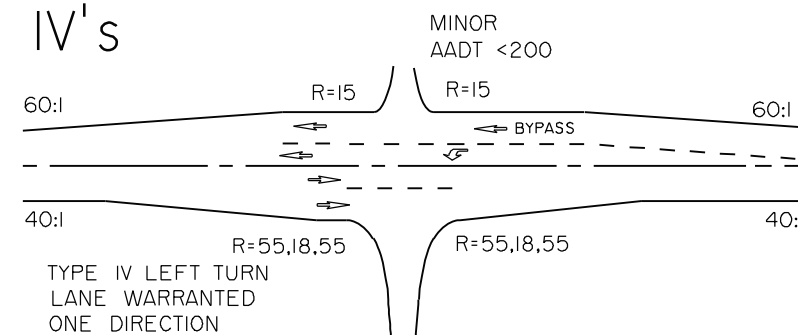


TYPE IIId

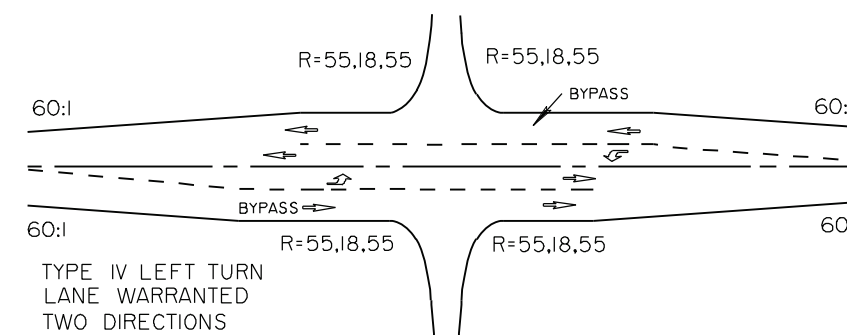
TYPE IV's



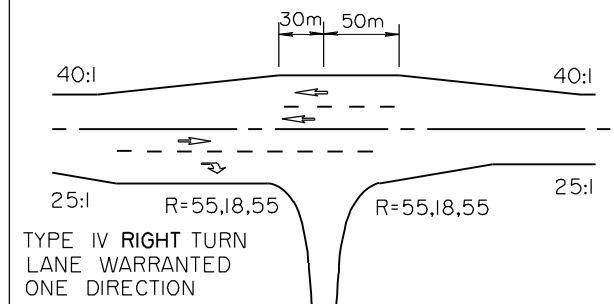
TYPE IVa



TYPE IVb



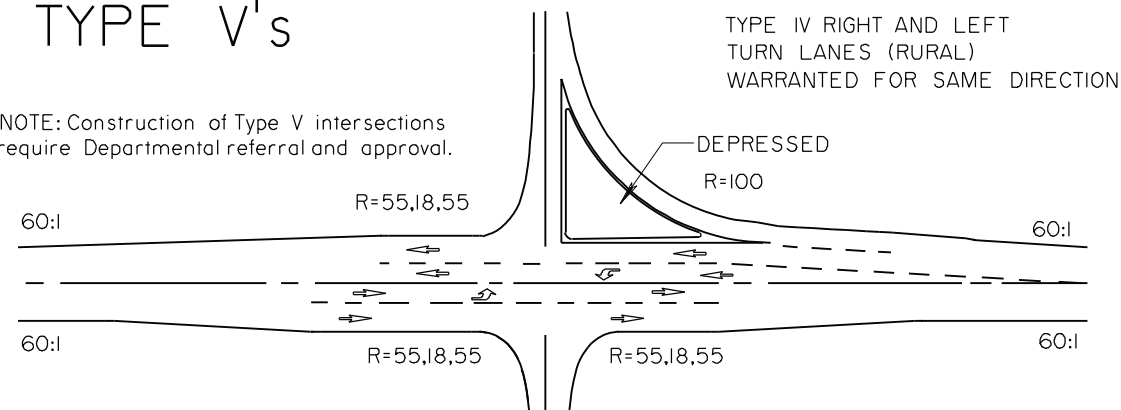
TYPE IVc



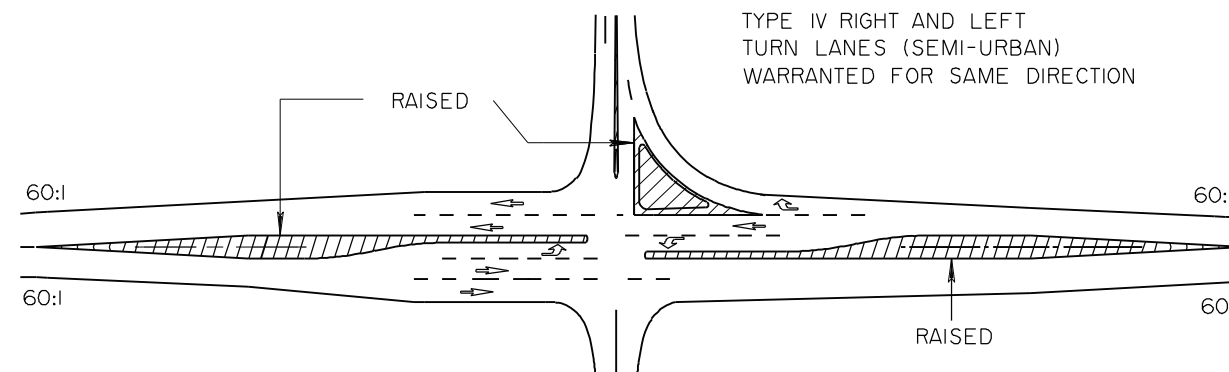
TYPE IVd

TYPE V's

NOTE: Construction of Type V intersections require Departmental referral and approval.



TYPE Vb



TYPE Vc

	REVISED LANE DIMENSIONS	TDN	06/98
No.	REVISIONS	BY	DATE

Alberta
INFRASTRUCTURE

FIGURE
D-7.5

Date: APRIL 1995

STANDARD AT-GRADE
INTERSECTION LAYOUTS
FOR TWO-LANE HIGHWAYS

Prepared By: LT	Checked By: B.K.	Scale: N.T.S.	PAGE D-III
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- NOTES:
1. This is not a pavement marking drawing.
 2. This figure depicts the typical layouts used for at-grade intersections. Detailed design considerations may dictate some

minor alterations for particular intersections. The tapers shown here are typical for a 110 km/h design speed on the main highway.

Intersection Analysis

Rural Two-Lane Undivided Highways

INPUT	Value
85 th percentile speed, km/h:	110
Main Road A.A.D.T.	2,640
Minor (intersecting) Road A.A.D.T	340
Left turn volume (V_{LT}), veh/h:	12
Advancing volume (V_{adv}), veh/h:	158
Opposing volume (V_{opp}), veh/h:	96
Left turn truck volume, trucks/h:	4
Right turn volume (V_{RT}), veh/day:	23

OUTPUT	Value
Percent left-turns in advancing volume:	7.6%
Percent trucks in left turn volume:	33.3%
Probability of conflict threshold:	0.58%
Calculated probability of conflicting arrival:	0.1%
Calculated conflicts per hour, veh/h:	0.2

Use Detailed Method

Type II

Additional Storage Not Required	base storage requirement	-
	- standard storage length	-
	+ additional truck storage	-
	= total additional storage required	-

CALIBRATION CONSTANTS

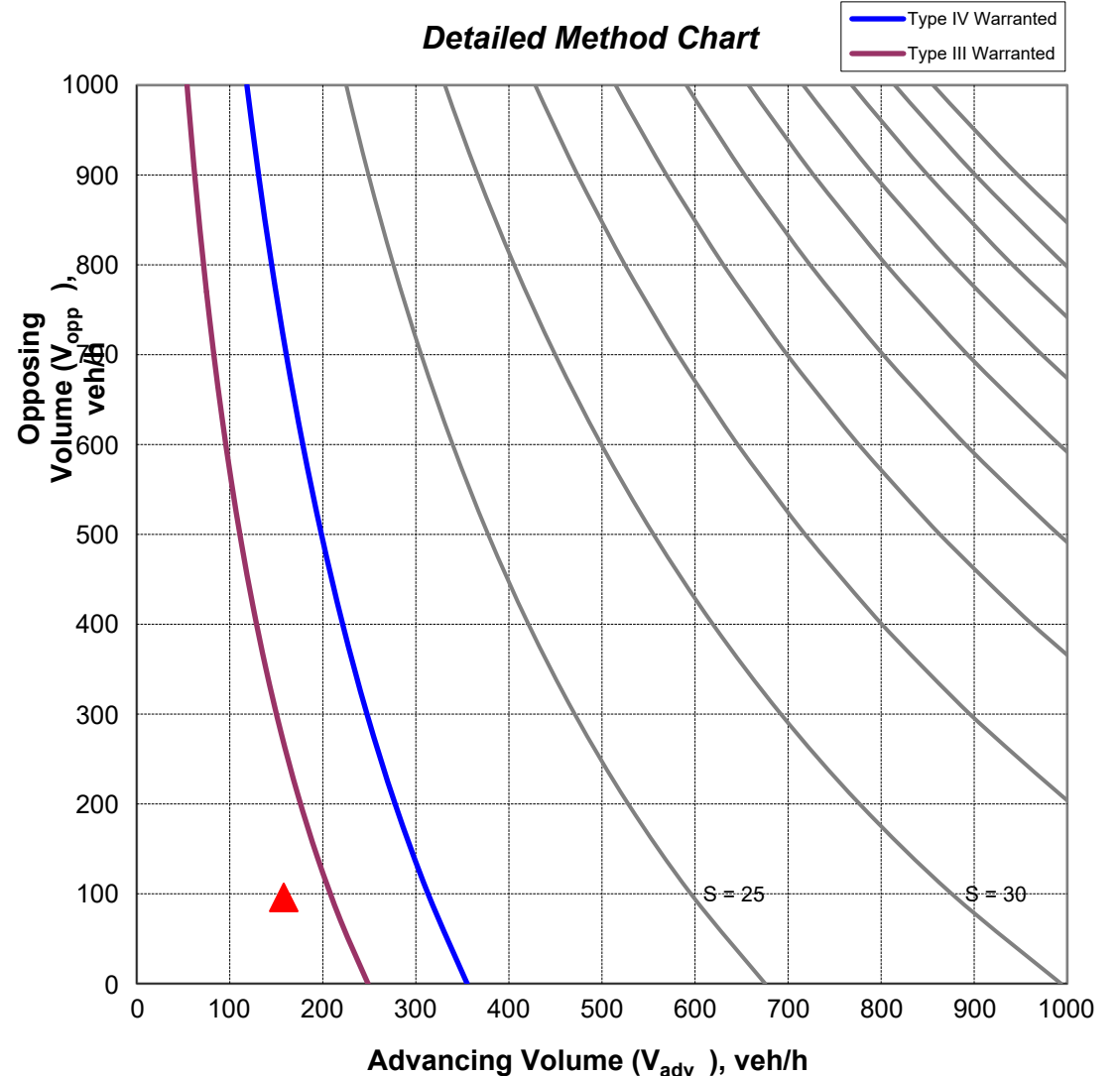
Variable	Value
Average time for making left-turn, s:	3.0
Critical headway (gap), s:	5.0
Average time to clear, s:	1.9

Main Rd: Highway 581
Minor Rd: Range Road 12

Direction: WB
Period: PM. Peak

Year of Analysis: 2027
Date of Analysis: 24-Jun-2026

Detailed Method Chart



Intersection Analysis

Rural Two-Lane Undivided Highways

INPUT	Value
85 th percentile speed, km/h:	110
Main Road A.A.D.T.	3,180
Minor (intersecting) Road A.A.D.T	360
Left turn volume (V_{LT}), veh/h:	12
Advancing volume (V_{adv}), veh/h:	190
Opposing volume (V_{opp}), veh/h:	117
Left turn truck volume, trucks/h:	4
Right turn volume (V_{RT}), veh/day:	24

OUTPUT	Value
Percent left-turns in advancing volume:	6.3%
Percent trucks in left turn volume:	33.3%
Probability of conflict threshold:	0.58%
Calculated probability of conflicting arrival:	0.2%
Calculated conflicts per hour, veh/h:	0.4

Use Detailed Method

Type II

Additional Storage Not Required	base storage requirement	-
	- standard storage length	-
	+ additional truck storage	-
	= total additional storage required	-

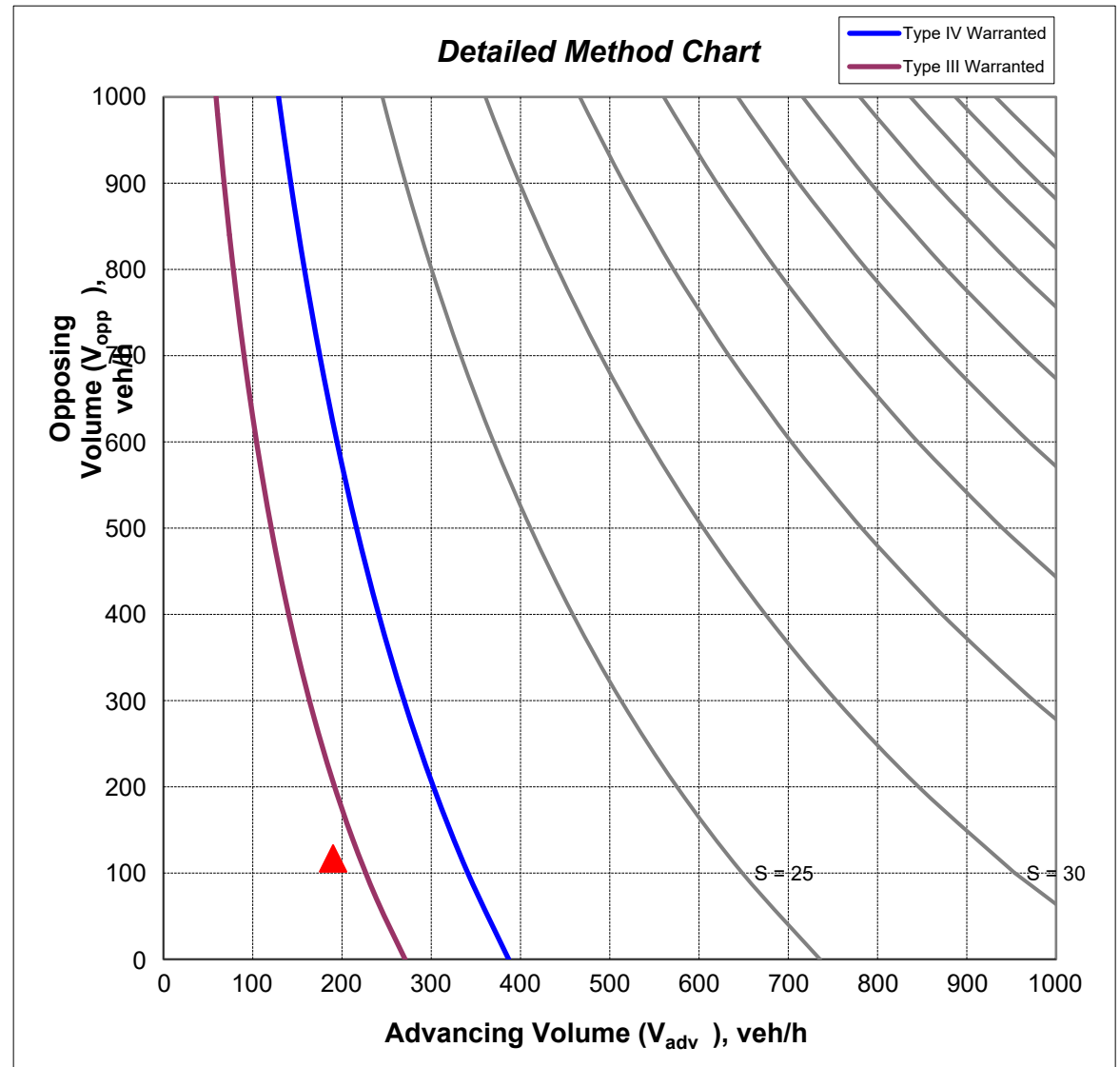
CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway (gap), s:	5.0
Average time to clear, s:	1.9

Main Rd: Highway 581
Minor Rd: Range Road 12

Direction: WB
Period: PM. Peak

Year of Analysis: 2037
Date of Analysis: 24-Jun-2026



Rural Two-Lane Undivided Highways

INPUT	Value
85 th percentile speed, km/h:	110
Main Road A.A.D.T.	3,820
Minor (intersecting) Road A.A.D.T	400
Left turn volume (V_{LT}), veh/h:	12
Advancing volume (V_{adv}), veh/h:	229
Opposing volume (V_{opp}), veh/h:	142
Left turn truck volume, trucks/h:	4
Right turn volume (V_{RT}), veh/day:	25

OUTPUT	Value
Percent left-turns in advancing volume:	5.2%
Percent trucks in left turn volume:	33.3%
Probability of conflict threshold:	0.58%
Calculated probability of conflicting arrival:	0.2%
Calculated conflicts per hour, veh/h:	0.6

Use Detailed Method

Type II

Additional Storage Not Required	base storage requirement	-
	- standard storage length	-
	+ additional truck storage	-
	= total additional storage required	-

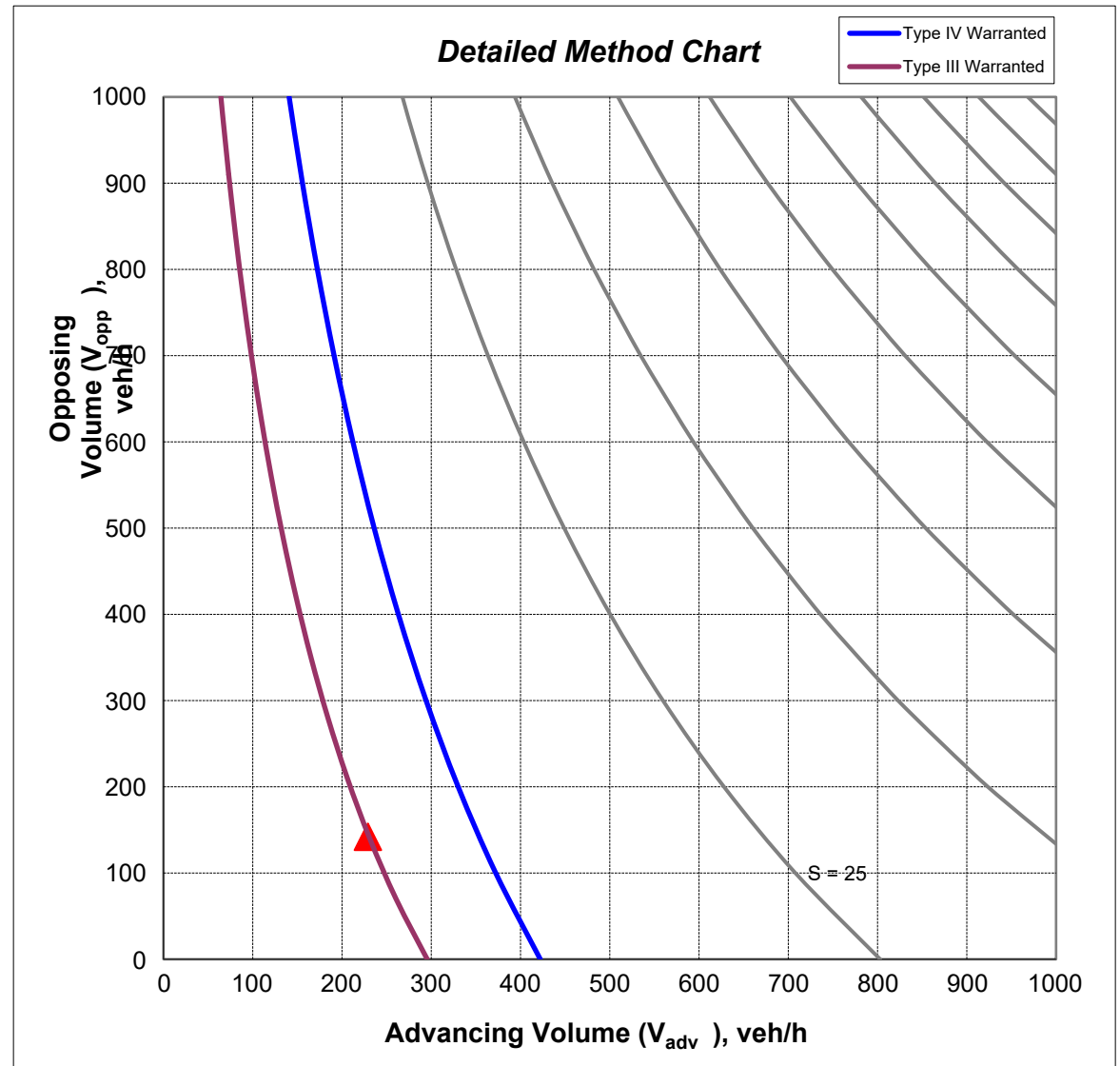
CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway (gap), s:	5.0
Average time to clear, s:	1.9

Main Rd: Highway 581
Minor Rd: Range Road 12

Direction: WB
Period: PM. Peak

Year of Analysis: 2047
Date of Analysis: 24-Jun-2026



Post Development Signal Warrant Analysis (2027)

Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Highway 581	Direction (EW or NS)	EW	Road Authority:	
Side Street (name)	Range Road 12	Direction (EW or NS)	NS	City:	Carstairs
Quadrant / Int #		Comments Scenario 1/ Assumptions as listed in assumptions workbook		Analysis Date:	2026 Jun 24, Wed
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET			Count Date:	
				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
Highway 581	WB		1				1	2,900	1
Highway 581	EB		1				1	2,900	1
Range Road 12	NB			1					
Range Road 12	SB			1					
Are the Range Road 12 NB right turns significantly impeded by through movements? (y/n)							y		
Are the Range Road 12 SB right turns significantly impeded by through movements? (y/n)							y		

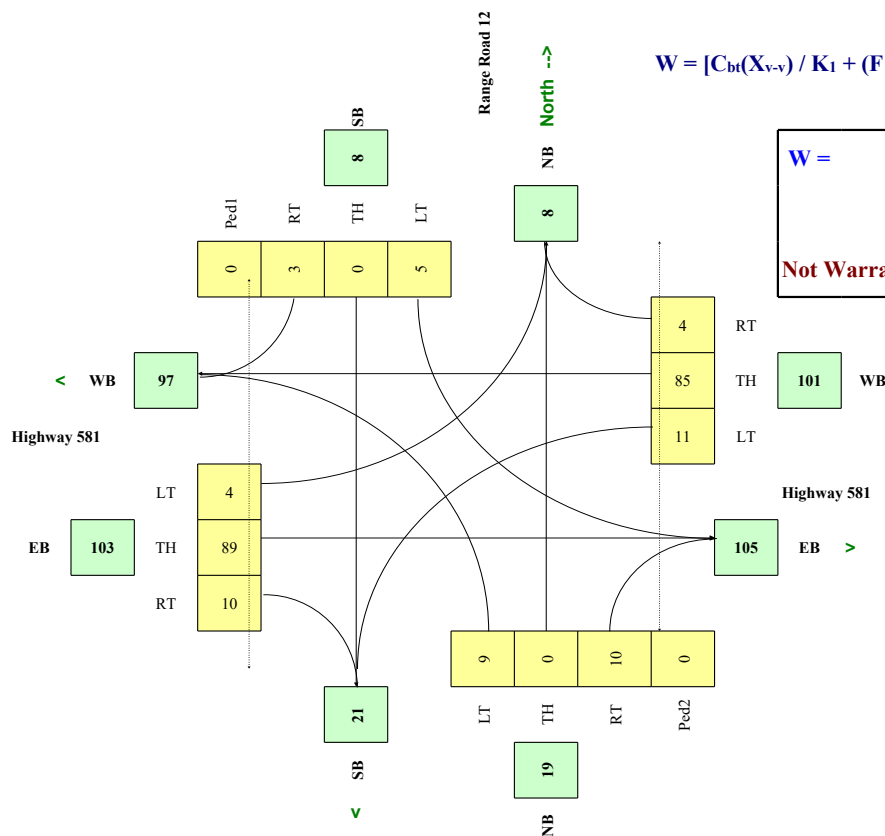
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	5,697
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 581	EW	80	2.0%	n	0.0
Range Road 12	NS	80	2.0%	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	7	0	10	4	0	2	12	45	6	3	116	12	0	0	0	0
8:00 - 9:00	7	0	10	4	0	2	12	45	6	3	116	12	0	0	0	0
11:00 - 12:00	11	0	9	1	0	4	10	65	3	3	61	11	0	0	0	0
12:00 - 13:00	11	0	9	1	0	4	10	65	3	3	61	11	0	0	0	0
16:00 - 17:00	10	0	11	11	0	2	12	146	3	5	91	7	0	0	0	0
17:00 - 18:00	10	0	11	11	0	2	12	146	3	5	91	7	0	0	0	0
Total (6-hour peak)	56	0	60	32	0	16	68	512	24	22	536	60	0	0	0	0
Average (6-hour peak)	9	0	10	5	0	3	11	85	4	4	89	10	0	0	0	0

Average 6-hour Peak Turning Movements

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



$$W = 4 \quad 4 \quad 0$$

Veh Ped

Not Warranted - Vs<75

RESET SHEET

Post Development Signal Warrant Analysis (2037)

Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Highway 581	Direction (EW or NS)	EW
Side Street (name)	Range Road 12	Direction (EW or NS)	NS
Quadrant / Int #		Comments	Scenario 1/ Assumptions as listed in assumptions workbook
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	
City:	Carstairs
Analysis Date:	2026 Jun 24, Wed
Count Date:	
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
Highway 581	WB		1				1	2,900	1
Highway 581	EB		1				1	2,900	1
Range Road 12	NB			1					
Range Road 12	SB			1					
Are the Range Road 12 NB right turns significantly impeded by through movements? (y/n)								y	
Are the Range Road 12 SB right turns significantly impeded by through movements? (y/n)								y	

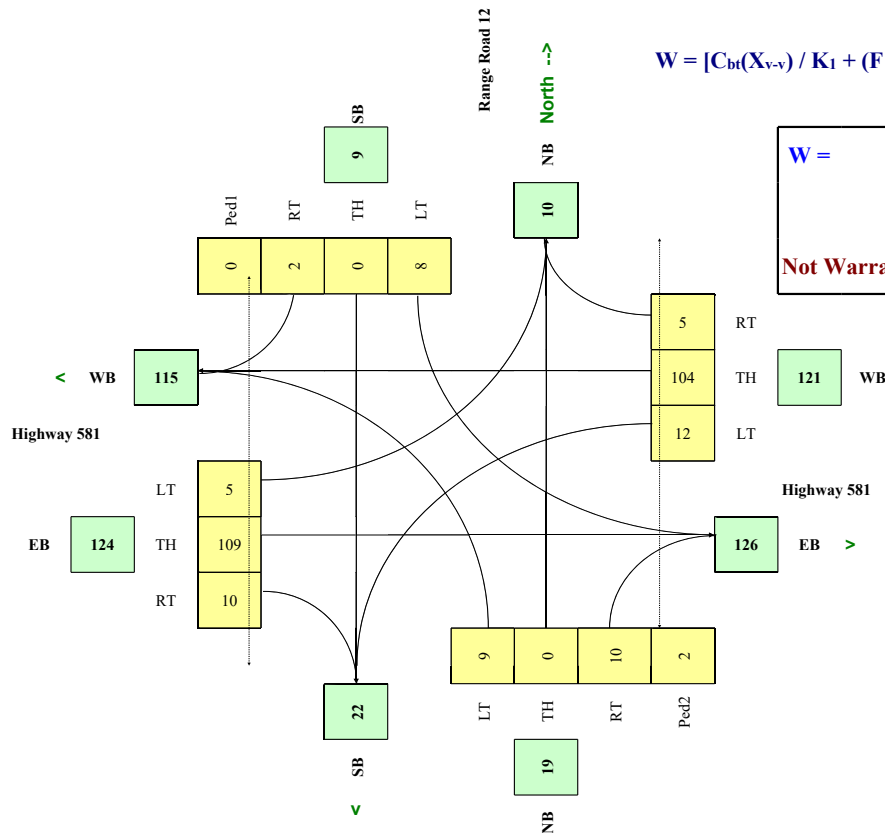
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	5,861
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 581	EW	100	2.0%	n	0.0
Range Road 12	NS	80	2.0%	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	7	0	10	5	0	2	13	55	7	4	141	12	0	0	0	0
8:00 - 9:00	7	0	10	5	0	2	13	55	7	4	141	12	0	0	0	0
11:00 - 12:00	11	0	9	5	0	1	10	79	4	4	74	12	0	5	0	5
12:00 - 13:00	11	0	9	5	0	1	10	79	4	4	74	12	0	5	0	5
16:00 - 17:00	10	0	11	13	0	2	12	178	4	6	111	7	0	0	0	0
17:00 - 18:00	10	0	11	13	0	2	12	178	4	6	111	7	0	0	0	0
Total (6-hour peak)	56	0	60	46	0	10	70	624	30	28	652	62	0	10	0	10
Average (6-hour peak)	9	0	10	8	0	2	12	104	5	5	109	10	0	2	0	2

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 =	6	6	0
		Veh	Ped
Not Warranted - Vs<75			

RESET SHEET

Post Development Signal Warrant Analysis (2047)

Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Highway 581	Direction (EW or NS)	EW
Side Street (name)	Range Road 12	Direction (EW or NS)	NS
Quadrant / Int #		Comments	Scenario 1/ Assumptions as listed in assumptions workbook
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	
City:	Carstairs
Analysis Date:	2026 Jun 24, Wed
Count Date:	
Date Entry Format:	(yyyy-mm-dd)

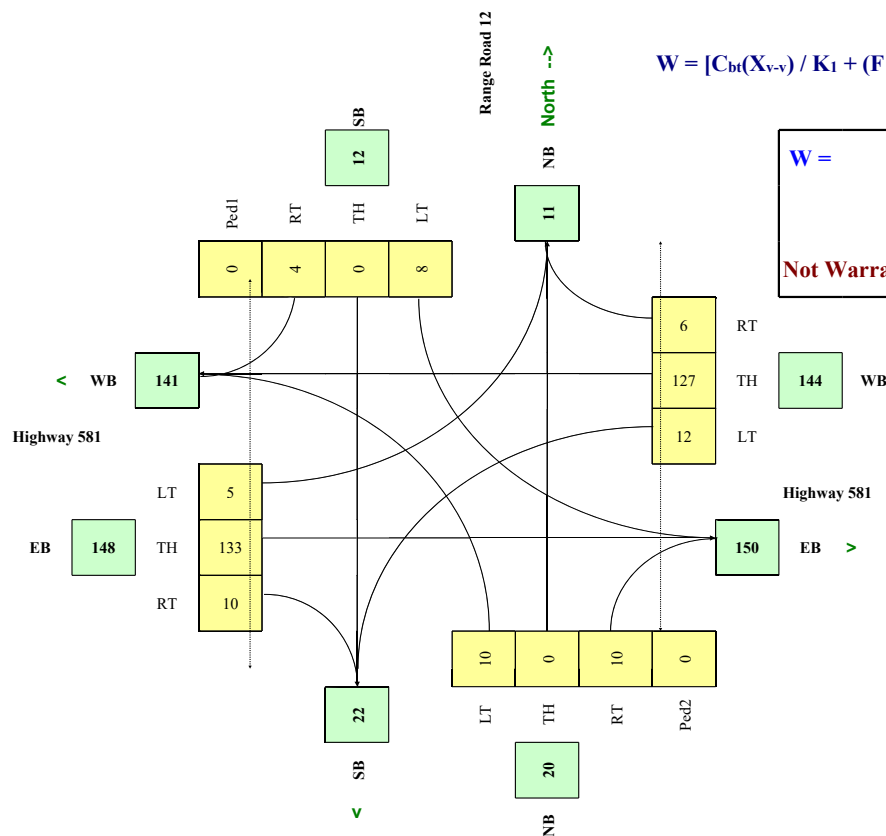
Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Highway 581	WB		1				1	2,900	1
Highway 581	EB		1				1	2,900	1
Range Road 12	NB			1					
Range Road 12	SB			1					
Are the Range Road 12 NB right turns significantly impeded by through movements? (y/n)								y	
Are the Range Road 12 SB right turns significantly impeded by through movements? (y/n)								y	

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	6,327
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 581	EW	100	2.0%	n	0.0
Range Road 12	NS	80	2.0%	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	7	0	10	6	0	3	13	67	9	4	172	12	0	0	0	0
8:00 - 9:00	7	0	10	6	0	3	13	67	9	4	172	12	0	0	0	0
11:00 - 12:00	12	0	9	1	0	6	10	97	4	4	91	12	0	0	0	0
12:00 - 13:00	12	0	9	1	0	6	10	97	4	4	91	12	0	0	0	0
16:00 - 17:00	10	0	11	16	0	3	12	217	4	7	135	7	0	0	0	0
17:00 - 18:00	10	0	11	16	0	3	12	217	4	7	135	7	0	0	0	0
Total (6-hour peak)	58	0	60	46	0	24	70	762	34	30	796	62	0	0	0	0
Average (6-hour peak)	10	0	10	8	0	4	12	127	6	5	133	10	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 =	7	7	0
		Veh	Ped
Not Warranted - Vs<75			

RESET SHEET

Post Development Lighting Warrant(2027)

Illumination of Isolated Rural Intersections

LIGHTING WARRANT SPREADSHEET

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

Highway 581	Main Road
Range Road 12	Minor Road
Carstairs, AB	City/Town

Date June 25, 2026

Other i.e. source of intersection information

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	80				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	C	0				
Posted Speed Category =		0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	0.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	4	2	3	Number of legs = 3 or more	OK	6
Geometric Factors Subtotal						6

OPERATIONAL FACTORS

Is the intersection signalized ? (Y / N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	2640	2	10		OK	20
AADT on Minor Road (2-way)	340	0	20	Either Use the two AADT inputs OR the Descriptive Signalization Warrant (Unused values should be set to Zero) Refer to Table 1(B) for description and rating values for signalization warrant.	OK	0
Signalization Warrant	Descriptive	0	30		OK	0
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	0	5	Refer to Table 1(B) for ratings.	OK	0
Operating Speed or Posted Speed on Major Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operating Speed on Minor Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operational Factors Subtotal						50

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
Environmental Factor Subtotal						0

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	1.0	1	15	Enter either the annual frequency (See Table 1(C), note #4)	OK	15
OR				OR the number of collisions / MEV	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
Collision History Subtotal						15

Check Intersection Signalization:
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	50
Environmental Factor Subtotal	0
Collision History Subtotal	15
TOTAL POINTS	71

Post Development Lighting Warrant(2037)

Illumination of Isolated Rural Intersections

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

Highway 581	Main Road
Range Road 12	Minor Road
Carstairs, AB	City/Town

Date June 25, 2026

Other i.e. source of intersection information

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	80				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	C	0				
Posted Speed Category =		0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	0.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	4	2	3	Number of legs = 3 or more	OK	6
Geometric Factors Subtotal						6

OPERATIONAL FACTORS

Is the intersection signalized ? (Y / N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	3180	3	10		OK	30
AADT on Minor Road (2-way)	360	0	20	Either Use the two AADT inputs OR the Descriptive Signalization Warrant (Unused values should be set to Zero) Refer to Table 1(B) for description and rating values for signalization warrant.	OK	0
Signalization Warrant	Descriptive	0	30		OK	0
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	0	5	Refer to Table 1(B) for ratings.	OK	0
Operating Speed or Posted Speed on Major Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operating Speed on Minor Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operational Factors Subtotal						60

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
Environmental Factor Subtotal						0

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	1.0	1	15	Enter either the annual frequency (See Table 1(C), note #4)	OK	15
OR				OR the number of collisions / MEV	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
Collision History Subtotal						15

Check Intersection Signalization:
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	60
Environmental Factor Subtotal	0
Collision History Subtotal	15
TOTAL POINTS	81

Post Development Lighting Warrant(2047)

Illumination of Isolated Rural Intersections

This spreadsheet is to be used in conjunction with *Illumination of Isolated Rural Intersections*, Transportation Association of Canada, February 2001.

Please enter information in the cells with yellow background

INTERSECTION CHARACTERISTICS

Highway 581	Main Road
Range Road 12	Minor Road
Carstairs AB	City/Town

Date June 25, 2026

Other i.e. source of intersection information

GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	0		Refer to Table 1(A) to determine rating value	OK	
Presence of raised channelization? (Y / N)	n				OK	
Highest operating speed on raised, channelized approach (km/h)	0		5		OK	
Channelization Factor					OK	0
Approach Sight Distance on most constrained approach (%)	100	0	10	Relative to the recommended minimum sight distance	OK	0
Posted Speed limit (in 10's of km/h)	80				OK	
Radius of Horizontal Curve (m)	T			Enter "T" for tangent (no horizontal curve at the intersection)	OK	
Posted Speed Category =		0				
Posted Speed Category =		0				
Posted Speed Category =	C	0				
Posted Speed Category =		0				
Horizontal Curvature Factor		0	5		OK	0
Angle of Intersection (10's of Degrees)	90	0	5		OK	0
Downhill Approach Grade (x.x%)	0.0	0	3	Rounded to nearest tenth of a percent	OK	0
Number of Intersection Legs	4	2	3	Number of legs = 3 or more	OK	6
Geometric Factors Subtotal						6

OPERATIONAL FACTORS

Is the intersection signalized ? (Y / N)	n			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	3840	3	10		OK	30
AADT on Minor Road (2-way)	400	0	20	Either Use the two AADT inputs OR the Descriptive Signalization Warrant (Unused values should be set to Zero) Refer to Table 1(B) for description and rating values for signalization warrant.	OK	0
Signalization Warrant	Descriptive	0	30		OK	0
Night-Time Hourly Pedestrian Volume	0	0	10	Refer to Table 1(B), note #2, to account for children and seniors	OK	0
Intersecting Roadway Classification	Descriptive	0	5	Refer to Table 1(B) for ratings.	OK	0
Operating Speed or Posted Speed on Major Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operating Speed on Minor Road (km/h)	80	3	5	Refer to Table 1(B), note #3	OK	15
Operational Factors Subtotal						60

ENVIRONMENTAL FACTOR

Lighted Developments within 150 m radius of intersection	0	0	5	Maximum of 4 quadrants	OK	0
Environmental Factor Subtotal						0

COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole #)	1.0	1	15	Enter either the annual frequency (See Table 1(C), note #4)	OK	15
OR				OR the number of collisions / MEV	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0	(Unused values should be set to Zero)	OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	n	0			OK	
Collision History Subtotal						15

Check Intersection Signalization:
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	60
Environmental Factor Subtotal	0
Collision History Subtotal	15
TOTAL POINTS	81