



**Bentley Southeast ASP  
Transportation Impact  
Assessment**

Prepared for:

Town of Bentley / Lacombe County

Prepared by:

Stantec Consulting Ltd.

Date: October 14, 2022

# Executive Summary

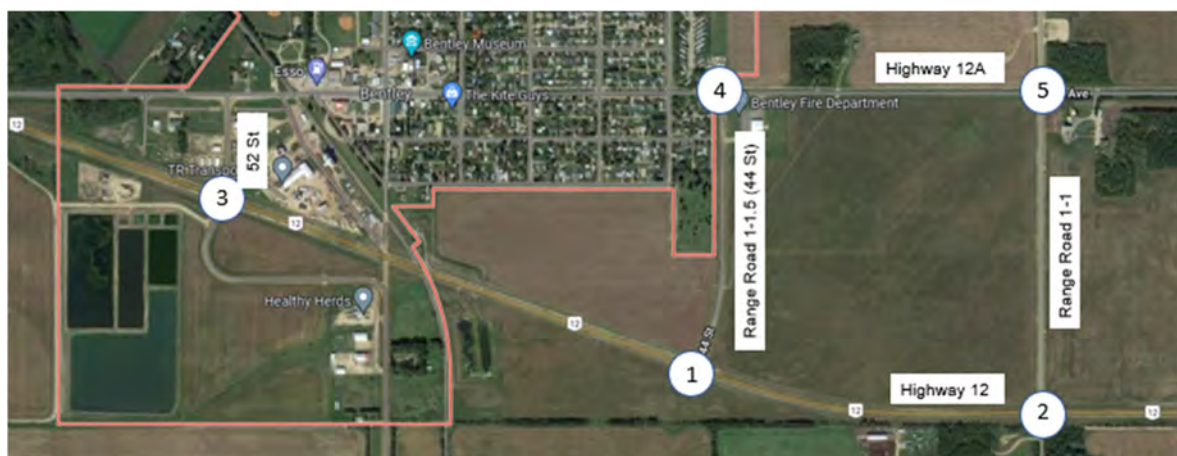
Stantec Consulting Inc. ('Stantec') was retained by the Town of Bentley and Lacombe County ("the Client") to undertake a Transportation Impact Assessment (TIA) for the Bentley Southeast Area Structure Plan (SEASP) for the development of approximately 170 hectares. The objectives of this analysis include:

- Examining the existing site conditions, including roadways, intersections and traffic volumes.
- Establishing future background traffic conditions in the vicinity of the proposed SEASP.
- Estimating the magnitude and characteristics of traffic generated by the proposed SEASP and site-adjacent developments at different future horizon years, including the Sandy Point development to the north, which will have an impact to the operations of the intersections on Range Road 1-1.
- Evaluating the impacts of the generated vehicular traffic on the roadway network adjacent to the study area.
- Recommending appropriate roadway and intersection improvements to mitigate any unacceptable impacts.

A detailed traffic operation analysis, including traffic simulation, was completed to determine the roadway and intersection requirements for the 15-year horizon (2037) assuming 50% SEASP built out and 30-year horizon (2052) with 100% SEASP built out. The study intersections in this TIA include:

- Highway 12 & Range Road 1-1.5 (44 Street);
- Highway 12 & Range Road 1-1;
- Highway 12 & 52 Street;
- Highway 12A & Range Road 1-1.5 (44 Street); and
- Highway 12A & Range Road 1-1

**Figure E.1 Road Network and Study Intersections**



2021 AM and PM peak hour traffic volumes for the following three (3) intersections were available from the Alberta Transportation (AT)'s website for the following three intersections:

- Highway 12 & 44 Street
- Highway 12 & 52 Street
- Highway 12A & 49 Street

Turning movements at the remaining study intersections were estimated based on developments in the area and engineering judgement. Also, after reviewing Google's aerial image, it was determined that approximately 33% of the Sandy Point Subdivision was already developed, these trips were also included in the existing volumes.

Intersection capacity analysis (ICA) was carried out by using Synchro 11 software. All study intersections are currently unsignalized and operating adequately with all movements staying within the threshold criteria in terms of Level of Service (LOS) and Volume/Capacity (V/C) ratio.

The Institute of Transportation Engineers (ITE) Trip Generation Manual (11<sup>th</sup> Edition) was used in this study to estimate the traffic generated by the proposed SEASP. Generated trips were calculated for the AM and PM peak hours and based on the following land uses.

**Table E.1 - Land Use Breakdowns**

PROPOSED DEVELOPMENT	ITE LAND USE (CODE)	Size (Ha)
A. Highway Commercial	Blended Commercial Rates <sup>^</sup>	19.63
B. Light Industrial	General Light Industrial (110)	48.94
C. Heavy Industrial	Industrial Park (130)	97.66
D. Public Institutional – Cemetery Expansion	Cemetery (566)	1.36
E. Public Institutional – Fire Department	Existing	2.03

No reduction has been applied to the trip generation for transit and active modes. While acknowledging that there is the potential for future transit service, the context of the SEASP makes it unlikely that the area will experience above average transit or active mode shares.

Trip distribution was estimated based on a review of the existing traffic volumes in the roadway network, and overall development and travel patterns in the study area. Four external zones and the associated trip distribution percentages are summarized in for both AM and PM peak hours for all scenarios.

**Table E.2 - Trip Distribution**

External Zone		AM IN	AM OUT	PM IN	PM OUT
A	Highway 12A East	10%	10%	8%	11%
B	Highway 12 East	34%	41%	42%	34%
C	Highway 12 West	37%	30%	29%	37%
D	Highway 12A West	20%	19%	20%	18%
<b>Total</b>		<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Traffic data for Highway 12 and Highway 12A between 2012 and 2021 from the Automatic Traffic Recorder (ATR) were available through the AT website. Both highways experienced minimal or decrease in traffic growth. For this study, 1% annual growth rate was used between 2021 and 2037, and 2% annual growth rate was used from 2037 to 2052.

The design traffic volumes were calculated by superimposing the future site generated traffic volumes from the SEASP development and adjacent developments over the future background volumes in different study scenarios. The assessment of the study intersections consists of four parts:

- Signal/Roundabout Warrant Analysis (SWA);
- Illumination Warrant Analysis (IWA);
- Intersection Treatment Analysis (ITA); and
- Intersection Capacity Analysis (ICA).

The intersection upgrade staging is summarized as follows:

**Table E.3- Proposed Future Infrastructure Staging Strategy Summary**

Scenario	ASP Staging	Recommended Infrastructure Adjustments				
		Hwy 12 & 44 Street	Hwy 12 & Range Road 1-1	Hwy 12 & 52 St	Hwy 12A & 44 Street	Hwy 12A & Range Road 1-1
<b>Existing Conditions</b>	0%	No change	No change	No change	No change	No change
<b>2037 15-Year Horizon</b>	50%	Signalized intersection with turn lanes on Highway 12 or a single lane roundabout	Signalized intersection with turn lanes on Highway 12 or a single lane roundabout	No change	Upgrade to Type IIa with an eastbound right turn lane	Signalized intersection or a single lane roundabout
<b>2052 30-Year Horizon</b>	100%	No additional improvements required	No additional improvements required	Signalized intersection or a single lane roundabout	No additional improvements required	No additional improvements required

Conceptual single-lane roundabout designs were completed for the four intersections that will be required to be upgraded in the future and are included in Figures 4.1 to 4.4. Roundabouts were chosen as the design basis over signalized intersections because roundabouts are Alberta Transportation's preferred intersection treatment. Signalized intersections, though less expensive, are typically accepted only when it can be demonstrated through a lifecycle cost analysis that they are more economical or that there are other compelling reasons to implement them.

Opinion of probable costs were prepared for the five intersection upgrades, which are anticipated to cost approximately \$16M. The opinion of probable costs are based on the following important assumptions:



- The quantities are based on a desktop level exercise (Estimate Type B) and will be required to be refined at the time of detailed design, which will require topographic survey for more accuracy.
- The quantities are conservatively based on full resurfacing of the highway surfaces. There is strong potential that much of the existing surfaces can be matched/built upon without significant removals, depending on the road conditions in the future and refinement of the designs with actual topographic survey information.
- The quantities are based on the speed reduction geometry shown in the figures. There is strong potential that the extents of the speed reduction curves will change, depending on the order the intersections are upgraded and how the speed limit will be reduced in the future. Four long speed reduction curves are included in the grand total (i.e. an average of one per intersection).
- Unit rates are based on Alberta Transportation's 2022 Unit Price Averages for Central Alberta. It should be noted that the rates have been extremely volatile at the time of this report and that these OPCs should be updated in the future as needed.
- Land acquisition costs are excluded.
- Costs include amounts of 25% for contingency and 10% for engineering.
- Costs exclude 5% GST.

<b>Revision</b>	<b>Description</b>	<b>Author</b>		<b>Quality Check</b>		<b>Independent Review</b>	

# Sign-off Sheet

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APEGA Permit to Practice P0258

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## 1.0 INTRODUCTION

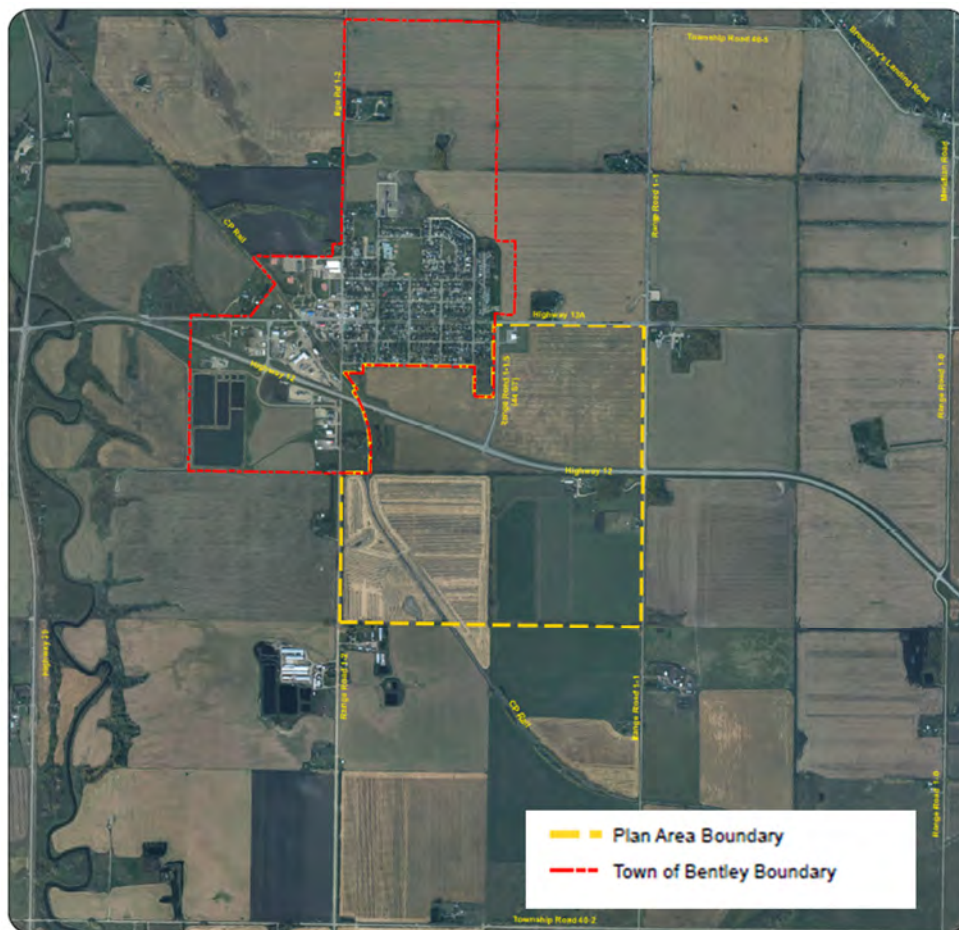
### 1.1 BACKGROUND

Stantec Consulting Inc. (“Stantec”) was retained by the Town of Bentley and Lacombe County (“the Client”) to undertake a Transportation Impact Assessment (TIA) for the Bentley Southeast Area Structure Plan (SEASP) for the development of approximately 170 Hectares. The Bentley SEASP is generally defined by the following boundaries:

- Northern Boundary: Highway 12A (50 Ave)
- South Boundary: Undeveloped lands
- Eastern Boundary: Range Road 1-1
- Western Boundary: Range Road 1-1.2

The location of the SEASP is shown in **Figure 1.1**.

**Figure 1.1 – Bentley SEASP Location**



## 1.2 STUDY OBJECTIVES

The objectives of this analysis include:

- Examining the existing site conditions, including roadways, intersections and traffic volumes.
- Establishing future background traffic conditions in the vicinity of the proposed SEASP.
- Estimating the magnitude and characteristics of traffic generated by the proposed SEASP and site-adjacent developments at different future horizon years.
- Evaluating the impacts of the generated vehicular traffic on the roadway network adjacent to the study area.
- Recommending appropriate roadway and intersection improvements to mitigate any unacceptable impacts.

## 1.3 METHODOLOGY

The following study tasks were undertaken towards achieving the established study objectives:

- Reviewing previously completed study reports and background information.
- Obtaining existing intersection turning movement traffic volumes for AM & PM peak periods on Highway 12 and Highway 12A intersections.
- Obtaining and estimating the site-generated traffic for the following nearby development:
  - Sandy Point Neighbourhood
- Determining trip generation analysis for the Bentley SEASP site.
- Carrying out trip distribution and trip assignment.
- Carrying out detailed traffic operation analysis including traffic simulation to determine the roadway and intersection requirements for the 15-year horizon (2037) assuming 50% SEASP built out and 30-year horizon (2052) with 100% SEASP built out.
- Prepared summary report documenting findings and recommendations.

The study intersections in this TIA include:

- 1) Highway 12 & Range Road 1-1.5 (44 Street)
- 2) Highway 12 & Range Road 1-1
- 3) Highway 12 & 52 Street
- 4) Highway 12A & Range Road 1-1.5 (44 Street)
- 5) Highway 12A & Range Road 1-1

The roadway network and the locations of study intersections are illustrated in **Figure 1.2**.



# BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT

Introduction  
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Figure 1.2 – Road Network and Study Intersections



## 2.0 EXISTING CONDITIONS

### 2.1 EXISTING ROADWAY NETWORK

The existing roadway network adjacent to the site includes:

**Hwy 12** is a two-way two-lane Alberta Transportation highway, bisecting the whole SEASP area. Dedicated left turn lanes are provided at the 44 Street and 52 Street intersections. The posted speed limit is 100 km/h.

**Hwy 12A (50 Ave)** is a two-way two-lane roadway, located north of the SEASP area. Dedicated turn lanes are not available on this roadway. The posted speed limit is 50 km/h within the Town limit.

**Range Road 1-1** is a two-way two-lane gravel roadway. The speed limit is assumed to be 50 km/h.

**Range Road 1-1.5 (44 Street)** is a two-way two-lane paved roadway. The posted speed limit is 60 km/h.

**52 Street** is a two-way two-lane paved roadway north of Highway 12 with a posted speed limit is 40 km/h. South of Highway 12, it is a two-way two-lane gravel roadway.

### 2.2 EXISTING TRAFFIC VOLUMES

Existing 2021 AM and PM peak hour traffic volumes for the following three (3) intersections are available from the Alberta Transportation (AT)'s website for the following three intersections:

- Highway 12 & 44 Street
- Highway 12 & 52 Street
- Highway 12A & 49 Street

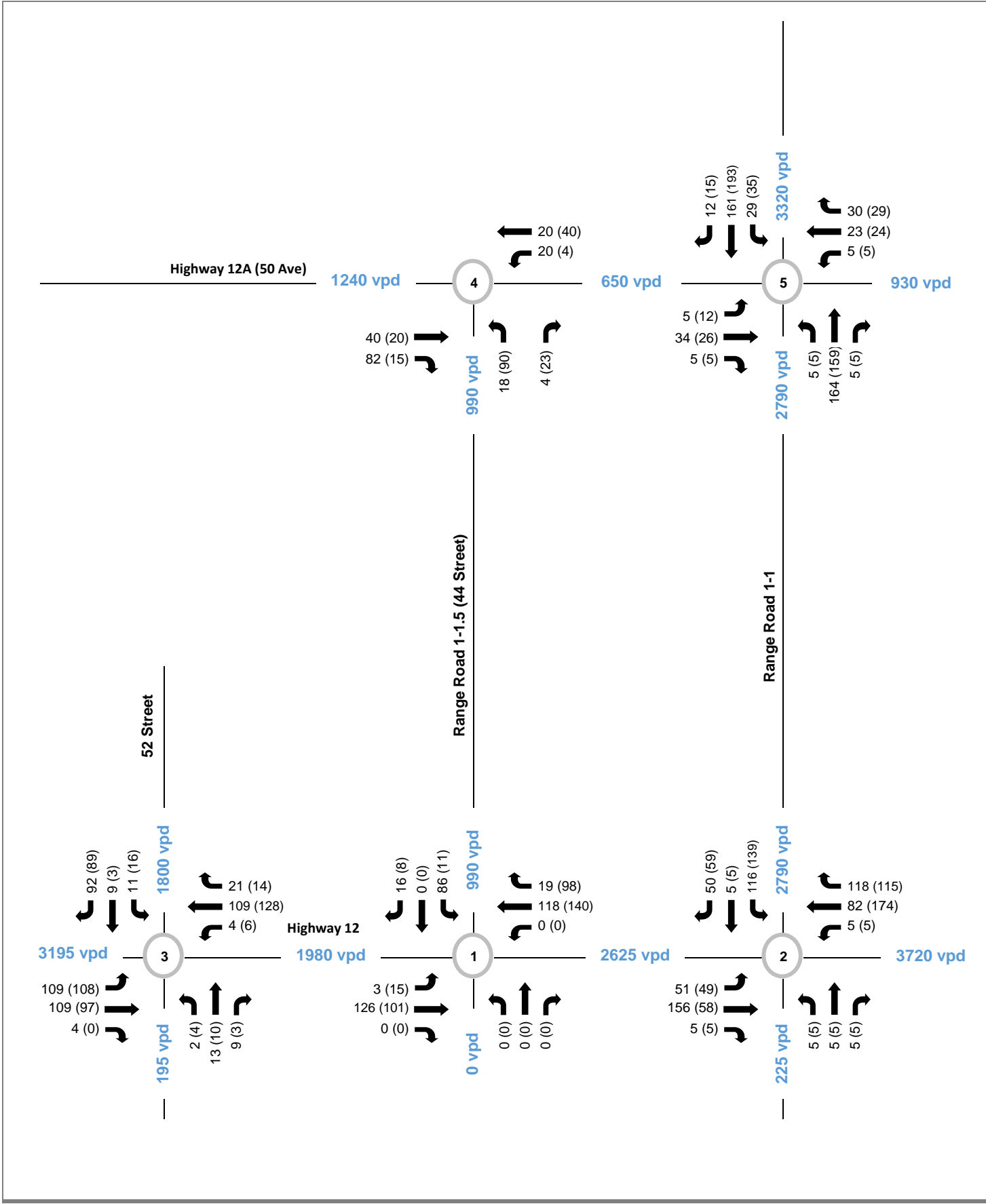
Turning movements at the remaining study intersections were estimated based on developments in the area and engineering judgement. Also, after reviewing Google's aerial image, it was determined that approximately 33% of the Sandy Point Subdivision was already developed, these trips were also included in the existing volumes. (Details of the Sandy Point Subdivision generated trips are included in Section 3.5)

The 2021 peak hour traffic volumes are illustrated in **Figure 2.1**, and the traffic data obtained from AT's website are included in **Appendix A**.

The existing intersection configurations are illustrated in **Figure 2.2**.





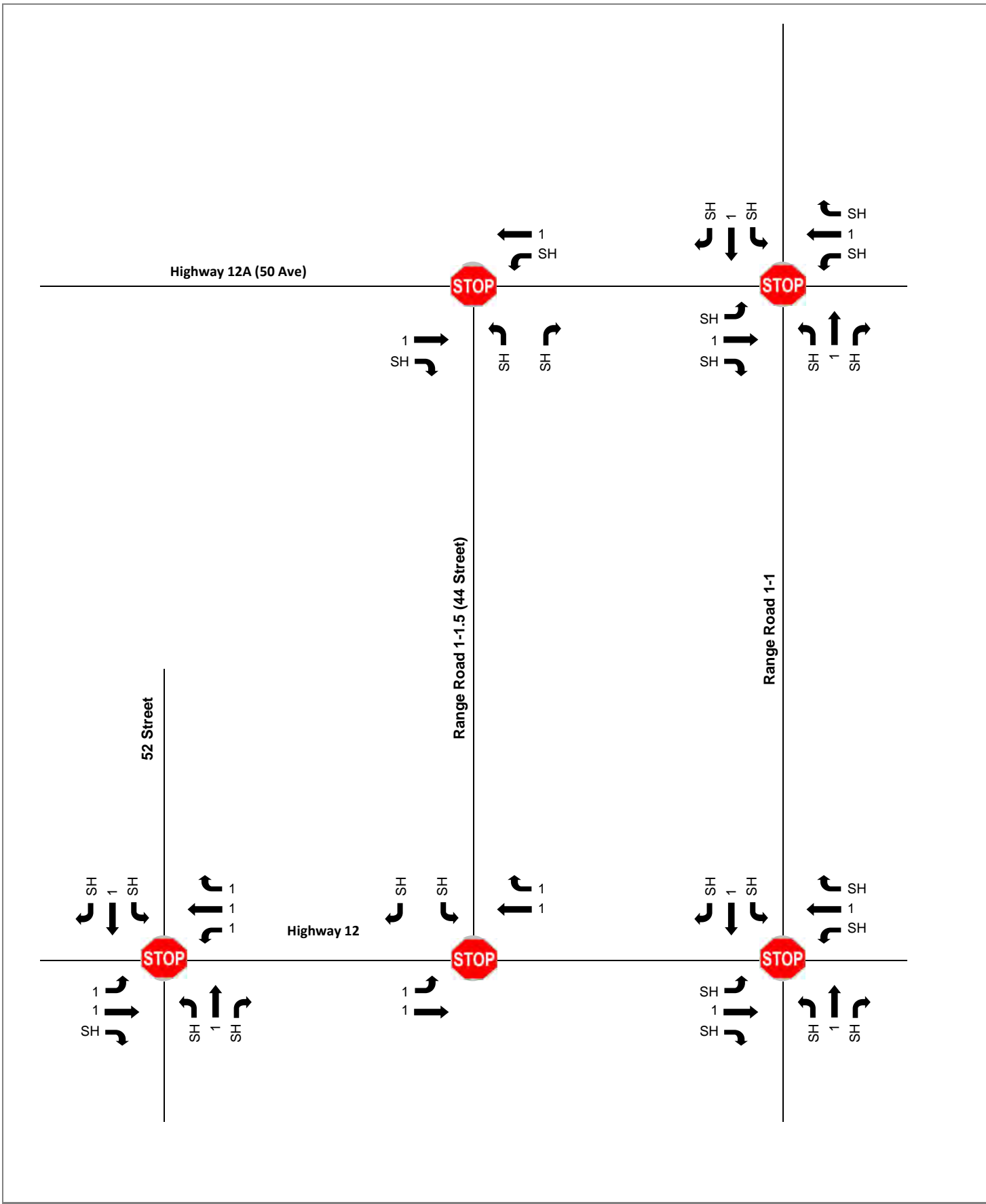


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**2.1**  
Title

2021 Existing Volumes



400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**2.2**  
Title  
Existing Intersection  
Configurations

Existing Conditions  
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### 2.3 EXISTING TRAFFIC CONDITIONS

Intersection capacity analysis (ICA) was carried out by using Synchro 11 software. All study intersections are currently unsignalized. The LOS criteria for unsignalized intersections are described in **Table 2.1**.

**Table 2.1 – Level of Service Criteria for Unsignalized Intersection**

LOS	Control Delay (seconds per vehicle)
	Unsignalized Intersection
A	10.0 or less
B	10.1 to 20.0
C	20.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	More than 50.0

The synchro analysis results for the 2021 existing conditions are summarized in **Table 2.2**. (Synchro outputs are included in **Appendix B**)

The analysis results indicated that all study intersections are currently operating adequately with all movements staying within the threshold criteria in terms of Level of Service (LOS) and Volume/Capacity (V/C) ratio.



**BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT**

Existing Conditions  
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**Table 2.2 – ICA Results – 2021 Existing Conditions**

Int#1 - Highway 12 & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	-	-	1	1	SH	1	SH	SH	-	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	3	126	-	-	118	19	-	-	-	86	-	16	Intersection
Volume/Capacity Ratio (v/c)	0	0.08	-	-	0.08	0.01	-	-	-	0.15	-	0.15	Delay
Total Delay (s)	7.5	0	-	-	0	0	-	-	-	10.7	-	10.7	3s
Lane LOS	A	A	-	-	A	A	-	-	-	B	-	B	LOS A
Queue Length 95th (m)	0	0	-	-	0	0	-	-	-	3.9	-	3.9	
<b>PM Peak Hour</b>													
Volumes (veh/h)	15	101	-	-	140	98	-	-	-	11	-	8	Intersection
Volume/Capacity Ratio (v/c)	0.01	0.06	-	-	0.09	0.06	-	-	-	0.03	-	0.03	Delay
Total Delay (s)	7.8	0	-	-	0	0	-	-	-	9.8	-	9.8	0.8s
Lane LOS	A	A	-	-	A	A	-	-	-	A	-	A	LOS A
Queue Length 95th (m)	0.3	0	-	-	0	0	-	-	-	0.6	-	0.6	
Int#2 - Highway 12 & Range Road 1-1	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	SH	1	SH	SH	1	SH	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	51	156	5	5	82	118	5	5	5	116	5	50	Intersection
Volume/Capacity Ratio (v/c)	0.04	0.04	0.04	0	0	0	0.03	0.03	0.03	0.33	0.33	0.33	Delay
Total Delay (s)	0.4	2.1	2.1	0	0.2	0.2	12	12	12	14.4	14.4	14.4	5.2s
Lane LOS	A	A	A	A	A	A	B	B	B	B	B	B	LOS A
Queue Length 95th (m)	1	1	1	0.1	0.1	0.1	0.7	0.7	0.7	10.7	10.7	10.7	
<b>PM Peak Hour</b>													
Volumes (veh/h)	49	58	5	5	174	115	5	5	5	139	5	59	Intersection
Volume/Capacity Ratio (v/c)	0.04	0.04	0.04	0	0	0	0.03	0.03	0.03	0.39	0.39	0.39	Delay
Total Delay (s)	0.4	3.7	3.7	0	0.1	0.1	11.9	11.9	11.9	15.5	15.5	15.5	6.1s
Lane LOS	A	A	A	A	A	A	B	B	B	C	C	C	LOS A
Queue Length 95th (m)	1	1	1	0.1	0.1	0.1	0.7	0.7	0.7	14.1	14.1	14.1	
Int#3 - Highway 12 & 52 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	SH	1	1	1	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	109	109	4	4	109	21	2	13	9	11	9	92	Intersection
Volume/Capacity Ratio (v/c)	0.08	0.07	0.07	0	0.07	0.01	0.05	0.05	0.05	0.16	0.16	0.16	Delay
Total Delay (s)	7.7	0	0	7.5	0	0	12.1	12.1	12.1	10.5	10.5	10.5	4.8s
Lane LOS	A	A	A	A	A	A	B	B	B	B	B	B	LOS A
Queue Length 95th (m)	2	0	0	0.1	0	0	1.2	1.2	1.2	4.2	4.2	4.2	
<b>PM Peak Hour</b>													
Volumes (veh/h)	108	97	0	6	128	14	4	10	3	16	3	89	Intersection
Volume/Capacity Ratio (v/c)	0.08	0.06	-	0	0.08	0.01	0.04	0.04	0.04	0.15	0.15	0.15	Delay
Total Delay (s)	7.7	0	-	7.4	0	0	13.4	13.4	13.4	10.5	10.5	10.5	4.7s
Lane LOS	A	A	-	A	A	A	B	B	B	B	B	B	LOS A
Queue Length 95th (m)	2	0	-	0.1	0	0	1	1	1	4.1	4.1	4.1	



# BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT

Existing Conditions

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Int#4 - Highway 12A & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	-	1	SH	SH	1	-	SH	-	SH	-	-	-	
<b>AM Peak Hour</b>													
Volumes (veh/h)	-	40	82	20	20	-	18	-	4	-	-	-	Intersection
Volume/Capacity Ratio (v/c)	-	0.08	0.08	0.02	0.02	-	0.03	-	0.03	-	-	-	Delay
Total Delay (s)	-	0	0	0.1	3.8	-	9.4	-	9.4	-	-	-	2s
Lane LOS	-	A	A	A	A	-	A	-	A	-	-	-	LOS A
Queue Length 95th (m)	-	0	0	0.4	0.4	-	0.7	-	0.7	-	-	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	-	20	15	4	40	-	90	-	23	-	-	-	Intersection
Volume/Capacity Ratio (v/c)	-	0.02	0.02	0	0	-	0.13	-	0.13	-	-	-	Delay
Total Delay (s)	-	0	0	0	0.6	-	9.4	-	9.4	-	-	-	5.7s
Lane LOS	-	A	A	A	A	-	A	-	A	-	-	-	LOS A
Queue Length 95th (m)	-	0	0	0.1	0.1	-	3.4	-	3.4	-	-	-	
Int#5 - Highway 12A & Range Road 1-	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	SH	1	SH	SH	1	SH	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	5	34	5	5	23	30	5	164	5	29	161	12	Intersection
Volume/Capacity Ratio (v/c)	0	0	0	0	0	0	0.24	0.24	0.24	0.29	0.29	0.29	Delay
Total Delay (s)	0	0.8	0.8	0	0.6	0.6	11.2	11.2	11.2	11.6	11.6	11.6	9.1s
Lane LOS	A	A	A	A	A	A	B	B	B	B	B	B	LOS A
Queue Length 95th (m)	0.1	0.1	0.1	0.1	0.1	0.1	7.3	7.3	7.3	9.1	9.1	9.1	
<b>PM Peak Hour</b>													
Volumes (veh/h)	12	26	5	5	24	29	5	159	5	35	193	15	Intersection
Volume/Capacity Ratio (v/c)	0.01	0.01	0.01	0	0	0	0.24	0.24	0.24	0.35	0.35	0.35	Delay
Total Delay (s)	0.1	2.1	2.1	0	0.6	0.6	11.3	11.3	11.3	12.3	12.3	12.3	9.8s
Lane LOS	A	A	A	A	A	A	B	B	B	B	B	B	LOS A
Queue Length 95th (m)	0.2	0.2	0.2	0.1	0.1	0.1	7.2	7.2	7.2	12	12	12	



### 3.0 DEVELOPMENT CHARACTERISTICS

Figure 3.1 shows the proposed Bentley SEASP concept plan.

Figure 3.1 – Proposed Bentley SEASP Concept Plan

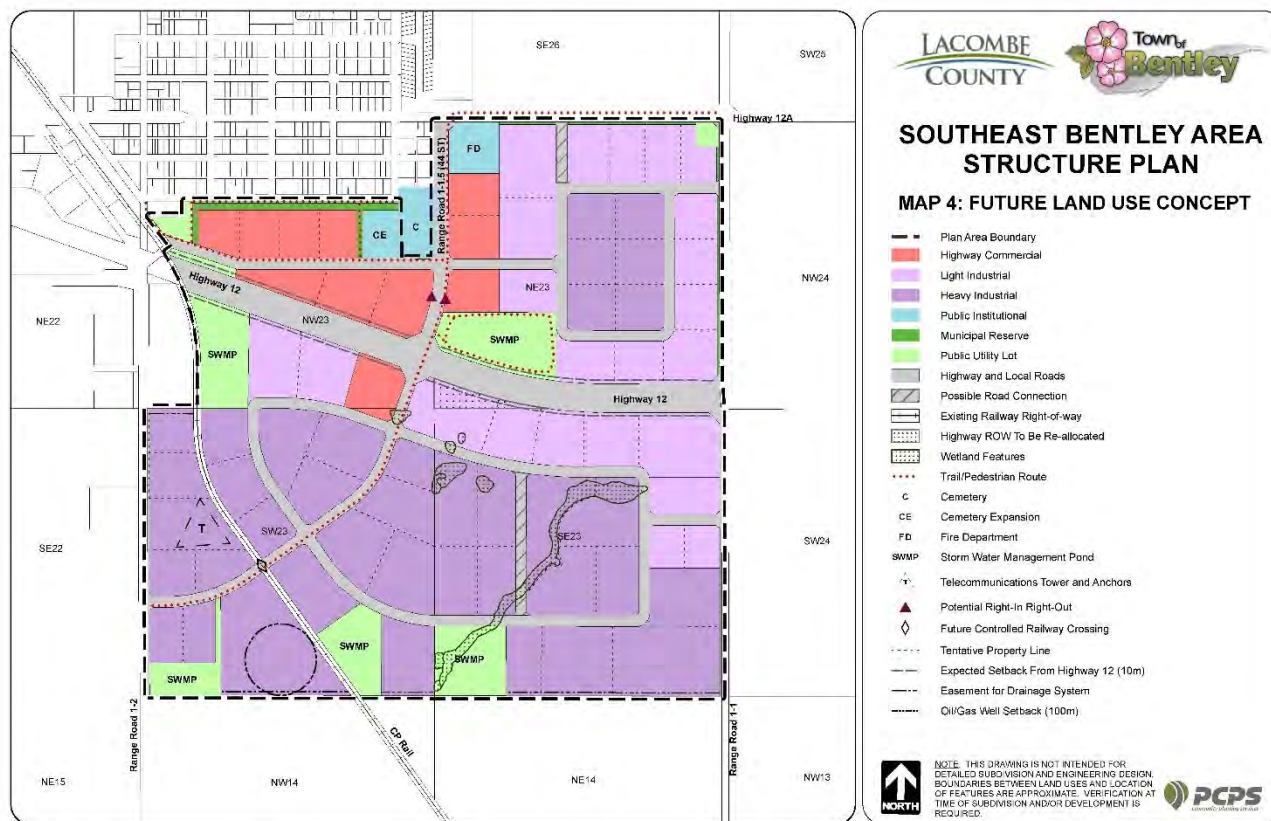


Table 3.1 shows the traffic-generating land uses within the ASP area.

Table 3.1 – Land Use Breakdown

PROPOSED DEVELOPMENT	ITE LAND USE (CODE)	Size (Ha)
A. Highway Commercial	Blended Commercial Rates <sup>^</sup>	19.63
B. Light Industrial	General Light Industrial (110)	48.94
C. Heavy Industrial	Industrial Park (130)	97.66
D. Public Institutional – Cemetery Expansion	Cemetery (566)	1.36
E. Public Institutional – Fire Department	Existing	2.03

<sup>^</sup> Specific commercial land use types are unknown. Trip generation was conducted using a “blend” of assumed commercial land uses intended to represent a typical development near a town. (Included in **Appendix C**)



# BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT

Development Characteristics  
October 14, 2022

## 3.1 TRIP GENERATION

The Institute of Transportation Engineers (ITE) Trip Generation Manual (11<sup>th</sup> Edition) was used in this study to estimate the traffic generated by the proposed SEASP. Generated trips were calculated for the AM and PM peak hours. **Table 3.2** shows the total trip generations for the Bentley SEASP.

**Table 3.2 – Total Expected Trip Generation**

Land Use	Units (Converted to ITE Units)	Trip Rate		Split (IN / OUT)		Trips (IN / OUT)		
		AM	PM	AM	PM	AM	PM	
A	48.50 acre	22.72**	30.85**	54%/46%	50%/50%	600/503	750/746	
B	790.1 x 1000 sf*	0.74	0.65	88%/12%	14%/86%	515/70	72/442	
C	1576.9 x 1000 sf*	0.34	0.34	81%/19%	22%/78%	434/102	118/418	
D	3.36 Acre	0.17	0.46	80%/20%	37%/69%	0/0	1/1	
E	32.3X 1000 sf*	Existing Building						
						<b>Total</b>	<b>1,549/675</b>	<b>941/1,607</b>

\* Assumed 15% Gross Floor Area; \*\* Blended Trip Generation Rates

**Pass-By Trips** are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion. For this TIA, pass-by trips are drawn from traffic passing the retail/commercial sites located north of Highway 12. It is expected that a significant amount of the trips into the commercial area will be pass-by trips from vehicles which would otherwise be travelling eastbound or westbound through Highway 12 with a different end destination. Based on this context, a 50% pass-by rate was applied to the retail/commercial trips for both AM and PM peak hours.

**Internal Trips** are trips between different land uses within a multi-use development that do not access the external roadway network and have both an origin and destination that is within the development. It is expected that 15% of commercial trips are internal trips between the different retails / services within the commercial area.

**External Trips** are trips made between the development and areas located outside the development, with the primary intent of accessing or departing a development area.

External trips for this proposed development are outlined in **Table 3.3** below.



**Table 3.3 – External Site-Generated Trips Bentley SEASP**

HORIZON YEAR	LAND USE	TRIPS			
		AM IN	AM OUT	PM IN	PM OUT
2037 (15-Year Horizon)	Total Trips	775	338	474	808
	Pass-By Trips	150	150	188	188
	Internal Trips	45	38	57	56
	<b>Total External Trips</b>	<b>580</b>	<b>150</b>	<b>229</b>	<b>564</b>
2052 (30-Year Horizon)	Total Trips	1,549	675	941	1,607
	Pass-By Trips	300	300	375	375
	Internal Trips	90	76	113	112
	<b>Total External Trips</b>	<b>1,159</b>	<b>299</b>	<b>453</b>	<b>1,120</b>

### 3.2 MODE SPLIT

No reduction has been applied to the trip generation for transit and active modes. While acknowledging that there is the potential for future transit service, the context of the SEASP makes it unlikely that the area will experience above average transit or active mode shares.

### 3.3 TRIP DISTRIBUTION

Trip distribution was estimated based on a review of the existing traffic volumes in the roadway network, and overall development and travel patterns in the study area. Four external zones and the associated trip distribution percentages are summarized in **Table 3.4** for both AM and PM peak hours for all scenarios.

**Table 3.4 – Trip Distribution**

External Zone		AM IN	AM OUT	PM IN	PM OUT
1	Highway 12A East	10%	10%	8%	11%
2	Highway 12 East	34%	41%	42%	34%
3	Highway 12 West	37%	30%	29%	37%
4	Highway 12A West	20%	19%	20%	18%
<b>Total</b>		<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

The Trip Distribution percentages are illustrated in **Figure 3.2**.







External Zone		AM IN	AM OUT	PM IN	PM OUT
1	Highway 12A East	10%	10%	8%	11%
2	Highway 12 East	34%	41%	42%	34%
3	Highway 12 West	37%	30%	29%	37%
4	Highway 12A West	20%	19%	20%	18%
<b>Total</b>		<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>



400-10220 103 Avenue NW  
Edmonton AB

6 (14)  
140 vpd

AM (PM) Peak Hour Traffic Volumes  
Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.2**  
Title

Trip Distribution

### 3.4 TRIP ASSIGNMENT

Traffic generated by the Bentley SEASP was assigned to the roadway network by using the most logical (shortest travel time) paths. A portion of the trips will likely utilize the existing 50<sup>th</sup> Street industrial roadway and intersection of Highway 12 and 52 Street as illustrated in **Figure 3.3**.

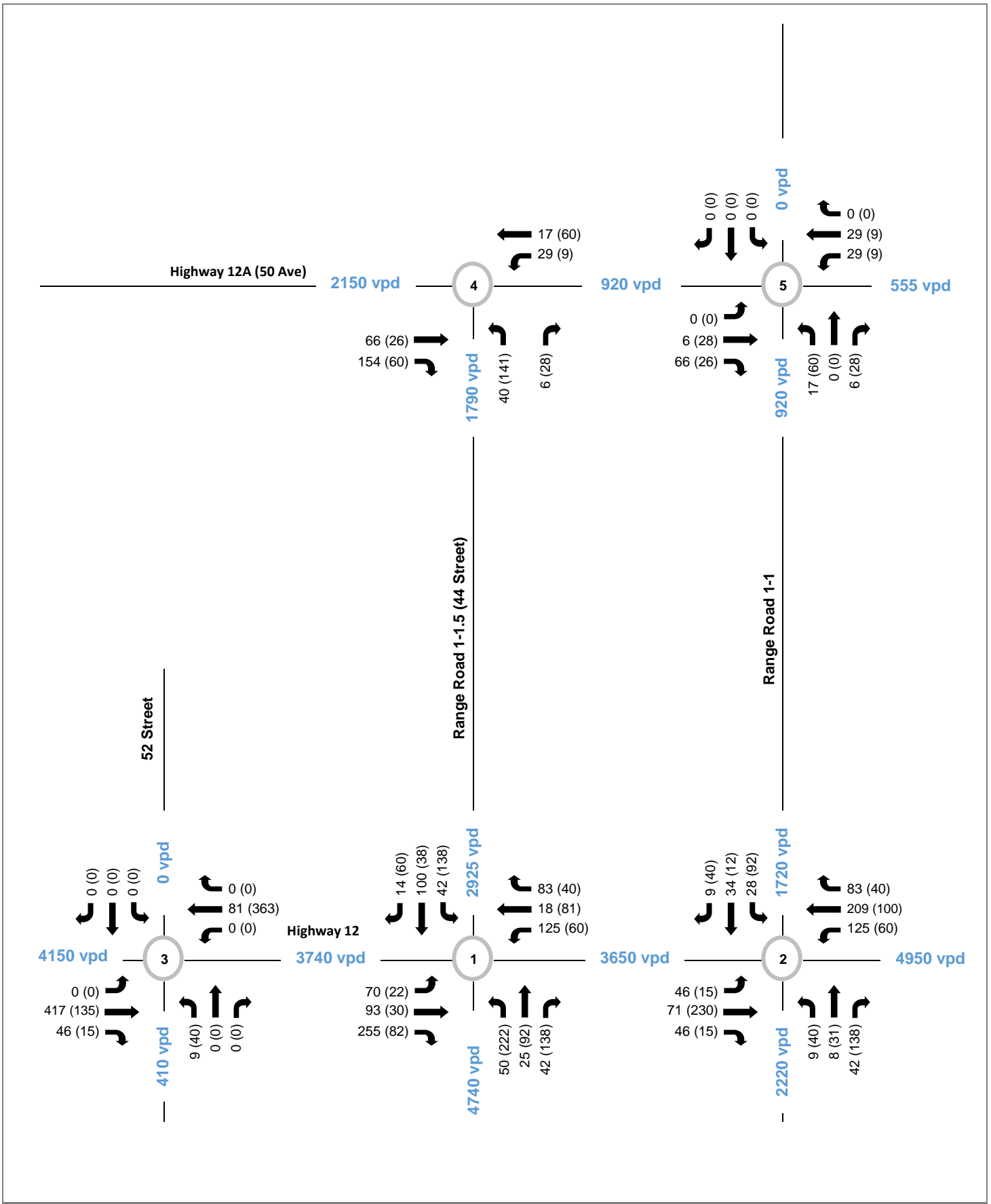
**Figure 3.3 – Trip Assignment**



The external trips, pass-by trips and total SEASP site-generated trips (external + pass-by) for the 2052 30-year horizon full built out are illustrated in **Figures 3.4 to 3.6**.

The external trips, pass-by trips and total SEASP site-generated trips (external + pass-by) for the 2037 15-year horizon 50% built out are illustrated in **Figures 3.7 to 3.9**.



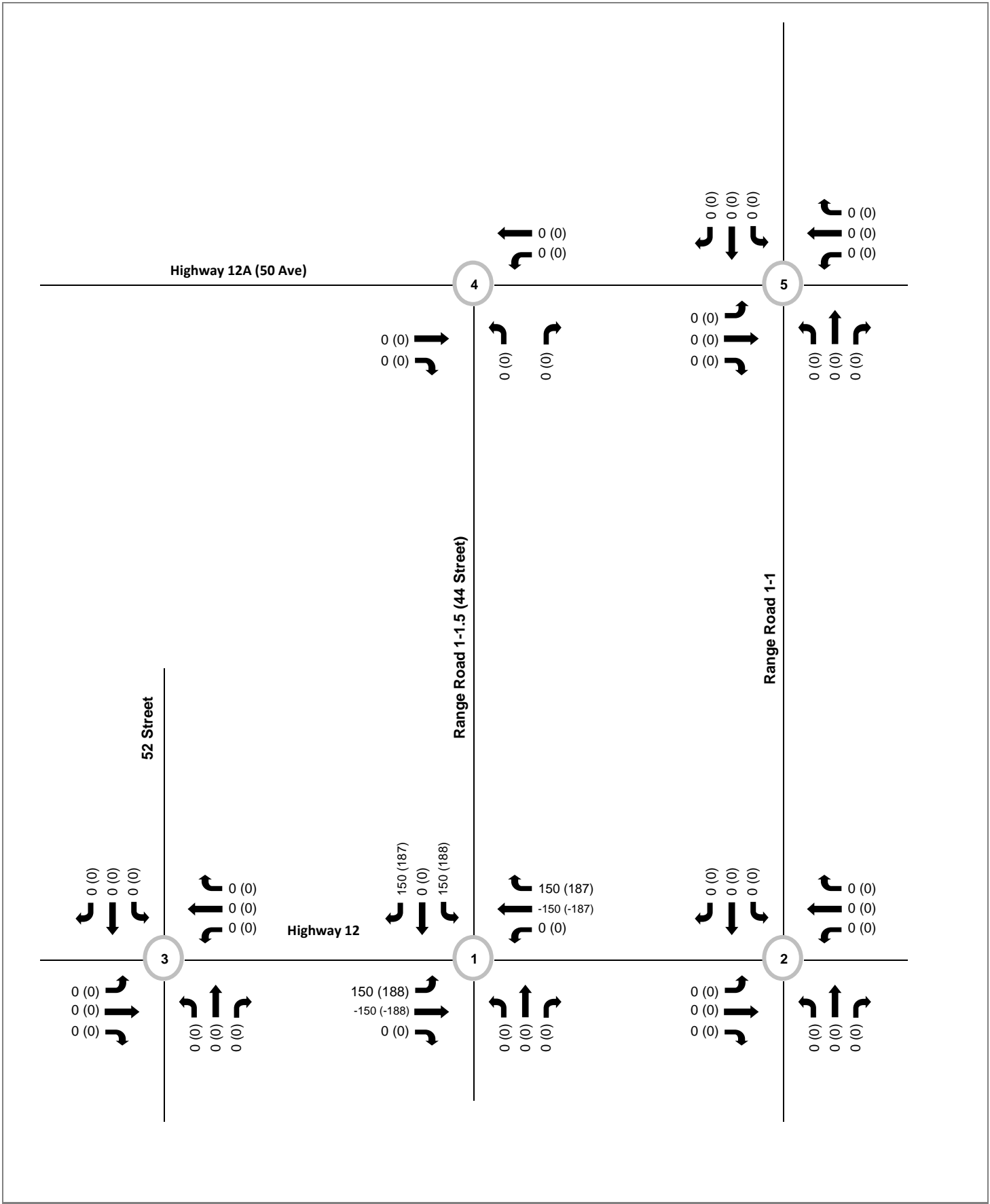


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.4**  
Title

SEASP Primary External Trips  
(2052 30-Year Horizon)

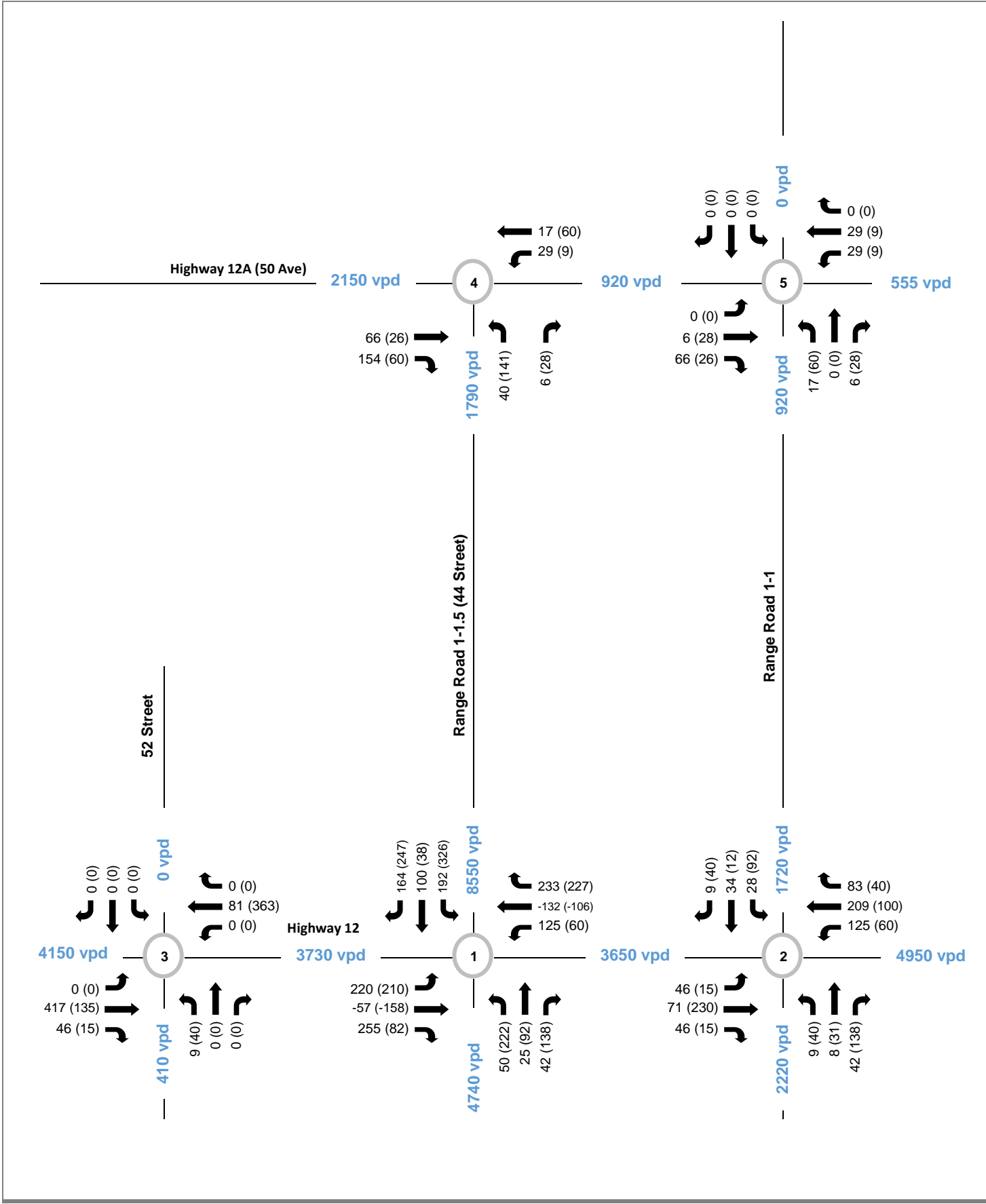


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.5**  
Title

SEASP Pass-By Trips  
(2052 30-Year Horizon)

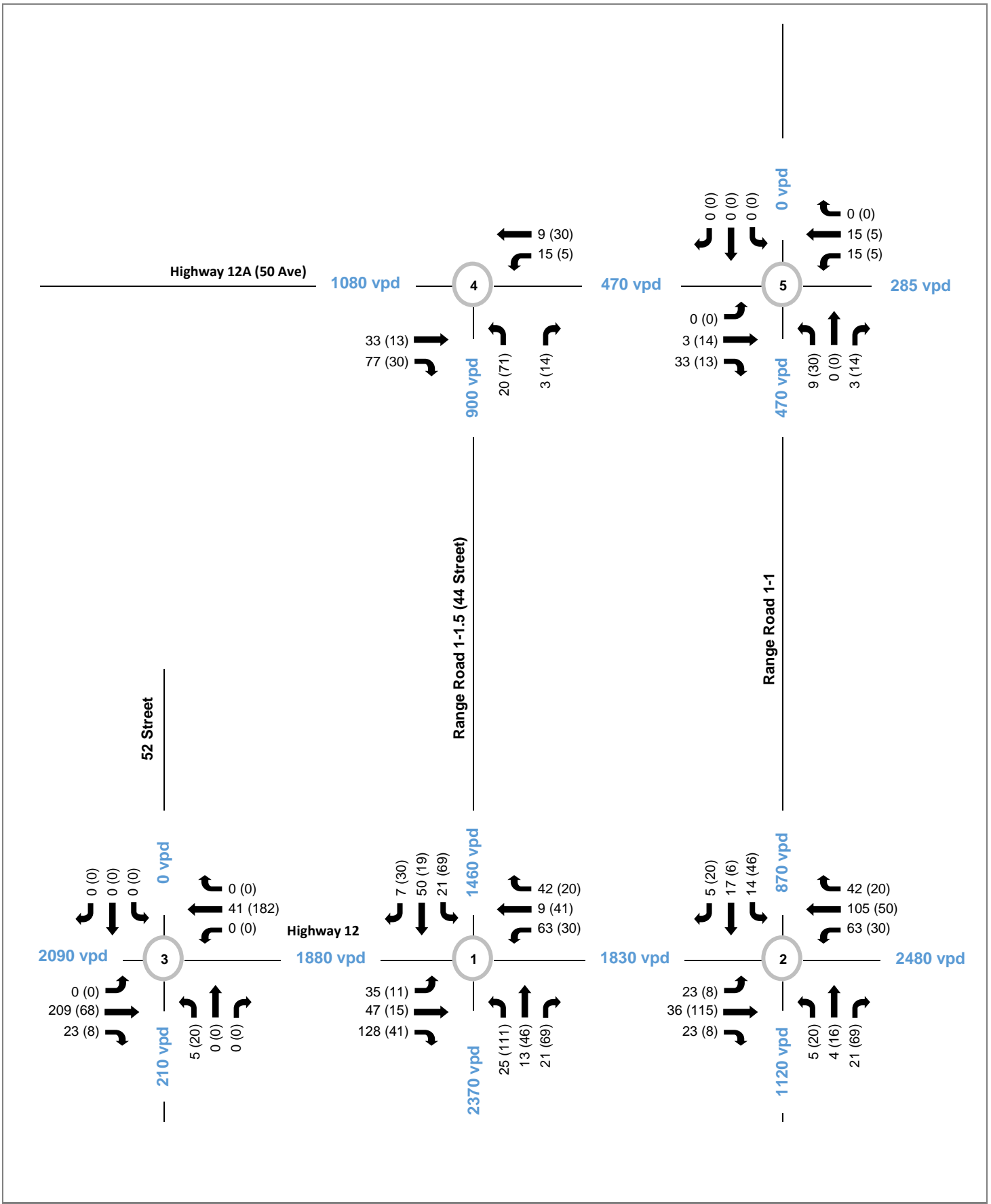


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.6**  
Title

SEASP Site Generated Trips  
(2052 30-Year Horizon)

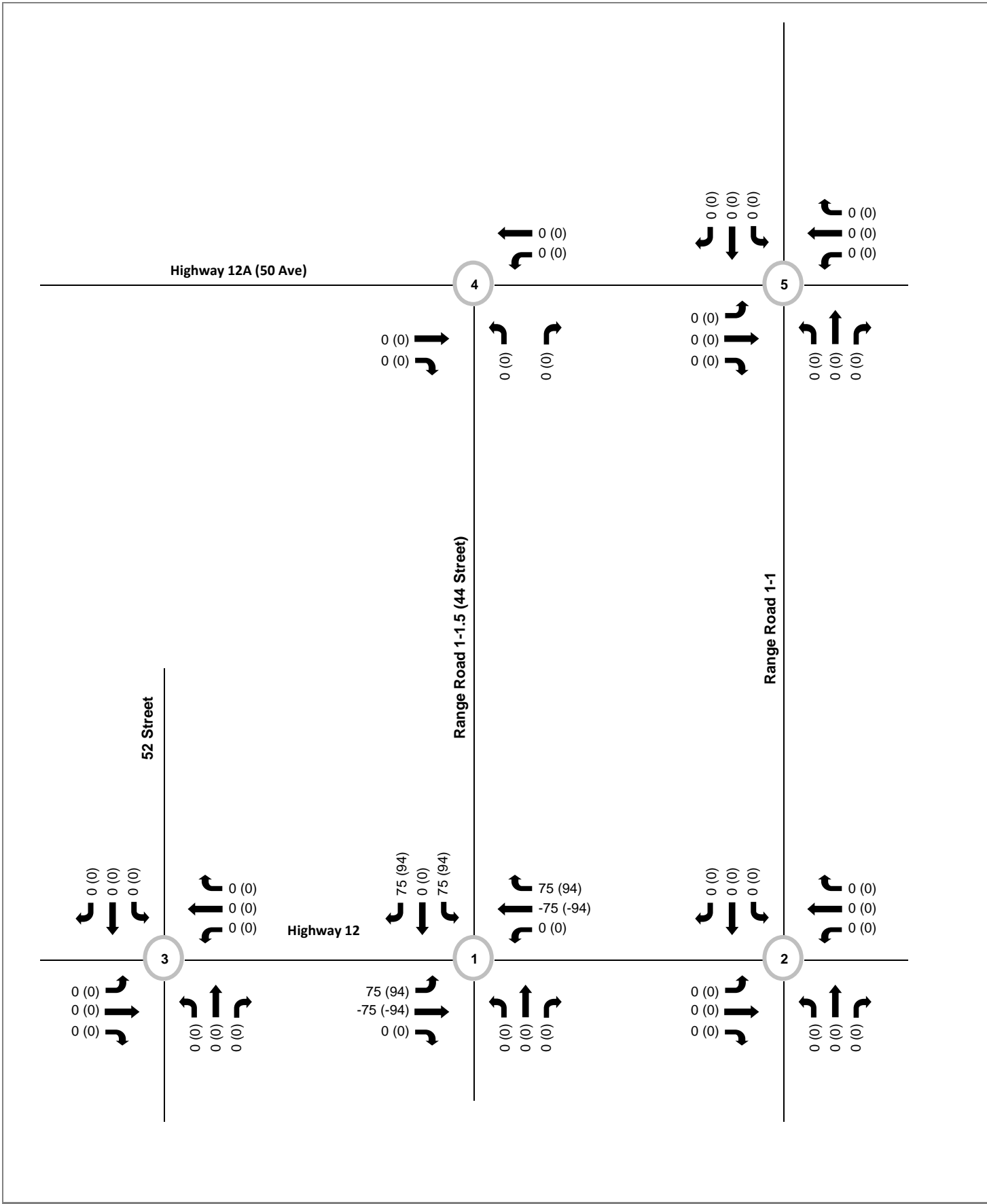


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.7**  
Title

SEASP Primary External Trips  
(2037 15-Year Horizon)



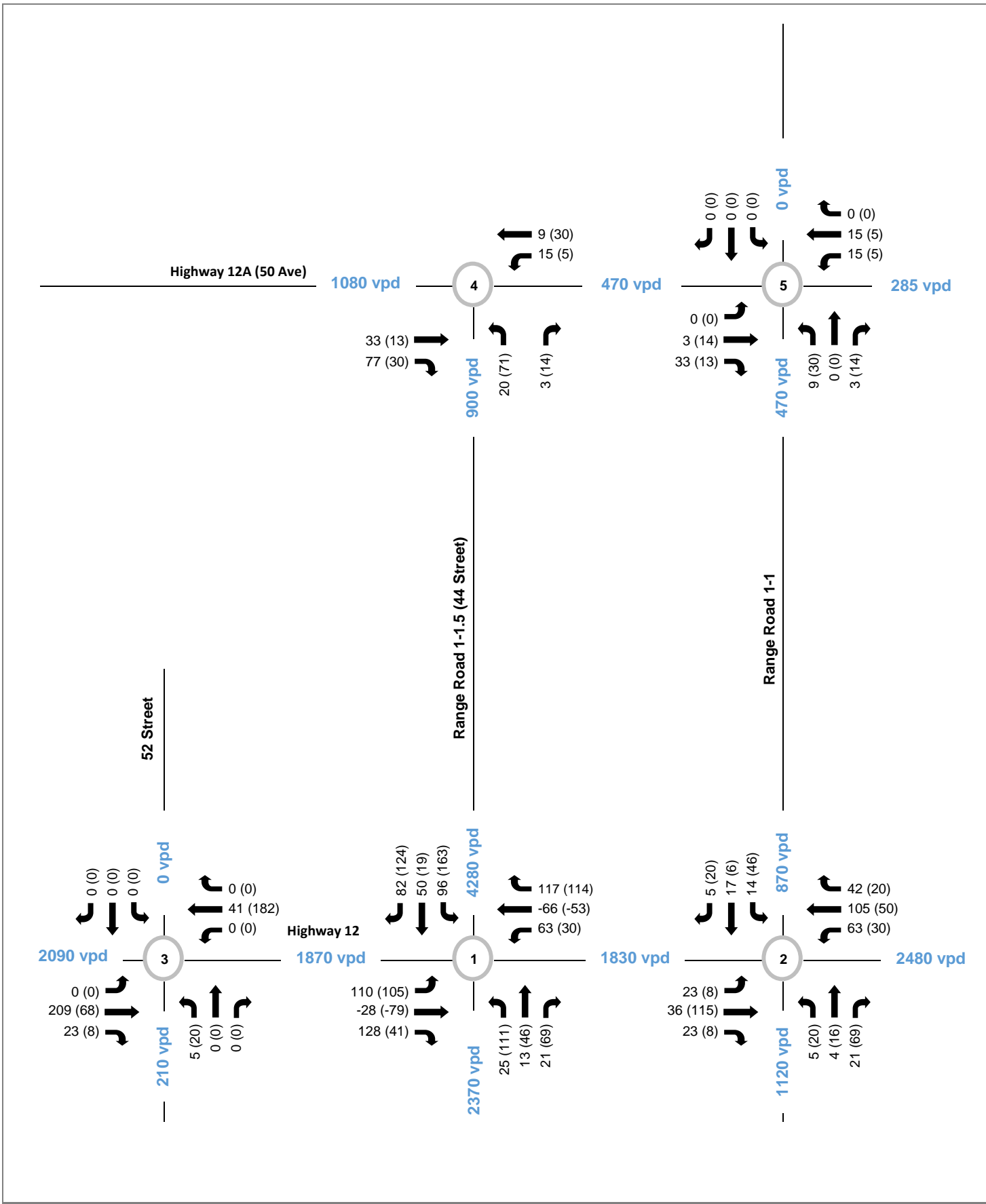
400-10220 103 Avenue NW  
Edmonton AB

6 (14)  
140 vpd

AM (PM) Peak Hour Traffic Volumes  
Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.8**  
Title

SEASP Pass-By Trips  
(2037 15-Year Horizon)



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Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.9**  
Title

SEASP Site Generated Trips  
(2037 15-Year Horizon)



### **3.5 OTHER NOTABLE DEVELOPMENTS**

As part of the TIA process, the trips generated by the Sandy Point Subdivision were also included as part of the background traffic.

Site generated trips from the Sandy Point Subdivision was obtained from the Traffic Impact Assessment (Section 1 and part of the South ½ Section 12-41-1-5) completed in 2008 by A.D. Williams Engineering Inc. The relevant excerpts from the TIA report are included in **Appendix D**.

As mentioned in Section 2.2, it was determined that approximately 33% of the Sandy Point Subdivision was already developed, these trips were included in the existing volumes. The remaining portions of Sandy Point Subdivision (67%) were assumed to be fully built out by the 2037 horizon.

The trip distribution of the Sandy Point Subdivision generated trips are illustrated in **Figure 3.10**.

The total Sandy Point Subdivision generated trips are illustrated in **Figure 3.11**.





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**6 (14)** AM (PM) Peak Hour Traffic Volumes  
**140 vpd** Two-way Daily Traffic Volumes (estimated)

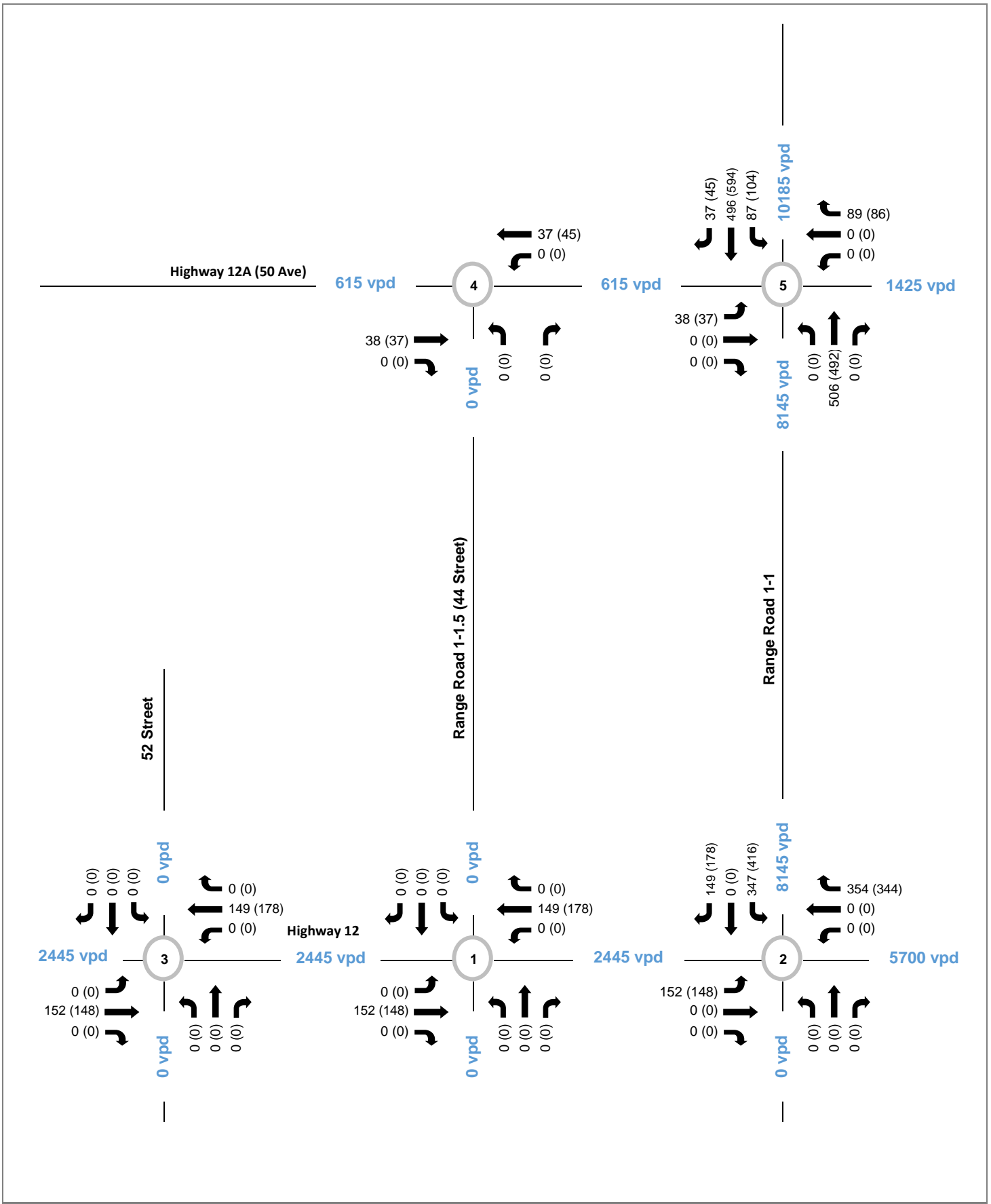
Client/Project  
Town of Bentley  
Southeast ASP TIA

Figure No.

**3.10**

Title

**Sandy Point Subdivision  
Trip Distribution**



400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.11**  
Title

Sandy Point Subdivision  
Total Generated Trips

### 3.6 FUTURE BACKGROUND TRAFFIC VOLUMES

Traffic data for Highway 12 and Highway 12A between 2012 and 2021 from the Automatic Traffic Recorder (ATR) were available through the AT website as illustrated in **Table 3.5**:

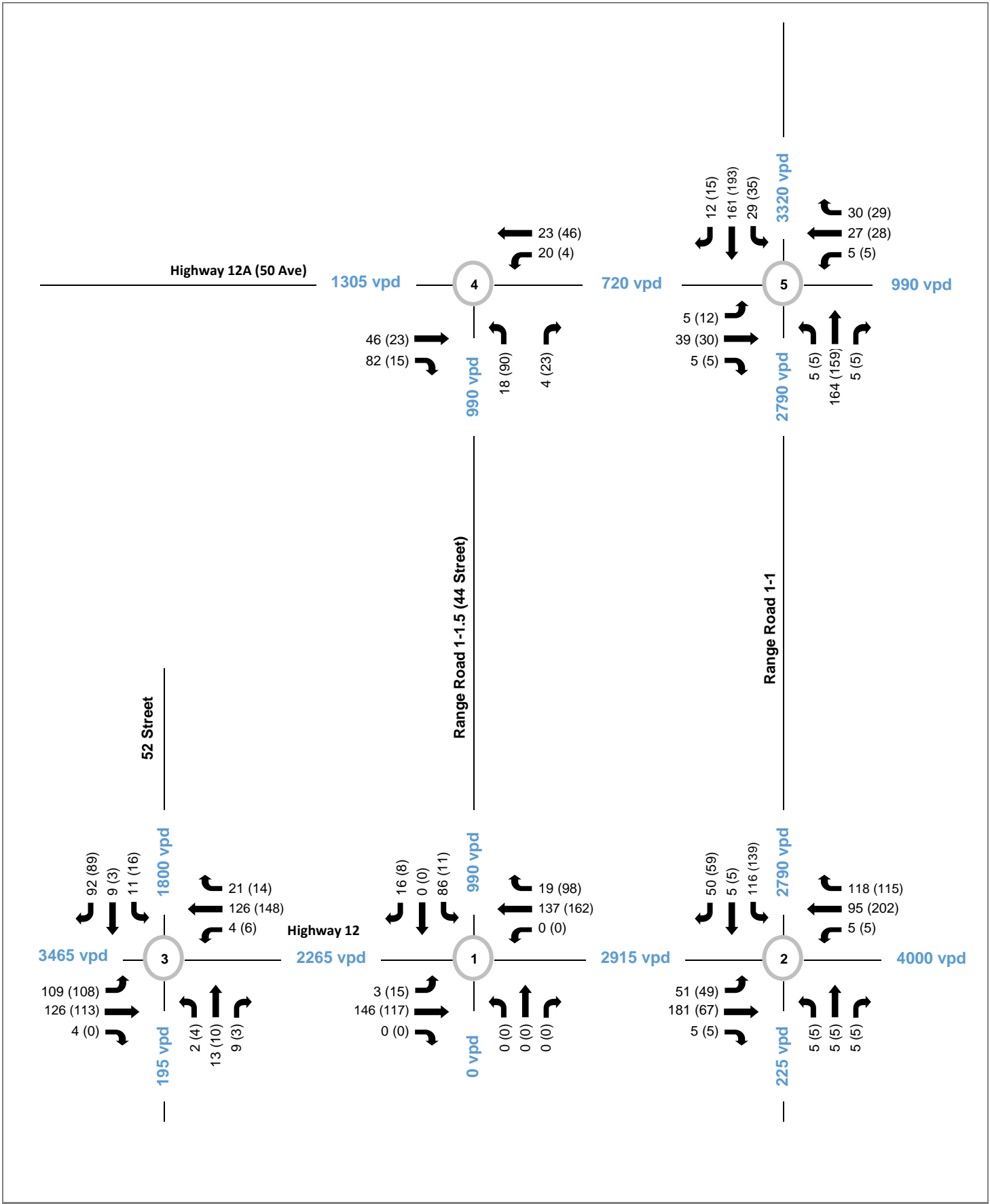
**Table 3.5 – Traffic Data on Highway 12 and Highway 12A**

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Highway 12 East of 44 Street	-	-	-	-	-	2780	2800	2810	2590	2790
Highway 12A East of 49 Street	2920	2860	2900	3130	3070	1010	1010	970	1510	1610

As shown above, both highways experienced minimal or decrease in traffic growth. For this study, 1% annual growth rate was used between 2021 and 2037, and 2% annual growth rate was used from 2037 to 2052.

The 2037 and 2052 background traffic volumes are illustrated in **Figures 3.12 and 3.13**.

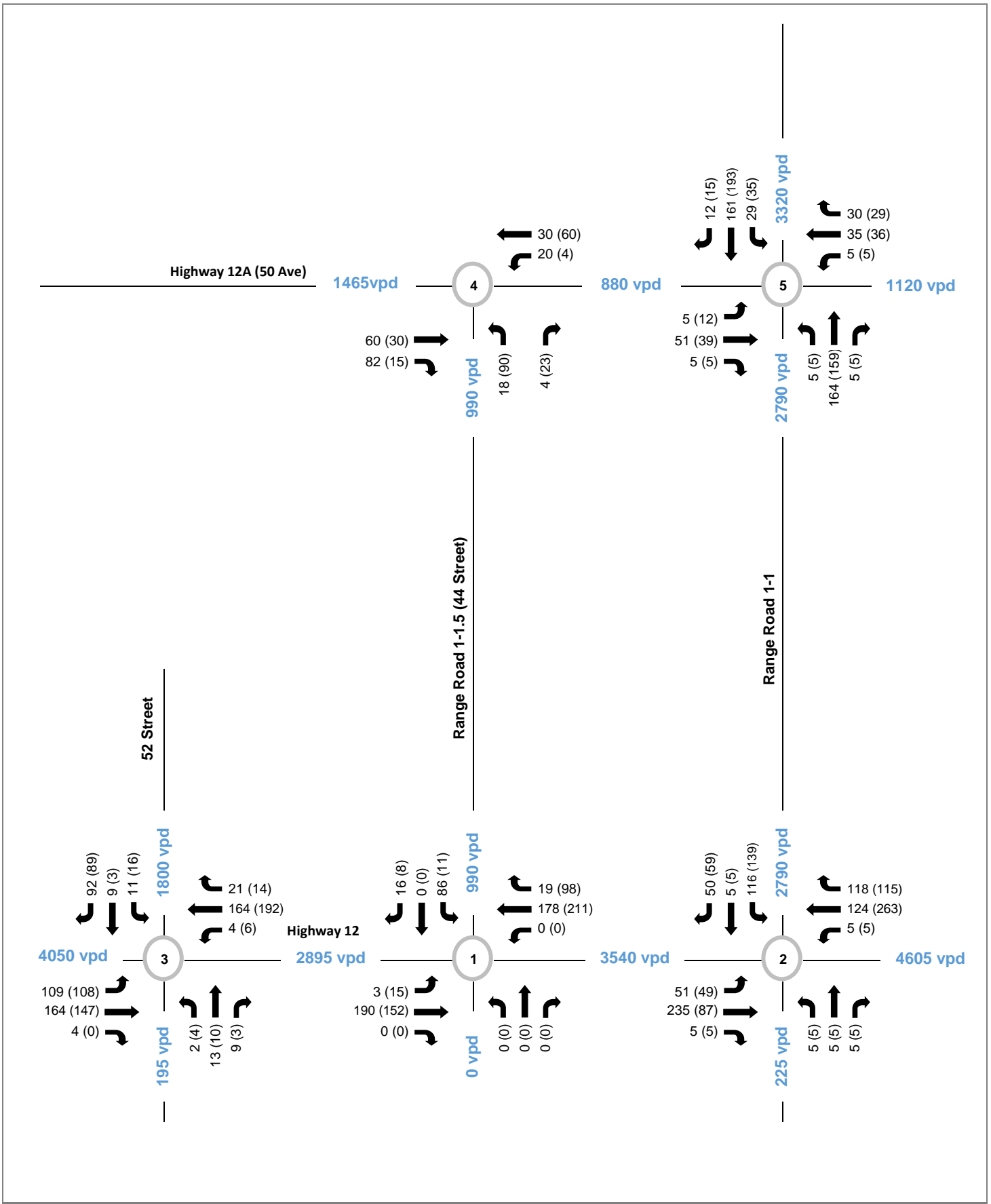




400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.12**  
Title



400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.13**  
Title

### **3.7 DESIGN TRAFFIC VOLUMES**

The design traffic volumes were calculated by superimposing the future site generated traffic volumes from the SEASP development and adjacent developments over the future background volumes in different study scenarios.

The 2037 design traffic volumes are the summation of:

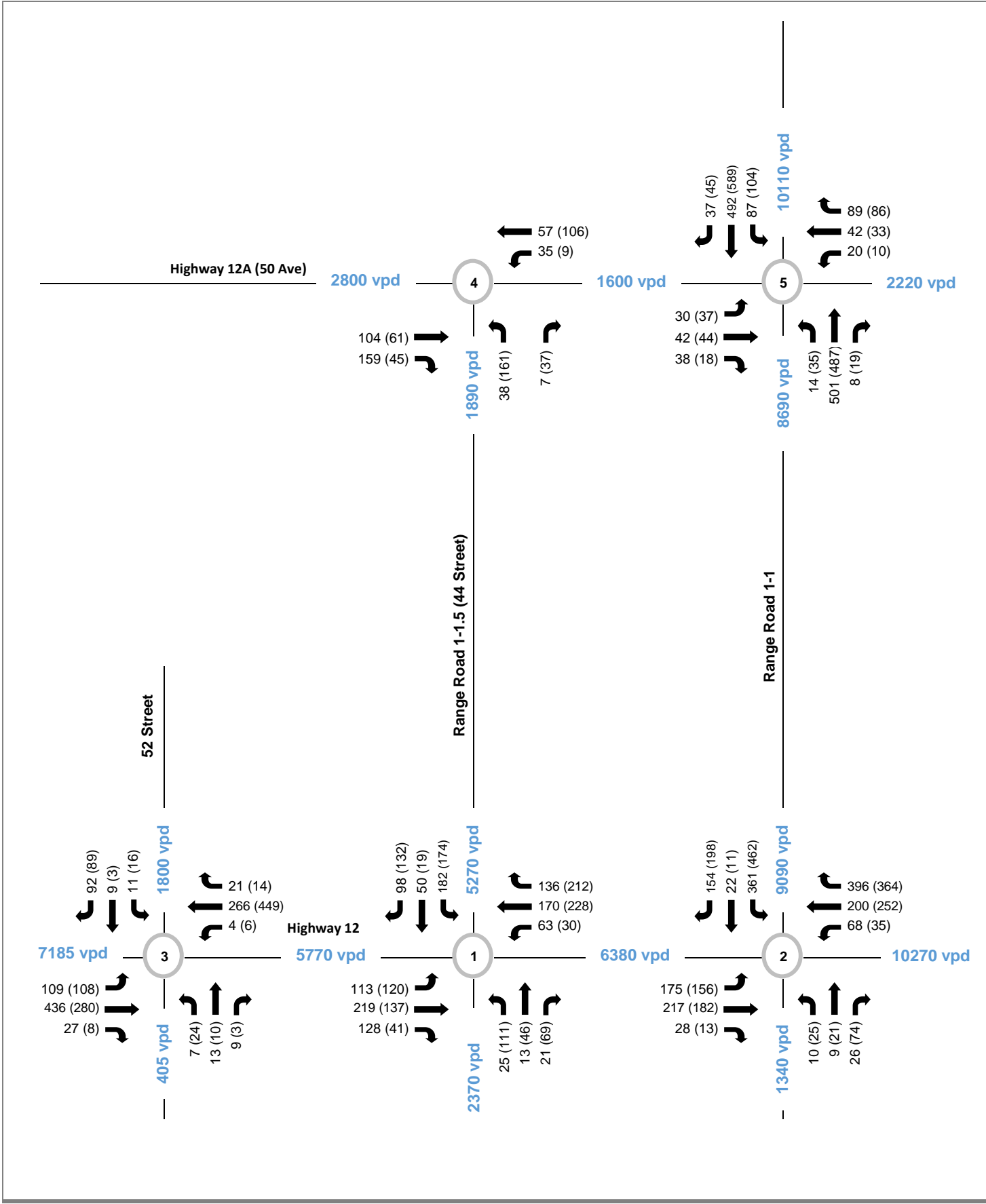
- Figure 3.9 – SEASP Site Generated Trips (2037 15-Year Horizon- 50% buildout)
- Figure 3.11 – Sandy Point Subdivision Total Generated Trips (67%)
- Figure 3.12 – 2037 Background Volumes

The 2052 design traffic volumes are the summation of:

- Figure 3.6 – SEASP Site Generated Trips (2052 30-Year Horizon – 100% buildout)
- Figure 3.11 – Sandy Point Subdivision Total Generated Trips (67%)
- Figure 3.13 – 2052 Background Volumes

The 2037 and 2052 design traffic volumes are illustrated in **Figures 3.14 and 3.15**.



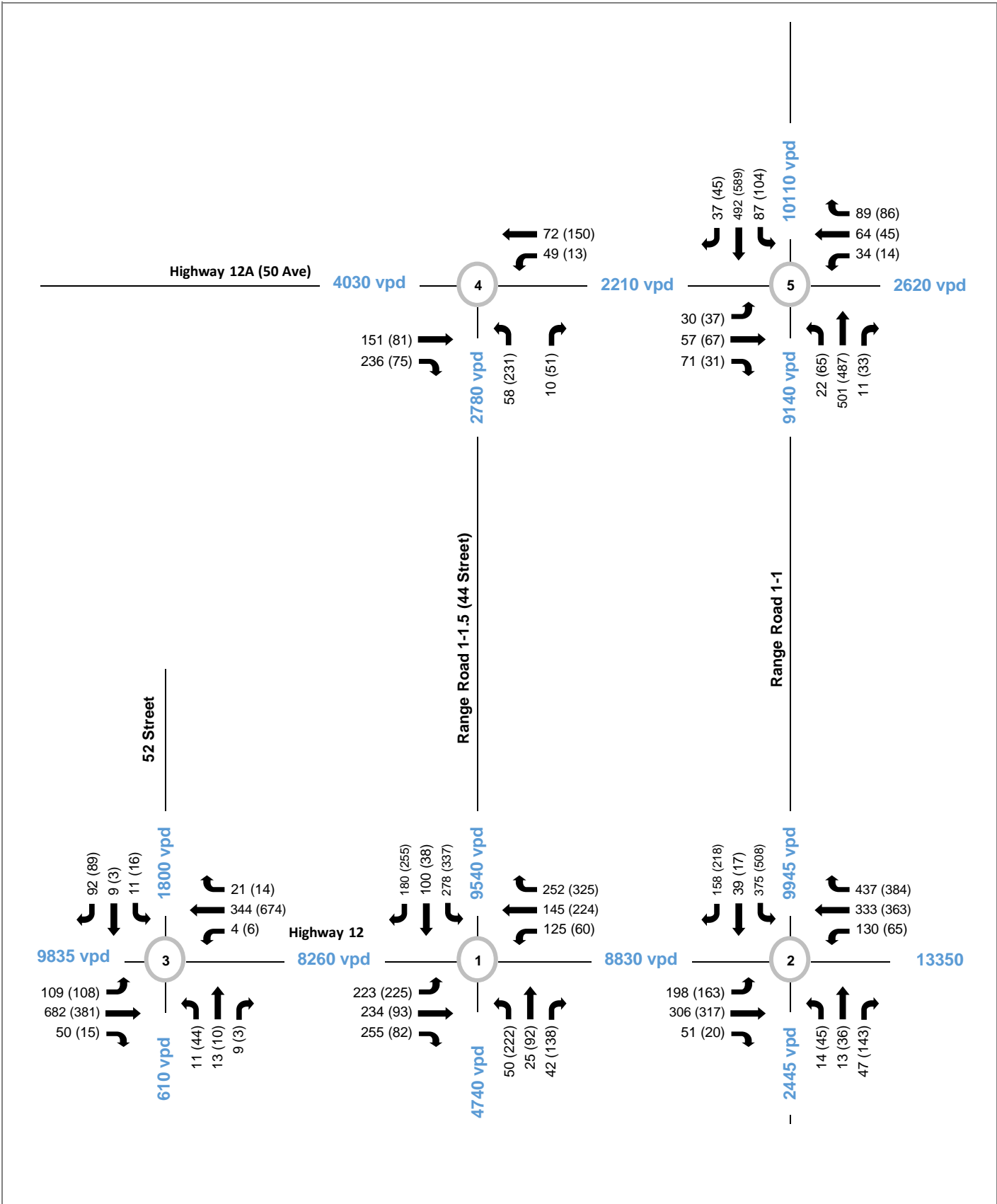


400-10220 103 Avenue NW  
Edmonton AB

6 (14) AM (PM) Peak Hour Traffic Volumes  
140 vpd Two-way Daily Traffic Volumes (estimated)

Client/Project  
Town of Bentley  
Southeast ASP TIA  
Figure No.  
**3.14**  
Title





## 4.0 TRANSPORTATION ASSESSMENT

The assessment of the study intersections consists of four parts:

- Signal Warrant Analysis (SWA);
- Illumination Warrant Analysis (IWA);
- Intersection Treatment Analysis (ITA); and
- Intersection Capacity Analysis (ICA).

The SWA will determine if and when signalization is required at the study intersection. The IWA will determine whether intersection illumination is warranted. The ITA is performed using AT’s Highway Geometric Design Guide (HGDG) and determines if and when geometric improvements are required at highway intersections. The ICA will confirm that the intersection can be expected to perform satisfactorily when subjected to the design volumes and whether any upgrades are required.

### 4.1 SIGNAL WARRANT ANALYSIS

The Signal Warrant Analysis was completed using Transportation Association of Canada’s (TAC) Traffic Signal Analysis Spreadsheet (2014). When the spreadsheet yields a W-value equal to or greater than 100 points, signalization is required. The analysis was completed for the 2021 existing conditions, 2037 15-year horizon and 2052 30-year horizon.

The following factors were applied to the AM peak and PM peak volumes to come up the values for the peak hours:

- AM Off-Peak – 72% of the AM Peak volumes
- AM Peak – 100% of the AM Peak volumes
- Noon Off-Peak – 60% of the AM Peak volumes
- Noon Peak – 60% of the PM Peak volumes
- PM Peak – 100% of the PM Peak volumes
- PM Off-Peak – 92% of the PM Peak volumes

The warrant yielded the following results summarized in **Table 4.1**. According to the results, signals are not warranted at all of the study intersections. The full signal warrants can be found in **Appendix E**.

**Table 4.1 – Signal Warrant Analysis Results**

	2021	Warranted?	2037	Warranted?	2052	Warranted?
Highway 12 & 44 Street	7	No	124	Yes	-	-
Highway 12 & Range Road 1-1	30	No	235	Yes	-	-
Highway 12 & 52 Street	14	No	45	No	73	No
Highway 12A & 44 Street	2	No	11	No	22	No
Highway 12A & Range Road 1-1	18	No	128	Yes	-	-

Based on the analysis results, the intersections of Highway 12 & 44 Street, Highway 12 & Range Road 1-1, and Highway 12A & Range Road 1-1 will require signalization prior to the 2037 15-year horizon. As development



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proceeds, developers should be required to complete additional traffic studies to evaluate the signal warrants in conjunction with the buildout of the area.

## 4.2 ILLUMINATION WARRANT ANALYSIS

Intersection illumination warrants for this TIA were completed utilizing TAC's *Illumination of Isolated Rural Intersections*, which rates intersections for illumination based on a number of parameters. An intersection must score 120 points or greater to warrant illumination. If the intersection is signalized (as per Section 4.1), illumination is warranted.

The warrant analysis was applied to all study intersections and yielded the following results, summarized in **Table 4.2**. The warrant worksheets are included in **Appendix F**.

**Table 4.2 – Illumination Warrant Analysis Results**

	2021	Warranted?	2037	Warranted?	2052	Warranted?
Highway 12 & 44 Street	83	No	163	Yes	-	-
Highway 12 & Range Road 1-1	141	Yes	-	-	-	-
Highway 12 & 52 Street	Illumination already in place					
Highway 12A & 44 Street	38	No	88	No	118	No
Highway 12A & Range Road 1-1	61	No	111	No	111	No

As shown in Table 4.2, delineation lighting is already warranted at the existing conditions for the intersection of Highway 12 & Range Road 1-1, and delineation lighting will be warranted prior to the 2037 15-Year horizon for the intersection of Highway 12 & 44 Street. Also, infill lighting between the intersections of Highway 12 & 44 Street and Highway 12 & Range Road 1-1 will be needed prior to the 2037 horizon.



### 4.3 INTERSECTION TREATMENT ANALYSIS

Intersections involving provincial highways must meet minimum requirements as defined by AT’s HGDG. The ITA for this report was completed utilizing section D7.4 and, where required, warrant analysis for dedicated left and right turn lanes were completed as per section D.7.6 and D.7.7 of the HGDG for all study intersections. Currently, the study intersections have the following treatment types as per AT’s HGDG Figure D-7b:

- Highway 12 & 44 Street – Type IVa
- Highway 12 & Range Road 1-1 – Type Ib
- Highway 12 & 52 Street – Type Vb
- Highway 12A & 44 Street – Type Ia
- Highway 12A & Range Road 1-1 – Type Ia

The calculations for the ITA are based on daily volumes as well as peak hour volumes. Thus, it is necessary to convert the peak hour volumes to daily volumes. As per AT’s HGDG:

- $DHV = k (AADT)$ , where DHV is the design hourly volume and AADT is the average annual daily traffic.

The k factor was calculated to be 0.133 based on the existing volumes along Highway 12. Estimated AADT along the study roadways for the three horizons are illustrated in **Table 4.3** by horizon.

**Table 4.3 – AADT by Horizon**

	2021	2037	2052
<b>Highway 12 &amp; 44 Street</b>			
Highway 12 East of 44 Street	2625	6380	8830
Highway 12 West of 44 Street	1980	5770	8260
44 Street North of Highway 12	990	5270	9540
44 Street South of Highway 12	-	2370	4740
<b>Highway 12 &amp; Range Road 1-1</b>			
Highway 12 East of Range Road 1-1	3720	10270	13350
Highway 12 West of Range Road 1-1	2625	6380	8830
Range Road 1-1 North of Highway 12	2790	9090	9945
Range Road 1-1 South of Highway 12	225	1340	2445
<b>Highway 12 &amp; 52 Street</b>			
Highway 12 East of 52 Street	1980	5770	8260
Highway 12 West of 52 Street	3195	7185	9835
52 Street North of Highway 12	1800	1800	1800
52 Street South of Highway 12	195	405	610
<b>Highway 12A &amp; 44 Street</b>			
Highway 12A East of 44 Street	650	1600	2210
Highway 12A West of 44 Street	1240	2800	4030



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44 Street South of Highway 12A	990	1890	2780
<b>Highway 12A &amp; Range Road 1-1</b>			
Highway 12A East of Range Road 1-1	930	2220	2620
Highway 12A West of Range Road 1-1	650	1600	2210
Range Road 1-1 North of Highway 12A	3320	10110	10110
Range Road 1-1 South of Highway 12A	2790	8690	9140

For Highway 12 & 52 Street intersection, no further geometry upgrades on Highway 12 are expected as it is already a Type Vb intersection.



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## 4.3.1 Preliminary Assessment

Figure D-7.4 of the HG DG was used to conduct a preliminary assessment of intersection treatment requirements based on AADT. The warrant worksheet outlining the results of this assessment is included in **Appendix G**, and a summary of the results are illustrated in **Table 4.4**.

**Table 4.4 – Intersection Treatment Analysis Results**

	<b>2021</b>	<b>2037</b>	<b>2052</b>
Highway 12 & 44 Street	Detailed Analysis Required	Detailed Analysis Required	Detailed Analysis Required
Highway 12 & Range Road 1-1	Detailed Analysis Required	Detailed Analysis Required	Detailed Analysis Required
Highway 12A & 44 Street	Type II or Type III	Detailed Analysis Required	Detailed Analysis Required
Highway 12A & Range Road 1-1	Detailed Analysis Required	Detailed Analysis Required	Detailed Analysis Required

The results of the preliminary assessment indicated that the intersections of Highway 12 & 44 Street, Highway 12 & Range Road 1-1, and Highway 12A & Range Road 1-1 will require detailed analysis to determine the intersection type. As for the intersection of Highway 12A & 44 Street, it currently warrants a Type II or Type III intersection type, and detailed analysis is required for each of the future analysis horizons for the intersection. The specific warrants are discussed in further detail below.



### 4.3.2 Left Turn Lane Warrant

Left turn warrant analysis was conducted for the left turn movements for the 15-year and 30-year horizons, using Figure D-7.6-2d of the HGDG. The calculated percentage of left turning vehicles for each peak hour at each horizon can be seen in **Table 4.5**.

**Table 4.5 – Left Turn Lane Warrant**

Intersection	2037			2052		
	% of Left Turning Vehicles		Intersection Type Required	% of Left Turning Vehicles		Intersection Type Required
	AM Peak	PM Peak		AM Peak	PM Peak	
<b>Highway 12 &amp; 44 Street</b>						
Westbound	17%	6%	Type IV with an additional storage length of 10 m	24%	10%	Type IV with an additional storage length of 40 m
Eastbound	Left turn lane already in place					
<b>Highway 12 &amp; Range Road 1-1</b>						
Westbound	10%	5%	Type IV with an additional storage length of 15 m	14%	8%	Type IV with an additional storage length of 50 m
Eastbound	42%	44%	Type IV with an additional storage length of 35 m	36%	33%	Outside chart limit, will determine through intersection capacity analysis
<b>Highway 12A &amp; 44 Street</b>						
Westbound	38%	8%	Type II	40%	8%	Type II
<b>Highway 12A &amp; Range Road 1-1</b>						
Westbound	13%	8%	Type II	18%	10%	Type II
Eastbound	27%	37%	Type II	19%	27%	Type II

The warrant worksheets outlining the results of this assessment and the intersection type requirements are included in **Appendix G**.



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### 4.3.3 Right Turn Lane Warrant

Section D.7.7 of the HG DG outlines the conditions that warrant an exclusive right turn lane as:

- Main road AADT > 1800;
- Intersecting road AADT > 900; and
- Right turn volume > 360 (vpd).

#### Highway 12 & 44 Street:

- Westbound – Right turn lane already in place.
- Eastbound – Meeting all three conditions – Right turn lane warranted.

#### Highway 12 & Range Road 1-1:

- Westbound – Meeting all three conditions – Right turn lane warranted.
- Eastbound – Meeting all three conditions – Right turn lane warranted.

#### Highway 12A & 44 Street:

- Eastbound – Meeting all three conditions – Right turn lane warranted.

#### Highway 12A & Range Road 1-1:

- Westbound – Right turn less than 360 vpd – Right turn lane not warranted.
- Eastbound – Right turn less than 360 vpd – Right turn lane not warranted.





## 4.4 INTERSECTION CAPACITY ANALYSIS – 2037 – 15-YEAR HORIZON

ICA was carried out for the 2037 – 15-year horizon.

For signalized intersections, the methodology considers the intersection geometry, the traffic volumes, the posted speed limit, and the traffic signal phasing/timing plan. The average delay for each lane group and the overall intersection are calculated. An operational level of service (LOS) is then assigned based on the calculated average delay. The LOS criteria for both signalized and unsignalized intersections are described in **Table 4.6**.

**Table 4.6 – Level of Service Criteria**

LOS	Control Delay (seconds per vehicle)	
	Signalized Intersection	Unsignalized Intersection
A	10.0 or less	10.0 or less
B	10.1 to 20.0	10.1 to 20.0
C	20.1 to 35.0	20.1 to 25.0
D	35.1 to 55.0	25.1 to 35.0
E	55.1 to 80.0	35.1 to 50.0
F	More than 80.0	More than 50.0

The Synchro analysis results are illustrated in **Table 4.7**: (Synchro and SIDRA outputs are included in **Appendix H**)

- Intersection #1 – Highway 12 & 44 Street

As per the signal warrant analysis, this intersection would require signalization prior to the 15-year horizon. As a signalized intersection with turn lanes on Highway 12 and a left turn and a shared through and right turn lane on 44 Street, the intersection is expected to function adequately with a max v/c ratio of 0.51 for the southbound left turn movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.

This intersection was also modeled as a single lane roundabout using the SIDRA 9.0 software. As a single lane roundabout, this intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.531 for the eastbound movement during the AM peak hour. All LOS are LOS-B or better during both peak hours.

- Intersection #2 – Highway 12 & Range Road 1-1

As per the signal warrant analysis, this intersection would require signalization prior to the 15-year horizon. As a signalized intersection with turn lanes on Highway 12 and a left turn and a shared through and right turn lane on Range Road 1-1, the intersection is expected to function adequately with a max v/c ratio of 0.69 for the southbound left turn movement during the PM peak hour. All LOS are LOS-C or better during both peak hours.

This intersection was also modeled as a single lane roundabout. As a single lane roundabout, this intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.70 for the southbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.



## BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT

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- Intersection #3 – Highway 12 & 52 Street

This intersection was modeled with the existing intersection configuration. As a two-way stop control intersection, the northbound movement is projected to operate with LOS E during the PM peak hour. This is due to the increase in eastbound/westbound traffic on Highway 12, making it difficult for northbound vehicles to find a gap to enter. Given the low volumes for this movement and the low v/c ratios and queues, improvements are not recommended at this time.

- Intersection #4 – Highway 12A & 44 Street

This intersection was modeled with the existing intersection configuration with the addition of an eastbound right turn lane. As a stop control T-intersection, it is expected to function adequately with a max v/c ratio of 0.26 for the northbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.

- Intersection #5 – Highway 12A & Range Road 1-1

This intersection was first modeled as a two-way stop control intersection, as it was not warranted for signalization as per the signal warrant analysis. However, some movements are projected to go over capacity during both peak hours. As a signalized intersection, the intersection is expected to function adequately with a max v/c ratio of 0.75 for the southbound movement during the PM peak hour. All LOS are LOS-C or better during both peak hours.

This intersection was also modeled as a single lane roundabout. As a single lane roundabout, this intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.562 for the southbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.



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**Table 4.7 – ICA Results – 2037 – 15-Year Horizon**

Int#1 - Highway 12 & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	1	1	1	1	1	1	SH	1	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	113	219	128	63	170	136	25	13	21	182	50	98	Intersection
Volume/Capacity Ratio (v/c)	0.2	0.24	0.15	0.11	0.19	0.16	0.05	0.05	-	0.32	0.2	-	Delay
Total Delay (s)	10	9.5	2.8	9.2	9.2	2.8	11.4	7.1	-	14.6	5.9	-	8.3s
Lane LOS	A	A	A	A	A	A	B	A	-	B	A	-	LOS A
Queue Length 95th (m)	16	26.4	7.5	9.8	20.9	7.7	5.3	5	-	26.2	12.2	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	120	137	41	30	228	212	111	46	69	174	19	132	Intersection
Volume/Capacity Ratio (v/c)	0.26	0.18	0.06	0.06	0.3	0.28	0.34	0.23	-	0.51	0.28	-	Delay
Total Delay (s)	10.3	8.9	3.7	8.4	9.8	2.7	15.5	7.1	-	18.7	5	-	9.3s
Lane LOS	B	A	A	A	A	A	B	A	-	B	A	-	LOS A
Queue Length 95th (m)	16.6	16.7	4.1	5.5	26.8	9.3	17.1	11	-	25.9	10.2	-	
Int#2 - Highway 12 & Range Road 1-1	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	1	1	1	1	1	1	SH	1	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	175	217	28	68	200	396	10	9	26	361	22	154	Intersection
Volume/Capacity Ratio (v/c)	0.49	0.38	0.05	0.2	0.35	0.53	0.05	0.11	-	0.56	0.22	-	Delay
Total Delay (s)	23.4	19.5	0.2	18.4	19.1	4.7	25.6	14.3	-	13.4	3.1	-	12.9s
Lane LOS	C	B	A	B	B	A	C	B	-	B	A	-	LOS B
Queue Length 95th (m)	40.1	43.4	0	16.9	40	17.6	5.6	8.9	-	51.8	10.9	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	156	182	13	35	252	364	25	21	74	462	11	198	Intersection
Volume/Capacity Ratio (v/c)	0.53	0.33	0.02	0.1	0.45	0.51	0.13	0.29	-	0.69	0.25	-	Delay
Total Delay (s)	27.2	20.3	0.1	18.5	22.1	4.8	29.4	13.3	-	16.4	2.7	-	14.5s
Lane LOS	C	C	A	B	C	A	C	B	-	B	A	-	LOS B
Queue Length 95th (m)	39.5	38.3	0	10.5	52.8	17.4	11	16.5	-	74.9	11	-	
Int#3 - Highway 12 & 52 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	SH	1	1	1	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	109	436	27	4	266	21	7	13	9	11	9	92	Intersection
Volume/Capacity Ratio (v/c)	0.09	0.3	0.3	0	0.17	0.01	0.14	0.14	0.14	0.25	0.25	0.25	Delay
Total Delay (s)	8.2	0	0	8.4	0	0	23.6	23.6	23.6	14.6	14.6	14.6	3.2s
Lane LOS	A	A	A	A	A	A	C	C	C	B	B	B	LOS A
Queue Length 95th (m)	2.4	0	0	0.1	0	0	3.7	3.7	3.7	7.3	7.3	7.3	
<b>PM Peak Hour</b>													
Volumes (veh/h)	108	280	8	6	449	14	24	10	3	16	3	89	Intersection
Volume/Capacity Ratio (v/c)	0.11	0.18	0.18	0.01	0.29	0.01	0.26	0.26	0.26	0.28	0.28	0.28	Delay
Total Delay (s)	8.8	0	0	7.9	0	0	35.6	35.6	35.6	16.8	16.8	16.8	4.1s
Lane LOS	A	A	A	A	A	A	E	E	E	C	C	C	LOS A
Queue Length 95th (m)	2.8	0	-	0.1	0	0	7.3	7.3	7.3	8.5	8.5	8.5	



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Int#4 - Highway 12A & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	-	1	1	SH	1	-	SH	-	SH	-	-	-	
<b>AM Peak Hour</b>													
Volumes (veh/h)	-	104	159	35	57	-	38	-	7	-	-	-	Intersection
Volume/Capacity Ratio (v/c)	-	0.07	0.1	0.03	0.03	-	0.07	-	0.07	-	-	-	Delay
Total Delay (s)	-	0	0	0.2	3.2	-	10.2	-	10.2	-	-	-	1.9s
Lane LOS	-	A	A	A	A	-	B	-	B	-	-	-	LOS A
Queue Length 95th (m)	-	0	0	0.7	0.7	-	1.6	-	1.6	-	-	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	-	61	45	9	106	-	161	-	37	-	-	-	Intersection
Volume/Capacity Ratio (v/c)	-	0.04	0.03	0.01	0.01	-	0.26	-	0.26	-	-	-	Delay
Total Delay (s)	-	0	0	0.1	0.6	-	11	-	11	-	-	-	5.4s
Lane LOS	-	A	A	A	A	-	B	-	B	-	-	-	LOS A
Queue Length 95th (m)	-	0	0	0.2	0.2	-	8.1	-	8.1	-	-	-	
Int#5 - Highway 12A & Range Road 1-1	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	SH	1	SH	SH	1	SH	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	30	42	38	20	42	89	14	501	8	87	492	37	Intersection
Volume/Capacity Ratio (v/c)	-	0.21	-	-	0.27	-	-	0.5	-	-	0.67	-	Delay
Total Delay (s)	-	18.1	-	-	14.4	-	-	11.6	-	-	15.7	-	14.2s
Lane LOS	-	B	-	-	B	-	-	B	-	-	B	-	LOS B
Queue Length 95th (m)	-	25.8	-	-	27.9	-	-	68.4	-	-	100.2	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	37	44	18	10	33	86	35	487	19	104	589	45	Intersection
Volume/Capacity Ratio (v/c)	-	0.23	-	-	0.26	-	-	0.5	-	-	0.75	-	Delay
Total Delay (s)	-	25.2	-	-	12.8	-	-	10.5	-	-	17.4	-	15.1s
Lane LOS	-	C	-	-	B	-	-	B	-	-	B	-	LOS B
Queue Length 95th (m)	-	27.9	-	-	21.3	-	-	73.4	-	-	143.4	-	



## 4.5 INTERSECTION CAPACITY ANALYSIS – 2052 – 30-YEAR HORIZON

ICA was carried out for the 2052 – 30-year horizon, the Synchro analysis results are illustrated in **Table 4.8**: (Synchro and SIDRA outputs are included in **Appendix I**)

- Intersection #1 – Highway 12 & 44 Street

As a signalized intersection, the intersection is expected to continue to function adequately with a max v/c ratio of 0.75 for the southbound left turn movement during the PM peak hour. All LOS are LOS-C or better during both peak hours.

As a single lane roundabout, the intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.849 for the eastbound movement during the PM peak hour. All LOS are LOS-C or better during both peak hours.

- Intersection #2 – Highway 12 & Range Road 1-1

As a signalized intersection, the intersection is expected to continue to function adequately with a max v/c ratio of 0.87 for the southbound left turn and eastbound left turn movements during the PM peak hour. All LOS are LOS-D or better during both peak hours.

As a single lane roundabout, the southbound movement is approaching capacity with a v/c ratio of 0.953 during the PM peak hour. All LOS are LOS-D or better during both peak hours.

- Intersection #3 – Highway 12 & 52 Street

This intersection will no longer function as a two-way stop control intersection at the 30-year horizon. As a signalized intersection with the existing configurations, it is expected to function adequately with a max v/c ratio of 0.80 for the eastbound through movement in the AM Peak hour, and also 0.86 for the westbound through movement in the PM Peak hour. All LOS are LOS-C or better during both peak hours.

This intersection was also modeled as a single lane roundabout. As a single lane roundabout, this intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.620 for the westbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.

- Intersection #4 – Highway 12A & 44 Street

As a stop control T-intersection, it is expected to continue to function adequately with a max v/c ratio of 0.41 for the northbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.

- Intersection #5 – Highway 12A & Range Road 1-1

As a signalized intersection, the intersection is expected to continue to function adequately with a max v/c ratio of 0.84 for the southbound movement during the AM peak hour. All LOS are LOS-C or better during both peak hours.

As a single lane roundabout, this intersection is expected to function adequately in both peak hours with a max v/c ratio of 0.602 for the southbound movement during the PM peak hour. All LOS are LOS-B or better during both peak hours.



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**Table 4.8 – ICA Results – 2052 30-Year Horizon**

Int#1 - Highway 12 & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	1	1	1	1	1	1	SH	1	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	223	234	255	125	145	252	50	25	42	278	100	180	Intersection
Volume/Capacity Ratio (v/c)	0.47	0.33	0.34	0.29	0.2	0.33	0.15	0.12	-	0.64	0.44	-	Delay
Total Delay (s)	17	13.6	3.4	15.5	12.6	3.4	12.6	6.4	-	21.1	9.2	-	11.4s
Lane LOS	B	B	A	B	B	A	B	A	-	C	A	-	LOS B
Queue Length 95th (m)	43.7	39.8	12.8	24.8	25.5	12.7	10.5	8.6	-	50.5	29.9	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	225	93	82	60	224	325	222	92	138	337	38	255	Intersection
Volume/Capacity Ratio (v/c)	0.57	0.14	0.13	0.13	0.34	0.43	0.57	0.32	-	0.75	0.37	-	Delay
Total Delay (s)	24.9	16.8	5.1	17.3	18.4	4.1	19.9	7.3	-	27	3.8	-	14.5s
Lane LOS	C	B	A	B	B	A	B	A	-	C	A	-	LOS B
Queue Length 95th (m)	58.3	22.1	9	16.1	48.8	16.5	47	24.7	-	75.9	16.4	-	
Int#2 - Highway 12 & Range Road 1-1	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	1	1	1	1	1	1	SH	1	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	198	306	51	130	333	437	14	13	47	375	39	158	Intersection
Volume/Capacity Ratio (v/c)	0.52	0.56	0.09	0.33	0.68	0.6	0.08	0.22	-	0.71	0.28	-	Delay
Total Delay (s)	17.2	26.9	0.3	14.4	32.9	5.9	31.9	15	-	26.2	5.7	-	18.7w
Lane LOS	B	C	A	B	C	A	C	B	-	C	A	-	LOS B
Queue Length 95th (m)	31.6	66.3	0	21.4	77.1	20.3	7.3	12.5	-	74.9	17.2	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	163	317	20	65	363	384	45	36	143	508	17	218	Intersection
Volume/Capacity Ratio (v/c)	0.55	0.56	0.04	0.19	0.77	0.56	0.33	0.56	-	0.87	0.29	-	Delay
Total Delay (s)	26.1	33.7	0.1	19.8	45.2	6.4	49.8	20.6	-	36.1	3.7	-	26.4s
Lane LOS	C	C	A	B	D	A	D	C	-	D	A	-	LOS C
Queue Length 95th (m)	40.4	95.5	0	18.3	115.9	23.4	22	32.3	-	#137.5	15.2	-	
Int#3 - Highway 12 & 52 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	1	1	SH	1	1	1	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													
Volumes (veh/h)	109	682	50	4	344	21	11	13	9	11	9	92	Intersection
Volume/Capacity Ratio (v/c)	0.22	0.8	-	0.02	0.37	0.03	-	0.09	-	-	0.27	-	Delay
Total Delay (s)	7	16.2	-	5.2	7.8	1.4	-	16.8	-	-	9.3	-	12.5s
Lane LOS	A	B	-	A	A	A	-	B	-	-	A	-	LOS B
Queue Length 95th (m)	11	85.8	-	1	29.5	1.4	-	9.4	-	-	14.3	-	
<b>PM Peak Hour</b>													
Volumes (veh/h)	108	381	15	6	674	14	44	10	3	16	3	89	Intersection
Volume/Capacity Ratio (v/c)	0.42	0.41	-	0.02	0.86	0.02	-	0.16	-	-	0.23	-	Delay
Total Delay (s)	10.5	9.7	-	11	29.7	0.1	-	26.5	-	-	10.2	-	20.3s
Lane LOS	B	A	-	B	C	A	-	C	-	-	B	-	LOS C
Queue Length 95th (m)	11.9	45.9	-	2.6	138.8	0	-	18.9	-	-	16	-	



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Int#4 - Highway 12A & 44 Street	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	-	1	1	SH	1	-	SH	-	SH	-	-	-	
<b>AM Peak Hour</b>													Intersection Delay 2.1s LOS A
Volumes (veh/h)	-	151	236	49	72	-	58	-	10	-	-	-	
Volume/Capacity Ratio (v/c)	-	0.1	0.15	0.05	0.05	-	0.11	-	0.11	-	-	-	
Total Delay (s)	-	0	0	0.4	3.6	-	11.3	-	11.3	-	-	-	
Queue Length 95th (m)	-	0	0	1.1	1.1	-	2.9	-	2.9	-	-	-	
<b>PM Peak Hour</b>													Intersection Delay 6.4s LOS A
Volumes (veh/h)	-	81	75	13	150	-	231	-	51	-	-	-	
Volume/Capacity Ratio (v/c)	-	0.05	0.05	0.01	0.01	-	0.41	-	0.41	-	-	-	
Total Delay (s)	-	0	0	0.1	0.7	-	13.2	-	13.2	-	-	-	
Queue Length 95th (m)	-	0	0	0.2	0.2	-	15.5	-	15.5	-	-	-	
Int#5 - Highway 12A & Range Road 1-	Intersection Movements												Overall Intersection
	EB			WB			NB			SB			
	L	T	R	L	T	R	L	T	R	L	T	R	
Intersection / Laning Characteristics	SH	1	SH	SH	1	SH	SH	1	SH	SH	1	SH	
<b>AM Peak Hour</b>													Intersection Delay 19.5s LOS B
Volumes (veh/h)	30	57	71	34	64	89	22	501	11	87	492	37	
Volume/Capacity Ratio (v/c)	-	0.32	-	-	0.38	-	-	0.64	-	-	0.84	-	
Total Delay (s)	-	18.2	-	-	18.9	-	-	15	-	-	24.1	-	
Queue Length 95th (m)	-	34.7	-	-	40.8	-	-	71.7	-	-	100.9	-	
<b>PM Peak Hour</b>													Intersection Delay 16.4s LOS B
Volumes (veh/h)	37	67	31	14	45	86	65	487	33	104	589	45	
Volume/Capacity Ratio (v/c)	-	0.31	-	-	0.29	-	-	0.59	-	-	0.75	-	
Total Delay (s)	-	26.5	-	-	17.2	-	-	12.3	-	-	17.6	-	
Queue Length 95th (m)	-	36.7	-	-	28.2	-	-	89.2	-	-	145.5	-	



## 4.6 STAGING OF INFRASTRUCTURE IMPROVEMENTS

Table 4.9 summarizes the staging of infrastructure improvements proposed by this TIA, based on the ICA results.

**Table 4.9 – Proposed Future Infrastructure Staging Strategy Summary Table**

Scenario	ASP Staging	Recommended Infrastructure Adjustments				
		Hwy 12 & 44 Street	Hwy 12 & Range Road 1-1	Hwy 12 & 52 St	Hwy 12A & 44 Street	Hwy 12A & Range Road 1-1
Existing Conditions	0%	No change	No change	No change	No change	No change
2037 15-Year Horizon	50%	Signalized intersection with turn lanes on Highway 12 or a single lane roundabout	Signalized intersection with turn lanes on Highway 12 or a single lane roundabout	No change	Upgrade to Type IIa with an eastbound right turn lane	Signalized intersection or a single lane roundabout
2052 30-Year Horizon	100%	No additional improvements required	No additional improvements required	Signalized intersection or a single lane roundabout	No additional improvements required	No additional improvements required

## 4.7 CONCEPTUAL INTERSECTION UPGRADE DRAWINGS

Conceptual roundabout designs were completed for the four intersections that will be required to be upgraded in the future and are included in **Figures 4.1 to 4.4** at the end of this section. Roundabouts were chosen as the design basis over signalized intersections because roundabouts are Alberta Transportation’s preferred intersection treatment. Signalized intersections, though less expensive, are typically accepted only when it can be demonstrated through a lifecycle cost analysis that they are more economical or that there are other compelling reasons to implement them. The roundabout concepts were based on the following assumptions:

- The geometry is based on aerial photography. Minor adjustments should be expected at the time of detailed design when topographic survey is completed.
- Single lanes in each direction will be sufficient as per the results of the analysis above.
- Speed reduction curves will vary for posted speed limits of either 60 km/hr to 100 km/hr. The lengths of the curves may require alterations depending on the order the intersections are upgraded and how the posted speed limits are established. For example, if the intersection of Highway 12 and 44<sup>th</sup> Street is the first one to be upgraded, it may require the longer speed limit reduction curves for a posted speed limit of 100 km/h.
- No pedestrian crossings will be required except for maintaining the existing trail on Highway 12A that extends from Bentley to Gull Lake.





- Approximate areas for land acquisition and/or backsloping are included in the figures. The exact areas should be further reviewed at the time of detailed design.

## 4.8 OPINION OF PROBABLE COSTS

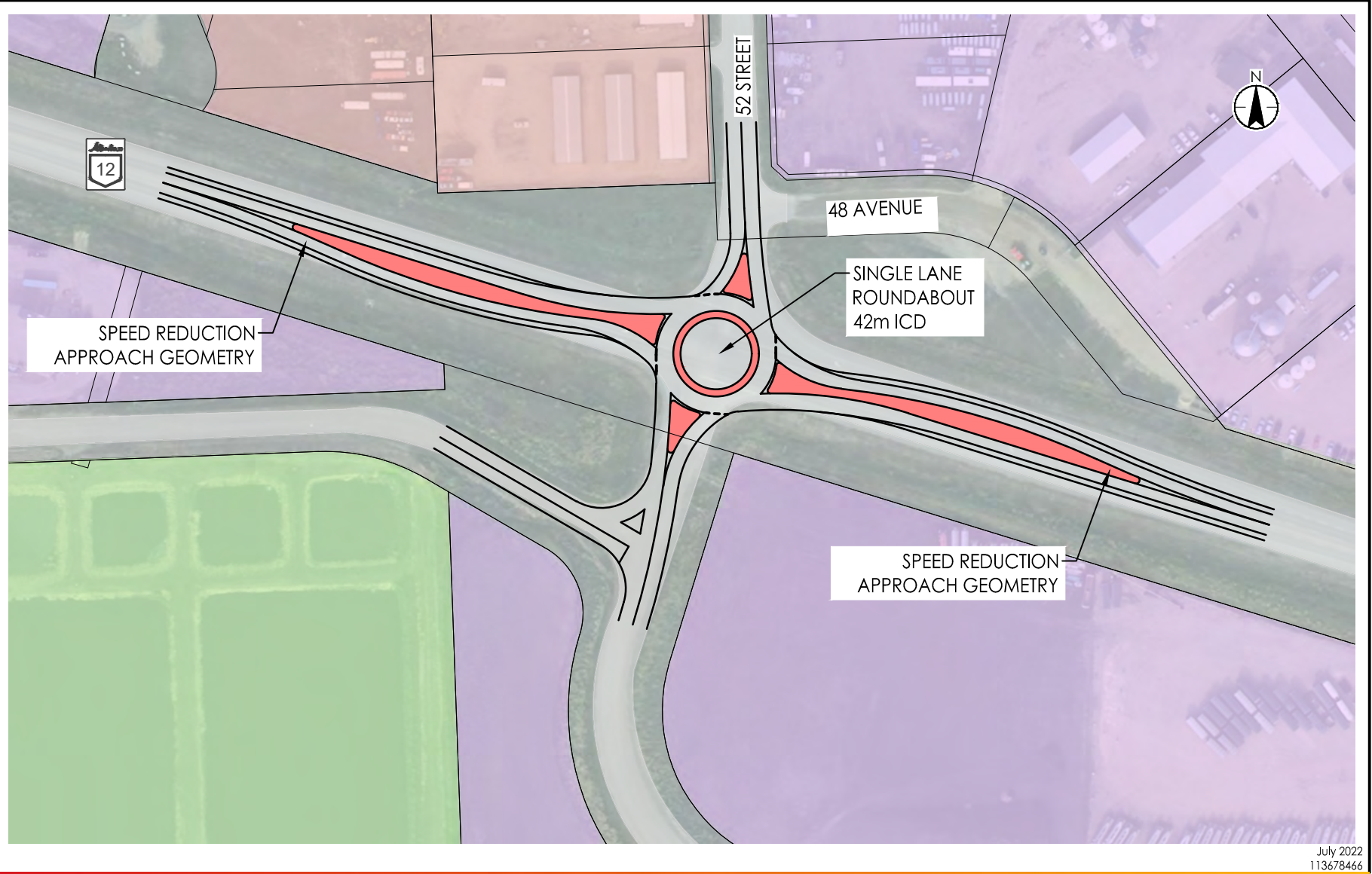
Stantec’s opinion of probable costs (OPCs) for each of the intersections that are proposed to be upgraded are presented below and are based on the following assumptions:

- The quantities are based on a desktop level exercise (Estimate Type B) and will be required to be refined at the time of detailed design, which will require topographic survey for more accuracy. Please refer to Appendix J for details.
- The quantities are conservatively based on full resurfacing of the highway surfaces. There is strong potential that much of the existing surfaces can be matched/built upon without significant removals, depending on the road conditions in the future and refinement of the designs with actual topographic survey information.
- The quantities are based on the speed reduction geometry shown in the figures. There is strong potential that the extents of the speed reduction curves will change, depending on the order the intersections are upgraded and how the speed limit will be reduced in the future. Four long speed reduction curves are included in the grand total (i.e. an average of one per intersection).
- Unit rates are based on Alberta Transportation’s 2022 Unit Price Averages for Central Alberta. It should be noted that the rates have been extremely volatile at the time of this report and that these OPCs should be updated in the future as needed.
- Land acquisition costs are excluded.
- Costs include amounts of 25% for contingency and 10% for engineering.
- Costs exclude 5% GST.

**Table 4.10 – Opinion of Probable Costs**

<b>Intersection</b>	<b>Cost</b>
Highway 12 and 52 Street	\$4,900,000
Highway 12 and 44 Street	\$3,100,000
Highway 12 and RR11	\$3,900,000
Highway 12A EBRT Lane	\$200,000
Highway 12A and RR11	\$3,900,000
<b>Grand Total</b>	<b>\$16,000,000</b>





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- COMMERCIAL
- MUNICIPAL RESERVE
- PUBLIC
- RESIDENTIAL
- HIGHWAY COMMERCIAL
- LIGHT INDUSTRIAL
- HEAVY INDUSTRIAL
- PUBLIC UTILITY LOT
- HIGHWAY AND LOCAL ROAD
- SOUTHEAST ASP LIMIT
- TOWN LIMIT



Client/Project

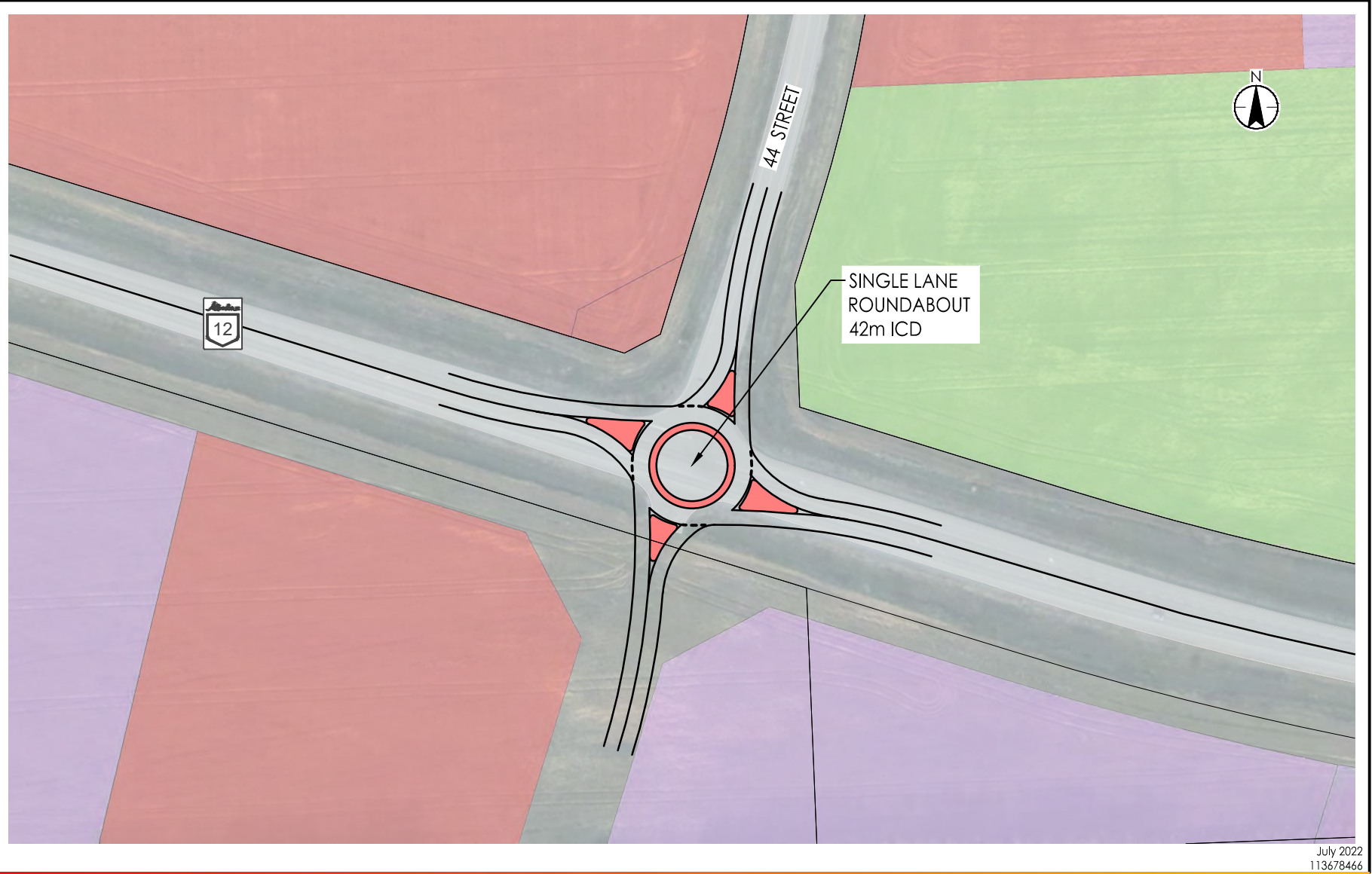
TOWN OF BENTLEY  
SOUTHEAST ASP

Figure No.

4.1

Title

52 ST & HIGHWAY 12  
42m ICD ROUNDABOUT CONCEPT



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- LIGHT INDUSTRIAL
- HEAVY INDUSTRIAL
- PUBLIC UTILITY LOT
- HIGHWAY AND LOCAL ROAD
- SOUTHEAST ASP LIMIT
- TOWN LIMIT



Client/Project

TOWN OF BENTLEY  
SOUTHEAST ASP

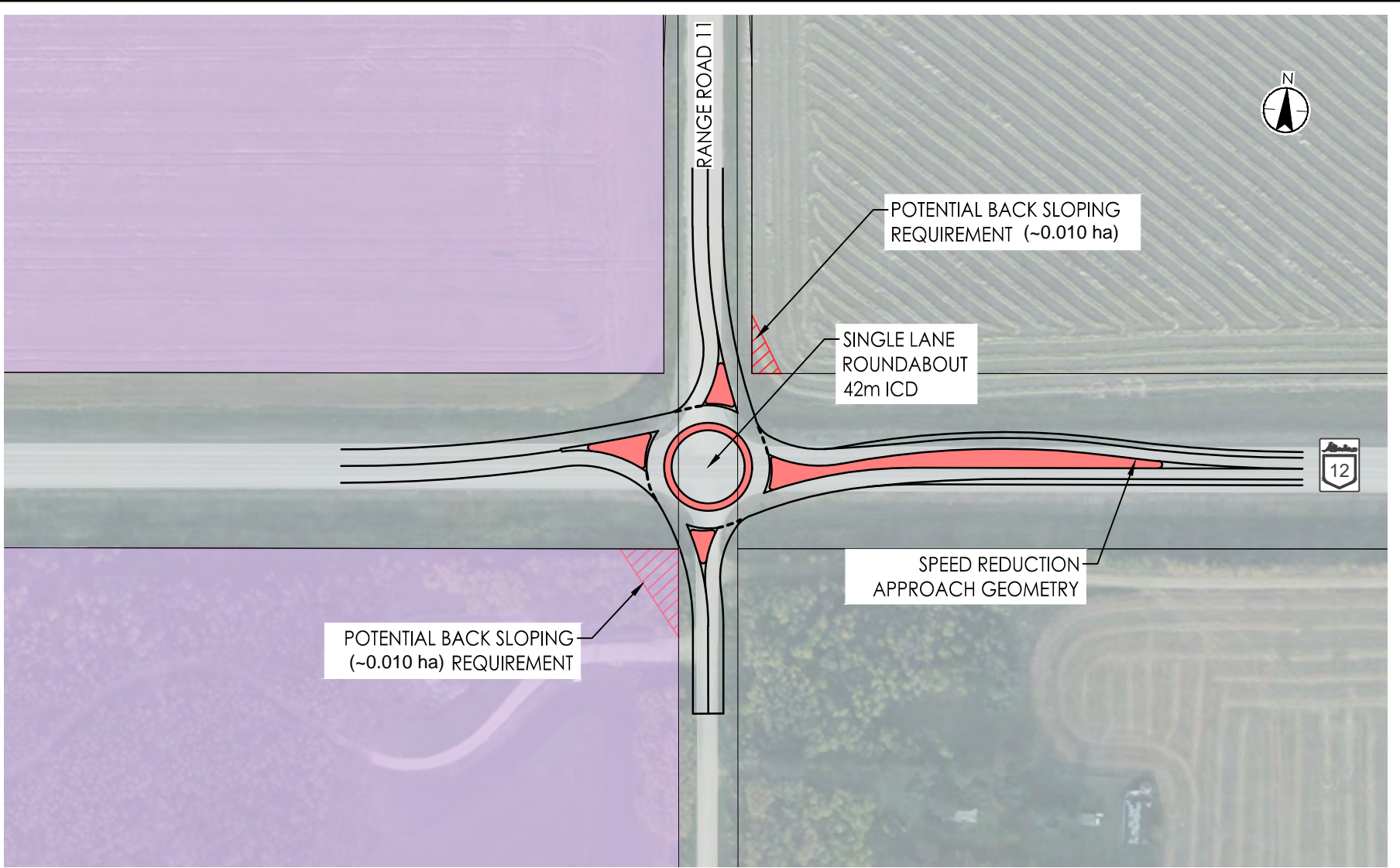
Figure No.

4.2

Title

44 ST & HIGHWAY 12  
42m ICD ROUNDABOUT CONCEPT





July 2022  
113678466



1100 - 4900 50th Street  
Red Deer, AB T4N 1X7  
www.stantec.com

LEGEND

- COMMERCIAL
- MUNICIPAL RESERVE
- PUBLIC
- RESIDENTIAL
- HIGHWAY COMMERCIAL
- LIGHT INDUSTRIAL
- HEAVY INDUSTRIAL
- PUBLIC UTILITY LOT
- HIGHWAY AND LOCAL ROAD
- SOUTHEAST ASP LIMIT
- TOWN LIMIT



Client/Project

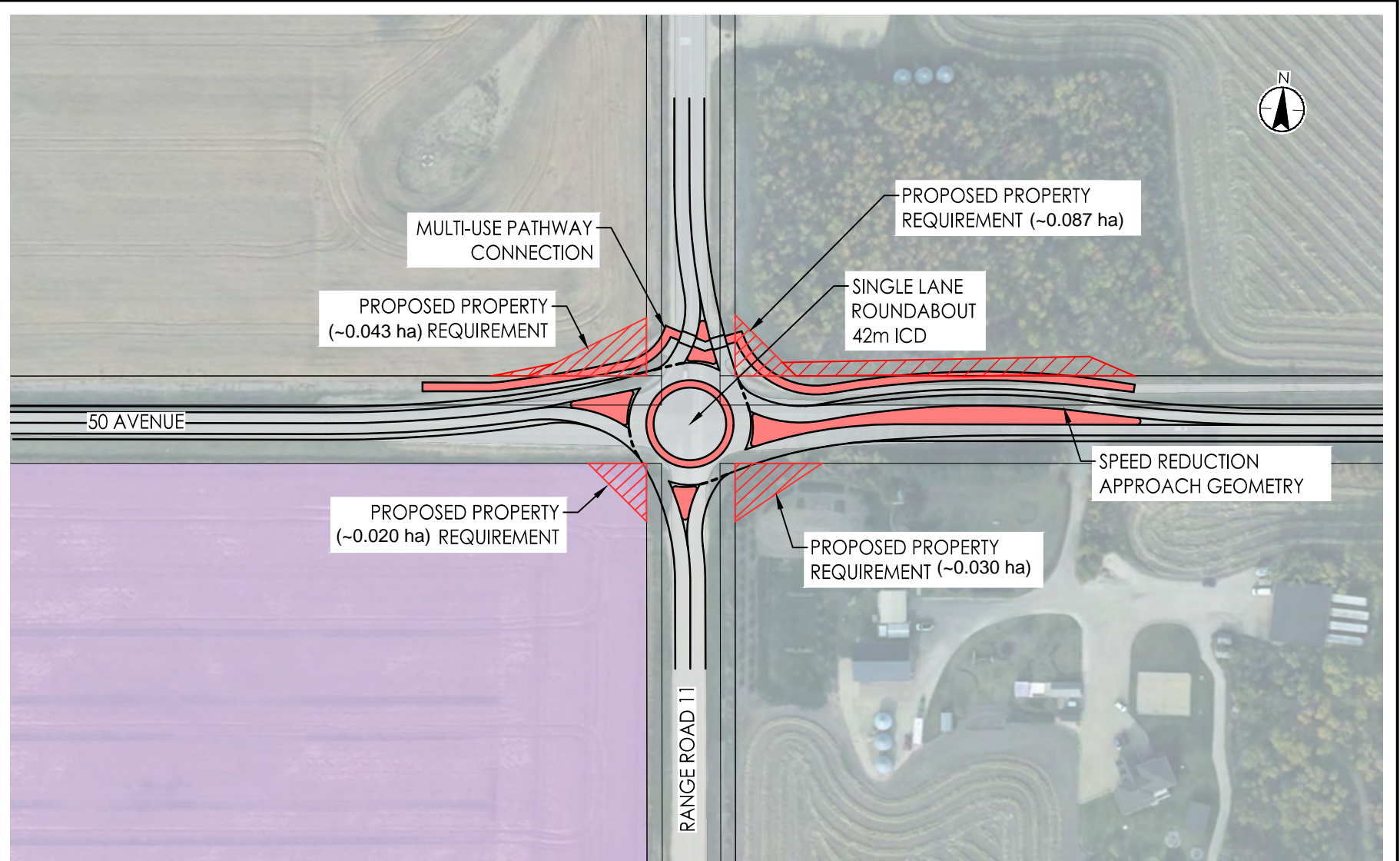
TOWN OF BENTLEY  
SOUTHEAST ASP

Figure No.

4.3

Title

RANGE ROAD 11 & HIGHWAY 12  
42m ICD ROUNDABOUT CONCEPT



July 2022  
113678466



1100 - 4900 50th Street  
Red Deer, AB T4N 1X7  
www.stantec.com

LEGEND

- COMMERCIAL
- MUNICIPAL RESERVE
- PUBLIC
- RESIDENTIAL
- HIGHWAY COMMERCIAL
- LIGHT INDUSTRIAL
- HEAVY INDUSTRIAL
- PUBLIC UTILITY LOT
- HIGHWAY AND LOCAL ROAD
- SOUTHEAST ASP LIMIT
- TOWN LIMIT



Client/Project

TOWN OF BENTLEY  
SOUTHEAST ASP

Figure No.

4.4

Title

RANGE ROAD 11 & 50 AVE  
42m ICD ROUNDABOUT CONCEPT

## 5.0 CONCLUSIONS

The Bentley SEASP TIA was prepared to evaluate the roadway/intersection capacity and identify any potential improvements required to support the development of the ASP. The findings of this TIA are as follows:

- All study intersections are currently operating adequately with all movements staying within the threshold criteria in terms of LOS and v/c ratio.
- Based on the signal warrant analysis results, the intersections of Highway 12 & 44 Street, Highway 12 & Range Road 1-1, and Highway 12A & Range Road 1-1 will require signalization prior to the 2037 15-year horizon.. As development proceeds, developers should be required to complete additional traffic studies to evaluate the signal warrants in conjunction with the buildout of the area.
- Based on the illumination warrant analysis results, delineation lighting is already warranted at the existing conditions for the intersection of Highway 12 & Range Road 1-1, and delineation lighting will be warranted prior to the 2037 15-Year horizon for the intersection of Highway 12 & 44 Street. Also, infill lighting between the intersections of Highway 12 & 44 Street and Highway 12 & Range Road 1-1 will be needed prior to the 2037 horizon.
- If not a roundabout, based on the intersection treatment analysis:
  - Highway 12 & 44 Street
    - Type IV with westbound left and right turn lanes.
  - Highway 12 & Range Road 1-1
    - Type IV with eastbound and westbound left and right turn lanes.
  - Highway 12A & 44 Street
    - Type II with eastbound right turn lane.
  - Highway 12A & Range Road 1-1
    - Type II.
- Intersection capacity analysis indicated that at the 2037 15-year horizon, the following improvements will be needed:
  - Highway 12 & 44 Street
    - Either a signalized intersection with turn lanes on Highway 12 and a left turn lane and a shared through and right turn lane on 44 Street or a single lane roundabout.
  - Highway 12 & Range Road 1-1



## BENTLEY SEASP TRANSPORTATION IMPACT ASSESSMENT

Conclusions

October 14, 2022

- Either a signalized intersection with turn lanes on Highway 12 and a left turn lane and a shared through and right turn lane on Range Road 1-1 or a single lane roundabout.
  - Highway 12A & Range Road 1-1
    - Either a signalized intersection or a single lane roundabout.
- Intersection capacity analysis indicated that at the 2052 30-year horizon, the following improvements will be needed:
  - Highway 12 & 52 Street
    - Either a signalized intersection or a single lane roundabout.
- The total opinion of probable cost is \$16.0M for the five intersections. The costs are based on Alberta Transportation's 2022 unit rates for Central Alberta. The costs may need to be revised accordingly in the future to address volatility and/or inflation.



## **6.0 APPENDICES**





## **Appendix A – Existing 2021 Traffic Volumes**

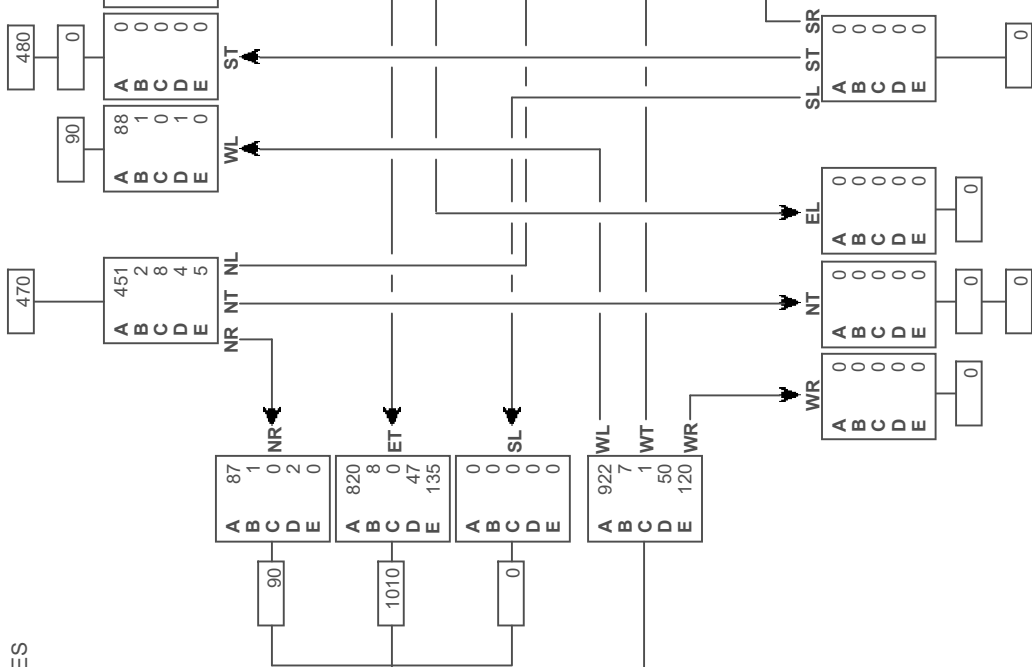
Turning Movement Summary Diagram

Reference No.: 70000749

Intersection of:  
12 & 44 ST (BENTLEY E ACC)

2021 AADT / ASDT ESTIMATES

North On 44 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	911	95.9
B: Recreational Vehicle	4	0.4
C: Bus	16	1.7
D: Single Unit Truck	9	0.9
E: Tractor Trailer Unit	10	1.1
<b>ASDT</b>	<b>1220</b>	<b>950</b>



West On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	1829	83.1
B: Recreational Vehicle	16	0.7
C: Bus	1	0.0
D: Single Unit Truck	99	4.5
E: Tractor Trailer Unit	255	11.6
<b>ASDT</b>	<b>2830</b>	<b>2200</b>

East On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	2390	85.7
B: Recreational Vehicle	16	0.6
C: Bus	17	0.6
D: Single Unit Truck	102	3.7
E: Tractor Trailer Unit	265	9.5
<b>ASDT</b>	<b>3590</b>	<b>2790</b>

South On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>ASDT</b>	<b>0</b>	<b>0</b>

**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

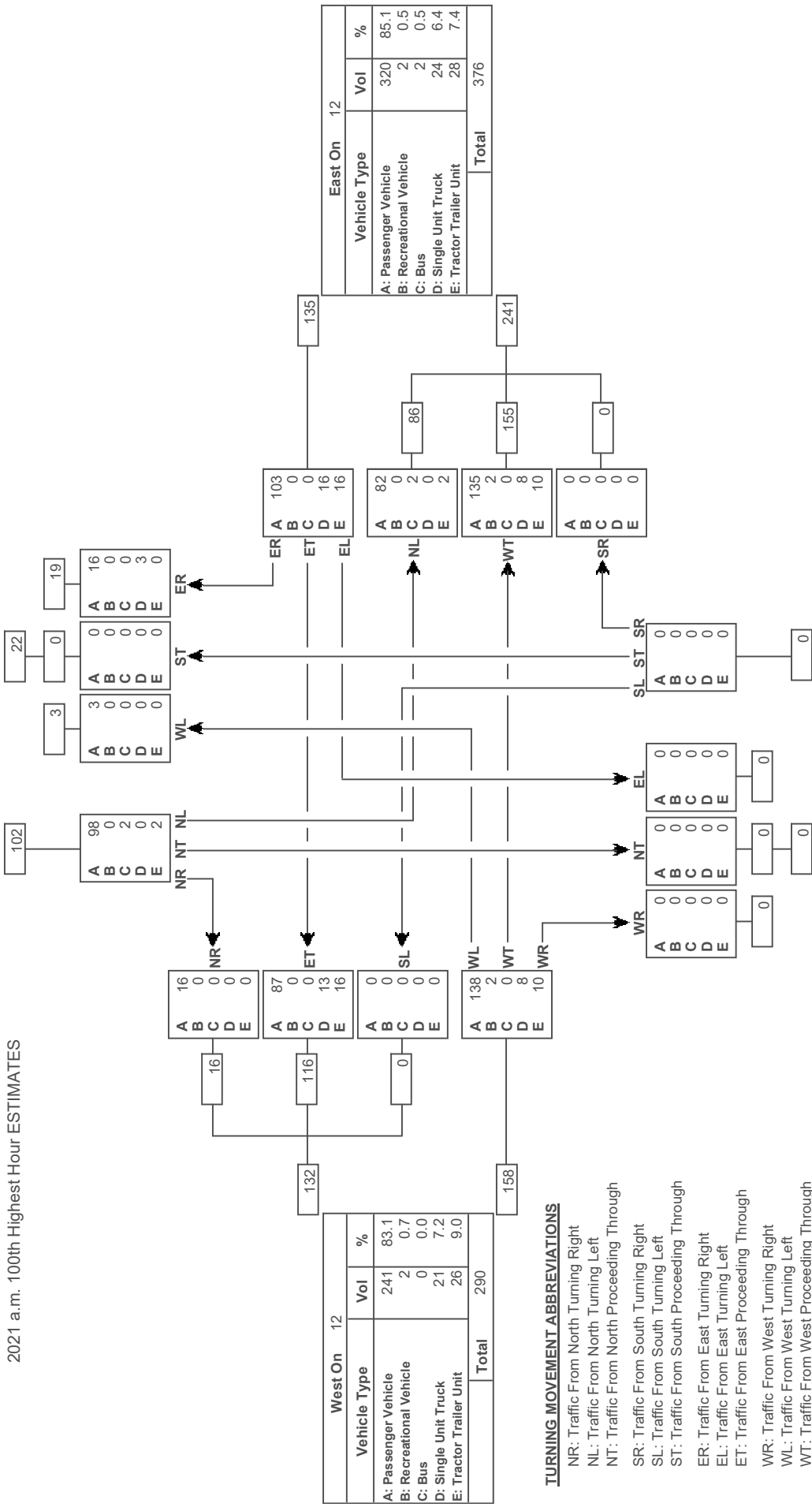
Reference No.: 70000749

Intersection of:

12 & 44 ST (BENTLEY E ACC)

2021 a.m. 100th Highest Hour ESTIMATES

North On 44 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	117	94.4
B: Recreational Vehicle	0	0.0
C: Bus	2	1.6
D: Single Unit Truck	3	2.4
E: Tractor Trailer Unit	2	1.6
<b>Total</b>	<b>124</b>	



West On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	241	83.1
B: Recreational Vehicle	2	0.7
C: Bus	0	0.0
D: Single Unit Truck	21	7.2
E: Tractor Trailer Unit	26	9.0
<b>Total</b>	<b>290</b>	

East On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	320	85.1
B: Recreational Vehicle	2	0.5
C: Bus	2	0.5
D: Single Unit Truck	24	6.4
E: Tractor Trailer Unit	28	7.4
<b>Total</b>	<b>376</b>	

South On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>0</b>	

**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

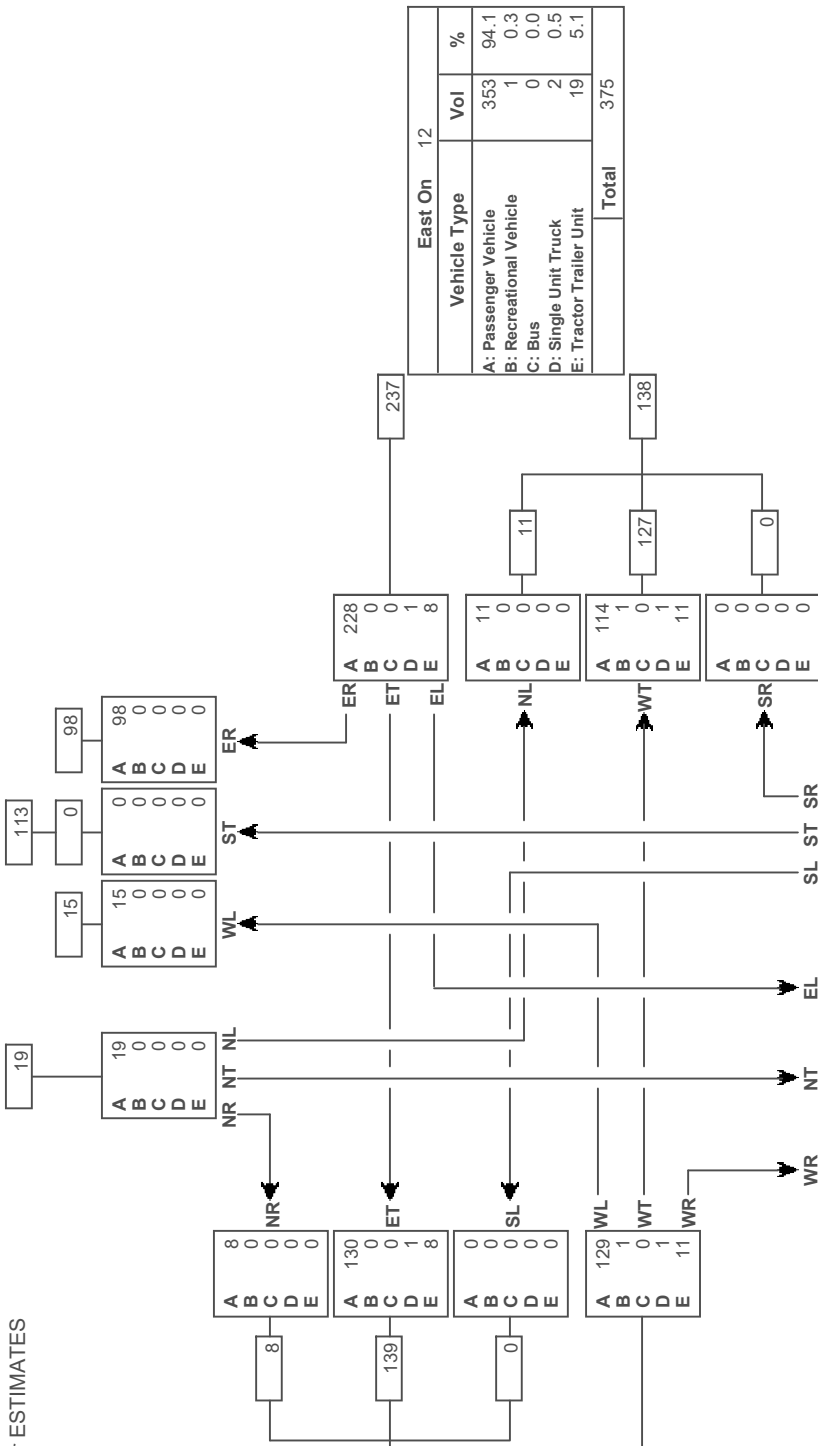
Turning Movement Summary Diagram

Reference No.: 70000749

Intersection of:  
12 & 44 ST (BENTLEY E ACC)

2021 p.m. 100th Highest Hour ESTIMATES

North On 44 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	132	100.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>132</b>	



West On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	267	92.4
B: Recreational Vehicle	1	0.3
C: Bus	0	0.0
D: Single Unit Truck	2	0.7
E: Tractor Trailer Unit	19	6.6
<b>Total</b>	<b>289</b>	

**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
- NT: Traffic From North Proceeding Through
- SR: Traffic From South Turning Right
- SL: Traffic From South Turning Left
- ST: Traffic From South Proceeding Through
- ER: Traffic From East Turning Right
- EL: Traffic From East Turning Left
- ET: Traffic From East Proceeding Through
- WR: Traffic From West Turning Right
- WL: Traffic From West Turning Left
- WT: Traffic From West Proceeding Through

South On		
Vehicle Type	Vol	%
A: Passenger Vehicle	0	0.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>0</b>	

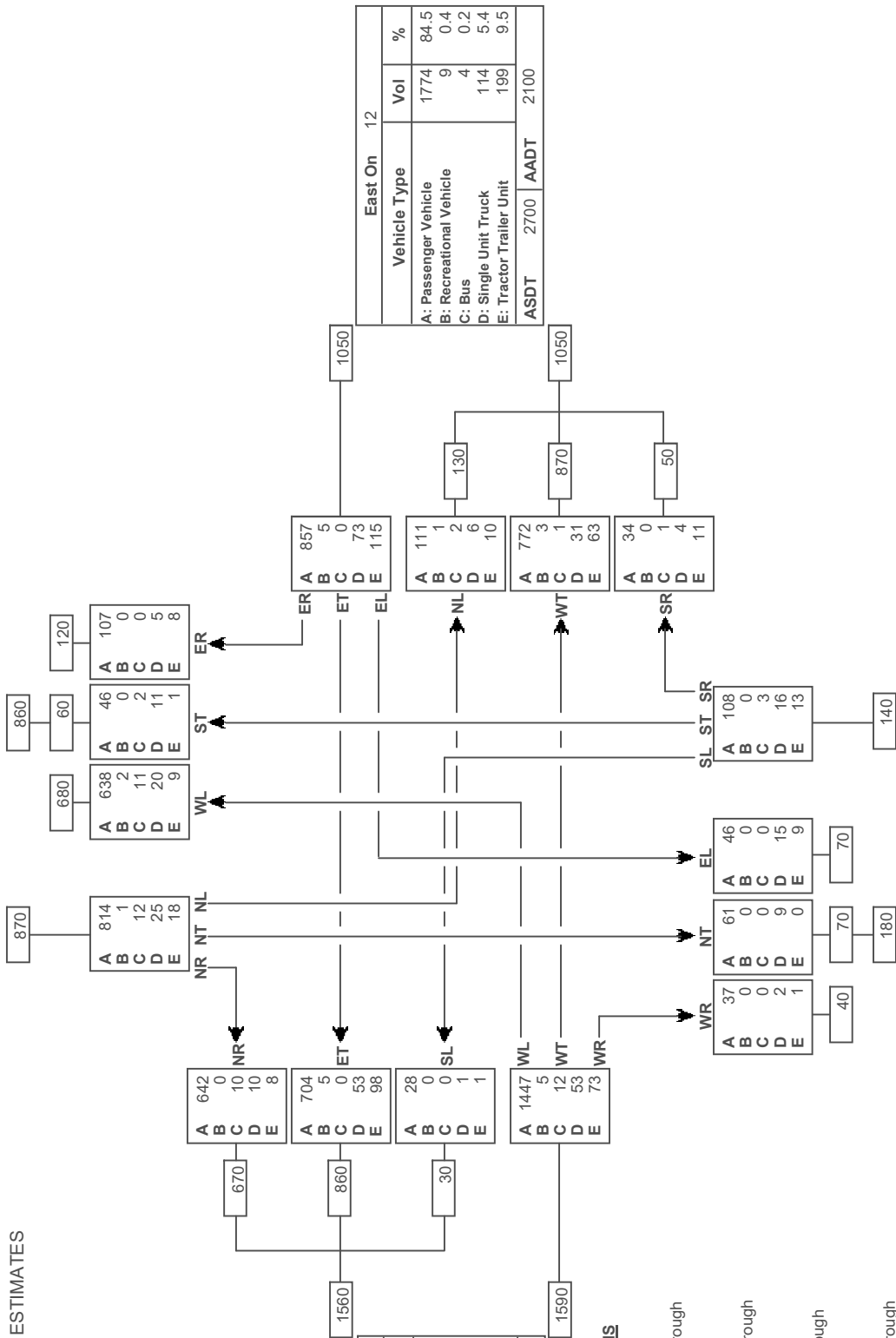
Turning Movement Summary Diagram

Reference No.: 70000748

Intersection of:  
12 & 52 ST (BENTLEY W ACC)

2021 AADT / ASDT ESTIMATES

North On 52 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	1605	92.8
B: Recreational Vehicle	3	0.2
C: Bus	25	1.4
D: Single Unit Truck	61	3.5
E: Tractor Trailer Unit	36	2.1
<b>ASDT</b>	<b>2220</b>	<b>1730</b>



West On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	2821	89.6
B: Recreational Vehicle	10	0.3
C: Bus	22	0.7
D: Single Unit Truck	117	3.7
E: Tractor Trailer Unit	180	5.7
<b>ASDT</b>	<b>4050</b>	<b>3150</b>

**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)

South On 52 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	252	78.8
B: Recreational Vehicle	0	0.0
C: Bus	3	0.9
D: Single Unit Truck	42	13.1
E: Tractor Trailer Unit	23	7.2
<b>ASDT</b>	<b>410</b>	<b>320</b>

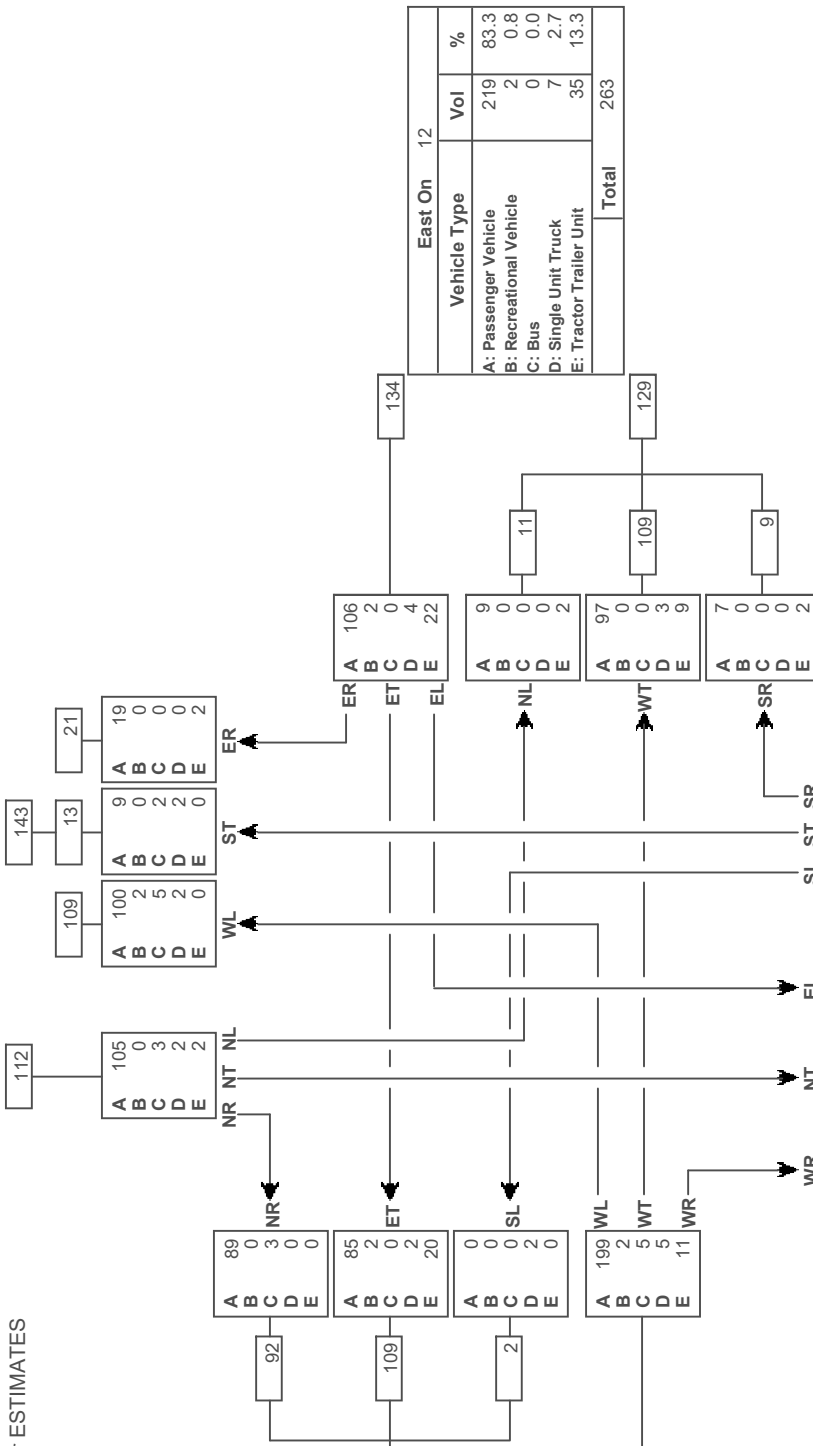
Turning Movement Summary Diagram

Reference No.: 70000748

Intersection of:  
12 & 52 ST (BENTLEY W ACC)

2021 a.m. 100th Highest Hour ESTIMATES

North On 52 St			
Vehicle Type	Vol	%	
A: Passenger Vehicle	233	91.4	
B: Recreational Vehicle	2	0.8	
C: Bus	10	3.9	
D: Single Unit Truck	6	2.4	
E: Tractor Trailer Unit	4	1.6	
<b>Total</b>	<b>255</b>		



West On 12			
Vehicle Type	Vol	%	
A: Passenger Vehicle	373	87.8	
B: Recreational Vehicle	4	0.9	
C: Bus	8	1.9	
D: Single Unit Truck	9	2.1	
E: Tractor Trailer Unit	31	7.3	
<b>Total</b>	<b>425</b>		

East On 12			
Vehicle Type	Vol	%	
A: Passenger Vehicle	219	83.3	
B: Recreational Vehicle	2	0.8	
C: Bus	0	0.0	
D: Single Unit Truck	7	2.7	
E: Tractor Trailer Unit	35	13.3	
<b>Total</b>	<b>263</b>		

South On 52 St			
Vehicle Type	Vol	%	
A: Passenger Vehicle	27	65.9	
B: Recreational Vehicle	0	0.0	
C: Bus	2	4.9	
D: Single Unit Truck	8	19.5	
E: Tractor Trailer Unit	4	9.8	
<b>Total</b>	<b>41</b>		

**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

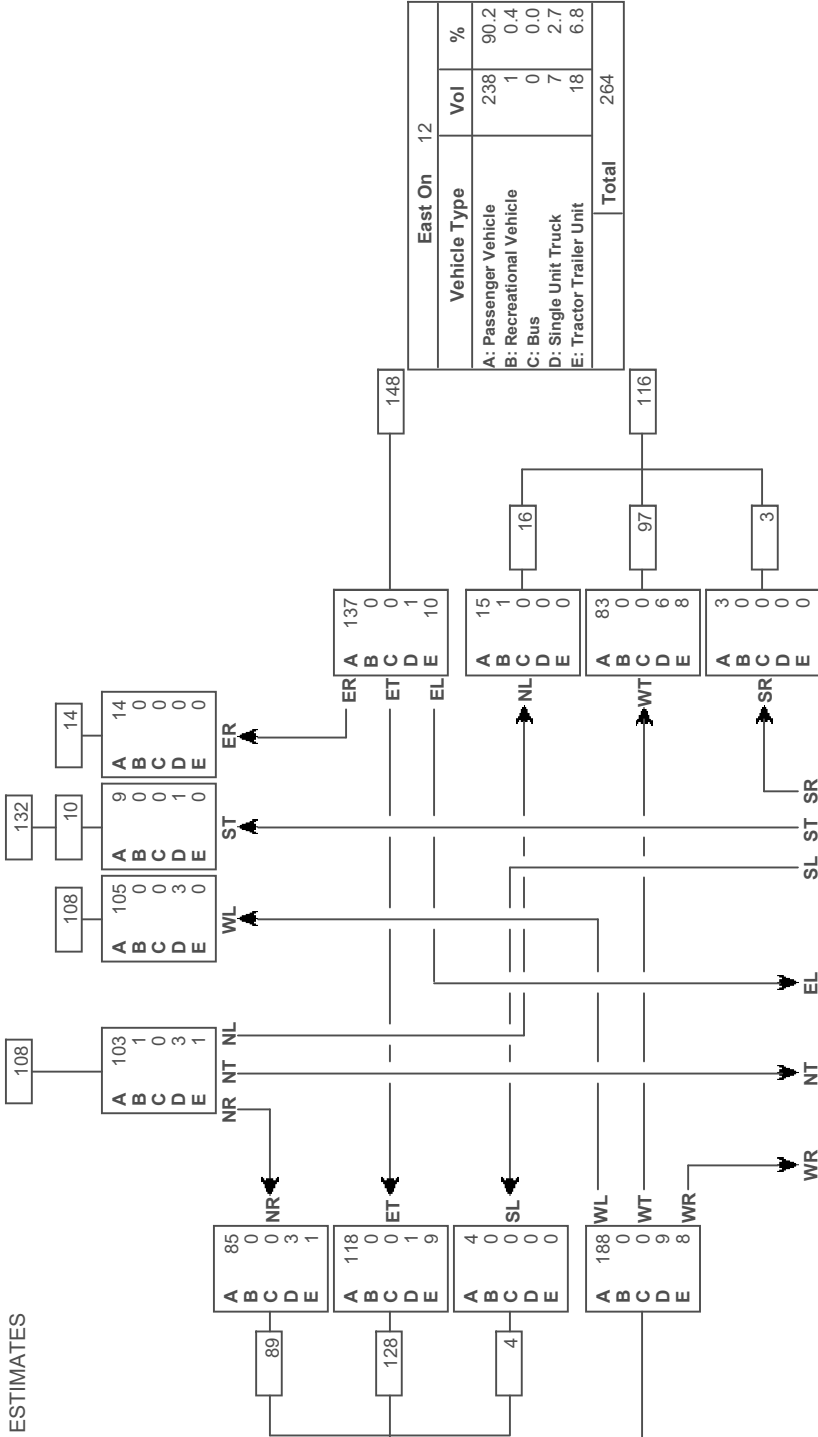
Turning Movement Summary Diagram

Reference No.: 70000748

Intersection of:  
12 & 52 ST (BENTLEY W ACC)

2021 p.m. 100th Highest Hour ESTIMATES

North On 52 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	231	96.3
B: Recreational Vehicle	1	0.4
C: Bus	0	0.0
D: Single Unit Truck	7	2.9
E: Tractor Trailer Unit	1	0.4
<b>Total</b>	<b>240</b>	



West On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	395	92.7
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	13	3.1
E: Tractor Trailer Unit	18	4.2
<b>Total</b>	<b>426</b>	

East On 12		
Vehicle Type	Vol	%
A: Passenger Vehicle	238	90.2
B: Recreational Vehicle	1	0.4
C: Bus	0	0.0
D: Single Unit Truck	7	2.7
E: Tractor Trailer Unit	18	6.8
<b>Total</b>	<b>264</b>	

South On 52 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	24	92.3
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	1	3.8
E: Tractor Trailer Unit	1	3.8
<b>Total</b>	<b>26</b>	

**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

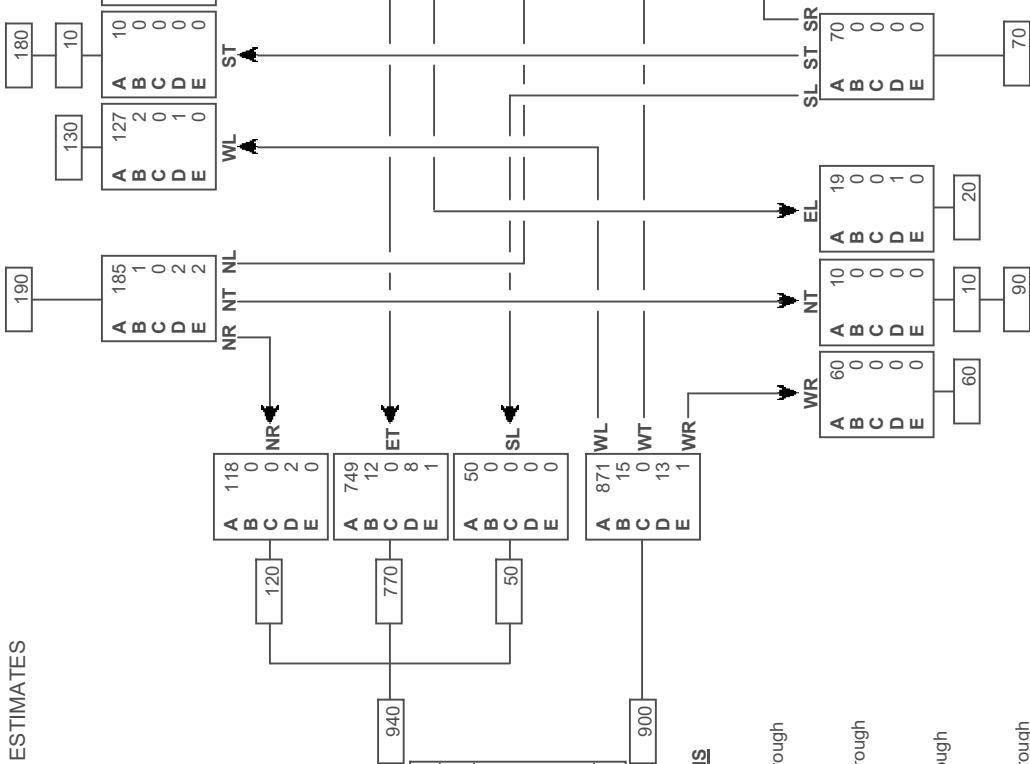
Reference No.: 70000165

Intersection of:

12A & 49 ST IN BENTLEY 23-40-1-514300000

2021 AADT / ASDT ESTIMATES

North On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	362	97.8
B: Recreational Vehicle	3	0.8
C: Bus	0	0.0
D: Single Unit Truck	3	0.8
E: Tractor Trailer Unit	2	0.5
<b>ASDT</b>	<b>480</b>	<b>AAADT 370</b>



West On 12A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1788	97.2
B: Recreational Vehicle	27	1.5
C: Bus	0	0.0
D: Single Unit Truck	23	1.3
E: Tractor Trailer Unit	2	0.1
<b>ASDT</b>	<b>2370</b>	<b>AAADT 1840</b>

East On 12A		
Vehicle Type	Vol	%
A: Passenger Vehicle	1559	96.8
B: Recreational Vehicle	26	1.6
C: Bus	0	0.0
D: Single Unit Truck	21	1.3
E: Tractor Trailer Unit	4	0.2
<b>ASDT</b>	<b>2070</b>	<b>AAADT 1610</b>

South On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	159	99.4
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	1	0.6
E: Tractor Trailer Unit	0	0.0
<b>ASDT</b>	<b>210</b>	<b>AAADT 160</b>

**TURNING MOVEMENT ABBREVIATIONS**

- NR: Traffic From North Turning Right
- NL: Traffic From North Turning Left
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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)



Turning Movement Summary Diagram

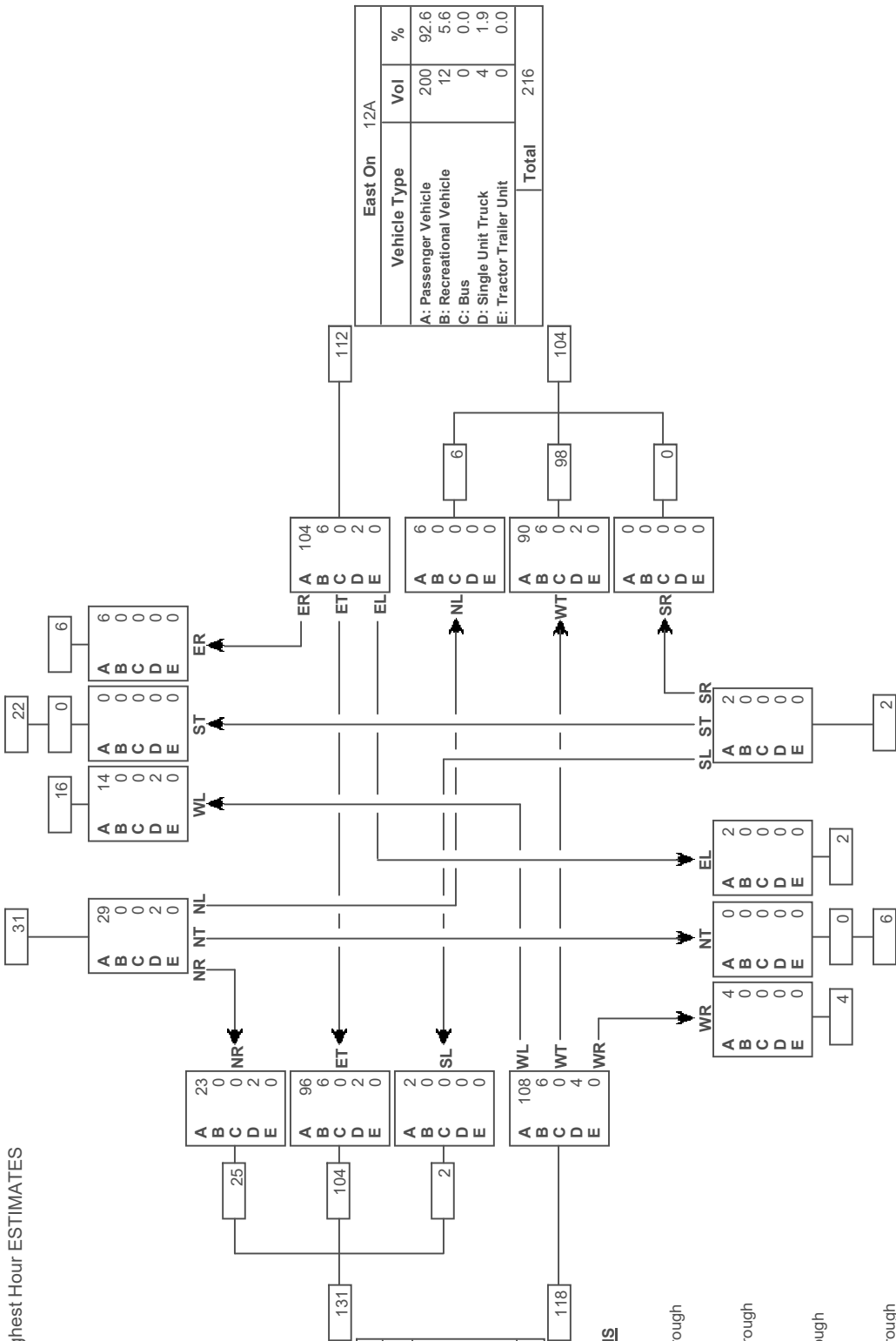
Reference No.: 70000165

Intersection of:

12A & 49 ST IN BENTLEY 23-40-1-514300000

2021 a.m. 100th Highest Hour ESTIMATES

North On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	49	92.5
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	4	7.5
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>53</b>	



South On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	8	100.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>8</b>	

Turning Movement Summary Diagram

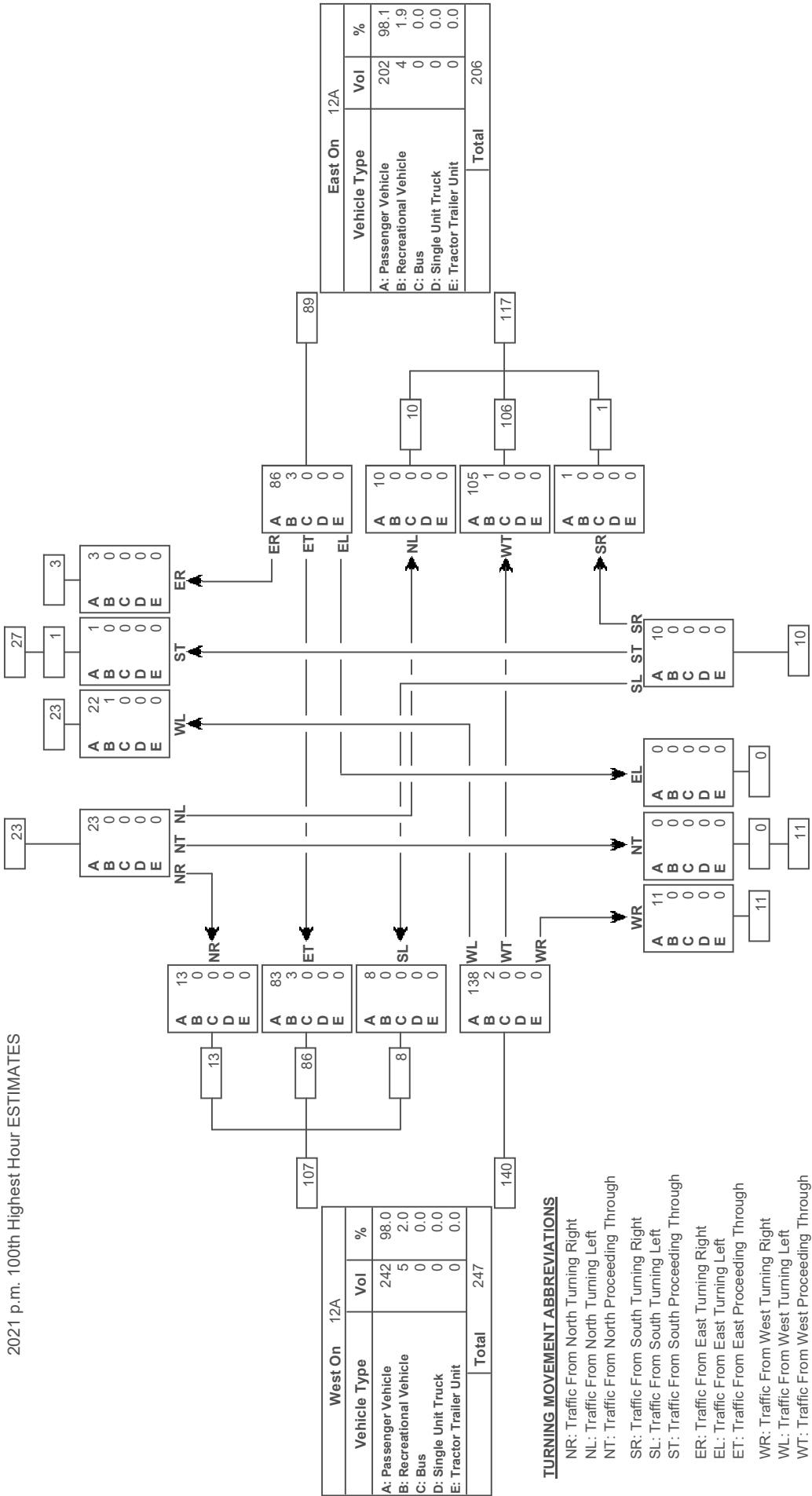
North On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	49	98.0
B: Recreational Vehicle	1	2.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>50</b>	

Reference No.: 70000165

Intersection of:

12A & 49 ST IN BENTLEY 23-40-1-514300000

2021 p.m. 100th Highest Hour ESTIMATES



West On 12A		
Vehicle Type	Vol	%
A: Passenger Vehicle	242	98.0
B: Recreational Vehicle	5	2.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>247</b>	

East On 12A		
Vehicle Type	Vol	%
A: Passenger Vehicle	202	98.1
B: Recreational Vehicle	4	1.9
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>206</b>	

South On 49 St		
Vehicle Type	Vol	%
A: Passenger Vehicle	21	100.0
B: Recreational Vehicle	0	0.0
C: Bus	0	0.0
D: Single Unit Truck	0	0.0
E: Tractor Trailer Unit	0	0.0
<b>Total</b>	<b>21</b>	

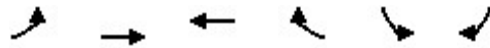
TURNING MOVEMENT ABBREVIATIONS

- 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 B – Existing Traffic Conditions – Synchro Outputs**

HCM Unsignalized Intersection Capacity Analysis  
 101: Highway 12 & 44 Street

















2021 Existing Conditions  
 Timing Plan: AM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	126	118	19	86	16
Future Volume (Veh/h)	3	126	118	19	86	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	137	128	21	93	17
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	149				271	128
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	149				271	128
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				87	98
cM capacity (veh/h)	1432				717	922
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	
Volume Total	3	137	128	21	110	
Volume Left	3	0	0	0	93	
Volume Right	0	0	0	21	17	
cSH	1432	1700	1700	1700	742	
Volume to Capacity	0.00	0.08	0.08	0.01	0.15	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	3.9	
Control Delay (s)	7.5	0.0	0.0	0.0	10.7	
Lane LOS	A				B	
Approach Delay (s)	0.2		0.0		10.7	
Approach LOS					B	
Intersection Summary						
Average Delay			3.0			
Intersection Capacity Utilization			19.0%		ICU Level of Service	A
Analysis Period (min)			15			





















HCM Unsignalized Intersection Capacity Analysis  
 102: Highway 12 & Range Road 1-1

2021 Existing Conditions  
 Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	156	5	5	82	118	5	5	5	116	5	50
Future Volume (Veh/h)	51	156	5	5	82	118	5	5	5	116	5	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	170	5	5	89	128	5	5	5	126	5	54
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	217			175			502	510	172	453	448	153
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	217			175			502	510	172	453	448	153
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	96			100			99	99	99	74	99	94
cM capacity (veh/h)	1353			1401			432	446	871	493	484	893
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	230	222	15	185								
Volume Left	55	5	5	126								
Volume Right	5	128	5	54								
cSH	1353	1401	526	566								
Volume to Capacity	0.04	0.00	0.03	0.33								
Queue Length 95th (m)	1.0	0.1	0.7	10.7								
Control Delay (s)	2.1	0.2	12.0	14.4								
Lane LOS	A	A	B	B								
Approach Delay (s)	2.1	0.2	12.0	14.4								
Approach LOS			B	B								
Intersection Summary												
Average Delay			5.2									
Intersection Capacity Utilization			49.6%		ICU Level of Service				A			
Analysis Period (min)			15									

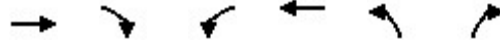
HCM Unsignalized Intersection Capacity Analysis  
 103: Highway 12 & 52 Street

2021 Existing Conditions  
 Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	109	4	4	109	21	2	13	9	11	9	92
Future Volume (Veh/h)	109	109	4	4	109	21	2	13	9	11	9	92
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	118	4	4	118	23	2	14	10	12	10	100
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	141			122			587	505	120	497	484	118
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	141			122			587	505	120	497	484	118
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	92			100			99	97	99	97	98	89
cM capacity (veh/h)	1442			1465			346	430	931	436	442	934
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	118	122	4	118	23	26	122					
Volume Left	118	0	4	0	0	2	12					
Volume Right	0	4	0	0	23	10	100					
cSH	1442	1700	1465	1700	1700	530	776					
Volume to Capacity	0.08	0.07	0.00	0.07	0.01	0.05	0.16					
Queue Length 95th (m)	2.0	0.0	0.1	0.0	0.0	1.2	4.2					
Control Delay (s)	7.7	0.0	7.5	0.0	0.0	12.1	10.5					
Lane LOS	A		A			B	B					
Approach Delay (s)	3.8		0.2			12.1	10.5					
Approach LOS						B	B					
Intersection Summary												
Average Delay			4.8									
Intersection Capacity Utilization			28.6%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

















2021 Existing Conditions  
 Timing Plan: AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→	↘	↙	←	↘	↙
Traffic Volume (veh/h)	40	82	20	20	18	4
Future Volume (Veh/h)	40	82	20	20	18	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	89	22	22	20	4
<b>Pedestrians</b>						
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			132		154	88
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			132		154	88
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	100
cM capacity (veh/h)			1453		825	971
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	132	44	24			
Volume Left	0	22	20			
Volume Right	89	0	4			
cSH	1700	1453	847			
Volume to Capacity	0.08	0.02	0.03			
Queue Length 95th (m)	0.0	0.4	0.7			
Control Delay (s)	0.0	3.8	9.4			
Lane LOS		A	A			
Approach Delay (s)	0.0	3.8	9.4			
Approach LOS			A			
<b>Intersection Summary</b>						
Average Delay			2.0			
Intersection Capacity Utilization			23.8%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 105: Range Road 1-1 & Highway 12A

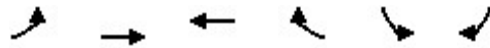
2021 Existing Conditions  
 Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	34	5	5	23	30	5	164	5	29	161	12
Future Volume (Veh/h)	5	34	5	5	23	30	5	164	5	29	161	12
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	37	5	5	25	33	5	178	5	32	175	13
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	58			42			202	118	40	195	104	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	58			42			202	118	40	195	104	42
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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			99	77	100	95	78	99
cM capacity (veh/h)	1546			1567			615	768	1032	622	782	1029
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	47	63	188	220								
Volume Left	5	5	5	32								
Volume Right	5	33	5	13								
cSH	1546	1567	768	764								
Volume to Capacity	0.00	0.00	0.24	0.29								
Queue Length 95th (m)	0.1	0.1	7.3	9.1								
Control Delay (s)	0.8	0.6	11.2	11.6								
Lane LOS	A	A	B	B								
Approach Delay (s)	0.8	0.6	11.2	11.6								
Approach LOS			B	B								
Intersection Summary												
Average Delay			9.1									
Intersection Capacity Utilization			34.1%		ICU Level of Service				A			
Analysis Period (min)			15									



HCM Unsignalized Intersection Capacity Analysis  
 101: Highway 12 & 44 Street

















2021 Existing Conditions  
 Timing Plan: PM Peak



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	101	140	98	11	8
Future Volume (Veh/h)	15	101	140	98	11	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	110	152	107	12	9
<b>Pedestrians</b>						
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	259			294	152	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	259			294	152	
tC, single (s)	4.1			6.4	6.2	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	99			98	99	
cM capacity (veh/h)	1306			688	894	
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>WB 2</b>	<b>SB 1</b>	
Volume Total	16	110	152	107	21	
Volume Left	16	0	0	0	12	
Volume Right	0	0	0	107	9	
cSH	1306	1700	1700	1700	764	
Volume to Capacity	0.01	0.06	0.09	0.06	0.03	
Queue Length 95th (m)	0.3	0.0	0.0	0.0	0.6	
Control Delay (s)	7.8	0.0	0.0	0.0	9.8	
Lane LOS	A				A	
Approach Delay (s)	1.0	0.0			9.8	
Approach LOS					A	
<b>Intersection Summary</b>						
Average Delay			0.8			
Intersection Capacity Utilization			22.5%	ICU Level of Service	A	
Analysis Period (min)			15			





















HCM Unsignalized Intersection Capacity Analysis  
 102: Highway 12 & Range Road 1-1

2021 Existing Conditions  
 Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	58	5	5	174	115	5	5	5	139	5	59
Future Volume (Veh/h)	49	58	5	5	174	115	5	5	5	139	5	59
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	53	63	5	5	189	125	5	5	5	151	5	64
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	314			68			500	496	66	440	436	252
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	314			68			500	496	66	440	436	252
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	96			100			99	99	99	70	99	92
cM capacity (veh/h)	1246			1533			424	454	998	502	491	787
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	121	319	15	220								
Volume Left	53	5	5	151								
Volume Right	5	125	5	64								
cSH	1246	1533	539	561								
Volume to Capacity	0.04	0.00	0.03	0.39								
Queue Length 95th (m)	1.0	0.1	0.7	14.1								
Control Delay (s)	3.7	0.1	11.9	15.5								
Lane LOS	A	A	B	C								
Approach Delay (s)	3.7	0.1	11.9	15.5								
Approach LOS			B	C								
Intersection Summary												
Average Delay			6.1									
Intersection Capacity Utilization			50.8%		ICU Level of Service				A			
Analysis Period (min)			15									

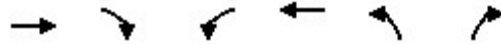
HCM Unsignalized Intersection Capacity Analysis  
103: Highway 12 & 52 Street

2021 Existing Conditions  
Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	108	97	0	6	128	14	4	10	3	16	3	89
Future Volume (Veh/h)	108	97	0	6	128	14	4	10	3	16	3	89
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	117	105	0	7	139	15	4	11	3	17	3	97
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	154			105			590	507	105	500	492	139
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	154			105			590	507	105	500	492	139
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	92			100			99	97	100	96	99	89
cM capacity (veh/h)	1426			1486			348	428	949	439	436	909
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	117	105	7	139	15	18	117					
Volume Left	117	0	7	0	0	4	17					
Volume Right	0	0	0	0	15	3	97					
cSH	1426	1700	1486	1700	1700	446	768					
Volume to Capacity	0.08	0.06	0.00	0.08	0.01	0.04	0.15					
Queue Length 95th (m)	2.0	0.0	0.1	0.0	0.0	1.0	4.1					
Control Delay (s)	7.7	0.0	7.4	0.0	0.0	13.4	10.5					
Lane LOS	A		A			B	B					
Approach Delay (s)	4.1		0.3			13.4	10.5					
Approach LOS						B	B					
Intersection Summary												
Average Delay			4.7									
Intersection Capacity Utilization			30.5%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

















2021 Existing Conditions  
 Timing Plan: PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	→			←	↘	↙
Traffic Volume (veh/h)	20	15	4	40	90	23
Future Volume (Veh/h)	20	15	4	40	90	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	16	4	43	98	25
<b>Pedestrians</b>						
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			38		81	30
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			38		81	30
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	98
cM capacity (veh/h)			1572		919	1044
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>WB 1</b>	<b>NB 1</b>			
Volume Total	38	47	123			
Volume Left	0	4	98			
Volume Right	16	0	25			
cSH	1700	1572	942			
Volume to Capacity	0.02	0.00	0.13			
Queue Length 95th (m)	0.0	0.1	3.4			
Control Delay (s)	0.0	0.6	9.4			
Lane LOS		A	A			
Approach Delay (s)	0.0	0.6	9.4			
Approach LOS			A			
<b>Intersection Summary</b>						
Average Delay			5.7			
Intersection Capacity Utilization			18.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis  
 105: Range Road 1-1 & Highway 12A

2021 Existing Conditions  
 Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	26	5	5	24	29	5	159	5	35	193	15
Future Volume (Veh/h)	12	26	5	5	24	29	5	159	5	35	193	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	28	5	5	26	32	5	173	5	38	210	16
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	58			33			230	124	30	200	111	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	58			33			230	124	30	200	111	42
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	99			100			99	77	100	94	73	98
cM capacity (veh/h)	1546			1579			559	757	1044	617	770	1029
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	46	63	183	264								
Volume Left	13	5	5	38								
Volume Right	5	32	5	16								
cSH	1546	1579	755	755								
Volume to Capacity	0.01	0.00	0.24	0.35								
Queue Length 95th (m)	0.2	0.1	7.2	12.0								
Control Delay (s)	2.1	0.6	11.3	12.3								
Lane LOS	A	A	B	B								
Approach Delay (s)	2.1	0.6	11.3	12.3								
Approach LOS			B	B								
Intersection Summary												
Average Delay			9.8									
Intersection Capacity Utilization			37.2%		ICU Level of Service				A			
Analysis Period (min)			15									

## **Appendix C – Trip Generation – Blended Commercial Rates**

**Table 1: Mixed Use Highway Commercial Areas - Trip Generation Rate Development**

**AM PEAK HOUR**

Land Use	Site Area (acres)	site percent	Site Coverage	Building Area (ft <sup>2</sup> )	Other Variable (Rooms/Fueling Positions)	Trip Rate (trips / 1000 ft <sup>2</sup> )	Trip Rate (trips / variable)	Directional Allocation (%)		Total Trips (vph)	Total Trips (vph)	
								Entering	Exiting		Entering	Exiting
Motel (320)	5.00	10%		-	100	-	0.35	37%	63%	35	13	22
Shopping Center (820)	25.00	52%	15%	163,350	-	0.84	-	62%	38%	137	85	52
Automobile Sales (840)	5.00	10%	15%	32,670	-	1.86	-	73%	27%	61	44	16
Automobile Parts Sales (843)	1.50	3%	15%	9,801	-	2.51	-	55%	45%	25	14	11
Tire Superstore(849)	2.50	5%	15%	16,335	-	1.34	-	65%	35%	22	14	8
Restaurant - High Turnover (932)	2.50	5%	15%	16,335	-	9.57	-	55%	45%	156	86	70
Fast Food Restaurant with Drive-Through (934)	1.50	3%	15%	9,801	-	44.61	-	51%	49%	437	223	214
Automobile Care Center (942)	2.50	5%	15%	16,335	-	2.25	-	66%	34%	37	24	12
Gas Station with Convenience Market (945)	3.00	6%		-	12	-	16.06	50%	50%	193	96	96
<b>GRAND TOTAL</b>	<b>48.50</b>			<b>264,627</b>						<b>1,102</b>	<b>600</b>	<b>503</b>
<b>OVERALL/AVERAGE RATES</b>		<b>48.50</b>					<b>TRIPS/ACRE: 22.72</b>	<b>54%</b>	<b>46%</b>	1102	600	503

**PM PEAK HOUR**

Land Use	Site Area (acres)	site percent	Site Coverage	Building Area (ft <sup>2</sup> )	Other Variable (Rooms/F)	Trip Rate (trips / 1000 ft <sup>2</sup> )	Trip Rate (trips / variable)	Directional Allocation (%)		Total Trips (vph)	Total Trips (vph)	
								Entering	Exiting		Entering	Exiting
Motel (320)	5.00	10%		-	100		0.36	54%	46%	36	19	17
Shopping Center (820)	25.00	52%	15%	163,350	-	3.40		48%	52%	555	267	289
Automobile Sales (840)	5.00	10%	15%	32,670	-	2.42		40%	60%	79	32	47
Automobile Parts Sales (843)	1.50	3%	15%	9,801	-	4.90		48%	52%	48	23	25
Tire Superstore(849)	2.50	5%	15%	16,335	-	2.11		47%	53%	34	16	18
Restaurant - High Turnover (932)	2.50	5%	15%	16,335	-	9.05		61%	39%	148	90	58
Fast Food Restaurant with Drive-Through (934)	1.50	3%	15%	9,801	-	33.03		52%	48%	324	168	155
Automobile Care Center (942)	2.50	5%	15%	16,335	-	3.11		48%	52%	51	24	26
Gas Station with Convenience Market (945)	3.00	6%		-	12		18.42	50%	50%	221	111	111
<b>GRAND TOTAL</b>	<b>48.50</b>			<b>264,627</b>						<b>1,496</b>	<b>750</b>	<b>746</b>
<b>OVERALL/AVERAGE RATES</b>		<b>48.50</b>					<b>TRIPS/ACRE: 30.85</b>	<b>50%</b>	<b>50%</b>	1496	750	746

## **Appendix D – Sandy Point Subdivision Traffic Data**





various timeframes (every 5 years). This will ensure that a reasonable average annual growth rate is used for analysis purposes. A growth rate of 3.5% was used.

**Table 7 - Projected Traffic Volumes for Highway 12 & Range Road 1-1**

<b>Year</b>	<b>Projected AADT</b>	<b>Projected Peak Hour</b>
Base Year (2008)	2,018	236
2013 (5 year)	2,371	278
2018 (10 year)	2,724	319
2023 (15 year)	3,077	360
2028 (20 year)	3,430	401
2033 (25 year)	3,783	443

**Table 8 - Projected Traffic Volumes for Range Road 1-1 & Township Road 41-0 (South Site Access)**

<b>Year</b>	<b>Projected AADT</b>	<b>Projected Peak Hour</b>
Base Year (2008)	120	14
2013 (5 year)	141	17
2018 (10 year)	162	19
2023 (15 year)	183	21
2028 (20 year)	204	24
2033 (25 year)	225	26

**Table 9 - Projected Traffic Volumes for Range Road 1-1 & Township Road 41-1 (North Site Access)**

<b>Year</b>	<b>Projected AADT</b>	<b>Projected Peak Hour</b>
Base Year (2008)	50	6
2013 (5 year)	59	7
2018 (10 year)	68	8
2023 (15 year)	77	9
2028 (20 year)	86	10
2033 (25 year)	95	11

## **Projected Development Traffic**

The Developer has indicated that the development will consist of a bare land condominium development, a beach park, marina, 18 hole golf course, fitness centre (spa), specialty stores, fast food restaurant and gasoline service station with convenience market. The development will consist of approximately 3,175 lots. Traffic generation estimates contained herein are therefore based upon the Institute of Transportation Engineers (ITE) Manual, 7<sup>th</sup> Edition. The manual identifies a number of residential options. For the



purpose of this review, we have used the following ITE average trip-end generation:

- *Recreational Homes (Code 260)*
- *Beach Park (Code 415)*
- *Marina (Code 420)*
- *Golf Course (Code 430)*
- *Health & Fitness Club (Code 492)*
- *Specialty Retail Center (Code 814)*
- *Gasoline Service Station (Code 944)*

All relevant charts have been attached to **Appendix C**.

ITE estimates are based upon observed measurement. ITE data provides a range of trip generation rates for the specific types of development, along with suggested averages. Estimates are categorized by typical weekday and AM/PM Peak Hour of the roadway, and can be applied on a “per dwelling”, “per hole”, “per acre”, “per vehicle fuelling station” or “per 1000 square feet” rate.

ITE estimates are based upon observed measurement. ITE data provides a range of trip generation rates for the specific types of development, along with suggested averages. Estimates are categorized by AM/PM Peak Hour of the roadway.

Peak hourly traffic generation rates for the above uses are as follows:

- Peak hourly traffic generation for Recreational Homes (Code 260), is suggested as 0.30 vehicle trip ends per dwelling unit for the AM peak and 0.31 vehicle trip ends per dwelling unit for the PM peak.
- Peak hourly traffic generation for Beach Park (Code 415), is suggested as 0.48 vehicle trip ends per acre for the AM peak and 0.60 vehicle trip ends per acre for the PM peak.



- Peak hourly traffic generation for Marina (Code 420), is suggested as 0.17 vehicle trip ends per berth for the AM peak and 0.21 vehicle trip ends per berth for the PM peak.
- Peak hourly traffic generation for Golf Course (Code 430), is suggested as 3.01 vehicle trip ends per hole for the AM peak and 3.56 vehicle trip ends per hole for the PM peak.
- Peak hourly traffic generation for Health/Fitness Club (Code 492), is suggested as 1.41 vehicle trip ends per 1000 square feet gross floor area for the AM peak and 4.06 vehicle trip ends per 1000 square feet gross floor area for the PM peak.
- Peak hourly traffic generation for Specialty Retail Center (Code 814), is suggested as 6.84 vehicle trip ends per 1000 square feet gross floor area for the AM peak and 5.02 vehicle trip ends per 1000 square feet gross floor area for the PM peak.
- Peak hourly traffic generation for Gasoline/Service Station (Code 944), is suggested as 12.58 vehicle trip ends per vehicle fuelling station for the AM peak and 15.65 vehicle trip ends per vehicle fuelling station for the PM peak.

Below are tables listing the estimated peak hour volumes that will be generated due to the development traffic.

**Table 10 - Estimated Peak Hour Volumes – Recreational Homes (Code 260)**

<b>Time Period</b>	<b>Units</b>	<b>Trip Rate</b>	<b>% In</b>	<b>% Out</b>	<b>In</b>	<b>Out</b>	<b>Total</b>
AM Peak Hour	3175	0.30	49	51	467	486	953
PM Peak Hour	3175	0.31	44	56	433	551	984



**Table 11 - Estimated Peak Hour Volumes – Beach Park (Code 415)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	21	0.48	59	41	6	4	10
PM Peak Hour	21	0.60	34	66	4	9	13

**Table 12 - Estimated Peak Hour Volumes – Marina (Code 420)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	732	0.17	64	36	80	45	125
PM Peak Hour	732	0.21	51	49	79	75	154

**Table 13 - Estimated Peak Hour Volumes – Golf Course (Code 430)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	18	3.01	47	53	25	29	54
PM Peak Hour	18	3.56	43	57	28	36	64

**Table 14 - Estimated Peak Hour Volumes – Health/Fitness Club (Code 492)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	3	1.41	42	58	2	2	4
PM Peak Hour	3	4.06	51	49	6	6	12

**Table 15 - Estimated Peak Hour Volumes – Specialty Retail Center (Code 814)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	1	6.84	48	52	3	4	7
PM Peak Hour	1	5.02	56	44	3	2	5



**Table 16 - Estimated Peak Hour Volumes – Gasoline/Service Station (Code 944)**

Time Period	Units	Trip Rate	% In	% Out	In	Out	Total
AM Peak Hour	8	12.58	50	50	50	50	100
PM Peak Hour	8	15.65	50	50	62	63	125

Converting all the Peak Hour Volumes to Average Annual Daily Traffic volumes, the anticipated daily traffic is as shown below.

**Table 17 - Estimated Average Annual Daily Traffic Volumes**

Type of Development	Peak Hour (In)	Peak Hour (Out)	AADT
Recreational Homes (Code 260)	467	551	8,701
Beach Park (Code 415)	6	9	128
Marina (Code 420)	80	75	1,325
Golf Course (Code 430)	29	36	556
Health and Fitness Club (Code 492)	6	6	103
Specialty Retail Center (Code 814)	3	4	60
Gasoline/Service Station (Code 944)	62	63	1,069
<b>TOTAL</b>	<b>653</b>	<b>744</b>	<b>11,942</b>



## Development Traffic Intersection Allotting

In order to establish design traffic flows at the intersections, the following traffic flow assumptions have been made.

- The north site access (Range Road 1-1 & Township Road 41-1) will be an exit/emergency access only. This access will not allow any traffic to enter the subdivision. The south site access (Range Road 1-1 & Township Road 41-0) will be a full entry/exit access. From this, all site generated traffic will enter the subdivision from the south site access (Range Road 1-1 & Township Road 41-0). All the site generated traffic will leave the site with a 50/50 split between the two site access locations.
- All traffic will access the subdivision from Highway 12 via Range Road 1-1. All development traffic will utilize Range Road 1-1, and 70% of the traffic will go east towards Highway 2. The remaining 30% of the traffic will go west towards Bentley, Alberta and Highway 20.

## Background & Development Traffic

The background traffic and development traffic have been combined for the determined projection years. The projected traffic numbers are for the peak hour volumes on each leg of the intersections. It is listed as follows:

**Table 18 - Projected Traffic Volume Rates for Highway 12 & Range Road 1-1**

Year	Background AADT	Development Traffic	Combined Traffic
Base Year (2008)	2,018	11,940	13,958
2013 (5 year)	2,371	11,940	14,311
2018 (10 year)	2,724	11,940	14,664
2022 (15 year)	3,077	11,940	15,017
2028 (20 year)	3,430	11,940	15,370
2033 (25 year)	3,783	11,940	15,723

## **Appendix E – Signal Warrant Analysis Results**



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	44 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2021 Existing Volumes
for Warrant Calculation Results, please hit 'Page Down'		CHECK SHEET	

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
Date Entry Format:	(yyyy-mm-dd)

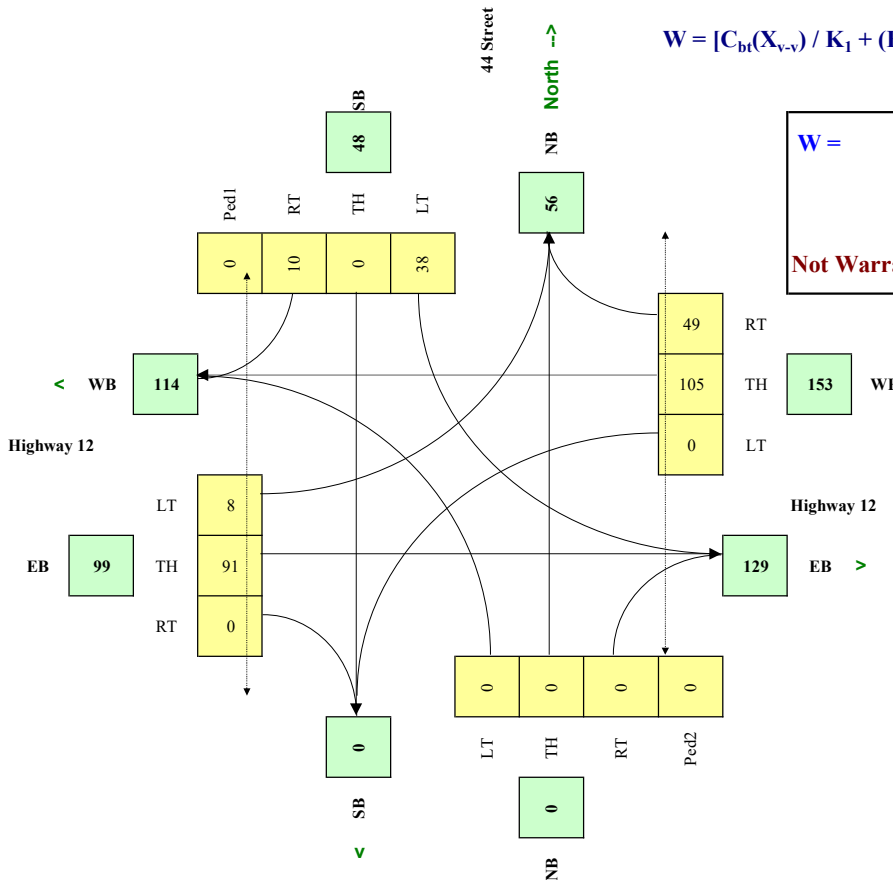
Lane Configuration		Excl LT	Th & LT	Through	Th+RT=LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Highway 12	WB			1			1		1
Highway 12	EB	1		1					1
44 Street	NB								
44 Street	SB				1				
Are the 44 Street SB right turns significantly impeded by through movements? (y/n)									
n									

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
44 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	0	0	0	62	0	12	0	85	14	2	91	0	0	0	0	0
	0	0	0	86	0	16	0	118	19	3	126	0	0	0	0	0
	0	0	0	52	0	10	0	71	11	2	76	0	0	0	0	0
	0	0	0	7	0	5	0	84	59	9	61	0	0	0	0	0
	0	0	0	11	0	8	0	140	98	15	101	0	0	0	0	0
	0	0	0	10	0	7	0	129	90	14	93	0	0	0	0	0
<b>Total (6-hour peak)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>228</b>	<b>0</b>	<b>58</b>	<b>0</b>	<b>627</b>	<b>291</b>	<b>45</b>	<b>548</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>38</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>105</b>	<b>49</b>	<b>8</b>	<b>91</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 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





# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	44 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2037 15-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
Date Entry Format:	(yyyy-mm-dd)

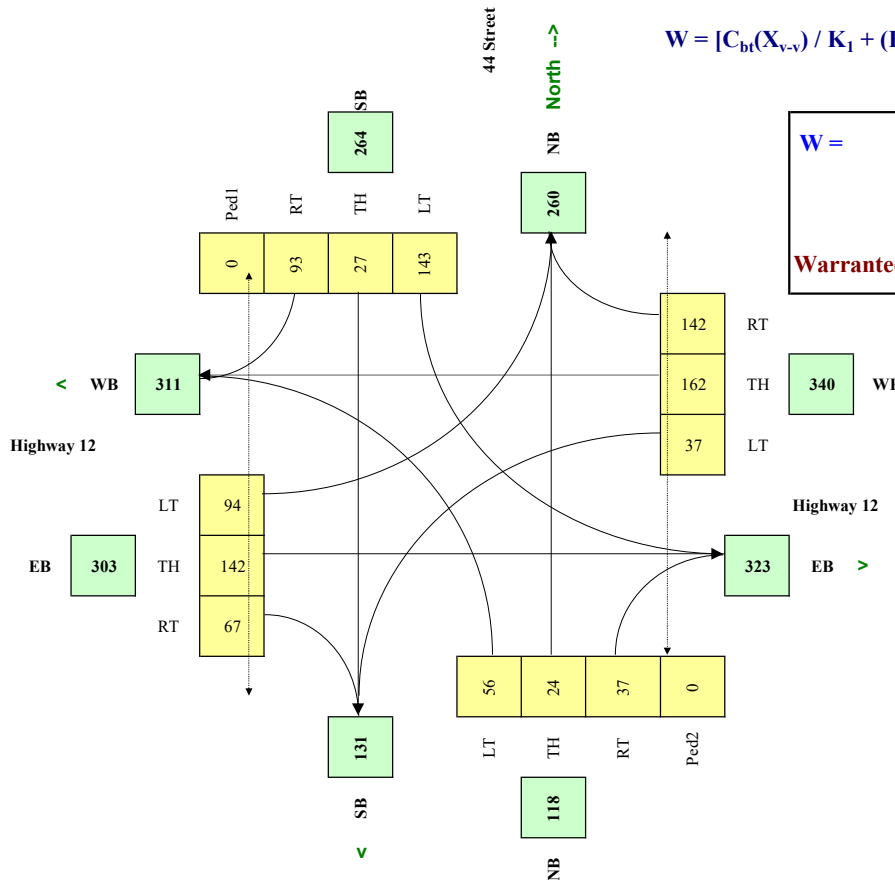
Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th & RT	Excl RT	UpStream Signal (m)	# of Thru Lanes
Highway 12	WB	1		1			1		1
Highway 12	EB	1		1			1		1
44 Street	NB	1		1			1		
44 Street	SB	1		1			1		

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
44 Street	NS	50	2.0%	n	

Traffic Input													Ped1	Ped2	Ped3	Ped4
	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
press 'Set Peak Hours' Button to set the peak hour periods	18	9	15	131	36	71	45	122	98	81	158	92	0	0	0	0
	25	13	21	182	50	98	63	170	136	113	219	128	0	0	0	0
	15	8	13	109	30	59	38	102	82	68	131	77	0	0	0	0
	67	28	41	104	11	79	18	137	127	72	82	25	0	0	0	0
	111	46	69	174	19	132	30	228	212	120	137	41	0	0	0	0
	102	42	63	160	17	121	28	210	195	110	126	38	0	0	0	0
<b>Total (6-hour peak)</b>	<b>338</b>	<b>146</b>	<b>222</b>	<b>860</b>	<b>163</b>	<b>560</b>	<b>222</b>	<b>969</b>	<b>850</b>	<b>564</b>	<b>853</b>	<b>401</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>56</b>	<b>24</b>	<b>37</b>	<b>143</b>	<b>27</b>	<b>93</b>	<b>37</b>	<b>162</b>	<b>142</b>	<b>94</b>	<b>142</b>	<b>67</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Average 6-hour Peak Turning Movements



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

<b>W =</b>	<b>124</b>	<b>124</b>	<b>0</b>
		<i>Veh</i>	<i>Ped</i>

**Warranted**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	Range Road 1-1	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2021 Existing Volumes
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12	WB				1				1
Highway 12	EB				1				1
Range Road 1-1	NB				1				
Range Road 1-1	SB				1				

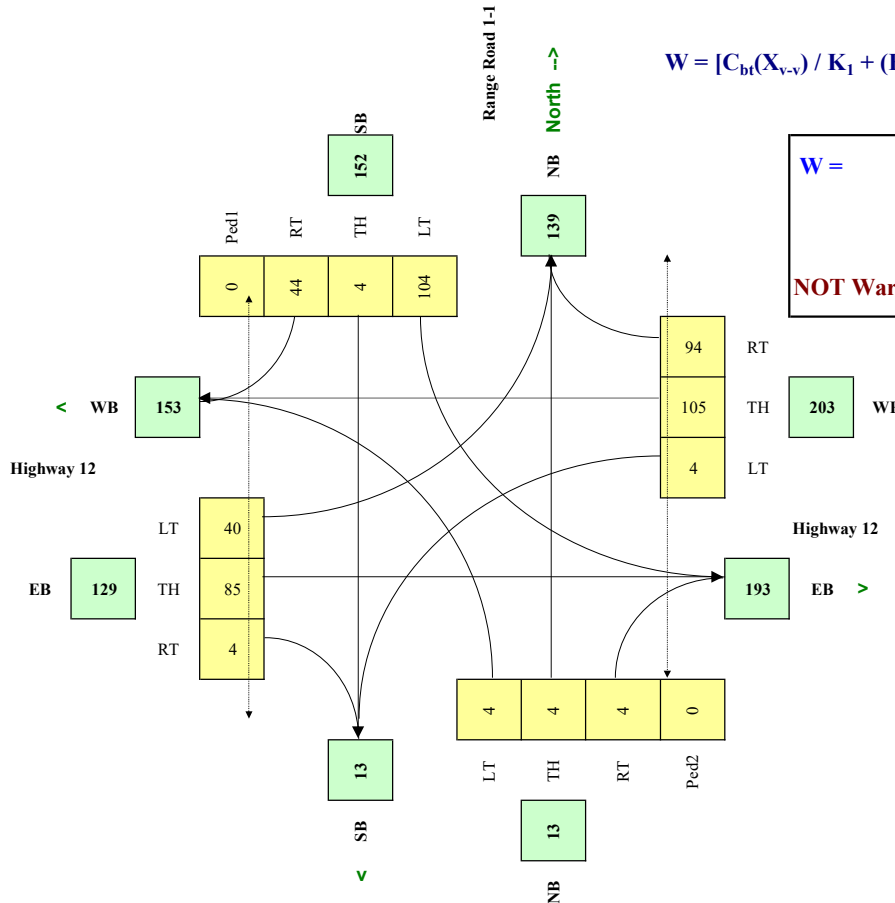
Are the Range Road 1-1 NB right turns significantly impeded by through movements? (y/n) n  
 Are the Range Road 1-1 SB right turns significantly impeded by through movements? (y/n) n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
Range Road 1-1	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	4	4	4	85	4	36	4	59	85	37	112	4	0	0	0	0
	5	5	5	118	5	50	5	82	118	51	156	5	0	0	0	0
	3	3	3	71	3	30	3	49	71	31	94	3	0	0	0	0
	3	3	3	83	3	35	3	104	69	29	35	3	0	0	0	0
	5	5	5	139	5	59	5	174	115	49	58	5	0	0	0	0
	5	5	5	128	5	54	5	160	106	45	53	5	0	0	0	0
Total (6-hour peak)	25	25	25	624	25	264	25	628	564	242	508	25	0	0	0	0
Average (6-hour peak)	4	4	4	104	4	44	4	105	94	40	85	4	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 =	30	30	0
		Veh	Ped

**NOT Warranted**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	Range Road 1-1	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2037 15-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12	WB				1				1
Highway 12	EB				1				1
Range Road 1-1	NB				1				
Range Road 1-1	SB				1				

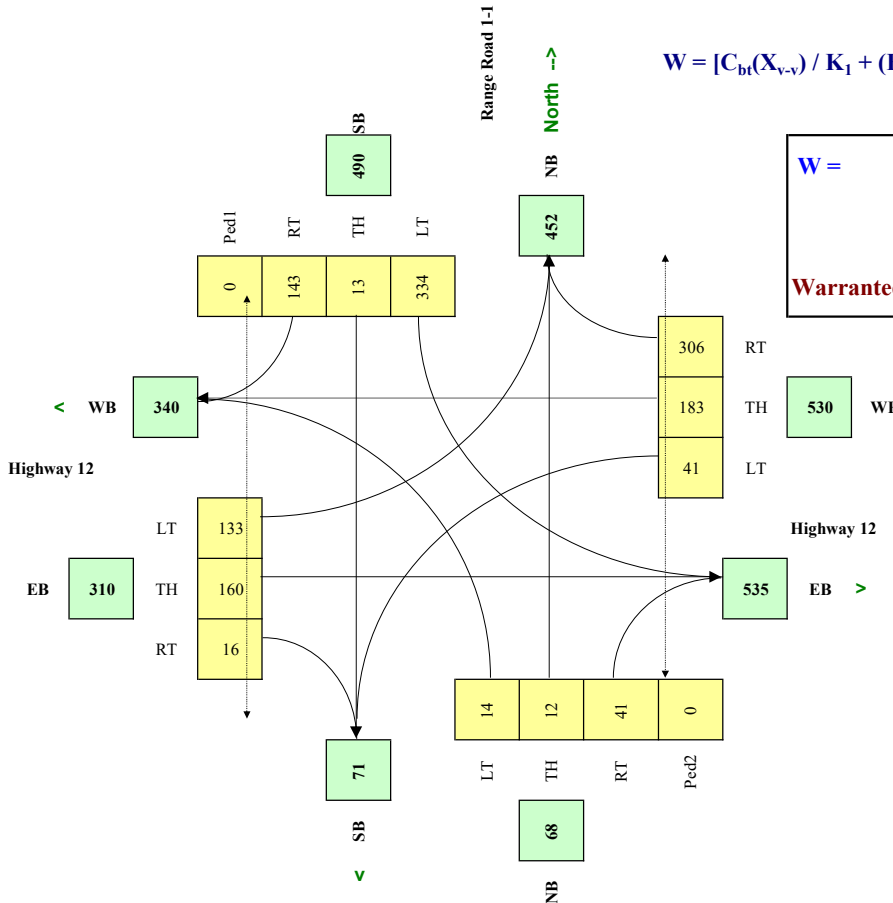
Are the Range Road 1-1 NB right turns significantly impeded by through movements? (y/n) n  
 Are the Range Road 1-1 SB right turns significantly impeded by through movements? (y/n) n

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
Range Road 1-1	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	7	6	19	260	16	111	49	144	285	126	156	20	0	0	0	0
	10	9	26	361	22	154	68	200	396	175	217	28	0	0	0	0
	6	5	16	217	13	92	41	120	238	105	130	17	0	0	0	0
	15	13	44	277	7	119	21	151	218	94	109	8	0	0	0	0
	25	21	74	462	11	198	35	252	364	156	182	13	0	0	0	0
	23	19	68	425	10	182	32	232	335	144	167	12	0	0	0	0
<b>Total (6-hour peak)</b>	<b>86</b>	<b>73</b>	<b>247</b>	<b>2,002</b>	<b>79</b>	<b>856</b>	<b>246</b>	<b>1,099</b>	<b>1,836</b>	<b>800</b>	<b>961</b>	<b>98</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>14</b>	<b>12</b>	<b>41</b>	<b>334</b>	<b>13</b>	<b>143</b>	<b>41</b>	<b>183</b>	<b>306</b>	<b>133</b>	<b>160</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 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 =	235	235	0
		Veh	Ped

**Warranted**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	52 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2021 Existing Volumes
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12	WB	1		1			1		1
Highway 12	EB	1				1			1
52 Street	NB				1				
52 Street	SB				1				

Are the 52 Street NB right turns significantly impeded by through movements? (y/n) n  
 Are the 52 Street SB right turns significantly impeded by through movements? (y/n) n

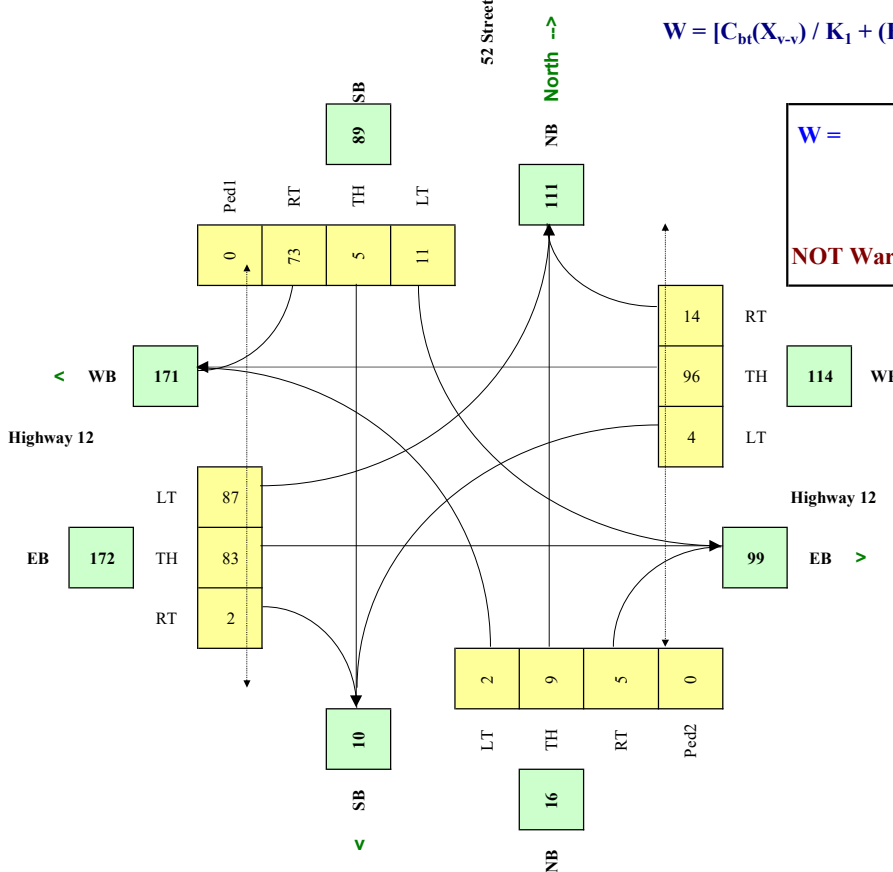
Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
52 Street	NS	50	2.0%	n	

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	1	9	6	8	6	66	3	78	15	78	78	3	0	0	0	0
	2	13	9	11	9	92	4	109	21	109	109	4	0	0	0	0
	1	8	5	7	5	55	2	65	13	65	65	2	0	0	0	0
	2	6	2	10	2	53	4	77	8	65	58	0	0	0	0	0
	4	10	3	16	3	89	6	128	14	108	97	0	0	0	0	0
	4	9	3	15	3	82	6	118	13	99	89	0	0	0	0	0
Total (6-hour peak)	14	55	28	67	28	437	25	575	84	524	496	9	0	0	0	0
Average (6-hour peak)	2	9	5	11	5	73	4	96	14	87	83	2	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 =	14	14	0
		Veh	Ped

**NOT Warranted**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	52 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2037 15-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12	WB	1		1			1		1
Highway 12	EB	1				1			1
52 Street	NB				1				
52 Street	SB				1				

Are the 52 Street NB right turns significantly impeded by through movements? (y/n) n  
 Are the 52 Street SB right turns significantly impeded by through movements? (y/n) n

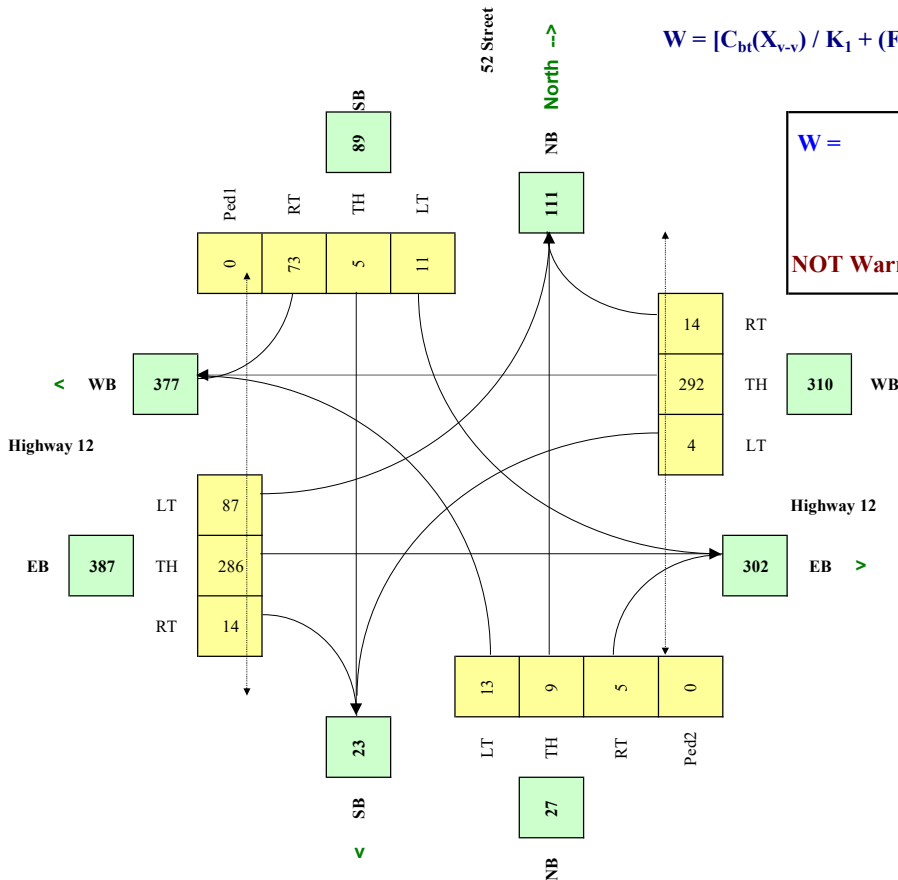
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
52 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	5	9	6	8	6	66	3	192	15	78	314	19	0	0	0	0
	7	13	9	11	9	92	4	266	21	109	436	27	0	0	0	0
	4	8	5	7	5	55	2	160	13	65	262	16	0	0	0	0
	14	6	2	10	2	53	4	269	8	65	168	5	0	0	0	0
	24	10	3	16	3	89	6	449	14	108	280	8	0	0	0	0
	22	9	3	15	3	82	6	413	13	99	258	7	0	0	0	0
Total (6-hour peak)	76	55	28	67	28	437	25	1,749	84	524	1,718	82	0	0	0	0
Average (6-hour peak)	13	9	5	11	5	73	4	292	14	87	286	14	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 =	45	45	0
		Veh	Ped
<b>NOT Warranted</b>			

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12	Direction (EW or NS)	EW
Side Street (name)	52 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2052 30-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12	WB	1		1			1		1
Highway 12	EB	1				1			1
52 Street	NB				1				
52 Street	SB				1				

Are the 52 Street NB right turns significantly impeded by through movements? (y/n) n  
 Are the 52 Street SB right turns significantly impeded by through movements? (y/n) n

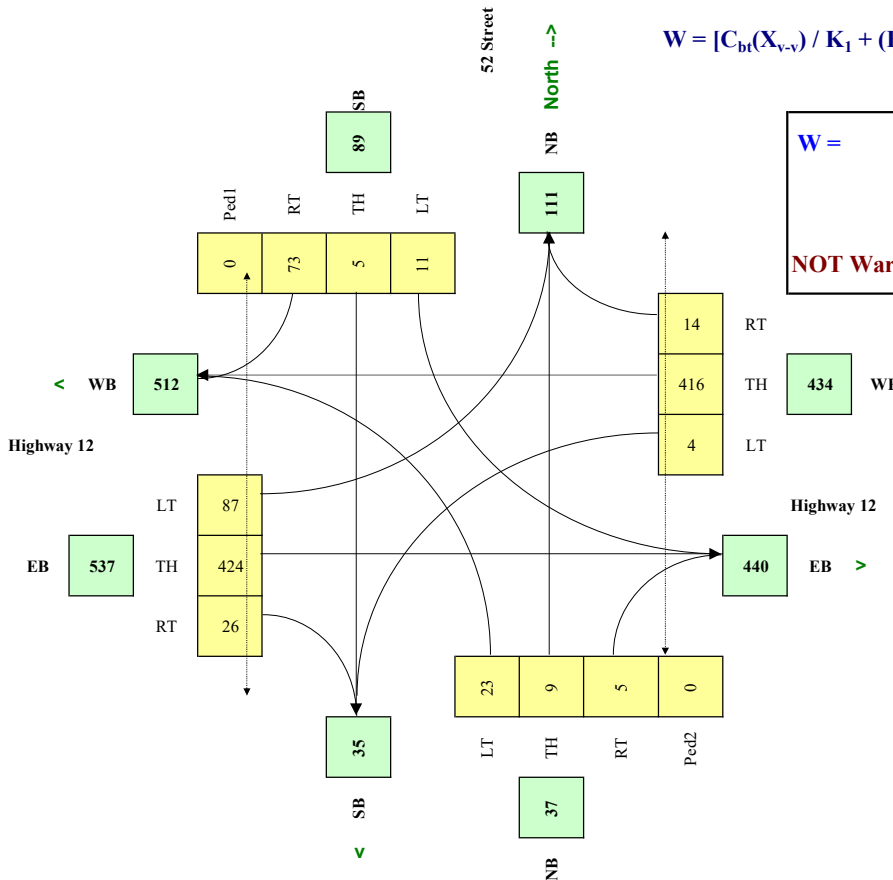
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12	EW	100	2.0%	n	
52 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	8	9	6	8	6	66	3	248	15	78	491	36	0	0	0	0
	11	13	9	11	9	92	4	344	21	109	682	50	0	0	0	0
	7	8	5	7	5	55	2	206	13	65	409	30	0	0	0	0
	26	6	2	10	2	53	4	404	8	65	229	9	0	0	0	0
	44	10	3	16	3	89	6	674	14	108	381	15	0	0	0	0
	40	9	3	15	3	82	6	620	13	99	351	14	0	0	0	0
<b>Total (6-hour peak)</b>	<b>136</b>	<b>55</b>	<b>28</b>	<b>67</b>	<b>28</b>	<b>437</b>	<b>25</b>	<b>2,496</b>	<b>84</b>	<b>524</b>	<b>2,543</b>	<b>154</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>23</b>	<b>9</b>	<b>5</b>	<b>11</b>	<b>5</b>	<b>73</b>	<b>4</b>	<b>416</b>	<b>14</b>	<b>87</b>	<b>424</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 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 =	73	73	0
		Veh	Ped
<b>NOT Warranted</b>			

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	44 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2021 Existing Volumes
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
44 Street	NB				1				
44 Street	SB								

Are the 44 Street NB right turns significantly impeded by through movements? (y/n)

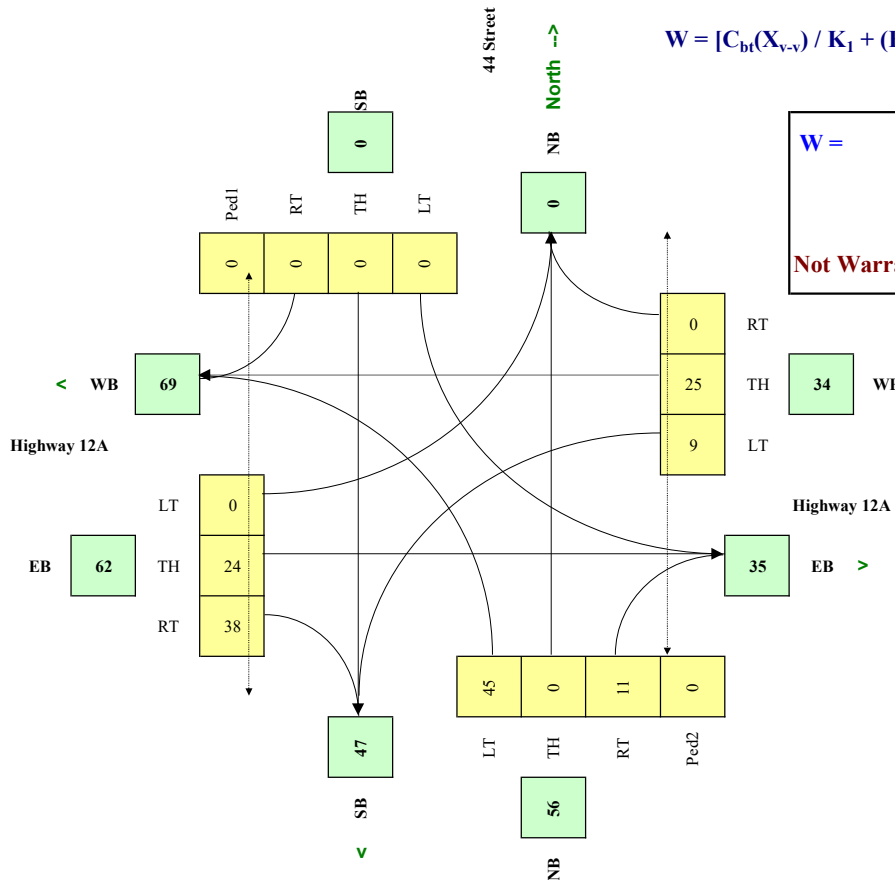
	n
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Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
44 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side			E Side			N Side			S Side			W Side	E Side	N Side	S Side
	13	0	3	0	0	0	14	14	0	0	29	59	0	0	0	0
	18	0	4	0	0	0	20	20	0	0	40	82	0	0	0	0
	11	0	2	0	0	0	12	12	0	0	24	49	0	0	0	0
	54	0	14	0	0	0	2	24	0	0	12	9	0	0	0	0
	90	0	23	0	0	0	4	40	0	0	20	15	0	0	0	0
	83	0	21	0	0	0	4	37	0	0	18	14	0	0	0	0
<b>Total (6-hour peak)</b>	<b>269</b>	<b>0</b>	<b>67</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>56</b>	<b>147</b>	<b>0</b>	<b>0</b>	<b>143</b>	<b>228</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>45</b>	<b>0</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>38</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 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 =	2	2	0
		Veh	Ped

**Not Warranted - Vs < 75**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	44 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2037 15-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
44 Street	NB				1				
44 Street	SB								
Are the 44 Street NB right turns significantly impeded by through movements? (y/n)									
n									
o									

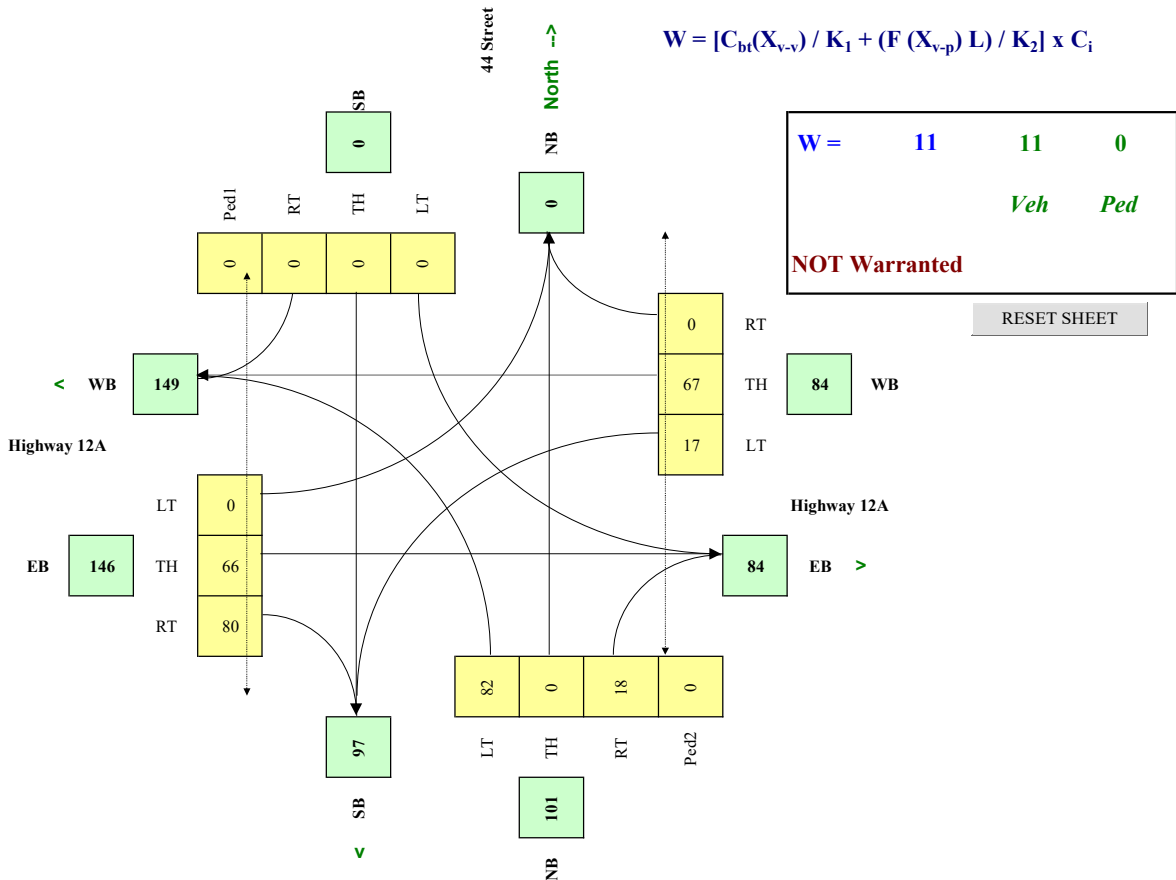
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
44 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	27	0	5	0	0	0	25	41	0	0	75	114	0	0	0	0
	38	0	7	0	0	0	35	57	0	0	104	159	0	0	0	0
	23	0	4	0	0	0	21	34	0	0	62	95	0	0	0	0
	97	0	22	0	0	0	5	64	0	0	37	27	0	0	0	0
	161	0	37	0	0	0	9	106	0	0	61	45	0	0	0	0
148	0	34	0	0	0	8	98	0	0	56	41	0	0	0	0	0
<b>Total (6-hour peak)</b>	<b>494</b>	<b>0</b>	<b>109</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>103</b>	<b>400</b>	<b>0</b>	<b>0</b>	<b>395</b>	<b>481</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>82</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>67</b>	<b>0</b>	<b>0</b>	<b>66</b>	<b>80</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Average 6-hour Peak Turning Movements

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







# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	44 Street	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2052 30-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'			
CHECK SHEET			

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
44 Street	NB				1				
44 Street	SB								

Are the 44 Street NB right turns significantly impeded by through movements? (y/n)

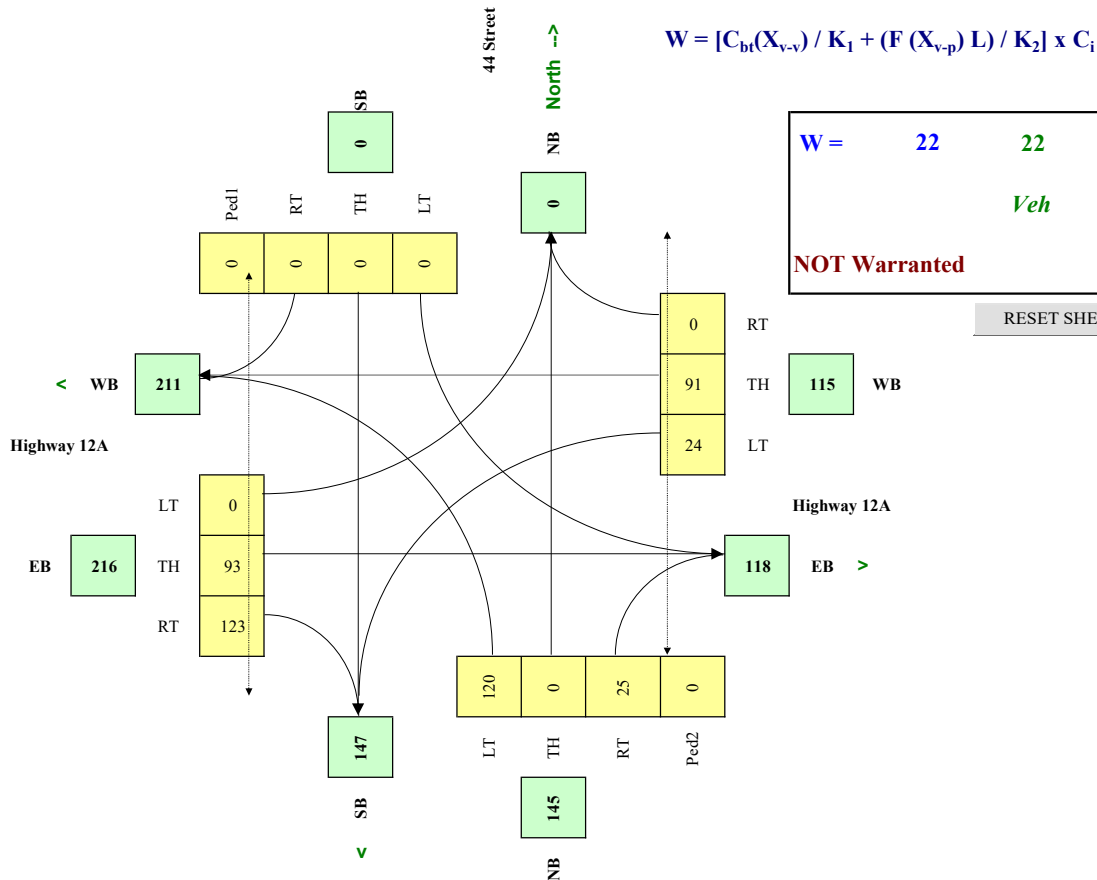
	n
	y

Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
44 Street	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	42	0	7	0	0	0	35	52	0	0	109	170	0	0	0	0
	58	0	10	0	0	0	49	72	0	0	151	236	0	0	0	0
	35	0	6	0	0	0	29	43	0	0	91	142	0	0	0	0
	139	0	31	0	0	0	8	90	0	0	49	45	0	0	0	0
	231	0	51	0	0	0	13	150	0	0	81	75	0	0	0	0
213	0	47	0	0	0	12	138	0	0	75	69	0	0	0	0	0
<b>Total (6-hour peak)</b>	<b>718</b>	<b>0</b>	<b>152</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>146</b>	<b>545</b>	<b>0</b>	<b>0</b>	<b>556</b>	<b>737</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>120</b>	<b>0</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>91</b>	<b>0</b>	<b>0</b>	<b>93</b>	<b>123</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Average 6-hour Peak Turning Movements





# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	Range Road 1-1	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2021 Existing Volumes
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
Range Road 1-1	NB				1				
Range Road 1-1	SB				1				

Are the Range Road 1-1 NB right turns significantly impeded by through movements? (y/n) n  
 Are the Range Road 1-1 SB right turns significantly impeded by through movements? (y/n) n

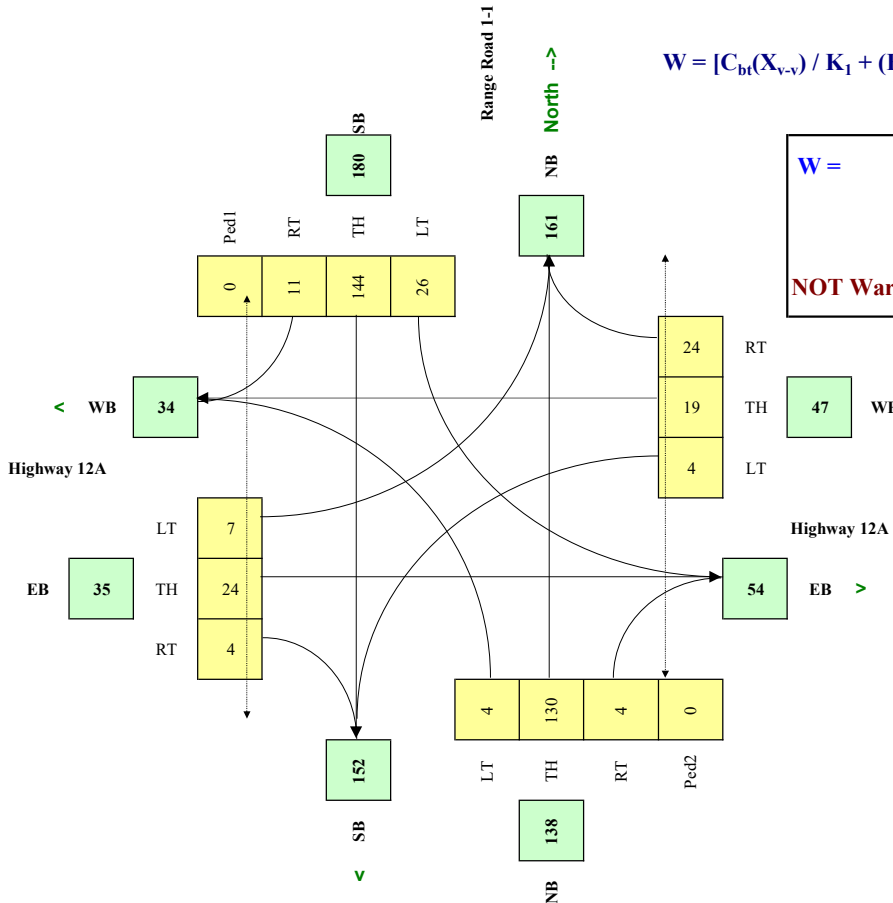
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
Range Road 1-1	NS	50	2.0%	n	

Traffic Input													Ped1	Ped2	Ped3	Ped4
	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
press 'Set Peak Hours' Button to set the peak hour periods	4	118	4	21	116	9	4	17	22	4	24	4	0	0	0	0
	5	164	5	29	161	12	5	23	30	5	34	5	0	0	0	0
	3	98	3	17	97	7	3	14	18	3	20	3	0	0	0	0
	3	95	3	21	116	9	3	14	17	7	16	3	0	0	0	0
	5	159	5	35	193	15	5	24	29	12	26	5	0	0	0	0
5	146	5	32	178	14	5	22	27	11	24	5	0	0	0	0	
<b>Total (6-hour peak)</b>	<b>25</b>	<b>780</b>	<b>25</b>	<b>155</b>	<b>861</b>	<b>66</b>	<b>25</b>	<b>114</b>	<b>143</b>	<b>42</b>	<b>144</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>4</b>	<b>130</b>	<b>4</b>	<b>26</b>	<b>144</b>	<b>11</b>	<b>4</b>	<b>19</b>	<b>24</b>	<b>7</b>	<b>24</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## 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 =	18	18	0
		Veh	Ped

**NOT Warranted**

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	Range Road 1-1	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2037 15-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'	CHECK SHEET		

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
Range Road 1-1	NB				1				
Range Road 1-1	SB				1				

Are the Range Road 1-1 NB right turns significantly impeded by through movements? (y/n) n  
 Are the Range Road 1-1 SB right turns significantly impeded by through movements? (y/n) n

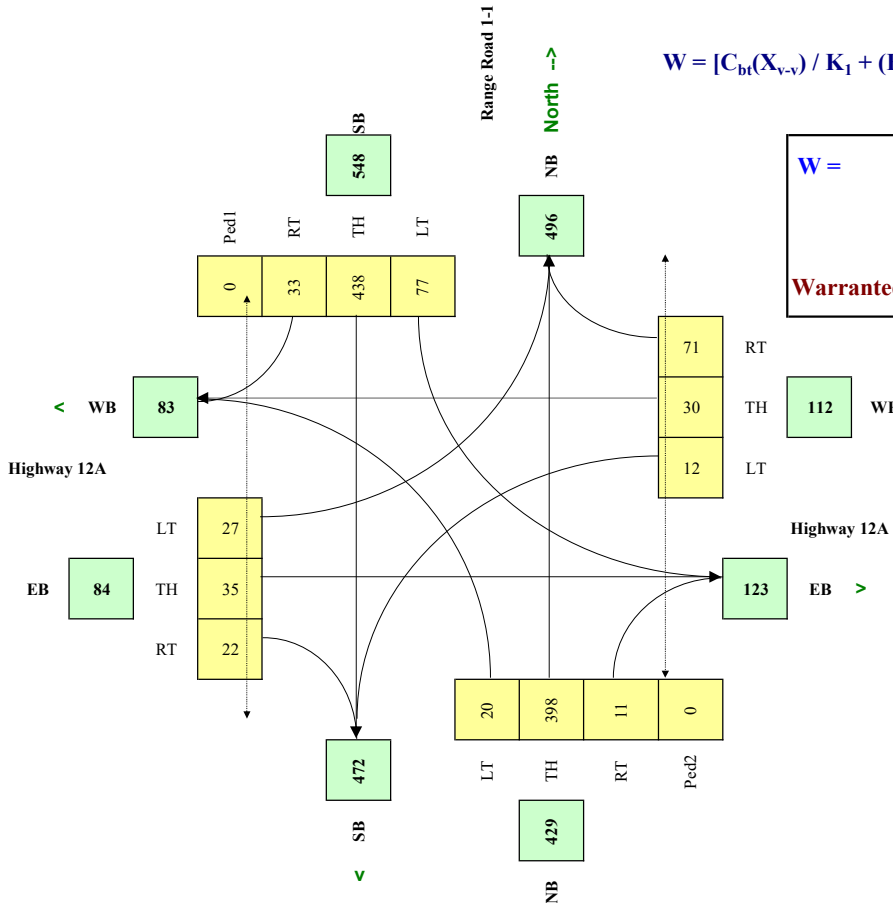
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
Range Road 1-1	NS	50	2.0%	n	

Traffic Input													Ped1	Ped2	Ped3	Ped4
	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
press 'Set Peak Hours' Button to set the peak hour periods	10	361	6	63	354	27	14	30	64	22	30	27	0	0	0	0
	14	501	8	87	492	37	20	42	89	30	42	38	0	0	0	0
	8	301	5	52	295	22	12	25	53	18	25	23	0	0	0	0
	21	292	11	62	353	27	6	20	52	22	26	11	0	0	0	0
	35	487	19	104	589	45	10	33	86	37	44	18	0	0	0	0
	32	448	17	96	542	41	9	30	79	34	40	17	0	0	0	0
<b>Total (6-hour peak)</b>	<b>120</b>	<b>2,390</b>	<b>66</b>	<b>464</b>	<b>2,625</b>	<b>199</b>	<b>71</b>	<b>180</b>	<b>423</b>	<b>163</b>	<b>207</b>	<b>134</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>20</b>	<b>398</b>	<b>11</b>	<b>77</b>	<b>438</b>	<b>33</b>	<b>12</b>	<b>30</b>	<b>71</b>	<b>27</b>	<b>35</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Average 6-hour Peak Turning Movements

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



<b>W =</b>	<b>128</b>	<b>128</b>	<b>0</b>
		<i>Veh</i>	<i>Ped</i>
<b>Warranted</b>			

RESET SHEET



# Alberta Transportation - Traffic Signal Warrant Analysis

Main Street (name)	Highway 12A	Direction (EW or NS)	EW
Side Street (name)	Range Road 1-1	Direction (EW or NS)	NS
Quadrant / Int #		Comments	2052 30-Year Horizon
for Warrant Calculation Results, please hit 'Page Down'		CHECK SHEET	

Road Authority:	Alberta Transportation
City:	Bentley, AB
Analysis Date:	2022 Jun 10, Fri
Count Date:	2021
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 12A	WB				1				1
Highway 12A	EB				1				1
Range Road 1-1	NB				1				
Range Road 1-1	SB				1				

Are the Range Road 1-1 NB right turns significantly impeded by through movements? (y/n) n  
 Are the Range Road 1-1 SB right turns significantly impeded by through movements? (y/n) n

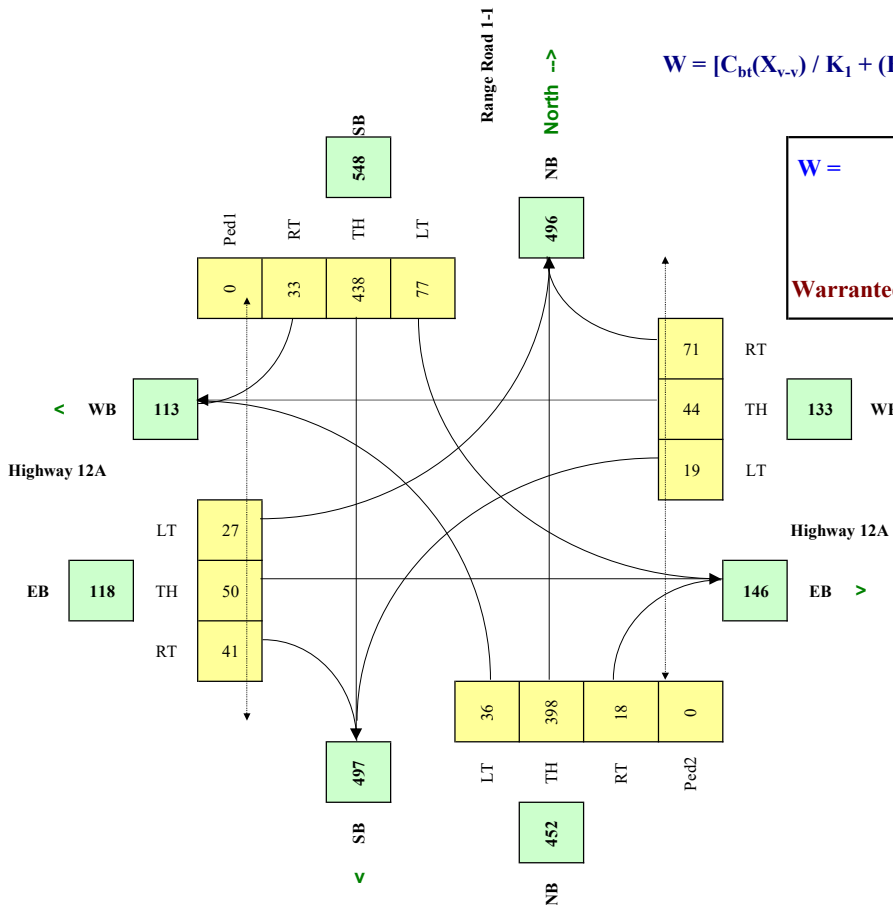
Demographics		
Elem. School/Mobility Challenged	(y/n)	n
Senior's Complex	(y/n)	n
Pathway to School	(y/n)	n
Metro Area Population	(#)	1,500
Central Business District	(y/n)	n

Other input		Speed (Km/h)	Truck %	Bus Rt (y/n)	Median (m)
Highway 12A	EW	50	2.0%	n	
Range Road 1-1	NS	50	2.0%	n	

Traffic Input	NB			SB			WB			EB			Ped1	Ped2	Ped3	Ped4
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	NS	NS	EW	EW
	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side	W Side	E Side	N Side	S Side
press 'Set Peak Hours' Button to set the peak hour periods	16	361	8	63	354	27	24	46	64	22	41	51	0	0	0	0
	22	501	11	87	492	37	34	64	89	30	57	71	0	0	0	0
	13	301	7	52	295	22	20	38	53	18	34	43	0	0	0	0
	39	292	20	62	353	27	8	27	52	22	40	19	0	0	0	0
	65	487	33	104	589	45	14	45	86	37	67	31	0	0	0	0
	60	448	30	96	542	41	13	41	79	34	62	29	0	0	0	0
<b>Total (6-hour peak)</b>	<b>215</b>	<b>2,390</b>	<b>109</b>	<b>464</b>	<b>2,625</b>	<b>199</b>	<b>113</b>	<b>261</b>	<b>423</b>	<b>163</b>	<b>301</b>	<b>244</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Average (6-hour peak)</b>	<b>36</b>	<b>398</b>	<b>18</b>	<b>77</b>	<b>438</b>	<b>33</b>	<b>19</b>	<b>44</b>	<b>71</b>	<b>27</b>	<b>50</b>	<b>41</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Average 6-hour Peak Turning Movements

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



<b>W =</b>	<b>166</b>	<b>166</b>	<b>0</b>
		<i>Veh</i>	<i>Ped</i>
<b>Warranted</b>			

RESET SHEET

## **Appendix F – Illumination Warrant Analysis Results**

# 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 12	Main Road
44 Street	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2021 Existing Conditions

### GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	3		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)	100		5		OK	
Channelization Factor					OK	15
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)	100				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 =	B	0				
Posted Speed Category =		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	3	1	3	Number of legs = 3 or more	OK	3
<b>Geometric Factors Subtotal</b>						<b>18</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	2625	2	10	Either Use the two AADT inputs <b>OR</b> 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	20
AADT on Minor Road (2-way)	990	1	20		OK	20
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	100	4	5	Refer to Table 1(B), note #3	OK	20
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>65</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
OR						
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**LIGHTING IS NOT WARRANTED**

### SUMMARY

Geometric Factors Subtotal	18
Operational Factor Subtotal	65
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS**      **83**

# 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 12	Main Road
44 Street	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2037 15-Year Horizon

### GEOMETRIC FACTORS

	Value	Rating	Weight	Comments	Check	Score
Channelization Rating	Descriptive	3		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)	100		5		OK	
Channelization Factor					OK	15
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)	100				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 =	B	0				
Posted Speed Category =		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	3	1	3	Number of legs = 3 or more	OK	3
<b>Geometric Factors Subtotal</b>						<b>18</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	6380	4	10	Either Use the two AADT inputs <b>OR</b> 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	40
AADT on Minor Road (2-way)	5270	4	20		OK	80
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	100	4	5	Refer to Table 1(B), note #3	OK	20
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>145</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
OR	0	0	0		OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**ILLUMINATION WARRANTED**  
DELINEATION LIGHTING TO ILLUMINATE PEDESTRIANS OR  
CROSS STREET TRAFFIC

### SUMMARY

Geometric Factors Subtotal	18
Operational Factor Subtotal	145
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS** **163**

# 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 12	Main Road
Range Road 1-1	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2021 Existing Conditions

### 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)	100		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)	100				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 =	B	0				
Posted Speed Category =		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
<b>Geometric Factors Subtotal</b>						<b>6</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	3270	3	10	Either Use the two AADT inputs <b>OR</b> 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	30
AADT on Minor Road (2-way)	2790	4	20		OK	80
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	100	4	5	Refer to Table 1(B), note #3	OK	20
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>135</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**ILLUMINATION WARRANTED**  
DELINEATION LIGHTING TO ILLUMINATE PEDESTRIANS OR  
CROSS STREET TRAFFIC

### SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	135
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS**      **141**



# 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 12A	Main Road
44 Street	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2021 Existing Conditions

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D	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	3	1	3	Number of legs = 3 or more	OK	3
<b>Geometric Factors Subtotal</b>						<b>3</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	1240	1	10	Either Use the two AADT inputs <b>OR</b> 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	10
AADT on Minor Road (2-way)	990	1	20		OK	20
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>35</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
OR						
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**LIGHTING IS NOT WARRANTED**

### SUMMARY

Geometric Factors Subtotal	3
Operational Factor Subtotal	35
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS      38**

# 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 12A	Main Road
44 Street	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2037 15-Year Horizon

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D					
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	3	1	3	Number of legs = 3 or more	OK	3
<b>Geometric Factors Subtotal</b>						<b>3</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	2800	2	10	Either Use the two AADT inputs <b>OR</b> 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	20
AADT on Minor Road (2-way)	1890	3	20		OK	60
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>85</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

### SUMMARY

Geometric Factors Subtotal	3
Operational Factor Subtotal	85
Environmental Factor Subtotal	0
Collision History Subtotal	0

<b>TOTAL POINTS</b>	<b>88</b>
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# 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 12A	Main Road
44 Street	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2052 30-Year Horizon

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D					
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	3	1	3	Number of legs = 3 or more	OK	3
<b>Geometric Factors Subtotal</b>						<b>3</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	4030	3	10	Either Use the two AADT inputs <b>OR</b> 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	30
AADT on Minor Road (2-way)	2780	4	20		OK	80
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>115</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

### SUMMARY

Geometric Factors Subtotal	3
Operational Factor Subtotal	115
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS**      **118**

# 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

Range Road 1-1	Main Road
Highway 12A	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2021 Existing Conditions

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D					
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
<b>Geometric Factors Subtotal</b>						<b>6</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	3320	3	10	Either Use the two AADT inputs <b>OR</b> 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	30
AADT on Minor Road (2-way)	930	1	20		OK	20
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>55</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
OR Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**LIGHTING IS NOT WARRANTED**

### SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	55
Environmental Factor Subtotal	0
Collision History Subtotal	0
<b>TOTAL POINTS</b>	<b>61</b>

# 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

Range Road 1-1	Main Road
Highway 12A	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2037 15-Year Horizon

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D	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
<b>Geometric Factors Subtotal</b>						<b>6</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	2220	2	10	Either Use the two AADT inputs <b>OR</b> 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	20
AADT on Minor Road (2-way)	10110	4	20		OK	80
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>105</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

LIGHTING IS NOT WARRANTED

### SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	105
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS**      **111**

# 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

Range Road 1-1	Main Road
Highway 12A	Minor Road
Bentley	City/Town

Date	June 16, 2022
Other	2037 15-Year Horizon

### 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)	50		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)	50				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 =		0				
Posted Speed Category =	D					
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
<b>Geometric Factors Subtotal</b>						<b>6</b>

### OPERATIONAL FACTORS

Is the intersection signalized ? ( Y / N )	N			Calculate the Signalization Warrant Factor		
AADT on Major Road (2-way)	2620	2	10	Either Use the two AADT inputs <b>OR</b> 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	20
AADT on Minor Road (2-way)	10110	4	20		OK	80
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	1	5	Refer to Table 1(B) for ratings.	OK	5
Operating Speed or Posted Speed on Major Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
Operating Speed on Minor Road (km/h)	50	0	5	Refer to Table 1(B), note #3	OK	0
<b>Operational Factors Subtotal</b>						<b>105</b>

### ENVIRONMENTAL FACTOR

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

### COLLISION HISTORY

Average Annual night-time collision frequency due to inadequate lighting (collisions/yr, rounded to nearest whole # )	0.0	0	0	Enter <b>either</b> the annual frequency (See Table 1(C), note #4) <b>OR</b> the number of collisions / MEV (Unused values should be set to Zero)	OK	0
Collision Rate over last 3 years, due to inadequate lighting (/MEV)	0	0	0		OK	0
Is the average ratio of all night to day collisions >= 1.5 (Y/N)	N	0			OK	
<b>Collision History Subtotal</b>						<b>0</b>

Check Intersection Signalization:  
Intersection is not Signalized

**LIGHTING IS NOT WARRANTED**

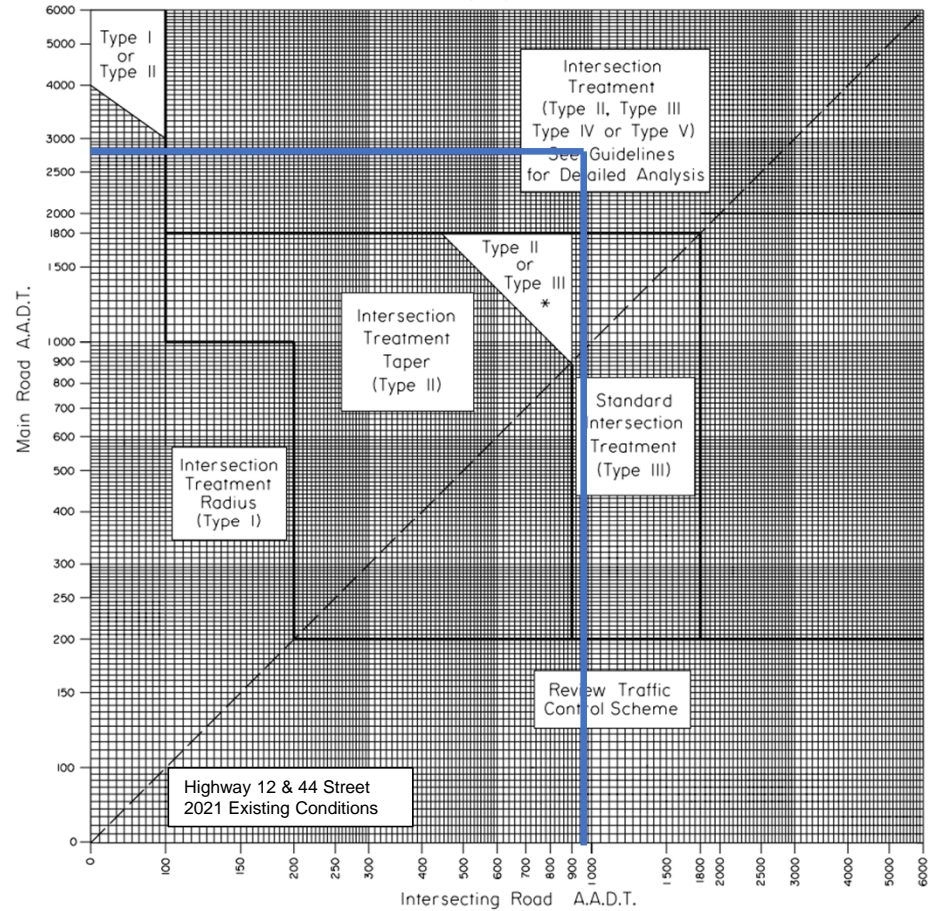
### SUMMARY

Geometric Factors Subtotal	6
Operational Factor Subtotal	105
Environmental Factor Subtotal	0
Collision History Subtotal	0

**TOTAL POINTS**      **111**

## **Appendix G – Intersection Treatment Analysis Results**

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)

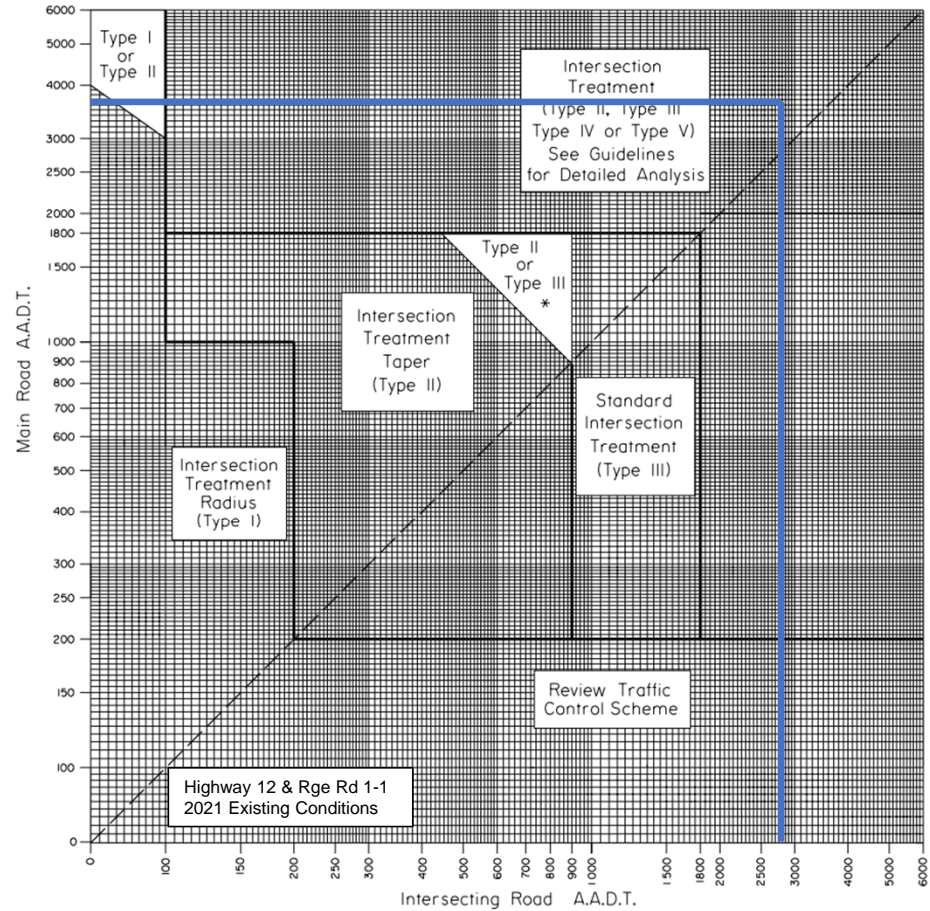


Notes:

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



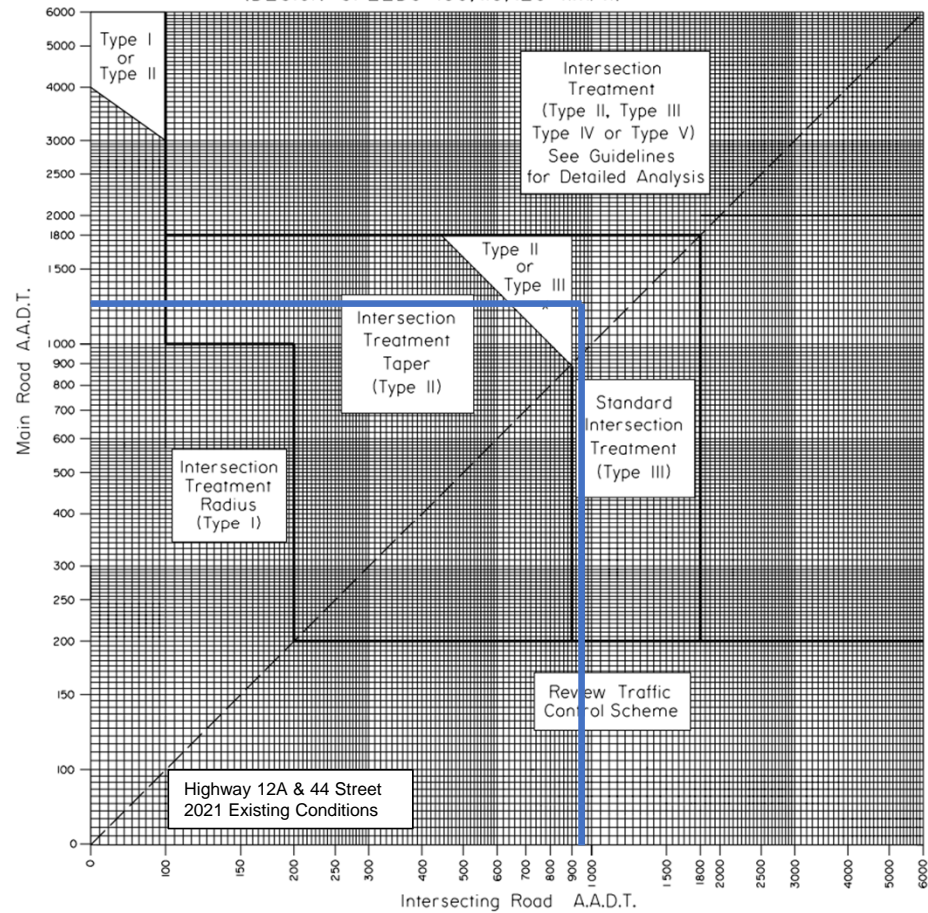
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



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

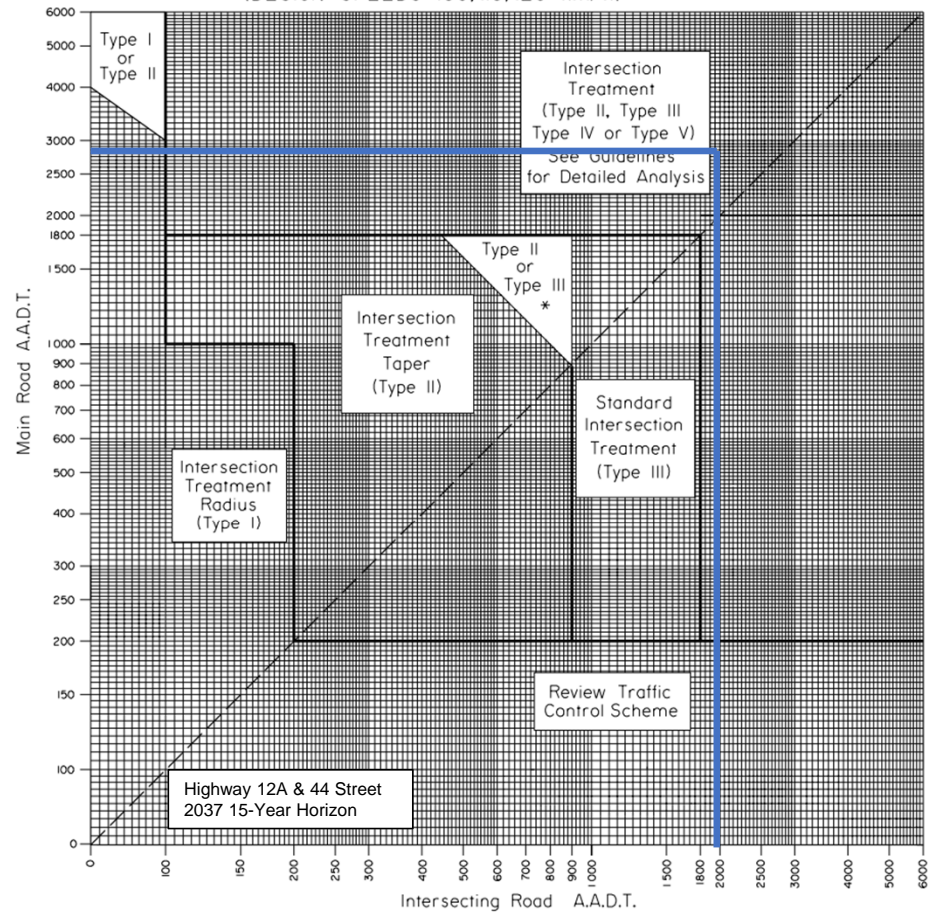
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



**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  $\text{Main Road AADT} \times \text{Intersecting Road AADT} = 800,000$

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)

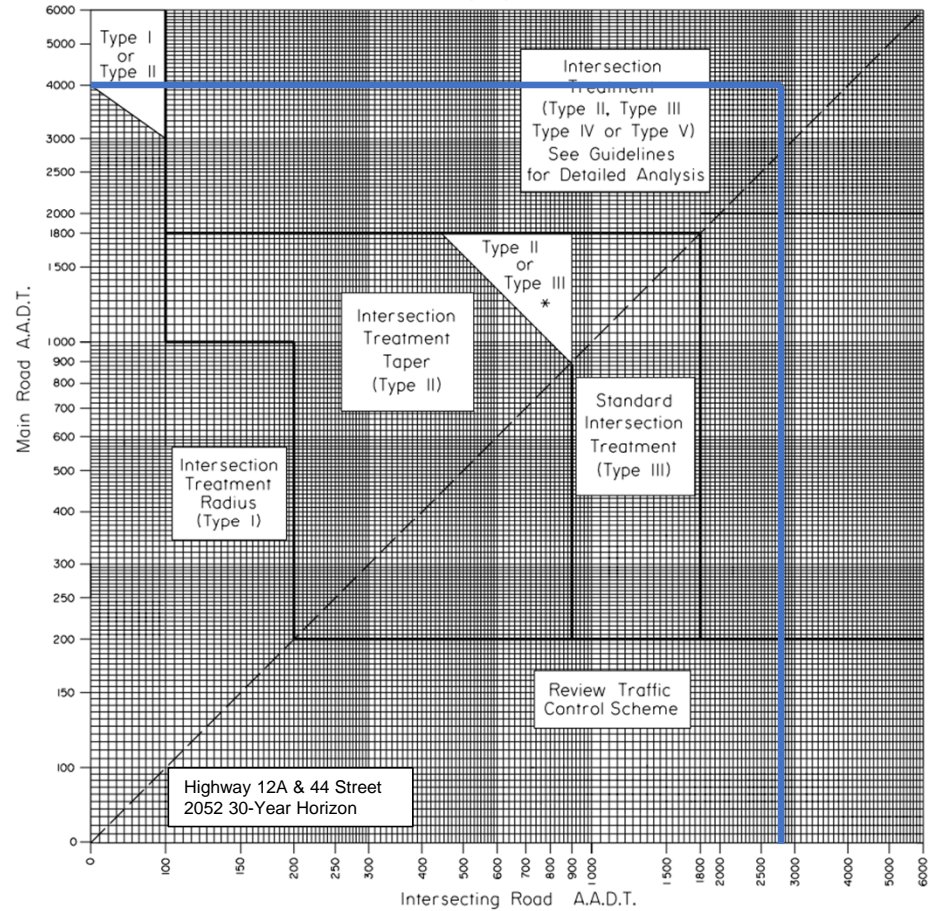


Notes:

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



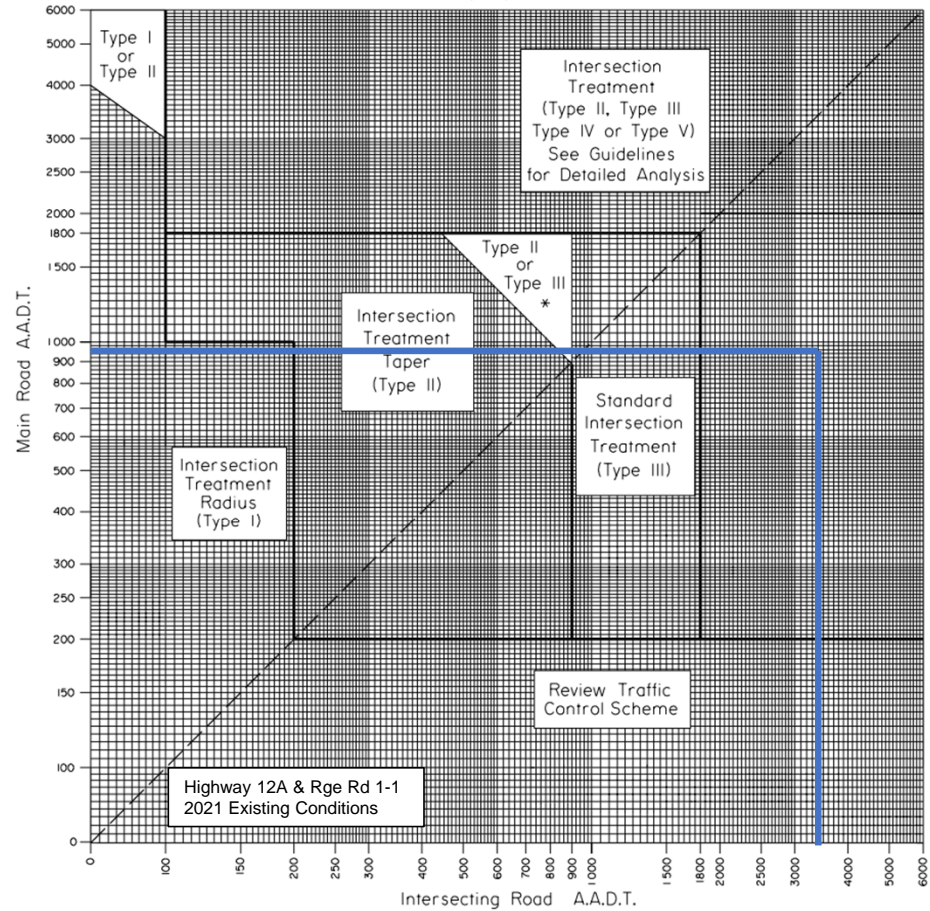
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



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  $\text{Main Road AADT} \times \text{Intersecting Road AADT} = 800,000$

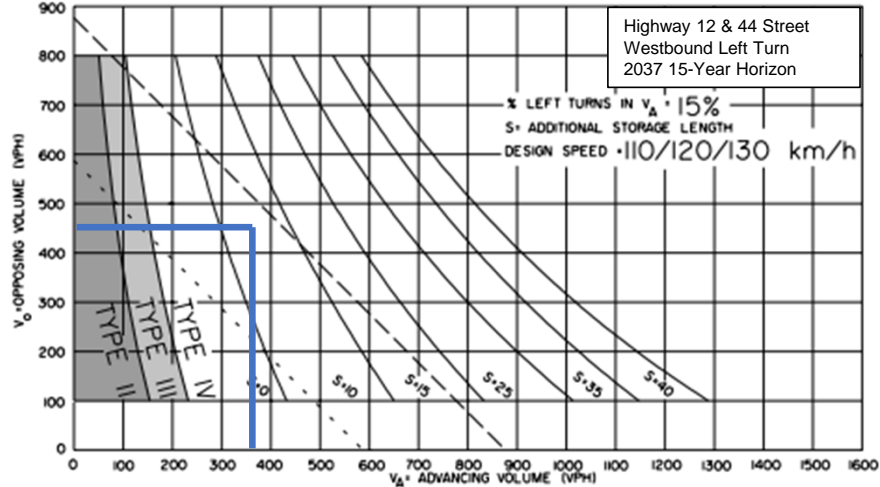
FIGURE D-7.4 TRAFFIC VOLUME WARRANT CHART FOR AT-GRADE INTERSECTION TREATMENT ON TWO-LANE RURAL HIGHWAYS (DESIGN SPEEDS 100, 110, 120 km/h)



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  $\text{Main Road AADT} \times \text{Intersecting Road AADT} = 800,000$

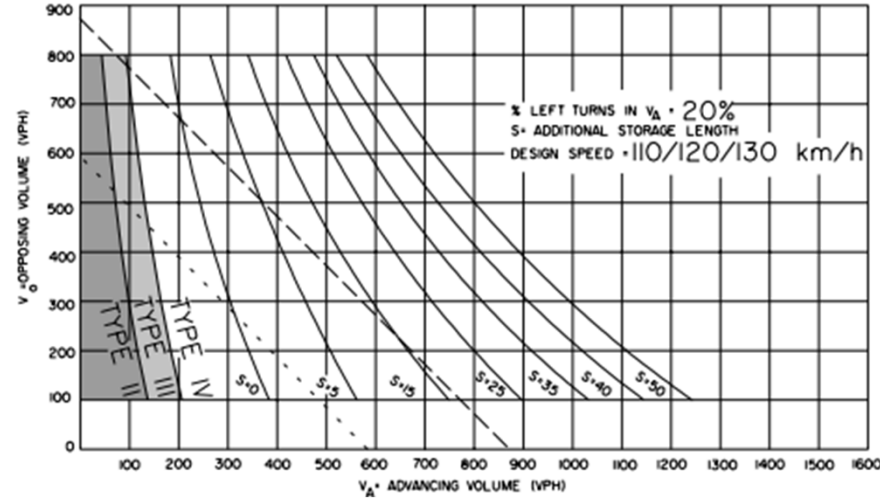
FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20%



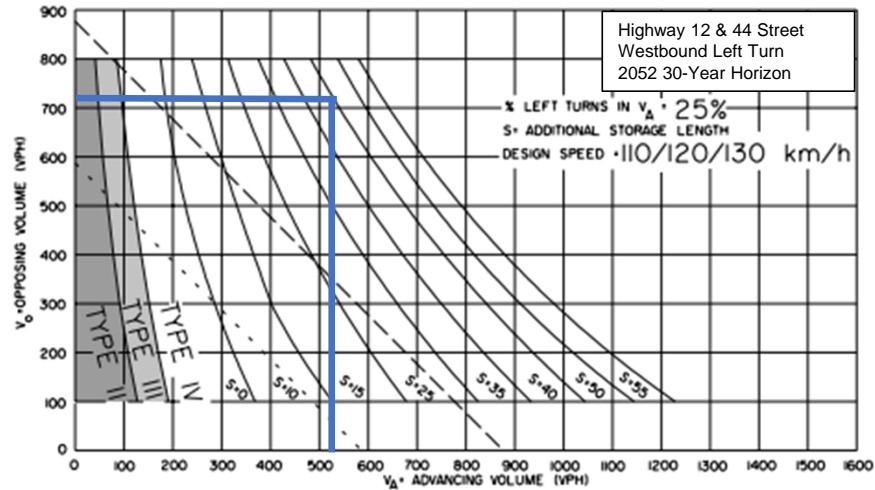
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer should check additional storage requirements for trucks, also see Table D.7.6a.

- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
--- Traffic signals may be warranted in "free flow" urban areas.

Notes:  
1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.  
2. Warrant for Type I treatment is shown in Figure D-7.4.



**FIGURE D-7.6-7c WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 25%, 30%**



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

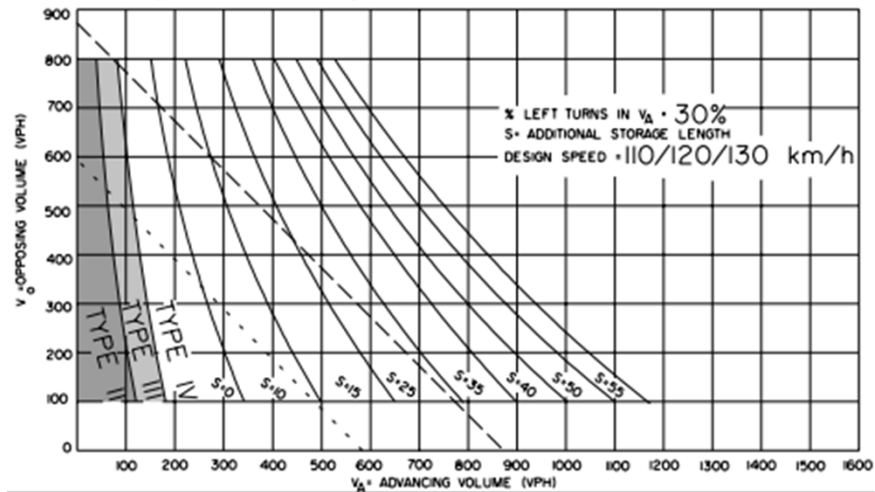
- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

— Traffic signals may be warranted in "free flow" urban areas.

Notes:

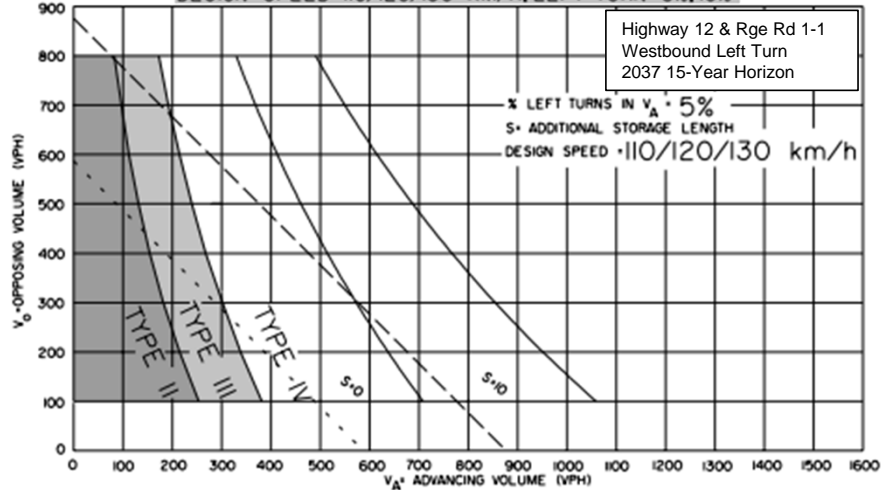
1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

2. Warrant for Type I treatment is shown in Figure D-7.4.





**FIGURE D-7.6-7a WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 5%, 10%**



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer should check additional storage requirements for trucks, also see Table D.7.6a.  
 - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
 ——— Traffic signals may be warranted in "free flow" urban areas.

Notes:  
 1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.  
 2. Warrant for Type I treatment is shown in Figure D-7.4.

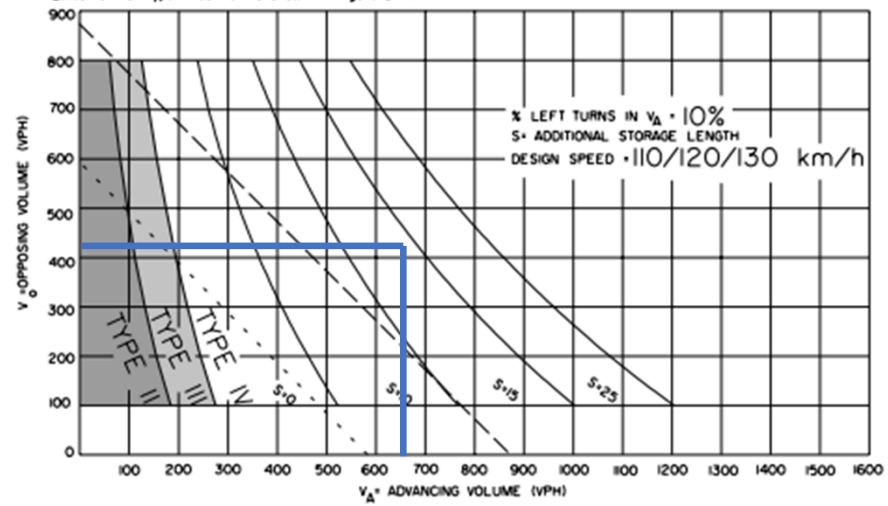
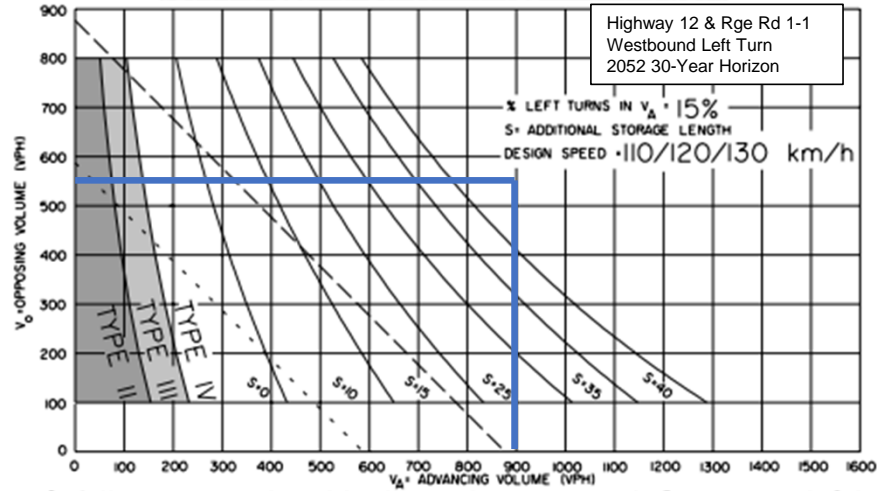




FIGURE D-7.6-7b WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 15%, 20%



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Design should check additional storage requirements for trucks, also see Table D.7.6a.

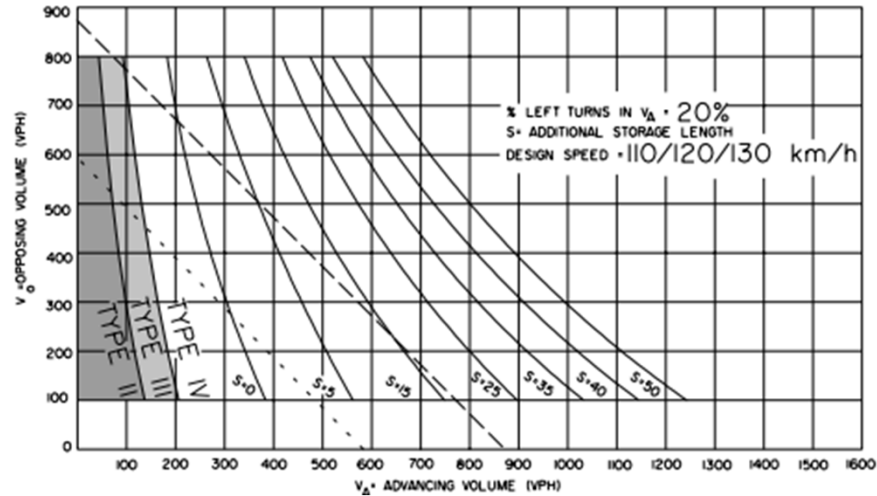
- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

--- Traffic signals may be warranted in "free flow" urban areas.

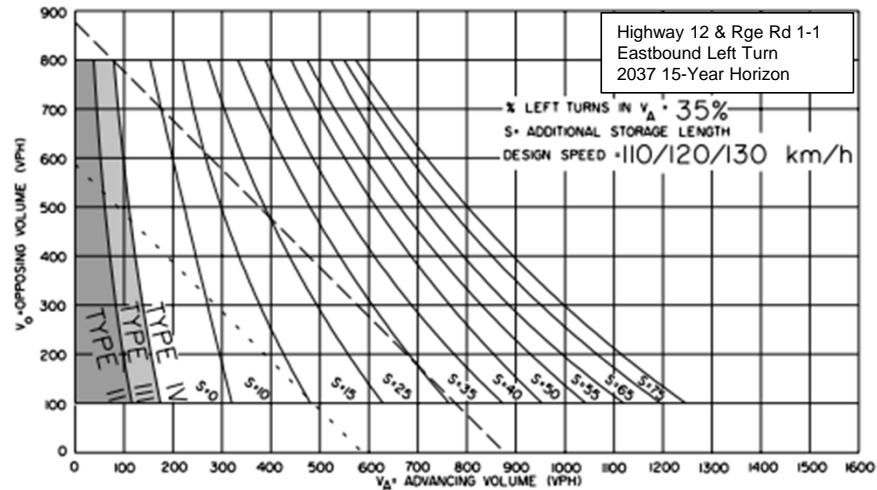
Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

2. Warrant for Type I treatment is shown in Figure D-7.4.



**FIGURE D-7.6-7d WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 35%, 40%**



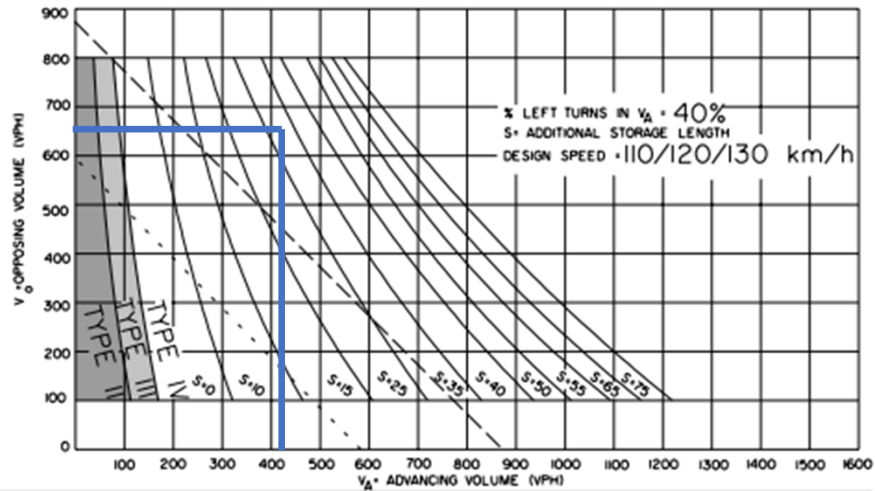
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer should check additional storage requirements for trucks, also see Table D.7.6a.

- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

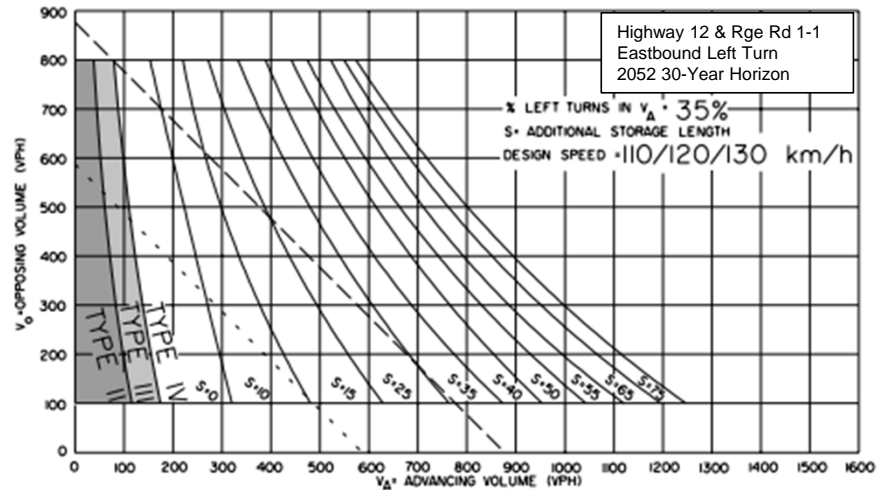
— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



**FIGURE D-7.6-7d WARRANTS FOR LEFT TURN LANES AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 110/120/130 KM/H, LEFT TURN 35%, 40%**



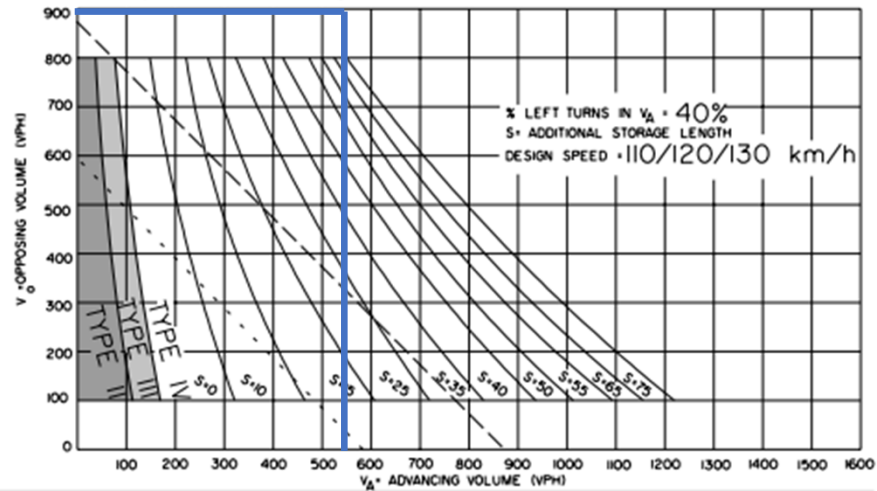
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designer should check additional storage requirements for trucks, also see Table D.7.6a.

- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

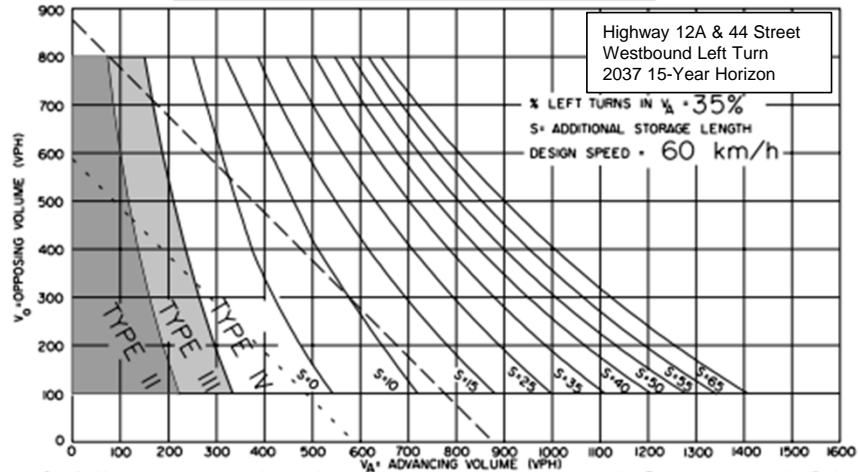
— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



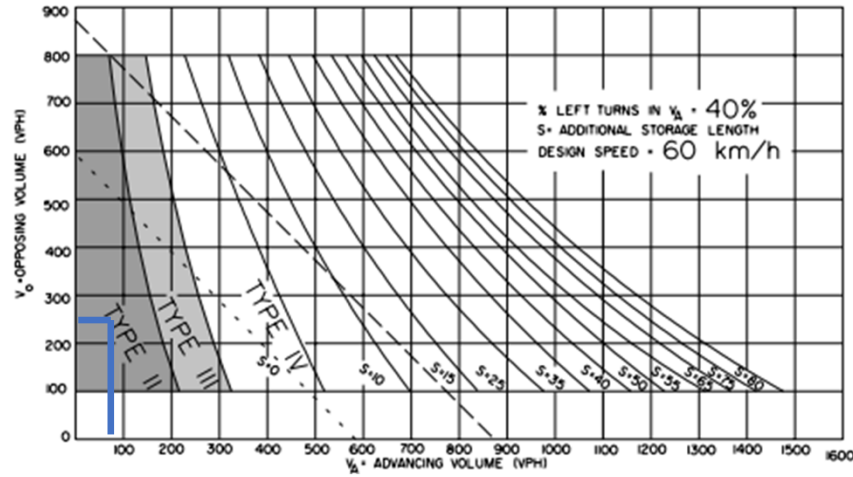
**FIGURE D-7.6-2d WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 60 KM/H, LEFT TURN 35%, 40%**



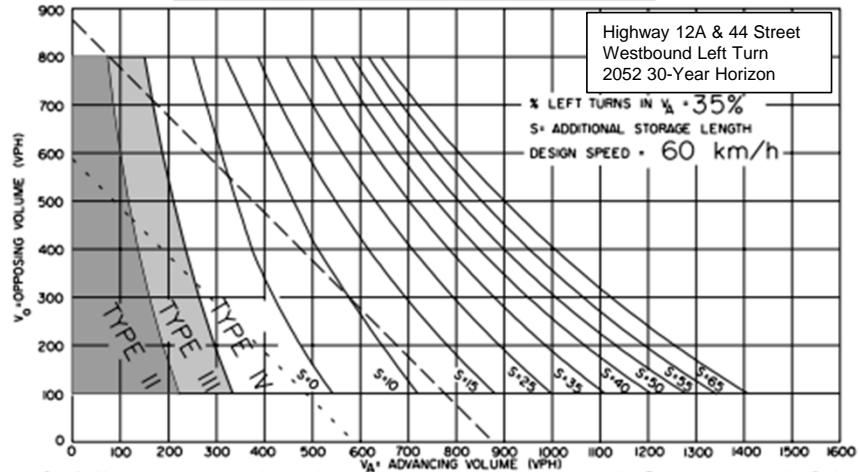
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.  
 - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
 ——— Traffic signals may be warranted in "free flow" urban areas.

**Notes:**

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



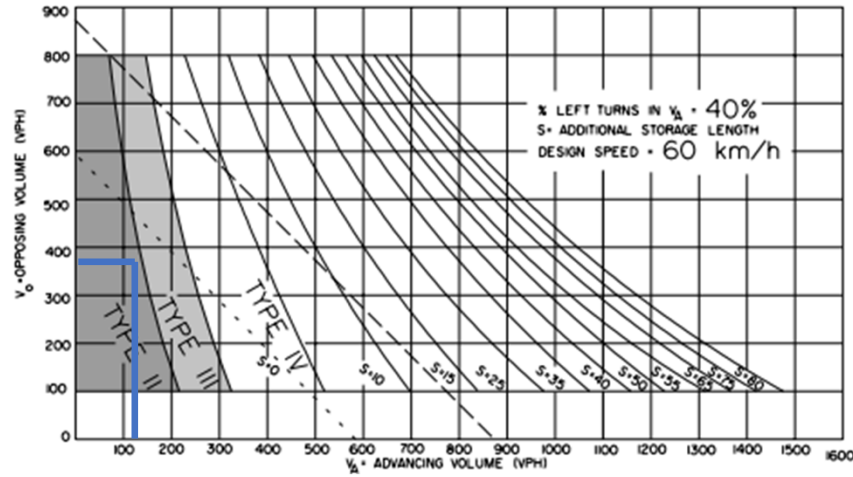
**FIGURE D-7.6-2d WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 60 KM/H, LEFT TURN 35%, 40%**



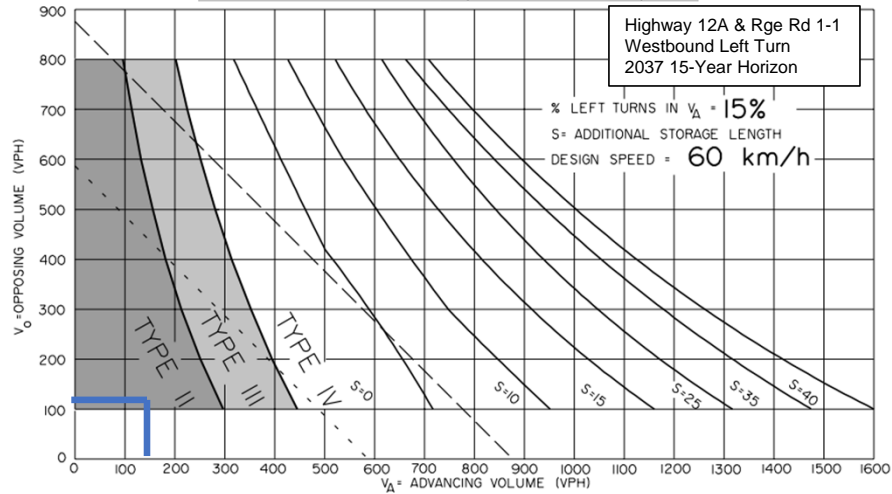
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.  
 - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
 ——— Traffic signals may be warranted in "free flow" urban areas.

**Notes:**

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



**FIGURE D-7.6-2b WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS**  
**DESIGN SPEED 60 KM/H, LEFT TURN 15%, 20%**



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

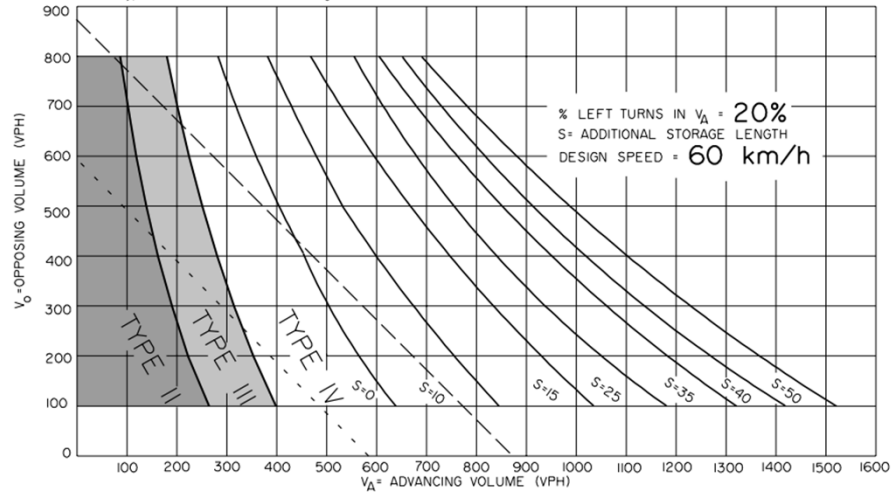
- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

— Traffic signals may be warranted in "free flow" urban areas.

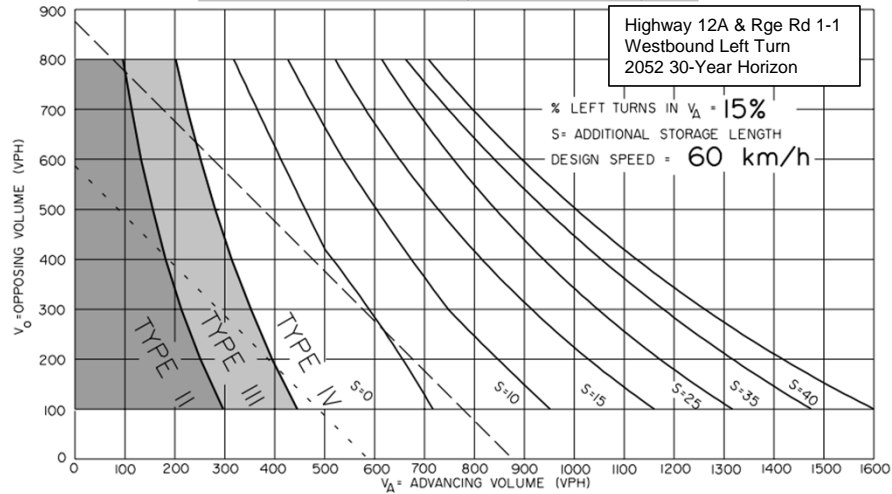
**Notes:**

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

2. Warrant for Type I treatment is shown in Figure D-7.4.



**FIGURE D-7.6-2b WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS**  
**DESIGN SPEED 60 KM/H, LEFT TURN 15%, 20%**



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.

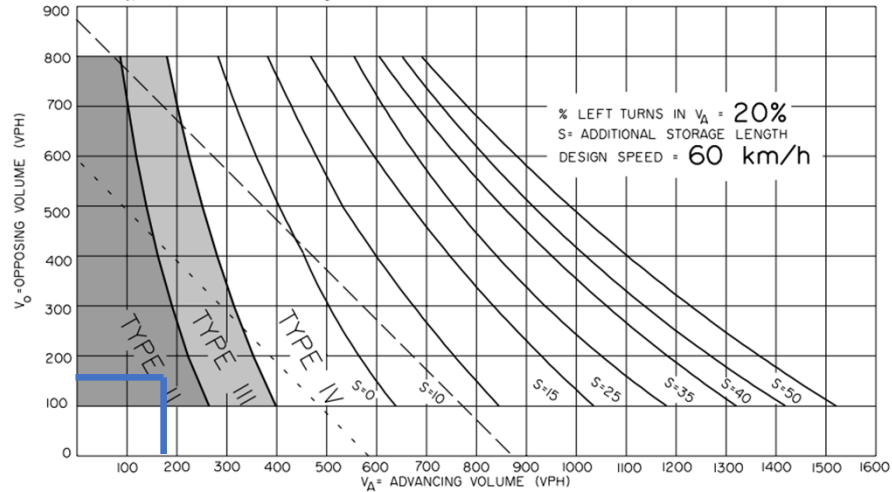
- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.

— Traffic signals may be warranted in "free flow" urban areas.

**Notes:**

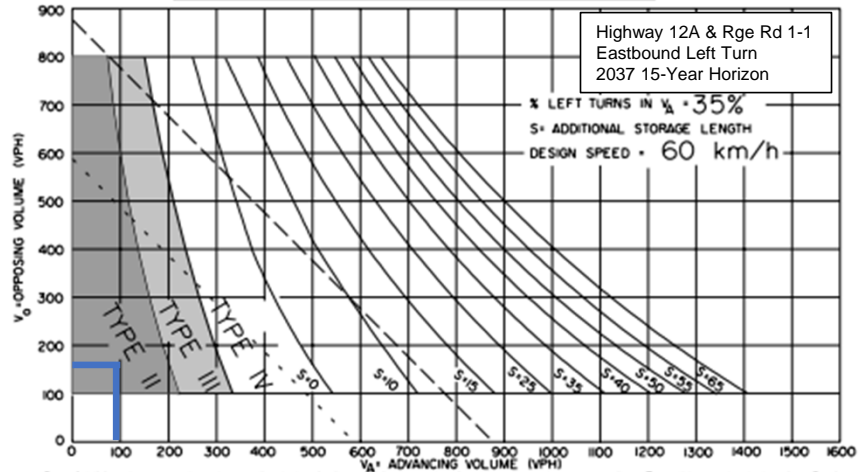
1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.

2. Warrant for Type I treatment is shown in Figure D-7.4.





**FIGURE D-7.6-2d WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 60 KM/H, LEFT TURN 35%, 40%**



S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.  
 - - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
 ——— Traffic signals may be warranted in "free flow" urban areas.

**Notes:**

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.

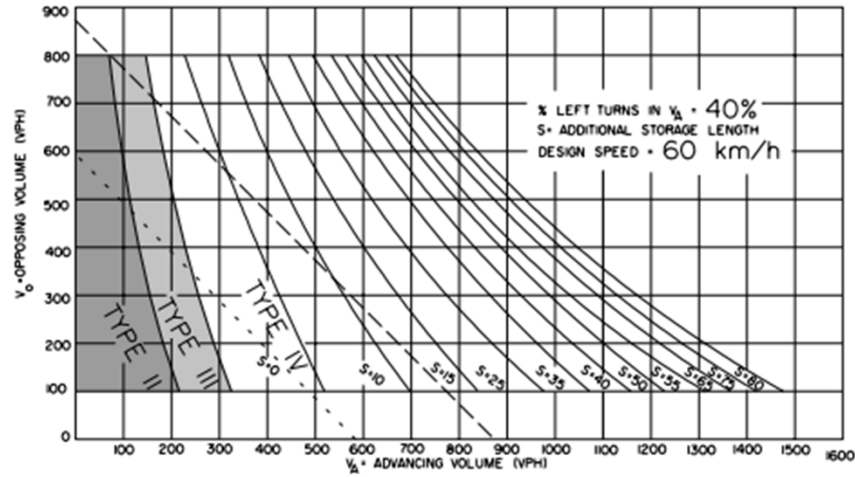
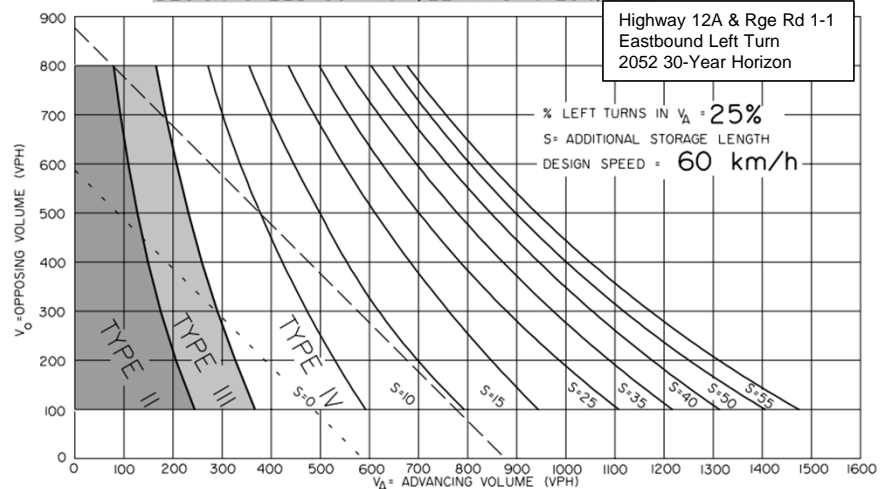




FIGURE D-7.6-2c WARRANTS FOR LEFT TURN TREATMENT AND STORAGE REQUIREMENTS FOR TWO-LANE HIGHWAYS  
DESIGN SPEED 60 KM/H, LEFT TURN 25%, 30%

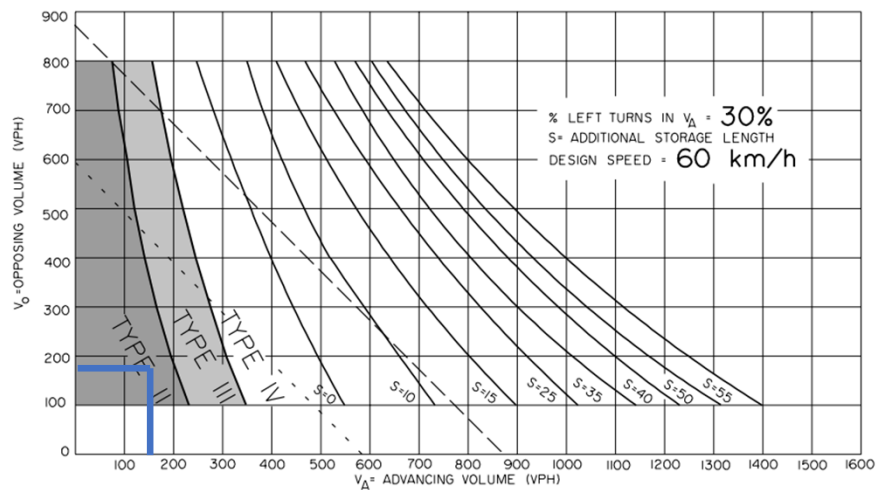


Highway 12A & Rge Rd 1-1  
Eastbound Left Turn  
2052 30-Year Horizon

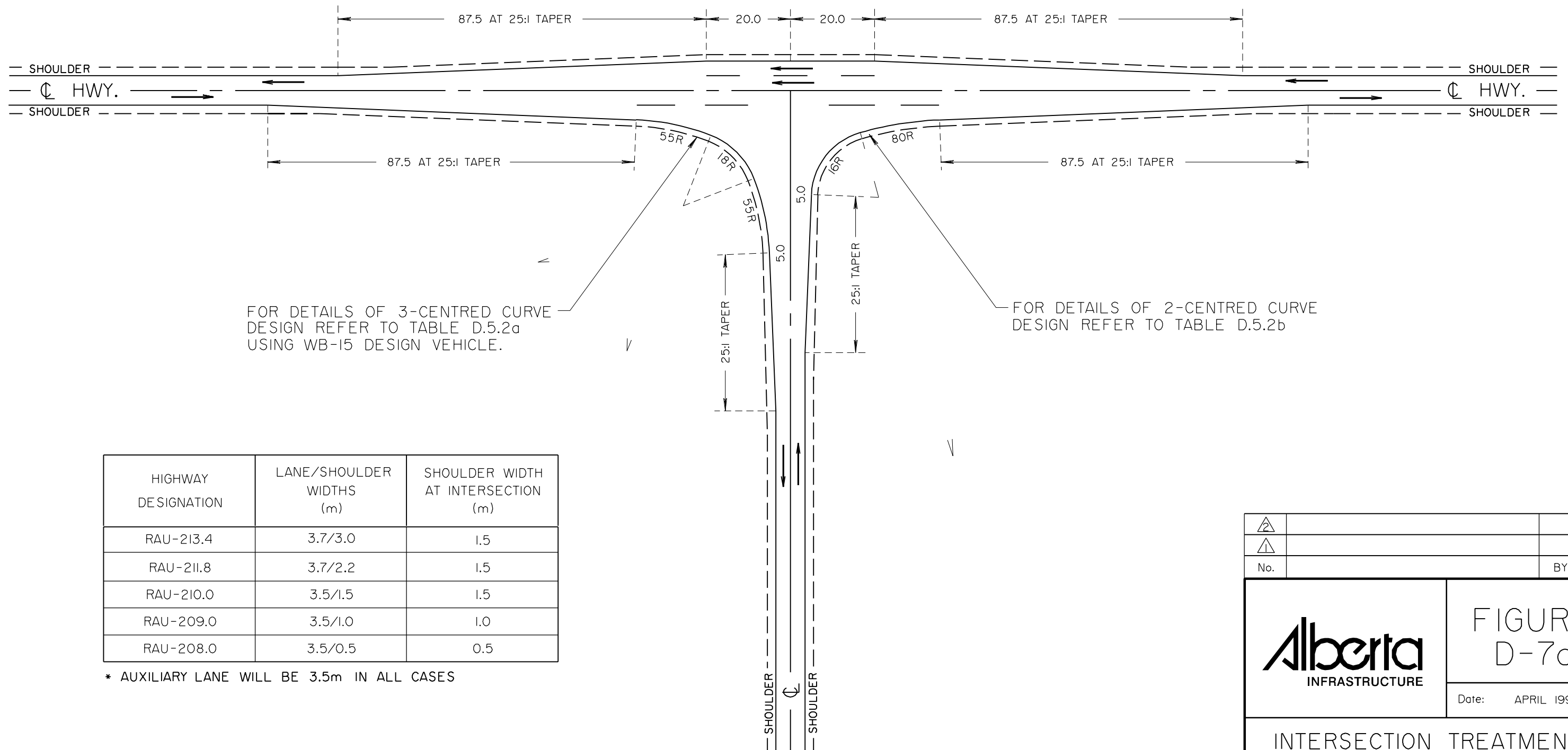
S = Additional storage length required, that is, in addition to what is shown on the appropriate Type IV standard drawing. Designers should check additional storage requirements for trucks, also see Table D.7.6a.  
- - - Traffic signals may be warranted in rural areas, or urban areas, with restricted flow.  
— Traffic signals may be warranted in "free flow" urban areas.

Notes:

1. The traffic signal warrant lines are provided for reference only. For detailed analysis of the requirements for signals, contact Roadway Engineering Branch.
2. Warrant for Type I treatment is shown in Figure D-7.4.



NOTES: DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS.  
ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW  
FOR DEPTH OF BASE COURSE AND PAVEMENT.



FOR DETAILS OF 3-CENTRED CURVE  
DESIGN REFER TO TABLE D.5.2a  
USING WB-15 DESIGN VEHICLE.

FOR DETAILS OF 2-CENTRED CURVE  
DESIGN REFER TO TABLE D.5.2b

HIGHWAY DESIGNATION	LANE/SHOULDER WIDTHS (m)	SHOULDER WIDTH AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5

\* AUXILIARY LANE WILL BE 3.5m IN ALL CASES

△			
△			
No.		BY	DATE

**Alberta**  
INFRASTRUCTURE

FIGURE  
D-7c

Date: APRIL 1995

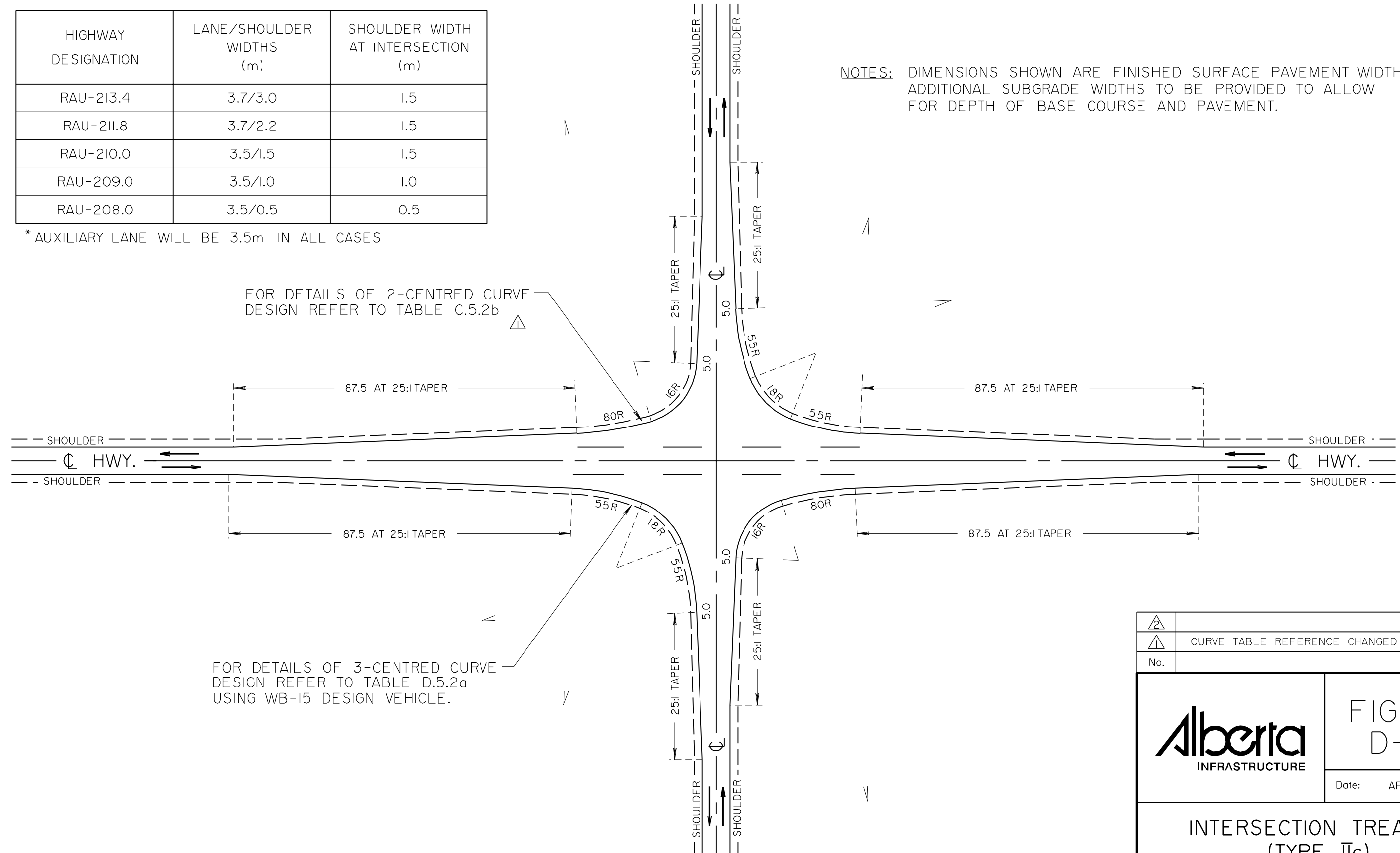
INTERSECTION TREATMENT  
(TYPE IIa)  
(TWO-LANE HIGHWAY)

Prepared By: R.T.	Checked By: B.K.	Scale: N.T.S.	PAGE D-II7
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HIGHWAY DESIGNATION	LANE/SHOULDER WIDTHS (m)	SHOULDER WIDTH AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5

\* AUXILIARY LANE WILL BE 3.5m IN ALL CASES

NOTES: DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS. ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW FOR DEPTH OF BASE COURSE AND PAVEMENT.



△			
△	CURVE TABLE REFERENCE CHANGED	R.M.	05/96
No.		BY	DATE

	<p>FIGURE D-7e</p>
	<p>Date: APRIL 1995</p>

INTERSECTION TREATMENT (TYPE IIc) (TWO-LANE HIGHWAY)

Prepared By: Cgk	Checked By: B.K.	Scale: N.T.S.	PAGE D-121
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TABLE 2: LEFT TURN LANE

HIGHWAY DESIGN SPEED km/h	LENGTH AND TAPER RATIO "TB" OF BYPASS LANE (m)	PARALLEL DECELERATION LANE "P2" ** (m)	LENGTH AVAILABLE FOR DECELERATION ½ TAPER+LANE	DECELERATION LENGTH REQUIRED BASED ON DESIGN SPEED	STORAGE LENGTH PROVIDED BY STANDARD TREATMENT
50	140 at 40:1	20	90	70	20
60	140 at 40:1	35	105	90	15
70	140 at 40:1	55	125	110	15
80	140 at 40:1	80	150	130	20
90	210 at 60:1	70	175	150	25
100	210 at 60:1	85	190	170	20
110	210 at 60:1	100	205	190	15
120	210 at 60:1	120	225	210	15
130	210 at 60:1	125	230	215	15

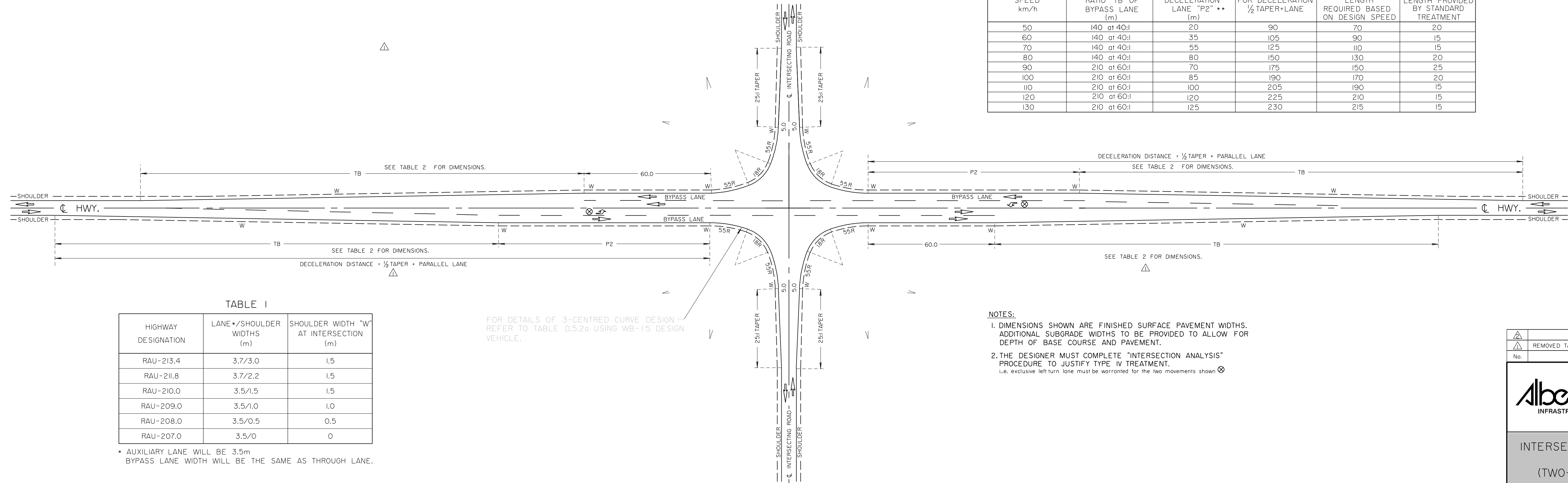


TABLE 1

HIGHWAY DESIGNATION	LANE*/SHOULDER WIDTHS (m)	SHOULDER WIDTH "W" AT INTERSECTION (m)
RAU-213.4	3.7/3.0	1.5
RAU-211.8	3.7/2.2	1.5
RAU-210.0	3.5/1.5	1.5
RAU-209.0	3.5/1.0	1.0
RAU-208.0	3.5/0.5	0.5
RAU-207.0	3.5/0	0

\* AUXILIARY LANE WILL BE 3.5m  
BYPASS LANE WIDTH WILL BE THE SAME AS THROUGH LANE.

FOR DETAILS OF 3-CENTRED CURVE DESIGN REFER TO TABLE D.5.2g USING WB-5 DESIGN VEHICLE.

NOTES:

- DIMENSIONS SHOWN ARE FINISHED SURFACE PAVEMENT WIDTHS. ADDITIONAL SUBGRADE WIDTHS TO BE PROVIDED TO ALLOW FOR DEPTH OF BASE COURSE AND PAVEMENT.
- THE DESIGNER MUST COMPLETE "INTERSECTION ANALYSIS" PROCEDURE TO JUSTIFY TYPE IV TREATMENT.  
i.e. exclusive left turn lane must be warranted for the two movements shown ⊗

△	REMOVED TABLE 3, REV TAPER NOTE	BK	8- 99
No.		BY	DATE

**Alberta**  
INFRASTRUCTURE

**FIGURE D-71**

























Date: OCTOBER 1994

INTERSECTION TREATMENT  
TYPE IVc  
(TWO-LANE HIGHWAY)

**Appendix H – 2037 15-Year Horizon  
Synchro and SIDRA Outputs**

Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2037 15-Year Horizon  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	219	128	63	170	136	25	13	21	182	50	98
Future Volume (vph)	113	219	128	63	170	136	25	13	21	182	50	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.907			0.900	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1708	0	1789	1695	0
Flt Permitted	0.641			0.611			0.655			0.733		
Satd. Flow (perm)	1207	1883	1601	1151	1883	1601	1234	1708	0	1381	1695	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139			148		23			107	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		1248.8			865.9			141.6			680.1	
Travel Time (s)		45.0			31.2			10.6			51.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	123	238	139	68	185	148	27	14	23	198	54	107
Shared Lane Traffic (%)												
Lane Group Flow (vph)	123	238	139	68	185	148	27	37	0	198	161	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		97	97		14	97		97	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		24.0	24.0	
Total Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		24.0	24.0	
Total Split (%)	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%	48.0%	48.0%		48.0%	48.0%	
Maximum Green (s)	20.0	20.0	20.0	20.0	20.0	20.0	18.0	18.0		18.0	18.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	

Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

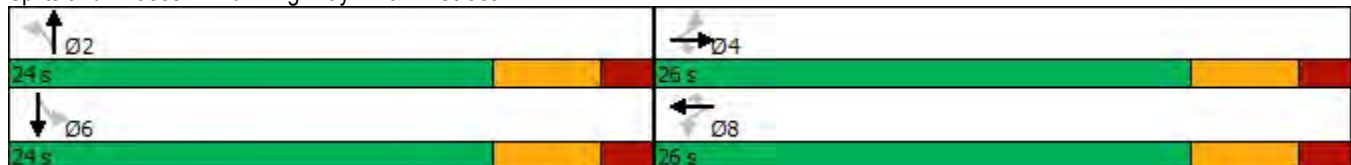
2037 15-Year Horizon  
Timing Plan: AM Peak

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	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	21.6	21.6	21.6	21.6	21.6	21.6	18.4	18.4		18.4	18.4	
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52	0.52	0.44	0.44		0.44	0.44	
v/c Ratio	0.20	0.24	0.15	0.11	0.19	0.16	0.05	0.05		0.32	0.20	
Control Delay	10.0	9.5	2.8	9.2	9.2	2.8	11.4	7.1		14.6	5.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.0	9.5	2.8	9.2	9.2	2.8	11.4	7.1		14.6	5.9	
LOS	A	A	A	A	A	A	B	A		B	A	
Approach Delay		7.8			6.9			9.0			10.7	
Approach LOS		A			A			A			B	
Queue Length 50th (m)	5.2	10.4	0.0	2.8	7.8	0.0	1.5	0.8		12.7	3.1	
Queue Length 95th (m)	16.0	26.4	7.5	9.8	20.9	7.7	5.3	5.0		26.2	12.2	
Internal Link Dist (m)		1224.8			841.9			117.6			656.1	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	627	978	898	598	978	902	576	810		645	849	
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	0.20	0.24	0.15	0.11	0.19	0.16	0.05	0.05		0.31	0.19	

Intersection Summary

























Area Type: Other  
 Cycle Length: 50  
 Actuated Cycle Length: 41.6  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.32  
 Intersection Signal Delay: 8.3  
 Intersection Capacity Utilization 69.1%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service C

Splits and Phases: 101: Highway 12 & 44 Street



Lanes, Volumes, Timings  
102: Highway 12 & Range Road 1-1

2037 15-Year Horizon  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	175	217	28	68	200	396	10	9	26	361	22	154
Future Volume (vph)	175	217	28	68	200	396	10	9	26	361	22	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.889				0.869
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1674	0	1789	1637	0
Flt Permitted	0.622			0.598			0.637			0.550		
Satd. Flow (perm)	1172	1883	1601	1126	1883	1601	1200	1674	0	1036	1637	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			430		28				167
Link Speed (k/h)		100			100			48				48
Link Distance (m)		865.9			685.6			377.3				800.6
Travel Time (s)		31.2			24.7			28.3				60.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	236	30	74	217	430	11	10	28	392	24	167
Shared Lane Traffic (%)												
Lane Group Flow (vph)	190	236	30	74	217	430	11	38	0	392	191	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		pm+pt		NA
Protected Phases		4			8			2		1		6
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		1		6
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		7.0		12.0
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		11.5		24.0
Total Split (s)	38.0	38.0	38.0	38.0	38.0	38.0	25.0	25.0		27.0		52.0
Total Split (%)	42.2%	42.2%	42.2%	42.2%	42.2%	42.2%	27.8%	27.8%		30.0%		57.8%
Maximum Green (s)	32.0	32.0	32.0	32.0	32.0	32.0	19.0	19.0		23.0		46.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		3.0		4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		1.0		2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		4.0		6.0
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	None	None	None	None	None	None	Min	Min		None		Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0				7.0



Lanes, Volumes, Timings  
102: Highway 12 & Range Road 1-1

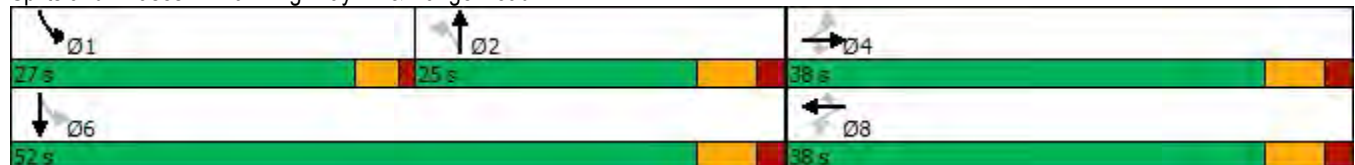
2037 15-Year Horizon  
Timing Plan: AM Peak

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
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0				0
Act Effct Green (s)	21.3	21.3	21.3	21.3	21.3	21.3	12.1	12.1		33.0	31.0	
Actuated g/C Ratio	0.33	0.33	0.33	0.33	0.33	0.33	0.19	0.19		0.51	0.48	
v/c Ratio	0.49	0.38	0.05	0.20	0.35	0.53	0.05	0.11		0.56	0.22	
Control Delay	23.4	19.5	0.2	18.4	19.1	4.7	25.6	14.3		13.4	3.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	23.4	19.5	0.2	18.4	19.1	4.7	25.6	14.3		13.4	3.1	
LOS	C	B	A	B	B	A	C	B		B	A	
Approach Delay		19.9			10.5			16.8			10.0	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	17.2	20.5	0.0	6.0	18.6	0.0	1.0	1.0		25.5	1.4	
Queue Length 95th (m)	40.1	43.4	0.0	16.9	40.0	17.6	5.6	8.9		51.8	10.9	
Internal Link Dist (m)		841.9			661.6			353.3			776.6	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	588	945	846	565	945	1018	357	519		802	1228	
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	0.32	0.25	0.04	0.13	0.23	0.42	0.03	0.07		0.49	0.16	

Intersection Summary






















Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 64.4  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.56  
 Intersection Signal Delay: 12.9  
 Intersection Capacity Utilization 75.0%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 102: Highway 12 & Range Road 1-1



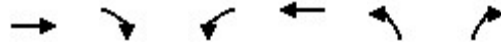
HCM Unsignalized Intersection Capacity Analysis  
 103: Highway 12 & 52 Street

2037 15-Year Horizon  
 Timing Plan: AM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	109	436	27	4	266	21	7	13	9	11	9	92
Future Volume (Veh/h)	109	436	27	4	266	21	7	13	9	11	9	92
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	474	29	4	289	23	8	14	10	12	10	100
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	312			503			1126	1044	488	1024	1036	289
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	312			503			1126	1044	488	1024	1036	289
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	91			100			94	93	98	93	95	87
cM capacity (veh/h)	1248			1061			141	206	579	184	209	750
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	118	503	4	289	23	32	122					
Volume Left	118	0	4	0	0	8	12					
Volume Right	0	29	0	0	23	10	100					
cSH	1248	1700	1061	1700	1700	225	495					
Volume to Capacity	0.09	0.30	0.00	0.17	0.01	0.14	0.25					
Queue Length 95th (m)	2.4	0.0	0.1	0.0	0.0	3.7	7.3					
Control Delay (s)	8.2	0.0	8.4	0.0	0.0	23.6	14.6					
Lane LOS	A		A			C	B					
Approach Delay (s)	1.6		0.1			23.6	14.6					
Approach LOS						C	B					
Intersection Summary												
Average Delay			3.2									
Intersection Capacity Utilization			45.4%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

2037 15-Year Horizon  
 Timing Plan: AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	
Traffic Volume (veh/h)	104	159	35	57	38	7
Future Volume (Veh/h)	104	159	35	57	38	7
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	113	173	38	62	41	8
<b>Pedestrians</b>						
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			286		251	113
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			286		251	113
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		94	99
cM capacity (veh/h)			1276		716	940
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>NB 1</b>		
Volume Total	113	173	100	49		
Volume Left	0	0	38	41		
Volume Right	0	173	0	8		
cSH	1700	1700	1276	745		
Volume to Capacity	0.07	0.10	0.03	0.07		
Queue Length 95th (m)	0.0	0.0	0.7	1.6		
Control Delay (s)	0.0	0.0	3.2	10.2		
Lane LOS			A	B		
Approach Delay (s)	0.0		3.2	10.2		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			1.9			
Intersection Capacity Utilization			21.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings  
105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	30	42	38	20	42	89	14	501	8	87	492	37
Future Volume (vph)	30	42	38	20	42	89	14	501	8	87	492	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.954			0.921			0.998			0.992	
Fl <sub>t</sub> Protected		0.986			0.993			0.999			0.993	
Satd. Flow (prot)	0	1772	0	0	1723	0	0	1878	0	0	1855	0
Fl <sub>t</sub> Permitted		0.884			0.945			0.979			0.854	
Satd. Flow (perm)	0	1588	0	0	1639	0	0	1840	0	0	1596	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		27			73			2			7	
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		789.8			959.6			800.6			722.0	
Travel Time (s)		59.2			72.0			60.0			54.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	46	41	22	46	97	15	545	9	95	535	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	120	0	0	165	0	0	569	0	0	670	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	26.0	26.0		26.0	26.0		64.0	64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%		71.1%	71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		58.0	58.0		58.0	58.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		21.4			21.4			39.1			39.1	

Lanes, Volumes, Timings  
 105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
 Timing Plan: AM Peak

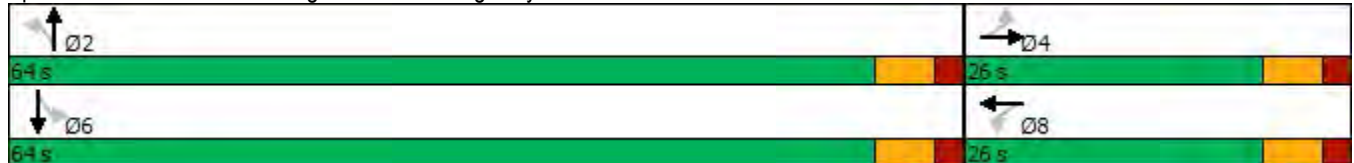


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.34			0.34			0.62			0.62	
v/c Ratio		0.21			0.27			0.50			0.67	
Control Delay		18.1			14.4			11.6			15.7	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.1			14.4			11.6			15.7	
LOS		B			B			B			B	
Approach Delay		18.1			14.4			11.6			15.7	
Approach LOS		B			B			B			B	
Queue Length 50th (m)		8.0			7.9			45.0			62.7	
Queue Length 95th (m)		25.8			27.9			68.4			100.2	
Internal Link Dist (m)		765.8			935.6			776.6			698.0	
Turn Bay Length (m)												
Base Capacity (vph)		559			607			1625			1410	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.21			0.27			0.35			0.48	

Intersection Summary

























Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	62.8
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.67
Intersection Signal Delay:	14.2
Intersection LOS:	B
Intersection Capacity Utilization:	92.2%
ICU Level of Service:	F
Analysis Period (min):	15

Splits and Phases: 105: Range Road 1-1 & Highway 12A



Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2037 15-Year Horizon  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	137	41	30	228	212	111	46	69	174	19	132
Future Volume (vph)	120	137	41	30	228	212	111	46	69	174	19	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.910			0.869	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1714	0	1789	1637	0
Flt Permitted	0.605			0.662			0.653			0.677		
Satd. Flow (perm)	1139	1883	1601	1247	1883	1601	1230	1714	0	1275	1637	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			45			230		75			143	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		1248.8			865.9			141.6			680.1	
Travel Time (s)		45.0			31.2			10.6			51.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	149	45	33	248	230	121	50	75	189	21	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	130	149	45	33	248	230	121	125	0	189	164	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		24.0	24.0	
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0	47.0	47.0		47.0	47.0	
Total Split (%)	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	52.2%	52.2%		52.2%	52.2%	
Maximum Green (s)	37.0	37.0	37.0	37.0	37.0	37.0	41.0	41.0		41.0	41.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	

Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2037 15-Year Horizon  
Timing Plan: 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	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	20.0	20.0	20.0	20.0	20.0	20.0	13.2	13.2		13.2	13.2	
Actuated g/C Ratio	0.44	0.44	0.44	0.44	0.44	0.44	0.29	0.29		0.29	0.29	
v/c Ratio	0.26	0.18	0.06	0.06	0.30	0.28	0.34	0.23		0.51	0.28	
Control Delay	10.3	8.9	3.7	8.4	9.8	2.7	15.5	7.1		18.7	5.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	10.3	8.9	3.7	8.4	9.8	2.7	15.5	7.1		18.7	5.0	
LOS	B	A	A	A	A	A	B	A		B	A	
Approach Delay		8.8			6.5			11.2			12.4	
Approach LOS		A			A			B			B	
Queue Length 50th (m)	5.6	6.2	0.0	1.3	10.9	0.0	7.4	2.8		12.2	1.2	
Queue Length 95th (m)	16.6	16.7	4.1	5.5	26.8	9.3	17.1	11.0		25.9	10.2	
Internal Link Dist (m)		1224.8			841.9			117.6			656.1	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	932	1541	1318	1020	1541	1352	1116	1561		1156	1498	
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	0.14	0.10	0.03	0.03	0.16	0.17	0.11	0.08		0.16	0.11	

Intersection Summary

























Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 45.3  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.51  
 Intersection Signal Delay: 9.3  
 Intersection Capacity Utilization 73.3%  
 Analysis Period (min) 15  
 Intersection LOS: A  
 ICU Level of Service D

Splits and Phases: 101: Highway 12 & 44 Street



Lanes, Volumes, Timings  
102: Highway 12 & Range Road 1-1

2037 15-Year Horizon  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	156	182	13	35	252	364	25	21	74	462	11	198
Future Volume (vph)	156	182	13	35	252	364	25	21	74	462	11	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.883			0.858	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1663	0	1789	1616	0
Flt Permitted	0.529			0.633			0.617			0.520		
Satd. Flow (perm)	996	1883	1601	1192	1883	1601	1162	1663	0	979	1616	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			85			396		80			215	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		865.9			685.6			377.3			800.6	
Travel Time (s)		31.2			24.7			28.3			60.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	170	198	14	38	274	396	27	23	80	502	12	215
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	198	14	38	274	396	27	103	0	502	227	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		3.7			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		7.0	12.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		11.5	24.0	
Total Split (s)	35.0	35.0	35.0	35.0	35.0	35.0	25.0	25.0		30.0	55.0	
Total Split (%)	38.9%	38.9%	38.9%	38.9%	38.9%	38.9%	27.8%	27.8%		33.3%	61.1%	
Maximum Green (s)	29.0	29.0	29.0	29.0	29.0	29.0	19.0	19.0		26.0	49.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		4.0	6.0	
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	None	None	None	None	None	None	Min	Min		None	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0			7.0	



Lanes, Volumes, Timings  
 102: Highway 12 & Range Road 1-1

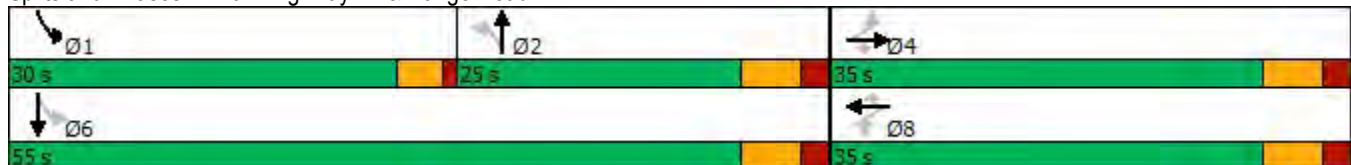
2037 15-Year Horizon  
 Timing Plan: PM Peak

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
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0				0
Act Effct Green (s)	22.1	22.1	22.1	22.1	22.1	22.1	12.2	12.2		36.3	34.3	
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.32	0.32	0.18	0.18		0.53	0.50	
v/c Ratio	0.53	0.33	0.02	0.10	0.45	0.51	0.13	0.29		0.69	0.25	
Control Delay	27.2	20.3	0.1	18.5	22.1	4.8	29.4	13.3		16.4	2.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	27.2	20.3	0.1	18.5	22.1	4.8	29.4	13.3		16.4	2.7	
LOS	C	C	A	B	C	A	C	B		B	A	
Approach Delay		22.6			12.2			16.6			12.1	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	17.0	18.3	0.0	3.3	26.5	0.0	2.8	2.3		35.5	0.7	
Queue Length 95th (m)	39.5	38.3	0.0	10.5	52.8	17.4	11.0	16.5		74.9	11.0	
Internal Link Dist (m)		841.9			661.6			353.3			776.6	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	427	807	734	511	807	912	326	524		829	1229	
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	0.40	0.25	0.02	0.07	0.34	0.43	0.08	0.20		0.61	0.18	

Intersection Summary





















Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 68.5  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.69  
 Intersection Signal Delay: 14.5  
 Intersection Capacity Utilization 80.6%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service D

Splits and Phases: 102: Highway 12 & Range Road 1-1



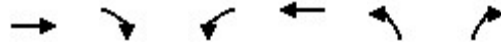
HCM Unsignalized Intersection Capacity Analysis  
 103: Highway 12 & 52 Street

2037 15-Year Horizon  
 Timing Plan: PM Peak

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	108	280	8	6	449	14	24	10	3	16	3	89
Future Volume (Veh/h)	108	280	8	6	449	14	24	10	3	16	3	89
Sign Control	Free			Free			Stop			Stop		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	117	304	9	7	488	15	26	11	3	17	3	97
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	503			313			1143	1060	308	1048	1049	488
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	503			313			1143	1060	308	1048	1049	488
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
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 %	89			99			80	94	100	90	99	83
cM capacity (veh/h)	1061			1247			133	198	732	179	201	580
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1					
Volume Total	117	313	7	488	15	40	117					
Volume Left	117	0	7	0	0	26	17					
Volume Right	0	9	0	0	15	3	97					
cSH	1061	1700	1247	1700	1700	157	422					
Volume to Capacity	0.11	0.18	0.01	0.29	0.01	0.26	0.28					
Queue Length 95th (m)	2.8	0.0	0.1	0.0	0.0	7.3	8.5					
Control Delay (s)	8.8	0.0	7.9	0.0	0.0	35.6	16.8					
Lane LOS	A		A			E	C					
Approach Delay (s)	2.4		0.1			35.6	16.8					
Approach LOS						E	C					
Intersection Summary												
Average Delay			4.1									
Intersection Capacity Utilization			46.1%	ICU Level of Service		A						
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

2037 15-Year Horizon  
 Timing Plan: PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	
Traffic Volume (veh/h)	61	45	9	106	161	37
Future Volume (Veh/h)	61	45	9	106	161	37
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	66	49	10	115	175	40
<b>Pedestrians</b>						
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			115		201	66
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			115		201	66
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		78	96
cM capacity (veh/h)			1474		782	998
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>NB 1</b>		
Volume Total	66	49	125	215		
Volume Left	0	0	10	175		
Volume Right	0	49	0	40		
cSH	1700	1700	1474	815		
Volume to Capacity	0.04	0.03	0.01	0.26		
Queue Length 95th (m)	0.0	0.0	0.2	8.1		
Control Delay (s)	0.0	0.0	0.6	11.0		
Lane LOS			A	B		
Approach Delay (s)	0.0		0.6	11.0		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			5.4			
Intersection Capacity Utilization			30.6%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings  
105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	37	44	18	10	33	86	35	487	19	104	589	45
Future Volume (vph)	37	44	18	10	33	86	35	487	19	104	589	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.975			0.910			0.995			0.992	
Fl <sub>t</sub> Protected		0.982			0.996			0.997			0.993	
Satd. Flow (prot)	0	1803	0	0	1707	0	0	1868	0	0	1855	0
Fl <sub>t</sub> Permitted		0.857			0.972			0.923			0.845	
Satd. Flow (perm)	0	1574	0	0	1666	0	0	1730	0	0	1579	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			93			4			7	
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		789.8			959.6			800.6			722.0	
Travel Time (s)		59.2			72.0			60.0			54.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	48	20	11	36	93	38	529	21	113	640	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	108	0	0	140	0	0	588	0	0	802	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	26.0	26.0		26.0	26.0		64.0	64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%		71.1%	71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		58.0	58.0		58.0	58.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		21.1			21.1			49.6			49.6	

Lanes, Volumes, Timings  
 105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
 Timing Plan: PM Peak

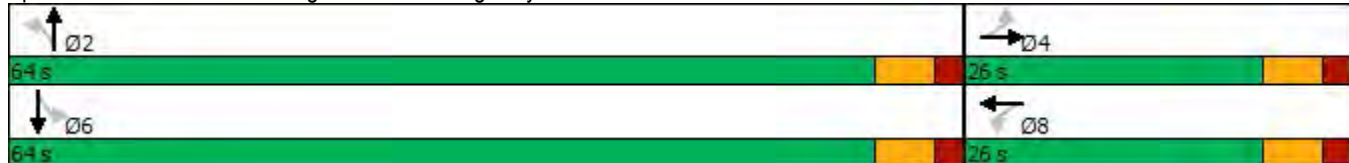


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.29			0.29			0.68			0.68	
v/c Ratio		0.23			0.26			0.50			0.75	
Control Delay		25.2			12.8			10.5			17.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		25.2			12.8			10.5			17.4	
LOS		C			B			B			B	
Approach Delay		25.2			12.8			10.5			17.4	
Approach LOS		C			B			B			B	
Queue Length 50th (m)		10.8			5.1			48.5			88.7	
Queue Length 95th (m)		27.9			21.3			73.4			143.4	
Internal Link Dist (m)		765.8			935.6			776.6			698.0	
Turn Bay Length (m)												
Base Capacity (vph)		461			545			1363			1245	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.23			0.26			0.43			0.64	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	73.4
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.75
Intersection Signal Delay:	15.1
Intersection LOS:	B
Intersection Capacity Utilization:	93.4%
ICU Level of Service:	F
Analysis Period (min):	15

Splits and Phases: 105: Range Road 1-1 & Highway 12A

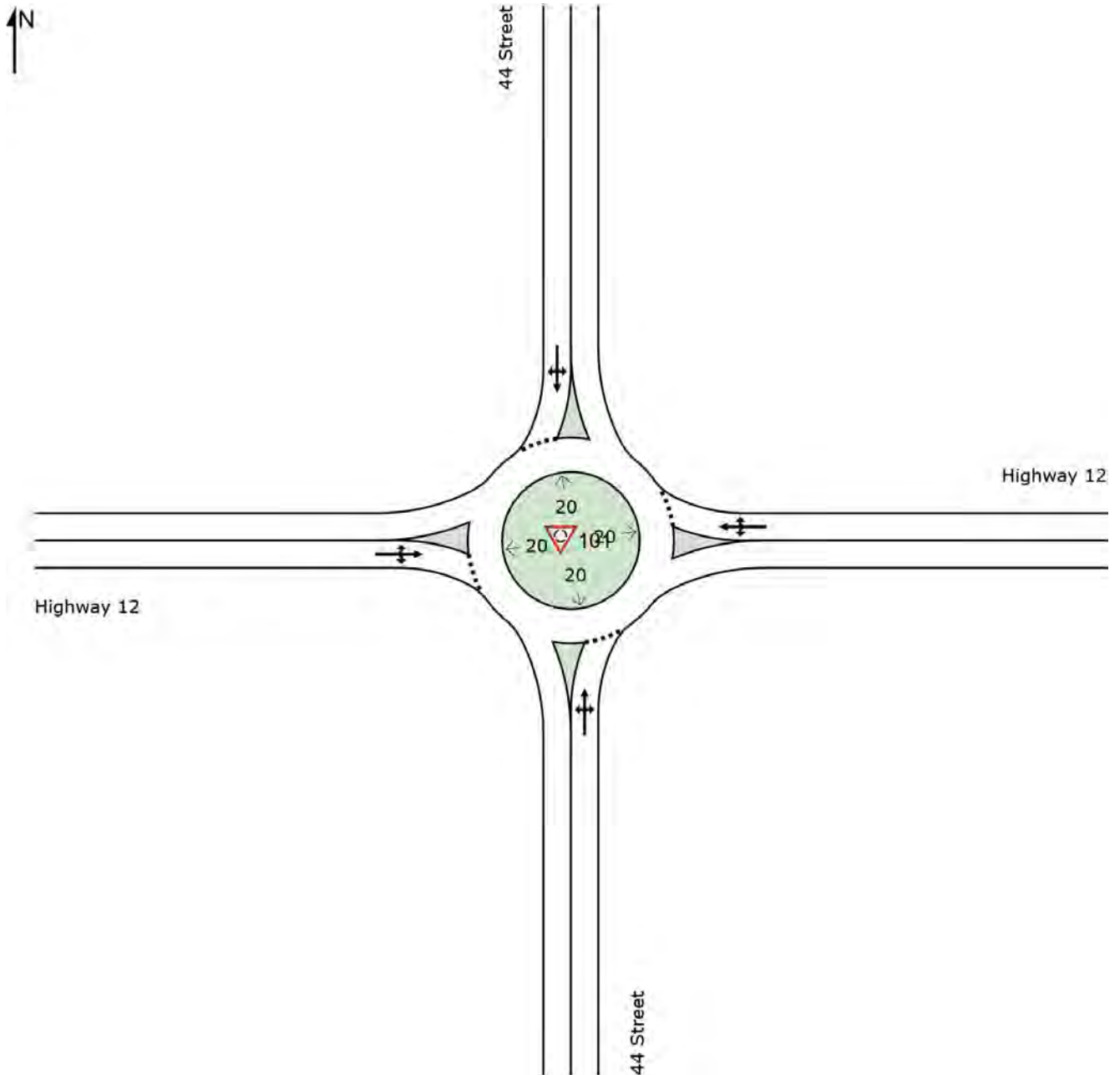


# SITE LAYOUT

 Site: 101 [Bentley SEASP TIA - Highway 12 & 44 St - 2037 - AM Peak (Site Folder: General)]

New Site  
Site Category: (None)  
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 44 St - 2037 - AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: 44 Street														
1	L2	25	2.0	27	2.0	0.074	11.7	LOS B	0.4	3.0	0.63	0.68	0.63	52.8
2	T1	13	2.0	14	2.0	0.074	7.0	LOS A	0.4	3.0	0.63	0.68	0.63	52.9
3	R2	21	2.0	23	2.0	0.074	6.8	LOS A	0.4	3.0	0.63	0.68	0.63	51.7
Approach		59	2.0	64	2.0	0.074	8.9	LOS A	0.4	3.0	0.63	0.68	0.63	52.4
East: Highway 12														
4	L2	63	2.0	68	2.0	0.325	9.7	LOS A	2.2	15.5	0.43	0.54	0.43	54.5
5	T1	170	2.0	185	2.0	0.325	5.1	LOS A	2.2	15.5	0.43	0.54	0.43	54.6
6	R2	136	2.0	148	2.0	0.325	4.8	LOS A	2.2	15.5	0.43	0.54	0.43	53.3
Approach		369	2.0	401	2.0	0.325	5.8	LOS A	2.2	15.5	0.43	0.54	0.43	54.1
North: 44 Street														
7	L2	182	2.0	198	2.0	0.330	10.5	LOS B	2.1	15.1	0.54	0.66	0.54	53.0
8	T1	50	2.0	54	2.0	0.330	5.8	LOS A	2.1	15.1	0.54	0.66	0.54	53.1
9	R2	98	2.0	107	2.0	0.330	5.6	LOS A	2.1	15.1	0.54	0.66	0.54	51.9
Approach		330	2.0	359	2.0	0.330	8.3	LOS A	2.1	15.1	0.54	0.66	0.54	52.7
West: Highway 12														
10	L2	113	2.0	123	2.0	0.471	11.0	LOS B	3.5	24.7	0.64	0.68	0.64	53.4
11	T1	219	2.0	238	2.0	0.471	6.4	LOS A	3.5	24.7	0.64	0.68	0.64	53.5
12	R2	128	2.0	139	2.0	0.471	6.2	LOS A	3.5	24.7	0.64	0.68	0.64	52.2
Approach		460	2.0	500	2.0	0.471	7.5	LOS A	3.5	24.7	0.64	0.68	0.64	53.1
All Vehicles		1218	2.0	1324	2.0	0.471	7.3	LOS A	3.5	24.7	0.55	0.63	0.55	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 44 St - 2037 - PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: 44 Street														
1	L2	111	2.0	121	2.0	0.261	11.5	LOS B	1.6	11.3	0.62	0.73	0.62	52.7
2	T1	46	2.0	50	2.0	0.261	6.9	LOS A	1.6	11.3	0.62	0.73	0.62	52.7
3	R2	69	2.0	75	2.0	0.261	6.7	LOS A	1.6	11.3	0.62	0.73	0.62	51.5
Approach		226	2.0	246	2.0	0.261	9.1	LOS A	1.6	11.3	0.62	0.73	0.62	52.3
East: Highway 12														
4	L2	30	2.0	33	2.0	0.470	10.9	LOS B	3.4	24.3	0.62	0.64	0.62	54.1
5	T1	228	2.0	248	2.0	0.470	6.2	LOS A	3.4	24.3	0.62	0.64	0.62	54.1
6	R2	212	2.0	230	2.0	0.470	6.0	LOS A	3.4	24.3	0.62	0.64	0.62	52.9
Approach		470	2.0	511	2.0	0.470	6.4	LOS A	3.4	24.3	0.62	0.64	0.62	53.5
North: 44 Street														
7	L2	174	2.0	189	2.0	0.361	11.3	LOS B	2.4	17.1	0.64	0.73	0.64	52.7
8	T1	19	2.0	21	2.0	0.361	6.7	LOS A	2.4	17.1	0.64	0.73	0.64	52.8
9	R2	132	2.0	143	2.0	0.361	6.5	LOS A	2.4	17.1	0.64	0.73	0.64	51.6
Approach		325	2.0	353	2.0	0.361	9.1	LOS A	2.4	17.1	0.64	0.73	0.64	52.3
West: Highway 12														
10	L2	120	2.0	130	2.0	0.291	10.2	LOS B	1.9	13.4	0.50	0.62	0.50	53.5
11	T1	137	2.0	149	2.0	0.291	5.5	LOS A	1.9	13.4	0.50	0.62	0.50	53.5
12	R2	41	2.0	45	2.0	0.291	5.3	LOS A	1.9	13.4	0.50	0.62	0.50	52.3
Approach		298	2.0	324	2.0	0.291	7.4	LOS A	1.9	13.4	0.50	0.62	0.50	53.3
All Vehicles		1319	2.0	1434	2.0	0.470	7.8	LOS A	3.4	24.3	0.60	0.67	0.60	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

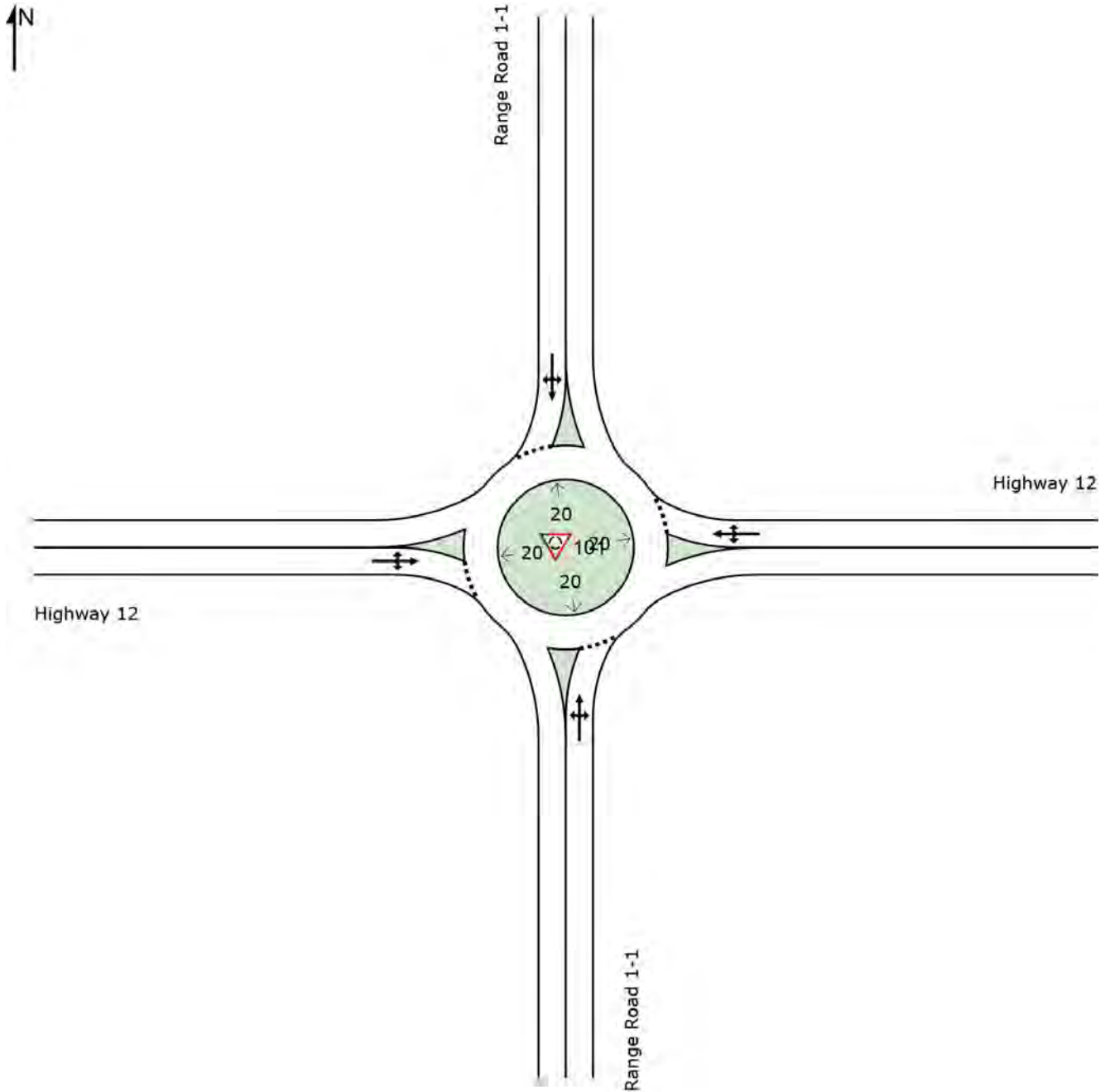


# SITE LAYOUT

Site: 101 [Bentley SEASP TIA - Highway 12 & Range Road 1-1 - 2037 AM Peak (Site Folder: General)]

New Site  
Site Category: (None)  
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & Range Road 1-1 - 2037 AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: Range Road 1-1														
1	L2	10	2.0	11	2.0	0.066	12.8	LOS B	0.4	2.8	0.71	0.70	0.71	52.7
2	T1	9	2.0	10	2.0	0.066	8.2	LOS A	0.4	2.8	0.71	0.70	0.71	52.8
3	R2	26	2.0	28	2.0	0.066	8.0	LOS A	0.4	2.8	0.71	0.70	0.71	51.6
Approach		45	2.0	49	2.0	0.066	9.1	LOS A	0.4	2.8	0.71	0.70	0.71	52.1
East: Highway 12														
4	L2	68	2.0	74	2.0	0.580	10.4	LOS B	5.2	37.3	0.64	0.61	0.64	54.0
5	T1	200	2.0	217	2.0	0.580	5.8	LOS A	5.2	37.3	0.64	0.61	0.64	54.1
6	R2	369	2.0	401	2.0	0.580	5.6	LOS A	5.2	37.3	0.64	0.61	0.64	52.8
Approach		637	2.0	692	2.0	0.580	6.2	LOS A	5.2	37.3	0.64	0.61	0.64	53.4
North: Range Road 1-1														
7	L2	261	2.0	284	2.0	0.448	10.8	LOS B	3.3	23.8	0.64	0.70	0.64	52.6
8	T1	22	2.0	24	2.0	0.448	6.2	LOS A	3.3	23.8	0.64	0.70	0.64	52.7
9	R2	154	2.0	167	2.0	0.448	6.0	LOS A	3.3	23.8	0.64	0.70	0.64	51.5
Approach		437	2.0	475	2.0	0.448	8.9	LOS A	3.3	23.8	0.64	0.70	0.64	52.2
West: Highway 12														
10	L2	175	2.0	190	2.0	0.463	11.4	LOS B	3.4	24.1	0.69	0.73	0.69	52.6
11	T1	217	2.0	236	2.0	0.463	6.8	LOS A	3.4	24.1	0.69	0.73	0.69	52.6
12	R2	28	2.0	30	2.0	0.463	6.6	LOS A	3.4	24.1	0.69	0.73	0.69	51.4
Approach		420	2.0	457	2.0	0.463	8.7	LOS A	3.4	24.1	0.69	0.73	0.69	52.5
All Vehicles		1539	2.0	1673	2.0	0.580	7.7	LOS A	5.2	37.3	0.65	0.67	0.65	52.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & Range Road 1-1 - 2037 PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: Range Road 1-1														
1	L2	25	2.0	27	2.0	0.213	15.0	LOS B	1.4	10.3	0.84	0.85	0.84	51.2
2	T1	21	2.0	23	2.0	0.213	10.4	LOS B	1.4	10.3	0.84	0.85	0.84	51.3
3	R2	74	2.0	80	2.0	0.213	10.2	LOS B	1.4	10.3	0.84	0.85	0.84	50.1
Approach		120	2.0	130	2.0	0.213	11.2	LOS B	1.4	10.3	0.84	0.85	0.84	50.5
East: Highway 12														
4	L2	35	2.0	38	2.0	0.599	10.5	LOS B	5.5	39.3	0.66	0.62	0.66	54.0
5	T1	252	2.0	274	2.0	0.599	5.9	LOS A	5.5	39.3	0.66	0.62	0.66	54.1
6	R2	364	2.0	396	2.0	0.599	5.7	LOS A	5.5	39.3	0.66	0.62	0.66	52.8
Approach		651	2.0	708	2.0	0.599	6.0	LOS A	5.5	39.3	0.66	0.62	0.66	53.4
North: Range Road 1-1														
7	L2	462	2.0	502	2.0	0.700	13.6	LOS B	8.4	59.9	0.84	0.86	0.99	50.7
8	T1	11	2.0	12	2.0	0.700	9.0	LOS A	8.4	59.9	0.84	0.86	0.99	50.8
9	R2	198	2.0	215	2.0	0.700	8.8	LOS A	8.4	59.9	0.84	0.86	0.99	49.6
Approach		671	2.0	729	2.0	0.700	12.1	LOS B	8.4	59.9	0.84	0.86	0.99	50.4
West: Highway 12														
10	L2	156	2.0	170	2.0	0.473	13.1	LOS B	3.8	27.0	0.83	0.86	0.88	51.6
11	T1	182	2.0	198	2.0	0.473	8.5	LOS A	3.8	27.0	0.83	0.86	0.88	51.7
12	R2	13	2.0	14	2.0	0.473	8.2	LOS A	3.8	27.0	0.83	0.86	0.88	50.5
Approach		351	2.0	382	2.0	0.473	10.5	LOS B	3.8	27.0	0.83	0.86	0.88	51.6
All Vehicles		1793	2.0	1949	2.0	0.700	9.5	LOS A	8.4	59.9	0.78	0.77	0.84	51.7

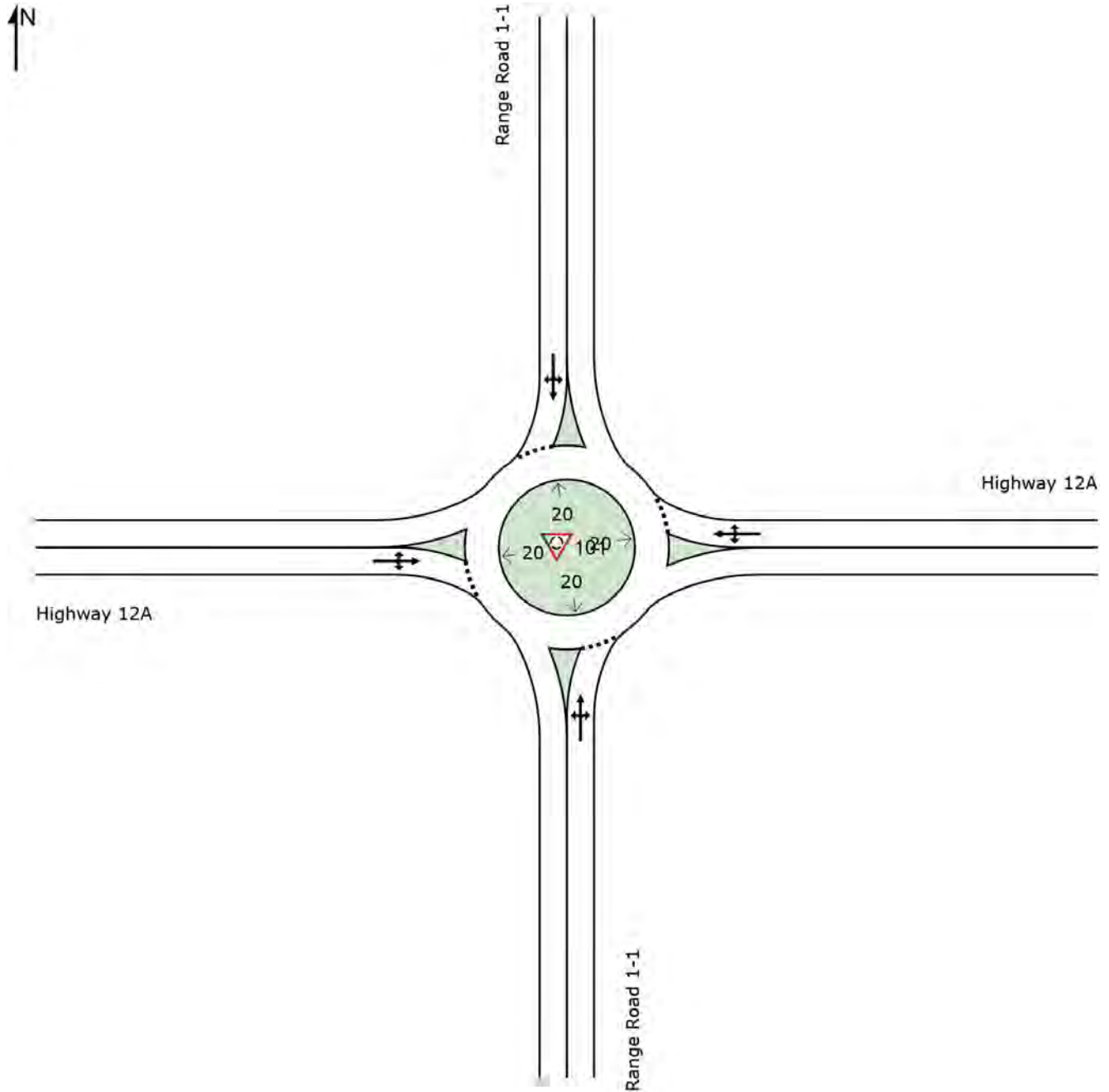
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
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 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

▼ Site: 101 [Bentley SEASP TIA - Highway 12A & Range Road 1-1  
- 2037 AM Peak (Site Folder: General)]

New Site  
Site Category: (None)  
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12A & Range Road 1-1 - 2037 AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h ]	[ HV ] %	[ Total veh/h ]	[ HV ] %				[ Veh. veh ]	[ Dist ] m				
South: Range Road 1-1														
1	L2	14	2.0	15	2.0	0.454	9.9	LOS A	3.4	24.0	0.48	0.52	0.48	54.4
2	T1	501	2.0	545	2.0	0.454	5.3	LOS A	3.4	24.0	0.48	0.52	0.48	54.5
3	R2	8	2.0	9	2.0	0.454	5.1	LOS A	3.4	24.0	0.48	0.52	0.48	53.2
Approach		523	2.0	568	2.0	0.454	5.4	LOS A	3.4	24.0	0.48	0.52	0.48	54.4
East: Highway 12A														
4	L2	20	2.0	22	2.0	0.199	12.2	LOS B	1.2	8.7	0.69	0.73	0.69	53.4
5	T1	42	2.0	46	2.0	0.199	7.6	LOS A	1.2	8.7	0.69	0.73	0.69	53.4
6	R2	89	2.0	97	2.0	0.199	7.4	LOS A	1.2	8.7	0.69	0.73	0.69	52.2
Approach		151	2.0	164	2.0	0.199	8.1	LOS A	1.2	8.7	0.69	0.73	0.69	52.7
North: Range Road 1-1														
7	L2	87	2.0	95	2.0	0.474	9.3	LOS A	4.1	28.9	0.36	0.47	0.36	54.7
8	T1	492	2.0	535	2.0	0.474	4.7	LOS A	4.1	28.9	0.36	0.47	0.36	54.7
9	R2	37	2.0	40	2.0	0.474	4.4	LOS A	4.1	28.9	0.36	0.47	0.36	53.4
Approach		616	2.0	670	2.0	0.474	5.3	LOS A	4.1	28.9	0.36	0.47	0.36	54.6
West: Highway 12A														
10	L2	30	2.0	33	2.0	0.150	12.6	LOS B	0.9	6.4	0.69	0.73	0.69	52.7
11	T1	42	2.0	46	2.0	0.150	8.0	LOS A	0.9	6.4	0.69	0.73	0.69	52.7
12	R2	38	2.0	41	2.0	0.150	7.7	LOS A	0.9	6.4	0.69	0.73	0.69	51.5
Approach		110	2.0	120	2.0	0.150	9.1	LOS A	0.9	6.4	0.69	0.73	0.69	52.3
All Vehicles		1400	2.0	1522	2.0	0.474	5.9	LOS A	4.1	28.9	0.47	0.54	0.47	54.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12A & Range Road 1-1 - 2037 PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

























Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist m ]				
South: Range Road 1-1														
1	L2	35	2.0	38	2.0	0.484	10.2	LOS B	3.7	26.2	0.53	0.56	0.53	54.1
2	T1	487	2.0	529	2.0	0.484	5.5	LOS A	3.7	26.2	0.53	0.56	0.53	54.2
3	R2	19	2.0	21	2.0	0.484	5.3	LOS A	3.7	26.2	0.53	0.56	0.53	52.9
Approach		541	2.0	588	2.0	0.484	5.8	LOS A	3.7	26.2	0.53	0.56	0.53	54.1
East: Highway 12A														
4	L2	10	2.0	11	2.0	0.174	12.3	LOS B	1.1	7.6	0.70	0.72	0.70	53.6
5	T1	33	2.0	36	2.0	0.174	7.7	LOS A	1.1	7.6	0.70	0.72	0.70	53.6
6	R2	86	2.0	93	2.0	0.174	7.4	LOS A	1.1	7.6	0.70	0.72	0.70	52.4
Approach		129	2.0	140	2.0	0.174	7.9	LOS A	1.1	7.6	0.70	0.72	0.70	52.8
North: Range Road 1-1														
7	L2	104	2.0	113	2.0	0.562	9.4	LOS A	5.2	37.2	0.40	0.47	0.40	54.5
8	T1	589	2.0	640	2.0	0.562	4.8	LOS A	5.2	37.2	0.40	0.47	0.40	54.6
9	R2	45	2.0	49	2.0	0.562	4.5	LOS A	5.2	37.2	0.40	0.47	0.40	53.3
Approach		738	2.0	802	2.0	0.562	5.4	LOS A	5.2	37.2	0.40	0.47	0.40	54.5
West: Highway 12A														
10	L2	37	2.0	40	2.0	0.152	13.6	LOS B	1.0	6.8	0.76	0.78	0.76	51.7
11	T1	44	2.0	48	2.0	0.152	9.0	LOS A	1.0	6.8	0.76	0.78	0.76	51.7
12	R2	18	2.0	20	2.0	0.152	8.8	LOS A	1.0	6.8	0.76	0.78	0.76	50.6
Approach		99	2.0	108	2.0	0.152	10.7	LOS B	1.0	6.8	0.76	0.78	0.76	51.5
All Vehicles		1507	2.0	1638	2.0	0.562	6.1	LOS A	5.2	37.2	0.49	0.55	0.49	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

**Appendix I – 2052 30-Year Horizon  
Synchro and SIDRA Outputs**

Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2052 30-Year Horizon  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	223	234	255	125	145	252	50	25	42	278	100	180
Future Volume (vph)	223	234	255	125	145	252	50	25	42	278	100	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.905			0.904	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1705	0	1789	1703	0
Flt Permitted	0.657			0.602			0.546			0.709		
Satd. Flow (perm)	1237	1883	1601	1134	1883	1601	1028	1705	0	1335	1703	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			277			274		46			135	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		1248.8			865.9			141.6			680.1	
Travel Time (s)		45.0			31.2			10.6			51.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	242	254	277	136	158	274	54	27	46	302	109	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	242	254	277	136	158	274	54	73	0	302	305	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		97	97		14	97		97	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		24.0	24.0	
Total Split (s)	42.0	42.0	42.0	42.0	42.0	42.0	48.0	48.0		48.0	48.0	
Total Split (%)	46.7%	46.7%	46.7%	46.7%	46.7%	46.7%	53.3%	53.3%		53.3%	53.3%	
Maximum Green (s)	36.0	36.0	36.0	36.0	36.0	36.0	42.0	42.0		42.0	42.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	



Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

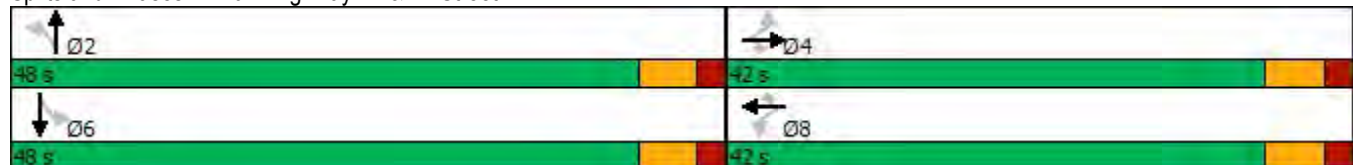
2052 30-Year Horizon  
Timing Plan: AM Peak

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	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	22.0	22.0	22.0	22.0	22.0	22.0	18.8	18.8		18.8	18.8	
Actuated g/C Ratio	0.41	0.41	0.41	0.41	0.41	0.41	0.35	0.35		0.35	0.35	
v/c Ratio	0.47	0.33	0.34	0.29	0.20	0.33	0.15	0.12		0.64	0.44	
Control Delay	17.0	13.6	3.4	14.5	12.6	3.4	12.6	6.4		21.1	9.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	17.0	13.6	3.4	14.5	12.6	3.4	12.6	6.4		21.1	9.2	
LOS	B	B	A	B	B	A	B	A		C	A	
Approach Delay		11.0			8.6			9.0			15.2	
Approach LOS		B			A			A			B	
Queue Length 50th (m)	14.4	14.0	0.0	7.4	8.3	0.0	3.1	1.5		21.5	10.4	
Queue Length 95th (m)	43.7	39.8	12.8	24.8	25.5	12.7	10.5	8.6		50.5	29.9	
Internal Link Dist (m)		1224.8			841.9			117.6			656.1	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	865	1317	1203	793	1317	1202	839	1400		1089	1415	
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	0.28	0.19	0.23	0.17	0.12	0.23	0.06	0.05		0.28	0.22	

Intersection Summary

























Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 53.1  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.64  
 Intersection Signal Delay: 11.4  
 Intersection LOS: B  
 Intersection Capacity Utilization 79.6%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 101: Highway 12 & 44 Street



Lanes, Volumes, Timings  
102: Highway 12 & Range Road 1-1

2052 30-Year Horizon  
Timing Plan: AM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	198	306	51	130	333	437	14	13	47	375	39	158
Future Volume (vph)	198	306	51	130	333	437	14	13	47	375	39	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.882				0.879
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1661	0	1789	1656	0
Flt Permitted	0.308			0.464			0.624			0.537		
Satd. Flow (perm)	580	1883	1601	874	1883	1601	1175	1661	0	1011	1656	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			133			475		51				172
Link Speed (k/h)		100			100			48				48
Link Distance (m)		865.9			685.6			377.3				800.6
Travel Time (s)		31.2			24.7			28.3				60.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	215	333	55	141	362	475	15	14	51	408	42	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	215	333	55	141	362	475	15	65	0	408	214	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	20.0	20.0	7.0	20.0	20.0	12.0	12.0		7.0	12.0	
Minimum Split (s)	11.0	26.0	26.0	11.0	26.0	26.0	24.0	24.0		11.0	24.0	
Total Split (s)	14.0	34.0	34.0	11.0	31.0	31.0	25.0	25.0		20.0	45.0	
Total Split (%)	15.6%	37.8%	37.8%	12.2%	34.4%	34.4%	27.8%	27.8%		22.2%	50.0%	
Maximum Green (s)	10.0	28.0	28.0	7.0	25.0	25.0	19.0	19.0		16.0	39.0	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		None	Min	
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0			7.0	

Lanes, Volumes, Timings  
 102: Highway 12 & Range Road 1-1

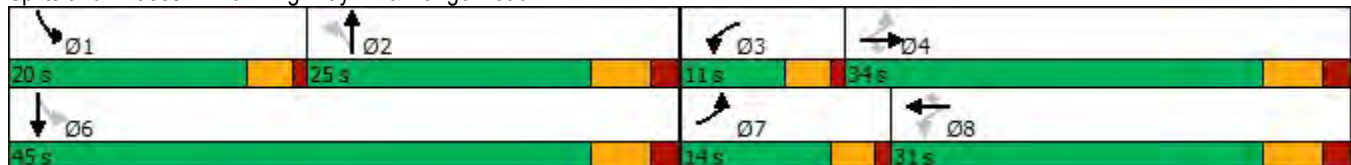
2052 30-Year Horizon  
 Timing Plan: AM Peak

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
Pedestrian Calls (#/hr)		0	0		0	0	0	0				0
Act Effct Green (s)	36.3	24.8	24.8	31.3	22.3	22.3	12.0	12.0		33.1	31.1	
Actuated g/C Ratio	0.46	0.31	0.31	0.40	0.28	0.28	0.15	0.15		0.42	0.39	
v/c Ratio	0.52	0.56	0.09	0.33	0.68	0.60	0.08	0.22		0.71	0.28	
Control Delay	17.2	26.9	0.3	14.4	32.9	5.9	31.9	15.0		26.2	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	17.2	26.9	0.3	14.4	32.9	5.9	31.9	15.0		26.2	5.7	
LOS	B	C	A	B	C	A	C	B		C	A	
Approach Delay		21.0			17.1			18.2			19.1	
Approach LOS		C			B			B			B	
Queue Length 50th (m)	18.6	41.9	0.0	11.6	49.3	0.0	2.0	1.9		44.4	3.8	
Queue Length 95th (m)	31.6	66.3	0.0	21.4	77.1	20.3	7.3	12.5		74.9	17.2	
Internal Link Dist (m)		841.9			661.6			353.3			776.6	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	423	669	654	427	597	832	283	439		582	906	
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	0.51	0.50	0.08	0.33	0.61	0.57	0.05	0.15		0.70	0.24	

Intersection Summary

Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 79  
 Natural Cycle: 75  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.71  
 Intersection Signal Delay: 18.7  
 Intersection LOS: B  
 Intersection Capacity Utilization 69.3%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 102: Highway 12 & Range Road 1-1



Lanes, Volumes, Timings  
103: Highway 12 & 52 Street

2052 30-Year Horizon  
Timing Plan: AM Peak

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	109	682	50	4	344	21	11	13	9	11	9	92
Future Volume (vph)	109	682	50	4	344	21	11	13	9	11	9	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	80.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990				0.850		0.962				0.889
Flt Protected	0.950			0.950				0.984				0.995
Satd. Flow (prot)	1789	1865	0	1789	1883	1601	0	1783	0	0	1666	0
Flt Permitted	0.533			0.194				0.882				0.970
Satd. Flow (perm)	1004	1865	0	365	1883	1601	0	1598	0	0	1624	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				36		10				100
Link Speed (k/h)		100			100			48				48
Link Distance (m)		172.7			1248.8			175.4				119.6
Travel Time (s)		6.2			45.0			13.2				9.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	118	741	54	4	374	23	12	14	10	12	10	100
Shared Lane Traffic (%)												
Lane Group Flow (vph)	118	795	0	4	374	23	0	36	0	0	122	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			0.0				0.0
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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		6		6
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0	20.0	12.0	12.0		12.0		12.0
Minimum Split (s)	26.0	26.0		26.0	26.0	26.0	24.0	24.0		24.0		24.0
Total Split (s)	64.0	64.0		64.0	64.0	64.0	26.0	26.0		26.0		26.0
Total Split (%)	71.1%	71.1%		71.1%	71.1%	71.1%	28.9%	28.9%		28.9%		28.9%
Maximum Green (s)	58.0	58.0		58.0	58.0	58.0	20.0	20.0		20.0		20.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0		4.0
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0		2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0				0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0		6.0				6.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	None	None		None	None	None	Min	Min		Min		Min
Walk Time (s)	7.0	7.0		7.0	7.0	7.0	7.0	7.0		7.0		7.0

Lanes, Volumes, Timings  
103: Highway 12 & 52 Street

2052 30-Year Horizon  
Timing Plan: AM 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	
Pedestrian Calls (#/hr)	0	0		0	0	0	0	0		0	0	
Act Effct Green (s)	28.1	28.1		28.1	28.1	28.1		12.2			12.2	
Actuated g/C Ratio	0.53	0.53		0.53	0.53	0.53		0.23			0.23	
v/c Ratio	0.22	0.80		0.02	0.37	0.03		0.09			0.27	
Control Delay	7.0	16.2		5.2	7.8	1.4		16.8			9.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Delay	7.0	16.2		5.2	7.8	1.4		16.8			9.3	
LOS	A	B		A	A	A		B			A	
Approach Delay		15.0			7.4			16.8			9.3	
Approach LOS		B			A			B			A	
Queue Length 50th (m)	5.1	52.1		0.2	17.7	0.0		1.8			1.6	
Queue Length 95th (m)	11.0	85.8		1.0	29.5	1.4		9.4			14.3	
Internal Link Dist (m)		148.7			1224.8			151.4			95.6	
Turn Bay Length (m)	80.0			80.0		60.0						
Base Capacity (vph)	981	1822		357	1840	1565		626			691	
Starvation Cap Reductn	0	0		0	0	0		0			0	
Spillback Cap Reductn	0	0		0	0	0		0			0	
Storage Cap Reductn	0	0		0	0	0		0			0	
Reduced v/c Ratio	0.12	0.44		0.01	0.20	0.01		0.06			0.18	

Intersection Summary

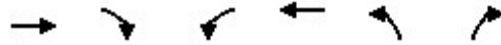
Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 52.6  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 12.5      Intersection LOS: B  
 Intersection Capacity Utilization 80.6%      ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 103: Highway 12 & 52 Street



HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

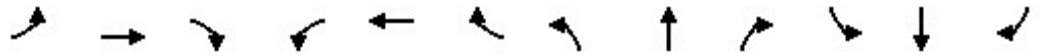
2052 30-Year Horizon  
 Timing Plan: AM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	
Traffic Volume (veh/h)	151	236	49	72	58	10
Future Volume (Veh/h)	151	236	49	72	58	10
Sign Control	Free		Free		Stop	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	164	257	53	78	63	11
<b>Pedestrians</b>						
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			421		348	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			421		348	164
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		90	99
cM capacity (veh/h)			1138		619	881
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>NB 1</b>		
Volume Total	164	257	131	74		
Volume Left	0	0	53	63		
Volume Right	0	257	0	11		
cSH	1700	1700	1138	647		
Volume to Capacity	0.10	0.15	0.05	0.11		
Queue Length 95th (m)	0.0	0.0	1.1	2.9		
Control Delay (s)	0.0	0.0	3.6	11.3		
Lane LOS			A	B		
Approach Delay (s)	0.0		3.6	11.3		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			2.1			
Intersection Capacity Utilization			28.3%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings  
105: Range Road 1-1 & Highway 12A

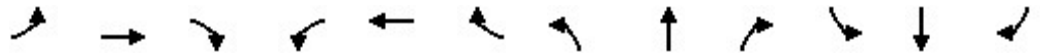
2052 30-Year Horizon  
Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	30	57	71	34	64	89	22	501	11	87	492	37
Future Volume (vph)	30	57	71	34	64	89	22	501	11	87	492	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.940			0.936			0.997			0.992	
Fl <sub>t</sub> Protected		0.990			0.991			0.998			0.993	
Satd. Flow (prot)	0	1753	0	0	1747	0	0	1874	0	0	1855	0
Fl <sub>t</sub> Permitted		0.910			0.918			0.961			0.850	
Satd. Flow (perm)	0	1611	0	0	1618	0	0	1805	0	0	1588	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42			47			2			7	
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		789.8			959.6			800.6			722.0	
Travel Time (s)		59.2			72.0			60.0			54.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	62	77	37	70	97	24	545	12	95	535	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	172	0	0	204	0	0	581	0	0	670	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	26.0	26.0		26.0	26.0		64.0	64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%		71.1%	71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		58.0	58.0		58.0	58.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		20.6			20.6			32.8			32.8	

Lanes, Volumes, Timings  
 105: Range Road 1-1 & Highway 12A

2052 30-Year Horizon  
 Timing Plan: AM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.31			0.31			0.50			0.50	
v/c Ratio		0.32			0.38			0.64			0.84	
Control Delay		18.2			18.9			15.0			24.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.2			18.9			15.0			24.1	
LOS		B			B			B			C	
Approach Delay		18.2			18.9			15.0			24.1	
Approach LOS		B			B			B			C	
Queue Length 50th (m)		11.5			14.2			46.9			63.0	
Queue Length 95th (m)		34.7			40.8			71.7			100.9	
Internal Link Dist (m)		765.8			935.6			776.6			698.0	
Turn Bay Length (m)												
Base Capacity (vph)		532			538			1592			1401	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.32			0.38			0.36			0.48	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	65.7
Natural Cycle:	60
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.84
Intersection Signal Delay:	19.5
Intersection LOS:	B
Intersection Capacity Utilization:	90.6%
ICU Level of Service:	E
Analysis Period (min):	15

























Splits and Phases: 105: Range Road 1-1 & Highway 12A





Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2037 15-Year Horizon  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	225	93	82	60	224	325	222	92	138	337	38	255
Future Volume (vph)	225	93	82	60	224	325	222	92	138	337	38	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.910				0.869
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1714	0	1789	1637	0
Flt Permitted	0.606			0.692			0.530			0.604		
Satd. Flow (perm)	1141	1883	1601	1303	1883	1601	998	1714	0	1138	1637	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			89			353		120				277
Link Speed (k/h)		100			100			48				48
Link Distance (m)		1248.8			865.9			141.6				680.1
Travel Time (s)		45.0			31.2			10.6				51.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	245	101	89	65	243	353	241	100	150	366	41	277
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	101	89	65	243	353	241	250	0	366	318	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0	20.0	20.0	20.0	20.0	12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	24.0	24.0		24.0	24.0	
Total Split (s)	39.0	39.0	39.0	39.0	39.0	39.0	51.0	51.0		51.0	51.0	
Total Split (%)	43.3%	43.3%	43.3%	43.3%	43.3%	43.3%	56.7%	56.7%		56.7%	56.7%	
Maximum Green (s)	33.0	33.0	33.0	33.0	33.0	33.0	45.0	45.0		45.0	45.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		Min	Min	
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0	

Lanes, Volumes, Timings  
101: Highway 12 & 44 Street

2037 15-Year Horizon  
Timing Plan: 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	
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0		0	0	
Act Effct Green (s)	24.2	24.2	24.2	24.2	24.2	24.2	27.0	27.0		27.0	27.0	
Actuated g/C Ratio	0.38	0.38	0.38	0.38	0.38	0.38	0.42	0.42		0.42	0.42	
v/c Ratio	0.57	0.14	0.13	0.13	0.34	0.43	0.57	0.32		0.76	0.37	
Control Delay	24.9	16.8	5.1	17.3	18.4	4.1	19.9	7.3		27.0	3.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	24.9	16.8	5.1	17.3	18.4	4.1	19.9	7.3		27.0	3.8	
LOS	C	B	A	B	B	A	B	A		C	A	
Approach Delay		19.0			10.7			13.5			16.2	
Approach LOS		B			B			B			B	
Queue Length 50th (m)	21.3	7.3	0.0	4.7	19.0	0.0	17.4	7.7		29.6	2.3	
Queue Length 95th (m)	58.3	22.1	9.0	16.1	48.8	16.5	47.0	24.7		75.9	16.4	
Internal Link Dist (m)		1224.8			841.9			117.6			656.1	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	625	1031	917	713	1031	1036	745	1311		850	1293	
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	0.39	0.10	0.10	0.09	0.24	0.34	0.32	0.19		0.43	0.25	

Intersection Summary

























Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 64  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.76  
 Intersection Signal Delay: 14.5  
 Intersection Capacity Utilization 85.3%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service E

Splits and Phases: 101: Highway 12 & 44 Street



Lanes, Volumes, Timings  
102: Highway 12 & Range Road 1-1

2037 15-Year Horizon  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	317	20	65	363	384	45	36	143	508	17	218
Future Volume (vph)	163	317	20	65	363	384	45	36	143	508	17	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.880			0.861	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1883	1601	1789	1883	1601	1789	1657	0	1789	1622	0
Flt Permitted	0.230			0.445			0.601			0.323		
Satd. Flow (perm)	433	1883	1601	838	1883	1601	1132	1657	0	608	1622	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			100			417		145			237	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		865.9			685.6			377.3			800.6	
Travel Time (s)		31.2			24.7			28.3			60.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	177	345	22	71	395	417	49	39	155	552	18	237
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	345	22	71	395	417	49	194	0	552	255	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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	7	4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	20.0	20.0	7.0	20.0	20.0	12.0	12.0		7.0	12.0	
Minimum Split (s)	11.0	26.0	26.0	11.0	26.0	26.0	24.0	24.0		11.0	24.0	
Total Split (s)	14.0	42.0	42.0	11.0	39.0	39.0	27.0	27.0		40.0	67.0	
Total Split (%)	11.7%	35.0%	35.0%	9.2%	32.5%	32.5%	22.5%	22.5%		33.3%	55.8%	
Maximum Green (s)	10.0	36.0	36.0	7.0	33.0	33.0	21.0	21.0		36.0	61.0	
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0		3.0	4.0	
All-Red Time (s)	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0		1.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0		4.0	6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	Min	Min		None	Min	
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0			7.0	

Lanes, Volumes, Timings  
 102: Highway 12 & Range Road 1-1

2037 15-Year Horizon  
 Timing Plan: 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
Pedestrian Calls (#/hr)		0	0		0	0	0	0				0
Act Effct Green (s)	42.0	32.3	32.3	36.1	26.9	26.9	13.0	13.0		47.5	45.5	
Actuated g/C Ratio	0.43	0.33	0.33	0.37	0.27	0.27	0.13	0.13		0.48	0.46	
v/c Ratio	0.55	0.56	0.04	0.19	0.77	0.56	0.33	0.56		0.87	0.29	
Control Delay	26.1	33.7	0.1	19.8	45.2	6.4	49.8	20.6		36.1	3.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	26.1	33.7	0.1	19.8	45.2	6.4	49.8	20.6		36.1	3.7	
LOS	C	C	A	B	D	A	D	C		D	A	
Approach Delay		29.9			24.8			26.5			25.9	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	20.9	56.5	0.0	7.9	69.9	0.0	8.8	8.7		75.7	1.8	
Queue Length 95th (m)	40.4	95.5	0.0	18.3	115.9	23.4	22.0	32.3		#137.5	15.2	
Internal Link Dist (m)		841.9			661.6			353.3			776.6	
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0			80.0		
Base Capacity (vph)	325	703	660	375	644	822	246	474		735	1113	
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	0.54	0.49	0.03	0.19	0.61	0.51	0.20	0.41		0.75	0.23	

Intersection Summary





















Area Type: Other  
 Cycle Length: 120  
 Actuated Cycle Length: 98.5  
 Natural Cycle: 80  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.87  
 Intersection Signal Delay: 26.4  
 Intersection LOS: C  
 Intersection Capacity Utilization 83.7%  
 ICU Level of Service E  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 102: Highway 12 & Range Road 1-1



Lanes, Volumes, Timings  
103: Highway 12 & 52 Street

2037 15-Year Horizon  
Timing Plan: PM Peak

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	108	381	15	6	674	14	44	10	3	16	3	89
Future Volume (vph)	108	381	15	6	674	14	44	10	3	16	3	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	80.0		0.0	80.0		60.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		1	0		0	0		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994				0.850		0.993			0.888	
Flt Protected	0.950			0.950				0.963			0.993	
Satd. Flow (prot)	1789	1872	0	1789	1883	1601	0	1801	0	0	1661	0
Flt Permitted	0.116			0.512				0.738			0.958	
Satd. Flow (perm)	218	1872	0	964	1883	1601	0	1380	0	0	1602	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				85		3			97	
Link Speed (k/h)		100			100			48			48	
Link Distance (m)		172.7			1248.8			175.4			119.6	
Travel Time (s)		6.2			45.0			13.2			9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	117	414	16	7	733	15	48	11	3	17	3	97
Shared Lane Traffic (%)												
Lane Group Flow (vph)	117	430	0	7	733	15	0	62	0	0	117	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			0.0			0.0	
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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8		8	2			6		
Detector Phase	7	4		8	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	20.0		20.0	20.0	20.0	5.0	5.0		20.0	20.0	
Minimum Split (s)	11.0	26.0		26.0	26.0	26.0	24.0	24.0		26.0	26.0	
Total Split (s)	11.0	64.0		53.0	53.0	53.0	26.0	26.0		26.0	26.0	
Total Split (%)	12.2%	71.1%		58.9%	58.9%	58.9%	28.9%	28.9%		28.9%	28.9%	
Maximum Green (s)	7.0	58.0		47.0	47.0	47.0	20.0	20.0		20.0	20.0	
Yellow Time (s)	3.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	2.0		2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	4.0	6.0		6.0	6.0	6.0		6.0			6.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	Min	Min		Min	Min	
Walk Time (s)		7.0		7.0	7.0	7.0	7.0	7.0		7.0	7.0	

Lanes, Volumes, Timings  
103: Highway 12 & 52 Street

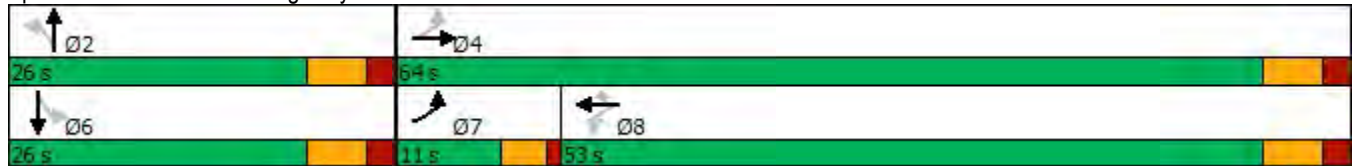
2037 15-Year Horizon  
Timing Plan: PM Peak

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	
Pedestrian Calls (#/hr)		0		0	0	0	0	0		0	0	
Act Effct Green (s)	44.7	42.7		34.4	34.4	34.4		20.8				20.8
Actuated g/C Ratio	0.59	0.56		0.45	0.45	0.45		0.27				0.27
v/c Ratio	0.42	0.41		0.02	0.86	0.02		0.16				0.23
Control Delay	10.5	9.7		11.0	29.7	0.1		26.5				10.2
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0				0.0
Total Delay	10.5	9.7		11.0	29.7	0.1		26.5				10.2
LOS	B	A		B	C	A		C				B
Approach Delay		9.9			29.0			26.5				10.3
Approach LOS		A			C			C				B
Queue Length 50th (m)	6.3	30.3		0.6	93.9	0.0		6.8				2.3
Queue Length 95th (m)	11.9	45.9		2.6	138.8	0.0		18.9				16.0
Internal Link Dist (m)		148.7			1224.8			151.4				95.6
Turn Bay Length (m)	80.0			80.0		60.0						
Base Capacity (vph)	278	1443		620	1211	1060		379				508
Starvation Cap Reductn	0	0		0	0	0		0				0
Spillback Cap Reductn	0	0		0	0	0		0				0
Storage Cap Reductn	0	0		0	0	0		0				0
Reduced v/c Ratio	0.42	0.30		0.01	0.61	0.01		0.16				0.23

Intersection Summary

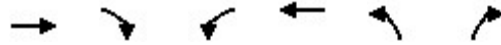
Area Type: Other  
 Cycle Length: 90  
 Actuated Cycle Length: 75.9  
 Natural Cycle: 75  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.86  
 Intersection Signal Delay: 20.3      Intersection LOS: C  
 Intersection Capacity Utilization 71.5%      ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 103: Highway 12 & 52 Street



HCM Unsignalized Intersection Capacity Analysis  
 104: 44 Street & Highway 12A

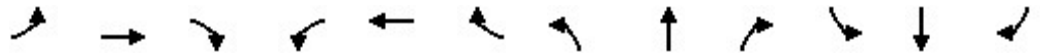
2037 15-Year Horizon  
 Timing Plan: PM Peak



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑		↑	↑	
Traffic Volume (veh/h)	81	75	13	150	231	51
Future Volume (Veh/h)	81	75	13	150	231	51
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	82	14	163	251	55
<b>Pedestrians</b>						
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			170		279	88
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		279	88
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		64	94
cM capacity (veh/h)			1407		704	970
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>WB 1</b>	<b>NB 1</b>		
Volume Total	88	82	177	306		
Volume Left	0	0	14	251		
Volume Right	0	82	0	55		
cSH	1700	1700	1407	740		
Volume to Capacity	0.05	0.05	0.01	0.41		
Queue Length 95th (m)	0.0	0.0	0.2	15.5		
Control Delay (s)	0.0	0.0	0.7	13.2		
Lane LOS			A	B		
Approach Delay (s)	0.0		0.7	13.2		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			6.4			
Intersection Capacity Utilization			37.9%	ICU Level of Service	A	
Analysis Period (min)			15			

Lanes, Volumes, Timings  
105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
Timing Plan: PM Peak



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	37	67	31	14	45	86	65	487	33	104	589	45
Future Volume (vph)	37	67	31	14	45	86	65	487	33	104	589	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr <sub>t</sub>		0.969			0.920			0.992			0.992	
Fl <sub>t</sub> Protected		0.987			0.995			0.994			0.993	
Satd. Flow (prot)	0	1801	0	0	1724	0	0	1857	0	0	1855	0
Fl <sub>t</sub> Permitted		0.874			0.959			0.851			0.838	
Satd. Flow (perm)	0	1595	0	0	1662	0	0	1590	0	0	1566	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			75			7			7	
Link Speed (k/h)		48			48			48			48	
Link Distance (m)		789.8			959.6			800.6			722.0	
Travel Time (s)		59.2			72.0			60.0			54.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	73	34	15	49	93	71	529	36	113	640	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	147	0	0	157	0	0	636	0	0	802	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			3.7			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	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24		14	24		14	24		14	24		14
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	20.0	20.0		20.0	20.0		12.0	12.0		12.0	12.0	
Minimum Split (s)	26.0	26.0		26.0	26.0		24.0	24.0		24.0	24.0	
Total Split (s)	26.0	26.0		26.0	26.0		64.0	64.0		64.0	64.0	
Total Split (%)	28.9%	28.9%		28.9%	28.9%		71.1%	71.1%		71.1%	71.1%	
Maximum Green (s)	20.0	20.0		20.0	20.0		58.0	58.0		58.0	58.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effect Green (s)		21.6			21.6			49.7			49.7	



Lanes, Volumes, Timings  
 105: Range Road 1-1 & Highway 12A

2037 15-Year Horizon  
 Timing Plan: PM Peak

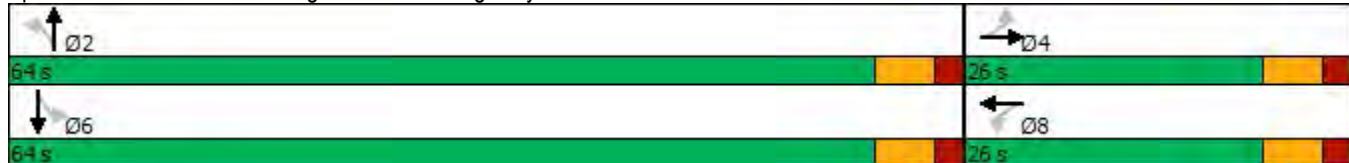


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio		0.30			0.30			0.68			0.68	
v/c Ratio		0.31			0.29			0.59			0.75	
Control Delay		26.5			17.2			12.3			17.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		26.5			17.2			12.3			17.6	
LOS		C			B			B			B	
Approach Delay		26.5			17.2			12.3			17.6	
Approach LOS		C			B			B			B	
Queue Length 50th (m)		15.5			9.3			57.3			89.4	
Queue Length 95th (m)		36.7			28.2			89.2			145.5	
Internal Link Dist (m)		765.8			935.6			776.6			698.0	
Turn Bay Length (m)												
Base Capacity (vph)		481			543			1243			1224	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.31			0.29			0.51			0.66	

Intersection Summary

Area Type:	Other
Cycle Length:	90
Actuated Cycle Length:	73.1
Natural Cycle:	75
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.75
Intersection Signal Delay:	16.4
Intersection LOS:	B
Intersection Capacity Utilization:	83.2%
ICU Level of Service:	E
Analysis Period (min):	15

Splits and Phases: 105: Range Road 1-1 & Highway 12A



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 44 St - 2052 - AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: 44 Street														
1	L2	50	2.0	54	2.0	0.201	14.1	LOS B	1.4	9.7	0.83	0.83	0.83	51.2
2	T1	25	2.0	27	2.0	0.201	9.5	LOS A	1.4	9.7	0.83	0.83	0.83	51.2
3	R2	42	2.0	46	2.0	0.201	9.2	LOS A	1.4	9.7	0.83	0.83	0.83	50.1
Approach		117	2.0	127	2.0	0.201	11.4	LOS B	1.4	9.7	0.83	0.83	0.83	50.8
East: Highway 12														
4	L2	125	2.0	136	2.0	0.550	11.4	LOS B	4.7	33.5	0.73	0.72	0.75	53.3
5	T1	145	2.0	158	2.0	0.550	6.7	LOS A	4.7	33.5	0.73	0.72	0.75	53.4
6	R2	252	2.0	274	2.0	0.550	6.5	LOS A	4.7	33.5	0.73	0.72	0.75	52.1
Approach		522	2.0	567	2.0	0.550	7.7	LOS A	4.7	33.5	0.73	0.72	0.75	52.7
North: 44 Street														
7	L2	278	2.0	302	2.0	0.593	12.2	LOS B	5.6	39.6	0.76	0.79	0.82	52.2
8	T1	100	2.0	109	2.0	0.593	7.6	LOS A	5.6	39.6	0.76	0.79	0.82	52.2
9	R2	180	2.0	196	2.0	0.593	7.3	LOS A	5.6	39.6	0.76	0.79	0.82	51.0
Approach		558	2.0	607	2.0	0.593	9.8	LOS A	5.6	39.6	0.76	0.79	0.82	51.8
West: Highway 12														
10	L2	223	2.0	242	2.0	0.914	31.2	LOS C	21.9	156.2	1.00	1.46	2.18	41.7
11	T1	234	2.0	254	2.0	0.914	26.6	LOS C	21.9	156.2	1.00	1.46	2.18	41.7
12	R2	255	2.0	277	2.0	0.914	26.3	LOS C	21.9	156.2	1.00	1.46	2.18	40.9
Approach		712	2.0	774	2.0	0.914	27.9	LOS C	21.9	156.2	1.00	1.46	2.18	41.4
All Vehicles		1909	2.0	2075	2.0	0.914	16.1	LOS B	21.9	156.2	0.85	1.02	1.31	47.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 44 St - 2052 - PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: 44 Street														
1	L2	222	2.0	241	2.0	0.677	19.8	LOS B	7.8	55.6	0.97	1.13	1.37	47.3
2	T1	92	2.0	100	2.0	0.677	15.2	LOS B	7.8	55.6	0.97	1.13	1.37	47.3
3	R2	138	2.0	150	2.0	0.677	14.9	LOS B	7.8	55.6	0.97	1.13	1.37	46.4
Approach		452	2.0	491	2.0	0.677	17.4	LOS B	7.8	55.6	0.97	1.13	1.37	47.0
East: Highway 12														
4	L2	60	2.0	65	2.0	0.812	22.6	LOS C	13.0	92.8	1.00	1.23	1.64	46.6
5	T1	224	2.0	243	2.0	0.812	18.0	LOS B	13.0	92.8	1.00	1.23	1.64	46.7
6	R2	325	2.0	353	2.0	0.812	17.8	LOS B	13.0	92.8	1.00	1.23	1.64	45.7
Approach		609	2.0	662	2.0	0.812	18.3	LOS B	13.0	92.8	1.00	1.23	1.64	46.1
North: 44 Street														
7	L2	337	2.0	366	2.0	0.811	21.6	LOS C	13.0	92.5	1.00	1.20	1.59	46.1
8	T1	38	2.0	41	2.0	0.811	17.0	LOS B	13.0	92.5	1.00	1.20	1.59	46.2
9	R2	255	2.0	277	2.0	0.811	16.7	LOS B	13.0	92.5	1.00	1.20	1.59	45.2
Approach		630	2.0	685	2.0	0.811	19.3	LOS B	13.0	92.5	1.00	1.20	1.59	45.8
West: Highway 12														
10	L2	225	2.0	245	2.0	0.500	12.6	LOS B	4.2	29.7	0.81	0.84	0.85	51.7
11	T1	93	2.0	101	2.0	0.500	7.9	LOS A	4.2	29.7	0.81	0.84	0.85	51.7
12	R2	82	2.0	89	2.0	0.500	7.7	LOS A	4.2	29.7	0.81	0.84	0.85	50.6
Approach		400	2.0	435	2.0	0.500	10.5	LOS B	4.2	29.7	0.81	0.84	0.85	51.4
All Vehicles		2091	2.0	2273	2.0	0.812	16.9	LOS B	13.0	92.8	0.96	1.12	1.41	47.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & Range Road 1-1 - 2052 AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: Range Road 1-1														
1	L2	14	2.0	15	2.0	0.152	16.0	LOS B	1.0	7.4	0.88	0.84	0.88	50.6
2	T1	13	2.0	14	2.0	0.152	11.3	LOS B	1.0	7.4	0.88	0.84	0.88	50.7
3	R2	47	2.0	51	2.0	0.152	11.1	LOS B	1.0	7.4	0.88	0.84	0.88	49.5
Approach		74	2.0	80	2.0	0.152	12.1	LOS B	1.0	7.4	0.88	0.84	0.88	49.9
East: Highway 12														
4	L2	130	2.0	141	2.0	0.851	15.4	LOS B	16.6	118.1	1.00	0.87	1.22	51.1
5	T1	333	2.0	362	2.0	0.851	10.8	LOS B	16.6	118.1	1.00	0.87	1.22	51.2
6	R2	437	2.0	475	2.0	0.851	10.6	LOS B	16.6	118.1	1.00	0.87	1.22	50.0
Approach		900	2.0	978	2.0	0.851	11.3	LOS B	16.6	118.1	1.00	0.87	1.22	50.6
North: Range Road 1-1														
7	L2	375	2.0	408	2.0	0.765	18.7	LOS B	10.8	76.7	1.00	1.10	1.40	47.5
8	T1	39	2.0	42	2.0	0.765	14.1	LOS B	10.8	76.7	1.00	1.10	1.40	47.6
9	R2	158	2.0	172	2.0	0.765	13.9	LOS B	10.8	76.7	1.00	1.10	1.40	46.6
Approach		572	2.0	622	2.0	0.765	17.0	LOS B	10.8	76.7	1.00	1.10	1.40	47.3
West: Highway 12														
10	L2	198	2.0	215	2.0	0.776	20.8	LOS C	11.1	79.1	1.00	1.17	1.51	47.0
11	T1	306	2.0	333	2.0	0.776	16.2	LOS B	11.1	79.1	1.00	1.17	1.51	47.1
12	R2	51	2.0	55	2.0	0.776	15.9	LOS B	11.1	79.1	1.00	1.17	1.51	46.1
Approach		555	2.0	603	2.0	0.776	17.8	LOS B	11.1	79.1	1.00	1.17	1.51	47.0
All Vehicles		2101	2.0	2284	2.0	0.851	14.6	LOS B	16.6	118.1	1.00	1.01	1.33	48.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & Range Road 1-1 - 2052 PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h ]	[ HV % ]	[ Total veh/h ]	[ HV % ]				[ Veh. veh ]	[ Dist ] m				
South: Range Road 1-1														
1	L2	45	2.0	49	2.0	0.525	24.7	LOS C	4.9	34.5	1.00	1.11	1.31	45.2
2	T1	36	2.0	39	2.0	0.525	20.1	LOS C	4.9	34.5	1.00	1.11	1.31	45.2
3	R2	143	2.0	155	2.0	0.525	19.8	LOS B	4.9	34.5	1.00	1.11	1.31	44.3
Approach		224	2.0	243	2.0	0.525	20.9	LOS C	4.9	34.5	1.00	1.11	1.31	44.6
East: Highway 12														
4	L2	65	2.0	71	2.0	0.779	13.8	LOS B	11.6	82.9	0.89	0.81	1.04	52.4
5	T1	363	2.0	395	2.0	0.779	9.1	LOS A	11.6	82.9	0.89	0.81	1.04	52.5
6	R2	384	2.0	417	2.0	0.779	8.9	LOS A	11.6	82.9	0.89	0.81	1.04	51.3
Approach		812	2.0	883	2.0	0.779	9.4	LOS A	11.6	82.9	0.89	0.81	1.04	51.9
North: Range Road 1-1														
7	L2	508	2.0	552	2.0	0.953	38.0	LOS D	28.4	202.0	1.00	1.61	2.53	38.1
8	T1	17	2.0	18	2.0	0.953	33.4	LOS C	28.4	202.0	1.00	1.61	2.53	38.2
9	R2	218	2.0	237	2.0	0.953	33.1	LOS C	28.4	202.0	1.00	1.61	2.53	37.5
Approach		743	2.0	808	2.0	0.953	36.5	LOS D	28.4	202.0	1.00	1.61	2.53	38.0
West: Highway 12														
10	L2	163	2.0	177	2.0	0.762	21.4	LOS C	10.4	74.3	1.00	1.18	1.50	46.8
11	T1	317	2.0	345	2.0	0.762	16.7	LOS B	10.4	74.3	1.00	1.18	1.50	46.8
12	R2	20	2.0	22	2.0	0.762	16.5	LOS B	10.4	74.3	1.00	1.18	1.50	45.9
Approach		500	2.0	543	2.0	0.762	18.2	LOS B	10.4	74.3	1.00	1.18	1.50	46.8
All Vehicles		2279	2.0	2477	2.0	0.953	21.3	LOS C	28.4	202.0	0.96	1.18	1.65	44.7

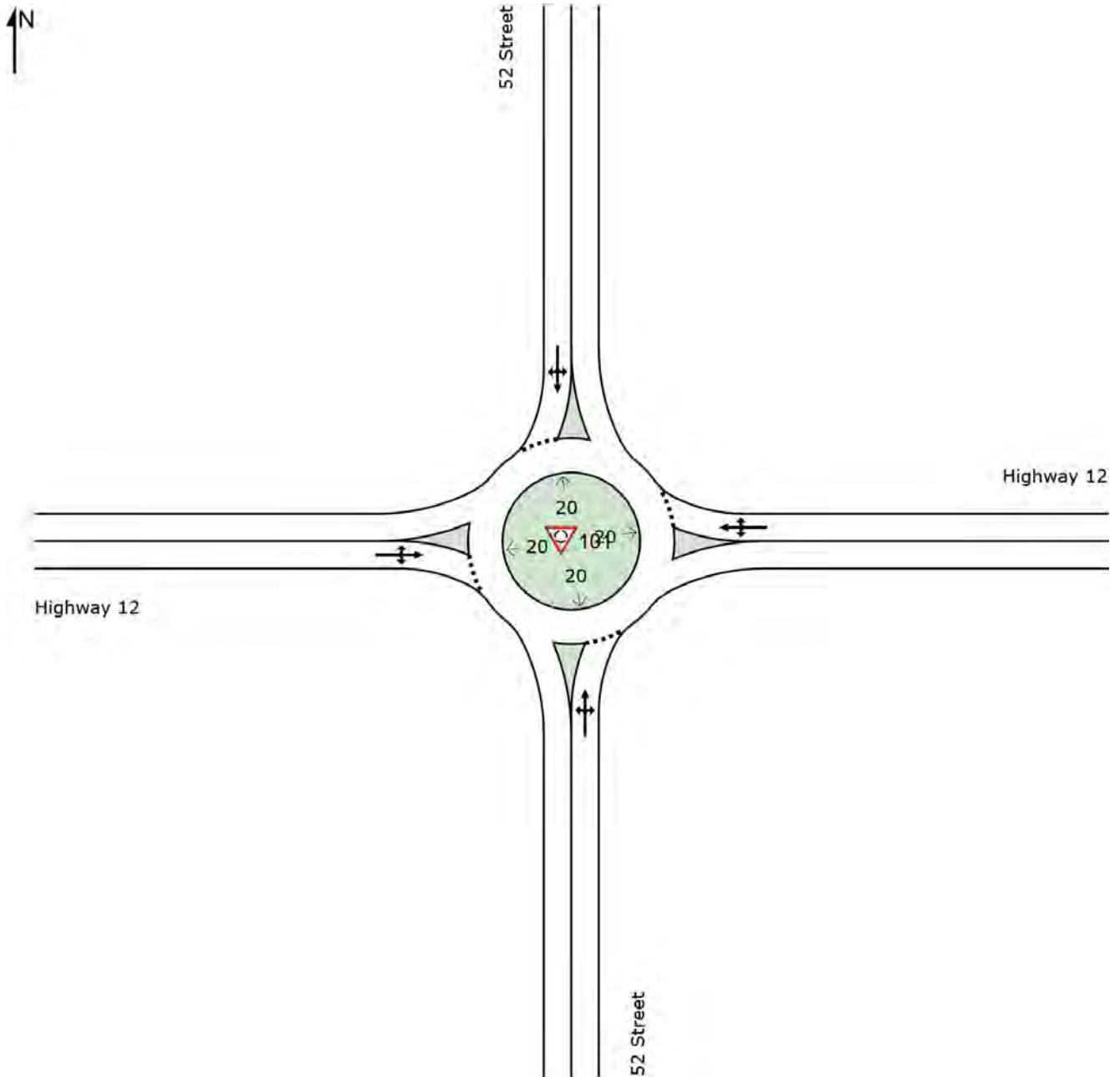
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

 Site: 101 [Bentley SEASP TIA - Highway 12 & 52 Street - 2052  
AM Peak (Site Folder: General)]

New Site  
Site Category: (None)  
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 52 Street - 2052 AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed	
		[ Total veh/h	HV ] %	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m					
South: 52 Street															
1	L2	11	2.0	12	2.0	0.053	14.5	LOS B	0.3	2.3	0.75	0.73	0.75	51.2	
2	T1	13	2.0	14	2.0	0.053	9.8	LOS A	0.3	2.3	0.75	0.73	0.75	51.3	
3	R2	9	2.0	10	2.0	0.053	9.6	LOS A	0.3	2.3	0.75	0.73	0.75	50.1	
Approach		33	2.0	36	2.0	0.053	11.3	LOS B	0.3	2.3	0.75	0.73	0.75	50.9	
East: Highway 12															
4	L2	4	2.0	4	2.0	0.314	9.6	LOS A	1.9	13.8	0.37	0.47	0.37	55.0	
5	T1	344	2.0	374	2.0	0.314	4.9	LOS A	1.9	13.8	0.37	0.47	0.37	55.1	
6	R2	21	2.0	23	2.0	0.314	4.7	LOS A	1.9	13.8	0.37	0.47	0.37	53.7	
Approach		369	2.0	401	2.0	0.314	5.0	LOS A	1.9	13.8	0.37	0.47	0.37	55.0	
North: 52 Street															
7	L2	11	2.0	12	2.0	0.123	10.7	LOS B	0.7	4.8	0.53	0.62	0.53	54.6	
8	T1	9	2.0	10	2.0	0.123	6.1	LOS A	0.7	4.8	0.53	0.62	0.53	54.7	
9	R2	92	2.0	100	2.0	0.123	5.9	LOS A	0.7	4.8	0.53	0.62	0.53	53.4	
Approach		112	2.0	122	2.0	0.123	6.4	LOS A	0.7	4.8	0.53	0.62	0.53	53.6	
West: Highway 12															
10	L2	109	2.0	118	2.0	0.569	8.9	LOS A	5.8	41.4	0.21	0.43	0.21	55.3	
11	T1	682	2.0	741	2.0	0.569	4.3	LOS A	5.8	41.4	0.21	0.43	0.21	55.4	
12	R2	50	2.0	54	2.0	0.569	4.1	LOS A	5.8	41.4	0.21	0.43	0.21	54.1	
Approach		841	2.0	914	2.0	0.569	4.9	LOS A	5.8	41.4	0.21	0.43	0.21	55.3	
All Vehicles		1355	2.0	1473	2.0	0.569	5.2	LOS A	5.8	41.4	0.29	0.46	0.29	55.0	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12 & 52 Street - 2052 PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: 52 Street														
1	L2	44	2.0	48	2.0	0.069	11.6	LOS B	0.4	2.6	0.58	0.69	0.58	51.8
2	T1	10	2.0	11	2.0	0.069	7.0	LOS A	0.4	2.6	0.58	0.69	0.58	51.8
3	R2	3	2.0	3	2.0	0.069	6.7	LOS A	0.4	2.6	0.58	0.69	0.58	50.7
Approach		57	2.0	62	2.0	0.069	10.5	LOS B	0.4	2.6	0.58	0.69	0.58	51.7
East: Highway 12														
4	L2	6	2.0	7	2.0	0.593	10.2	LOS B	5.1	36.5	0.55	0.54	0.55	54.1
5	T1	674	2.0	733	2.0	0.593	5.6	LOS A	5.1	36.5	0.55	0.54	0.55	54.2
6	R2	14	2.0	15	2.0	0.593	5.4	LOS A	5.1	36.5	0.55	0.54	0.55	52.9
Approach		694	2.0	754	2.0	0.593	5.6	LOS A	5.1	36.5	0.55	0.54	0.55	54.1
North: 52 Street														
7	L2	16	2.0	17	2.0	0.177	13.9	LOS B	1.2	8.2	0.80	0.80	0.80	52.2
8	T1	3	2.0	3	2.0	0.177	9.3	LOS A	1.2	8.2	0.80	0.80	0.80	52.3
9	R2	89	2.0	97	2.0	0.177	9.1	LOS A	1.2	8.2	0.80	0.80	0.80	51.1
Approach		108	2.0	117	2.0	0.177	9.8	LOS A	1.2	8.2	0.80	0.80	0.80	51.3
West: Highway 12														
10	L2	108	2.0	117	2.0	0.351	8.9	LOS A	2.7	19.3	0.17	0.45	0.17	55.2
11	T1	381	2.0	414	2.0	0.351	4.3	LOS A	2.7	19.3	0.17	0.45	0.17	55.3
12	R2	15	2.0	16	2.0	0.351	4.0	LOS A	2.7	19.3	0.17	0.45	0.17	54.0
Approach		504	2.0	548	2.0	0.351	5.2	LOS A	2.7	19.3	0.17	0.45	0.17	55.3
All Vehicles		1363	2.0	1482	2.0	0.593	6.0	LOS A	5.1	36.5	0.43	0.54	0.43	54.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12A & Range Road 1-1 - 2052 AM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: Range Road 1-1														
1	L2	22	2.0	24	2.0	0.473	10.1	LOS B	3.6	25.6	0.51	0.54	0.51	54.2
2	T1	501	2.0	545	2.0	0.473	5.4	LOS A	3.6	25.6	0.51	0.54	0.51	54.3
3	R2	11	2.0	12	2.0	0.473	5.2	LOS A	3.6	25.6	0.51	0.54	0.51	53.0
Approach		534	2.0	580	2.0	0.473	5.6	LOS A	3.6	25.6	0.51	0.54	0.51	54.2
East: Highway 12A														
4	L2	34	2.0	37	2.0	0.250	12.4	LOS B	1.6	11.4	0.72	0.76	0.72	53.0
5	T1	64	2.0	70	2.0	0.250	7.8	LOS A	1.6	11.4	0.72	0.76	0.72	53.1
6	R2	89	2.0	97	2.0	0.250	7.6	LOS A	1.6	11.4	0.72	0.76	0.72	51.9
Approach		187	2.0	203	2.0	0.250	8.5	LOS A	1.6	11.4	0.72	0.76	0.72	52.5
North: Range Road 1-1														
7	L2	87	2.0	95	2.0	0.509	9.7	LOS A	4.4	31.4	0.48	0.52	0.48	54.2
8	T1	492	2.0	535	2.0	0.509	5.1	LOS A	4.4	31.4	0.48	0.52	0.48	54.2
9	R2	37	2.0	40	2.0	0.509	4.8	LOS A	4.4	31.4	0.48	0.52	0.48	53.0
Approach		616	2.0	670	2.0	0.509	5.7	LOS A	4.4	31.4	0.48	0.52	0.48	54.2
West: Highway 12A														
10	L2	30	2.0	33	2.0	0.223	12.9	LOS B	1.4	10.1	0.74	0.77	0.74	52.7
11	T1	57	2.0	62	2.0	0.223	8.3	LOS A	1.4	10.1	0.74	0.77	0.74	52.8
12	R2	71	2.0	77	2.0	0.223	8.1	LOS A	1.4	10.1	0.74	0.77	0.74	51.6
Approach		158	2.0	172	2.0	0.223	9.1	LOS A	1.4	10.1	0.74	0.77	0.74	52.2
All Vehicles		1495	2.0	1625	2.0	0.509	6.4	LOS A	4.4	31.4	0.55	0.58	0.55	53.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

**Site: 101 [Bentley SEASP TIA - Highway 12A & Range Road 1-1 - 2052 PM Peak (Site Folder: General)]**

New Site  
 Site Category: (None)  
 Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV %	[ Total veh/h	HV %				[ Veh. veh	Dist ] m				
South: Range Road 1-1														
1	L2	65	2.0	71	2.0	0.538	10.5	LOS B	4.4	31.1	0.60	0.60	0.60	53.7
2	T1	487	2.0	529	2.0	0.538	5.8	LOS A	4.4	31.1	0.60	0.60	0.60	53.8
3	R2	33	2.0	36	2.0	0.538	5.6	LOS A	4.4	31.1	0.60	0.60	0.60	52.5
Approach		585	2.0	636	2.0	0.538	6.3	LOS A	4.4	31.1	0.60	0.60	0.60	53.7
East: Highway 12A														
4	L2	14	2.0	15	2.0	0.205	12.6	LOS B	1.3	9.3	0.74	0.76	0.74	53.2
5	T1	45	2.0	49	2.0	0.205	8.0	LOS A	1.3	9.3	0.74	0.76	0.74	53.3
6	R2	86	2.0	93	2.0	0.205	7.8	LOS A	1.3	9.3	0.74	0.76	0.74	52.0
Approach		145	2.0	158	2.0	0.205	8.3	LOS A	1.3	9.3	0.74	0.76	0.74	52.5
North: Range Road 1-1														
7	L2	104	2.0	113	2.0	0.602	9.9	LOS A	5.6	40.2	0.52	0.53	0.52	54.0
8	T1	589	2.0	640	2.0	0.602	5.3	LOS A	5.6	40.2	0.52	0.53	0.52	54.1
9	R2	45	2.0	49	2.0	0.602	5.0	LOS A	5.6	40.2	0.52	0.53	0.52	52.8
Approach		738	2.0	802	2.0	0.602	5.9	LOS A	5.6	40.2	0.52	0.53	0.52	54.0
West: Highway 12A														
10	L2	37	2.0	40	2.0	0.216	13.8	LOS B	1.4	10.1	0.80	0.81	0.80	51.8
11	T1	67	2.0	73	2.0	0.216	9.2	LOS A	1.4	10.1	0.80	0.81	0.80	51.9
12	R2	31	2.0	34	2.0	0.216	9.0	LOS A	1.4	10.1	0.80	0.81	0.80	50.7
Approach		135	2.0	147	2.0	0.216	10.4	LOS B	1.4	10.1	0.80	0.81	0.80	51.6
All Vehicles		1603	2.0	1742	2.0	0.602	6.7	LOS A	5.6	40.2	0.59	0.60	0.59	53.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Roundabout LOS Method: SIDRA Roundabout LOS.  
 Vehicle movement LOS values are based on average delay per movement.  
 Intersection and Approach LOS values are based on average delay for all vehicle movements.  
 Roundabout Capacity Model: SIDRA Standard.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

## **Appendix J – Opinion of Probable Cost**



**Roundabout Opinion of Probable Cost**

Description of Work  
**Single Lane Roundabout (42m ICD)**  
**Including Speed Reduction Geometry (EB & WB)**  
**Location: Hwy 12 & 52 Street**

Job No. **113678466**  
 Project : **Bentley TIA**  
 From:  
 From km:  
 To:  
 To km:

Estimate Type: **"B"**

CEB Code #	Bid Item Description *	Unit	Estimated Quantity	Unit Price	Estimated Cost	Spec No.s
C020	Mobilization and Demobilization	lump sum	1	10%	\$323,088	0
F485	Detour Road - Construct and Maintain	lump sum	1	\$ 100,000.00	\$100,000	BCS 18.7
F755	Surface Removal	m2	10,000	\$ 10.00	\$100,000	BCS 20.3.1
G248	Common and/or Borrow Excavation Loaded to Trucks	m3	17,000	\$ 30.00	\$510,000	
B180	Preparing Subgrade Surface (First Layer)	m2	13,000	\$ 5.00	\$65,000	
B152	Granular Fill	t	14,950	\$ 45.00	\$672,750	
F978	Asphalt Concrete Pavement - Mix Type H1 (150-200A)	t	4,438	\$ 150.00	\$665,625	
Q022	Misc. Surfacing Work	m2	0	\$ 75.00	\$0	
X320	Concrete Curb(____ Type)	m	2,450	\$ 110.00	\$269,500	4.2.5
X400	Solid Concrete Medians	m2	1,650	\$ 150.00	\$247,500	4.2.5
Q999	Portland Cement Concrete Pavement	m2	250	\$ 300.00	\$75,000	3.70.7
D430	Culverts - Supply and Install (900 mm dia. C.S.P.)	m	130	\$ 600.00	\$78,000	2.4.4
U123	Street Light Bases - Supply and Install	units	8	\$ 5,000.00	\$40,000	2.25.8
U125	Street Light Standard - Supply and Install	units	8	\$ 15,000.00	\$120,000	2.25.8
F150	Surface Preparation and Painting	lump sum	1	\$ 50,000.00	\$50,000	BCS 22.24
F990	Supply and Install Sign Structures	lump sum	4	\$ 25,000.00	\$100,000	BCS 24.4
S288	Install Sign - Less than 1 m2	signs	50	\$ 1,000.00	\$50,000	7.7.5
S772	Supply and Install Post (100mm x 150mm)	posts	50	\$ 250.00	\$12,500	7.7.5
C232	Hydroseeding	m2	15,000	\$ 5.00	\$75,000	02924
<b>Total</b>					<b>\$3,553,963</b>	

<b>Total</b>	<b>\$3,553,963</b>
<b>Total Estimated Contract Cost</b>	<b>\$3,553,960</b>
<b>Contingencies @ 25%</b>	<b>\$888,490</b>
<b>Total Estimated Contract Cost + Contingency</b>	<b>\$4,442,450</b>
<b>Estimated Engineering Cost @10%</b>	<b>\$444,245</b>
<b>Total Estimated Cost (Rounded To Nearest \$100,000 Dollars)</b>	<b>\$4,900,000</b>

Date : 5-Jul-22 Prepared By : Brad Tiedemann

Date : 5-Jul-22 Checked By : Brad Vander Heyden



**Roundabout Opinion of Probable Cost**

Description of Work  
**Single Lane Roundabout (42m ICD)**  
**Location: Hwy 12 & 44 Street**

Job No. **113678466**  
 Project : **Bentley TIA**  
 From:  
 From km:  
 To:  
 To km:

Estimate Type: **"B"**

CEB Code #	Bid Item Description *	Unit	Estimated Quantity	Unit Price	Estimated Cost	Spec No.s
C020	Mobilization and Demobilization	lump sum	1	10%	\$198,263	0
F485	Detour Road - Construct and Maintain	lump sum	1	\$ 100,000.00	\$100,000	BCS 18.7
F755	Surface Removal	m2	5,000	\$ 10.00	\$50,000	BCS 20.3.1
G248	Common and/or Borrow Excavation Loaded to Trucks	m3	11,000	\$ 30.00	\$330,000	
B180	Preparing Subgrade Surface (First Layer)	m2	7,500	\$ 5.00	\$37,500	
B152	Granular Fill	t	8,625	\$ 45.00	\$388,125	
F978	Asphalt Concrete Pavement - Mix Type H1 (150-200A)	t	2,750	\$ 150.00	\$412,500	
Q022	Misc. Surfacing Work	m2	0	\$ 75.00	\$0	
X320	Concrete Curb(____ Type)	m	650	\$ 110.00	\$71,500	4.2.5
X400	Solid Concrete Medians	m2	450	\$ 150.00	\$67,500	4.2.5
Q999	Portland Cement Concrete Pavement	m2	250	\$ 300.00	\$75,000	3.70.7
D430	Culverts - Supply and Install (900 mm dia. C.S.P.)	m	130	\$ 600.00	\$78,000	2.4.4
U123	Street Light Bases - Supply and Install	units	8	\$ 5,000.00	\$40,000	2.25.8
U125	Street Light Standard - Supply and Install	units	8	\$ 15,000.00	\$120,000	2.25.8
F150	Surface Preparation and Painting	lump sum	1	\$ 50,000.00	\$50,000	BCS 22.24
F990	Supply and Install Sign Structures	lump sum	4	\$ 25,000.00	\$100,000	BCS 24.4
S288	Install Sign - Less than 1 m2	signs	50	\$ 1,000.00	\$50,000	7.7.5
S772	Supply and Install Post (100mm x 150mm)	posts	50	\$ 250.00	\$12,500	7.7.5
C232	Hydroseeding	m2	10,000	\$ 5.00	\$50,000	02924
<b>Total</b>					<b>\$2,230,888</b>	

<b>Total</b>	<b>\$2,230,888</b>
<b>Total Estimated Contract Cost</b>	<b>\$2,230,890</b>
<b>Contingencies @ 25%</b>	<b>\$557,723</b>
<b>Total Estimated Contract Cost + Contingency</b>	<b>\$2,788,613</b>
<b>Estimated Engineering Cost @10%</b>	<b>\$278,861</b>
<b>Total Estimated Cost (Rounded To Nearest \$100,000 Dollars)</b>	<b>\$3,100,000</b>

Date : 5-Jul-22 Prepared By : Brad Tiedemann

Date : 5-Jul-22 Checked By : Brad Vander Heyden

**Roundabout Opinion of Probable Cost**

Description of Work  
**Single Lane Roundabout (42m ICD)**  
**Including Speed Reduction Geometry (WB approach Only)**  
**Location: Hwy 12 & Range Road 11 & 50 Ave & Range Road 11**

Job No. **113678466**  
 Project : **Bentley TIA**  
 From:  
 From km:  
 To:  
 To km:

Estimate Type: **"B"**

CEB Code #	Bid Item Description *	Unit	Estimated Quantity	Unit Price	Estimated Cost	Spec No.s
C020	Mobilization and Demobilization	lump sum	1	10%	\$266,756	0
F485	Detour Road - Construct and Maintain	lump sum	1	\$ 100,000.00	\$100,000	BCS 18.7
F755	Surface Removal	m2	7,500	\$ 10.00	\$75,000	BCS 20.3.1
G248	Common and/or Borrow Excavation Loaded to Trucks	m3	15,000	\$ 30.00	\$450,000	
B180	Preparing Subgrade Surface (First Layer)	m2	11,000	\$ 5.00	\$55,000	
B152	Granular Fill	t	12,650	\$ 45.00	\$569,250	
F978	Asphalt Concrete Pavement - Mix Type H1 (150-200A)	t	3,719	\$ 150.00	\$557,813	
Q022	Misc. Surfacing Work	m2	750	\$ 100.00	\$75,000	
X320	Concrete Curb(____ Type)	m	1,000	\$ 110.00	\$110,000	4.2.5
X400	Solid Concrete Medians	m2	1,000	\$ 150.00	\$150,000	4.2.5
Q999	Portland Cement Concrete Pavement	m2	250	\$ 300.00	\$75,000	3.70.7
D430	Culverts - Supply and Install (900 mm dia. C.S.P.)	m	130	\$ 600.00	\$78,000	2.4.4
U123	Street Light Bases - Supply and Install	units	8	\$ 5,000.00	\$40,000	2.25.8
U125	Street Light Standard - Supply and Install	units	8	\$ 15,000.00	\$120,000	2.25.8
F150	Surface Preparation and Painting	lump sum	1	\$ 50,000.00	\$50,000	BCS 22.24
F990	Supply and Install Sign Structures	lump sum	4	\$ 25,000.00	\$100,000	BCS 24.4
S288	Install Sign - Less than 1 m2	signs	50	\$ 1,000.00	\$50,000	7.7.5
S772	Supply and Install Post (100mm x 150mm)	posts	50	\$ 250.00	\$12,500	7.7.5
C232	Hydroseeding	m2	10,000	\$ 5.00	\$50,000	02924
<b>Total</b>					<b>\$2,984,319</b>	

<b>Total</b>	<b>\$2,984,319</b>
<b>Total Estimated Contract Cost</b>	<b>\$2,984,320</b>
<b>Contingencies @ 25%</b>	<b>\$596,864</b>
<b>Total Estimated Contract Cost + Contingency</b>	<b>\$3,581,184</b>
<b>Estimated Engineering Cost @10%</b>	<b>\$358,118</b>
<b>Total Estimated Cost (Rounded To Nearest \$100,000 Dollars)</b>	<b>\$3,900,000</b>

Date : 5-Jul-22 Prepared By : Brad Tiedemann

Date : 5-Jul-22 Checked By : Brad Vander Heyden