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01 February 2022
Project: 210753

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RE: TOWNHOUSE DEVELOPMENT – 114 CROSS STREET EAST, HALDIMAND COUNTY (DUNNVILLE), TRANSPORTATION AND PARKING BRIEF

Paradigm Transportation Solutions Limited (Paradigm) has been retained to prepare this Transportation Brief and Parking Justification for a proposed townhouse development located at 114 Cross Street East in Haldimand County (Dunnville). **Figure 1** (attached) illustrates the site location. The Transportation Brief evaluates the transportation impacts and forecasts the parking demand for the proposed development.

Site Description

The site concept plan consists of 39 stacked townhouse units in two buildings. Vehicle access is proposed by a private driveway to Cross Street East located approximately 80 metres east of Cedar Street. **Figure 2** (attached) illustrates the site concept plan.

The site's parking supply consists of 77 at grade parking spaces (1.97 per unit). Occupant parking is identified as 73 spaces (1.87 spaces per unit) and visitor parking is identified as 4 spaces (0.10 spaces per unit).

A sidewalk connection is proposed along the east side of the site driveway and will connect to the existing sidewalk on Cross Street East. Build-out is anticipated to occur by Year 2024.

Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation¹ methods were used to estimate the site's trip generation. Land Use Code (LUC) 220 (Multifamily Housing – Low Rise) was used to estimate the peak hour and daily trip generation of the townhouse units using regression equations.

¹ *Trip Generation Eleventh Edition*, Institute of Transportation Engineers, Washington D.C., 2021

To remain conservative, no modal split adjustments have been applied to the trip generation estimate to account for active transportation or other non-automobile-oriented trips.

Table 1 summarizes the estimated trip generation. The subject site is forecast to generate approximately 35 vehicle trips during the AM peak hour, 38 vehicle trips during the PM peak hour, and 325 daily vehicle trips.

TABLE 1: SITE GENERATED TRAFFIC

Land Use	AM Peak Hour			PM Peak Hour			Daily
	In	Out	Sum	In	Out	Sum	
Multifamily Housing (Low-Rise) - Not Close to Rail Transit (220) - 39 Units ²	8	27	35	24	14	38	325
Total Generation	8	27	35	24	14	38	325

Table 2 summarizes the estimated trip distribution. The estimated distribution is based on existing conditions as the nearby area is primarily residential. **Figure 3** (attached) illustrates the forecast site traffic assignment.

TABLE 2: ESTIMATED TRIP DISTRIBUTION

Trip Distribution	AM Peak Hour		PM Peak Hour	
	In	Out	In	Out
East via Cross Street East	65%	35%	35%	65%
West via Cross Street West	0%	15%	5%	15%
North via Cedar Street	10%	25%	20%	10%
South via Cedar Street	25%	25%	40%	10%
Total	100%	100%	100%	100%

Existing Conditions

Cross Street East is a two-lane east / west local roadway³ with a statutory speed limit of 50 km/h. The intersection with Cedar Street is stop controlled for the Cross Street East approach. The roadway has sidewalks on both sides and a pavement width of approximately 10 metres. On-street parking is permitted on both sides of the roadway.

Weekday turning movement count data was collected at the Cross Street East intersection with Cedar Street by Paradigm in December 2021. **Appendix A** contains the existing count data. **Figure 4** (attached) illustrates the existing AM and PM peak hour traffic volumes. Two-

² AM: $T = 0.31(X) + 22.85$ | PM: $T = 0.43(X) + 20.55$ | Daily: $T = 6.41(X) + 75.31$

³ Haldimand County Official Plan Schedule F.5 Dunnville Urban Area Transportation Plan



way traffic volumes on Cross Street East near the subject site are in the order of 20 to 30 vehicles per hour.

Haldimand County classifies roads based on their traffic service function, Average Daily Traffic (ADT) volumes, speed limits, and the type of vehicles that are typically accommodated⁴. The Haldimand County Design Criteria note that local streets typically prioritize land access and typically accommodate less than 3,000 vehicles per day. The estimated existing ADT on Cross Street East is approximately 300 vehicles per day, which is well below the daily traffic volumes typically associated with local roadways.

Forecast Traffic Volumes

The traffic volumes are forecast to Year 2029, which is 5-years after the expected occupancy of the development. As a typical background growth rate is not identified in the County's Traffic Impact Study (TIS) guidelines⁵, a growth rate of 2% per annum⁶ was applied to the existing traffic volumes to forecast future conditions.

Figure 5 (attached) illustrates the background traffic volumes for the weekday AM and PM peak hours. Background traffic is the general growth in traffic volumes unrelated to the subject site. Cross Street East is forecast to accommodate approximately 360 vehicles per day near the subject site under background conditions.

Figure 6 (attached) illustrates the total traffic volumes for the weekday AM and PM peak hours. Total traffic includes the estimated site traffic volumes with the background traffic. Cross Street East is forecast to accommodate approximately 570 vehicles per day near the subject site under total conditions.

The traffic generated by the subject site is not expected to change the environmental capacity of Cross Street East. The local roadway currently accommodates about 300 vehicles per day. The addition of site traffic plus the nominal growth in non-site generated traffic is expected to remain within the thresholds identified by Haldimand County for a local roadway (under 3,000 vehicles per day).

Traffic Operations

The operations of the Cross Street East intersections with Cedar Street and the proposed site driveway were evaluated using the forecast traffic volumes for the existing, background, and total traffic conditions using Synchro 10. **Table 3** summarizes the traffic operations.

Intersection operations are forecast to be in the LOS A to B range (less than 15 seconds of delay per vehicle) during the weekday AM and PM peak hours. No capacity issues are identified that might suggest the need for geometric or traffic control improvements. The

⁴ Section G 1.01 – Street Classification - Design Criteria Version 4.0, Haldimand County, April 2015.

⁵ Ibid., Section T – Traffic Impact Study Guidelines.

⁶ 2% per annum is typically requested by the Ministry of Transportation of Ontario when a local growth rate is unavailable.



addition of site generated traffic is expected to result in minor changes to intersection operations but is not expected to result in any critical movements.

The site driveway approach to Cross Street East is forecast to operate with delays in the LOS A range (less than 10 seconds per vehicle) and well within capacity with volume to capacity ratios of less than 0.05. Queuing on the site driveway approach is forecast to be minimal with a 95th percentile queue length of less than two metres (one car or less).

Appendix B contains the detailed Synchro 10 reports.

TABLE 3: TRAFFIC OPERATIONS

Horizon Year	Intersection	MOE	AM Peak Hour					PM Peak Hour				
			Approach				Overall	Approach				Overall
			EB	WB	NB	SB		EB	WB	NB	SB	
Existing Traffic	Cross Street East & Cedar Street	LOS	A	A	A	A	A	A	B	A	A	A
		Delay	9	10	0	0	2	9	10	0	1	1
		V/C	0.01	0.02	0.00	0.00		0.01	0.02	0.01	0.00	
		95th	0	1	0	0		0	0	0	0	
Background Traffic	Cross Street East & Cedar Street	LOS	A	A	A	A	A	A	B	A	A	A
		Delay	9	10	0	0	1	9	11	0	1	1
		V/C	0.01	0.02	0.00	0.00		0.01	0.02	0.01	0.01	
		95th	0	1	0	0		0	0	0	0	
Total Traffic	Cross Street East & Cedar Street	LOS	A	A	A	A	A	A	B	A	A	A
		Delay	9	10	0	0	2	10	11	0	1	1
		V/C	0.01	0.05	0.00	0.00		0.01	0.03	0.01	0.01	
		95th	0	1	0	0		0	1	0	0	
	Cross Street East & Site Driveway	LOS	A	A	A		A	A	A	A		A
		Delay	0	2	9		5	0	3	9		3
		V/C	0.01	0.00	0.03			0.02	0.01	0.01		
		95th	0	0	1			0	0	0		

MOE - Measure of Effectiveness

V/C - Volume to Capacity Ratio

LOS - Level of Service

95th - 95th Percentile Queue Length



Parking

Zoning Requirements

The zoning requirements for the subject site⁷ requires 2.00 spaces per unit plus 1 visitor space for every 10 units. The required minimum parking supply based on the by-law is 78 spaces for occupant and 4 visitor spaces for a total requirement of 82 spaces. With a supply of 77 spaces, the site is considered deficient by five spaces.

Published Data

An accepted industry standard for the determination of potential parking demand is ITE's Parking Generation Manual⁸. ITE provides data on surveys across the USA and Canada of peak parking demands for different land uses.

Land Use Code (LUC) 220 (Multifamily Housing – Low Rise) was used to estimate the site's peak parking generation using the regression equation⁹. The ITE estimate does not differentiate between occupant and visitor parking but provides an overall parking demand. **Table 4** summarizes the estimated peak parking generation for the subject site. **Figure 7** (attached) illustrates the temporal demand for parking.

TABLE 4: ITE PARKING GENERATION ESTIMATE

Land Use Code	Units	Parking Demand (Spaces)
Multifamily Housing (Low-Rise) (220)	39	44
Proposed Supply		77
Surplus		33

The site's parking demand using the ITE data is estimated to be approximately 44 spaces. With a total parking supply of 77 spaces, the site's parking demand is estimated to be well below the proposed supply. The site's parking demand is not expected to spill over onto Cross Street as the site's parking supply exceeds the forecast demand.

Transportation Demand Management

Transportation Demand Management (TDM) refers to ways of making the capacity of our roads more efficient by reducing vehicle demands. TDM approaches consider how people's choices of travel mode are affected by land use patterns, development design, parking availability, parking cost, and the relative cost, convenience, and availability of alternative modes of travel. Integrating TDM measures influences travel behavior for occupants and

⁷ Dunnville's By-Law 1-DU 80

⁸ Institute of Transportation Engineers. Parking Generation Manual, 5th Edition

⁹ $\text{Ln}(P) = 0.99 \text{ Ln}(X) + 0.15$



visitors, leading to potential lower transportation and parking impacts. The following TDM measures are recommended:

Walking

The site concept plan includes a sidewalk connection to Cross Street East. The sidewalk linking the southern half of the site to Cross Street East is indirect as the sidewalk continues around the at-grade parking area.

A more direct sidewalk following the drive aisle should be provided to establish a better on-site sidewalk network. The site's landscaping plan should consider enhanced pedestrian amenities such as benches, landscaping, and lighting to establish a strong pedestrian realm.

Bicycle Parking

Providing occupants and visitors with a location to park their bicycle can encourage travel by bicycle. Bicycle parking should be added to the site plan in convenient, secure, and readily accessible locations. A minimum of 22 bicycle parking spaces is recommended¹⁰.

Parking

The parking supply should be managed and monitored by the site operator to help limit any parking spill over impacts to the existing neighborhood. Occupant parking can effectively be managed by limiting the sale of spaces to individual units.

Conclusions

The main findings and conclusions of this study are as follows:

- ▶ The site concept plan consists of 39 stacked townhouse units in two buildings. Vehicle access is provided by a private driveway to Cross Street East. The site's parking supply is noted as 77 spaces (1.97 spaces per unit). Build-out and occupancy is expected by Year 2024.
- ▶ The subject site is forecast to generate approximately 35 new vehicle trips during the weekday AM peak hour and approximately 38 new vehicle trips during the PM peak hour. The daily trip generation is estimated to be approximately 325 daily vehicle trips.
- ▶ The traffic generated by the subject site is not expected to change the environmental capacity of Cross Street East. The local roadway currently accommodates about 300 vehicles per day. The addition of site traffic plus the nominal growth in non-site generated traffic is expected to remain within the thresholds identified by Haldimand County for a local roadway (under 3,000 vehicles per day).
- ▶ Intersection operations are forecast to be in the LOS A to B range (less than 15 seconds of delay per vehicle) during the weekday AM and PM peak hours. No capacity

¹⁰ Association of Pedestrian and Bicycle Professionals (APBP). 2010. Bicycle Parking Guidelines, 2nd Ed.



issues are identified that might suggest the need for geometric or traffic control improvements. The addition of site generated traffic is expected to result in minor changes to intersection operation but is not expected to result in any critical movements.

- ▶ The site's parking demand is forecast to be approximately 44 spaces. With a total parking supply of 77 spaces, the site's parking demand is estimated to be well below the proposed supply. The site's parking demand is not expected to spill over onto Cross Street as the site's parking supply exceeds the forecast demand.
- ▶ TDM measures should be included in the site plan to help manage the site's transportation and parking impacts.

Recommendations

Based on the findings of this study it is recommended that:

- ▶ A sidewalk be provided on the east side of the site driveway from the Cross Street East intersection to the southern most extension of the drive aisle;
- ▶ The site's landscaping plan include enhanced pedestrian amenities such as benches, landscaping, and lighting to establish a strong pedestrian realm;
- ▶ Bicycle parking spaces be provided on the site plan in convenient, secure, and readily accessible locations; and
- ▶ The site operator managed and monitored the site's parking demand to help limit any parking spill over impacts to the existing neighborhood.

We trust that the foregoing information will meet your requirements. Please do not hesitate to contact us if we can be of further assistance.

PARADIGM TRANSPORTATION SOLUTIONS LIMITED



Scott Catton, C.E.T.
Senior Project Manager

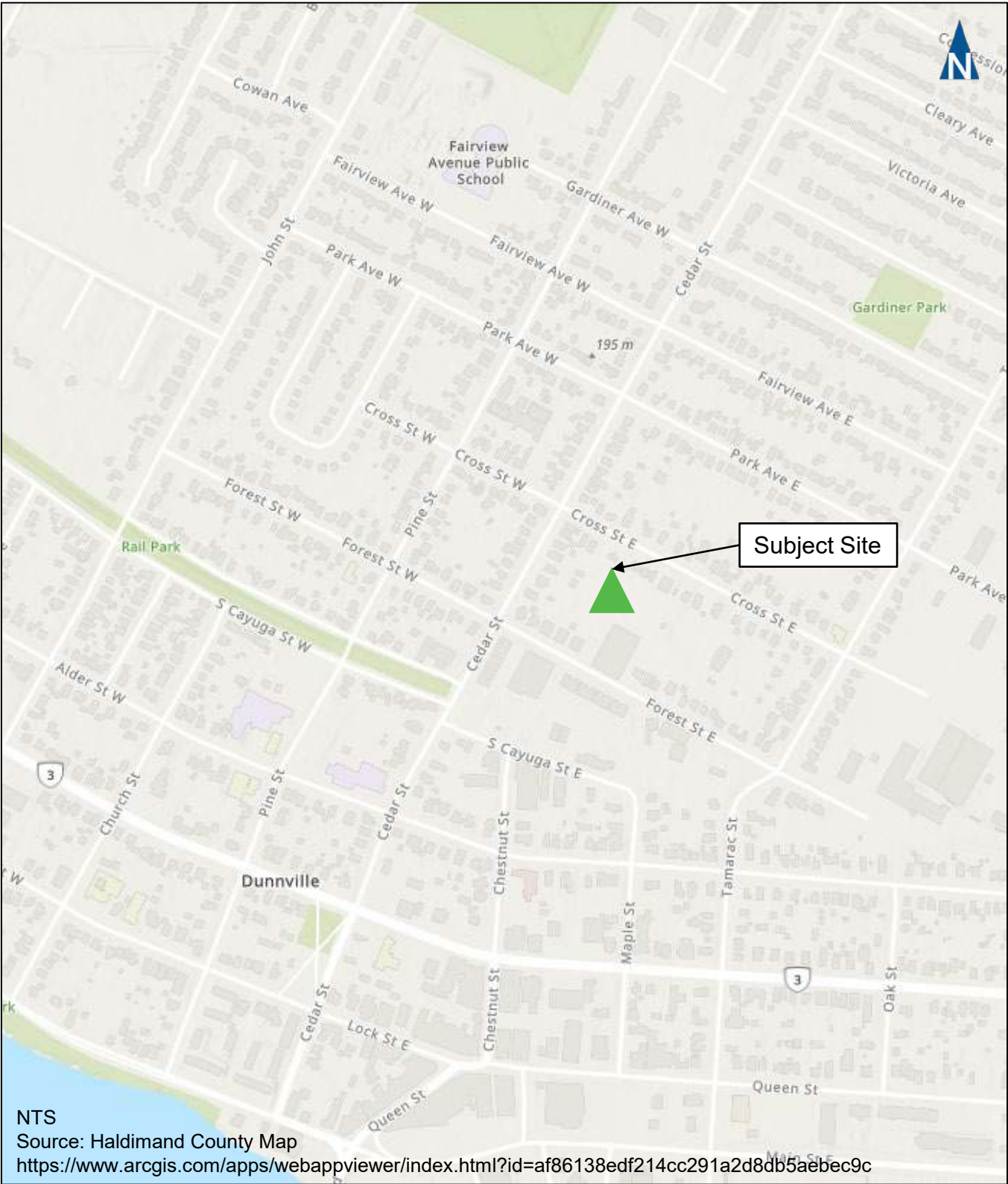


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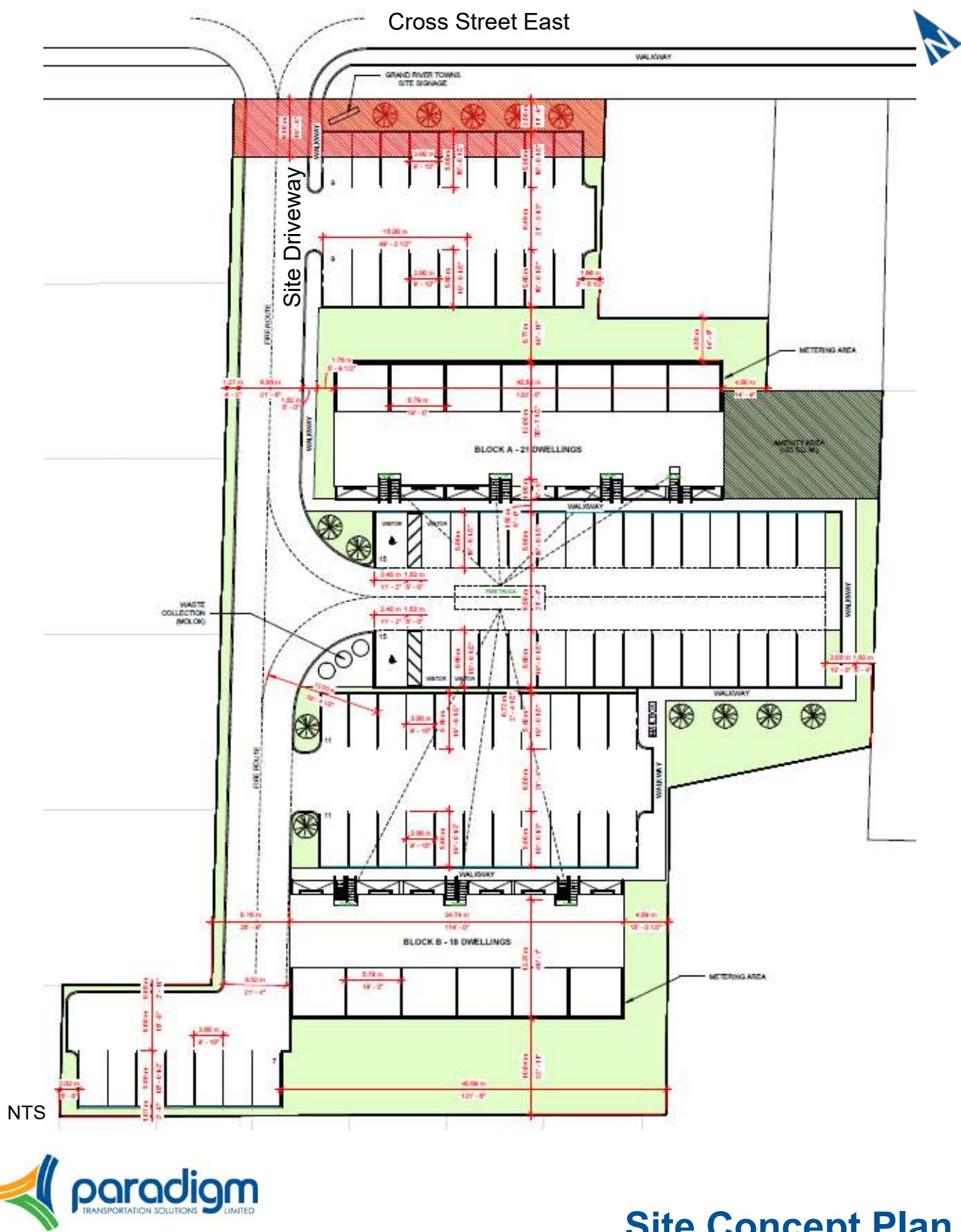




Site Location

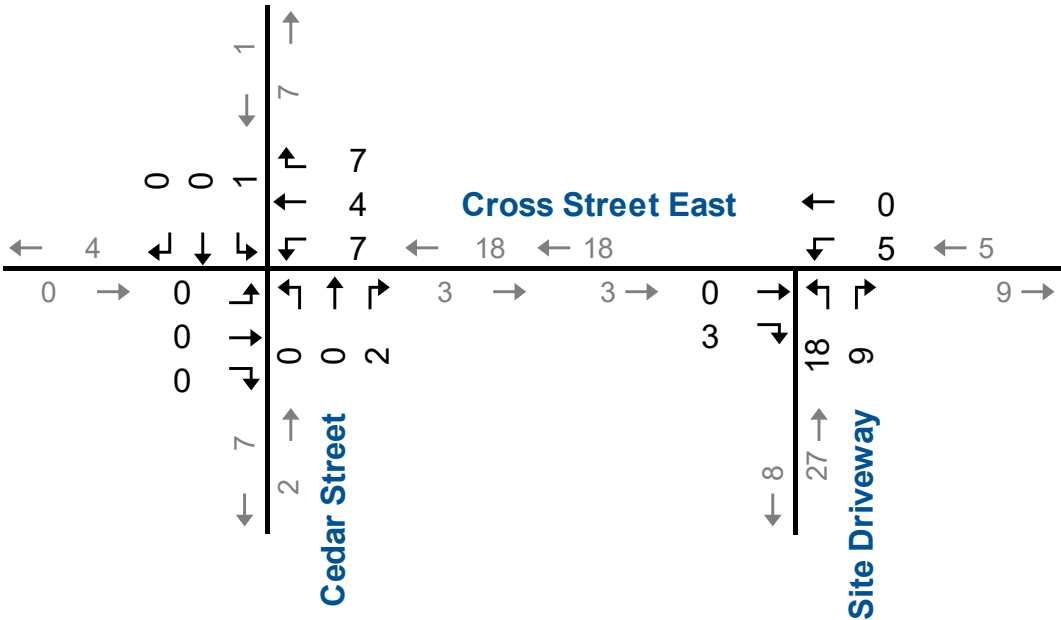
114 Cross Street East
210753

Figure 1

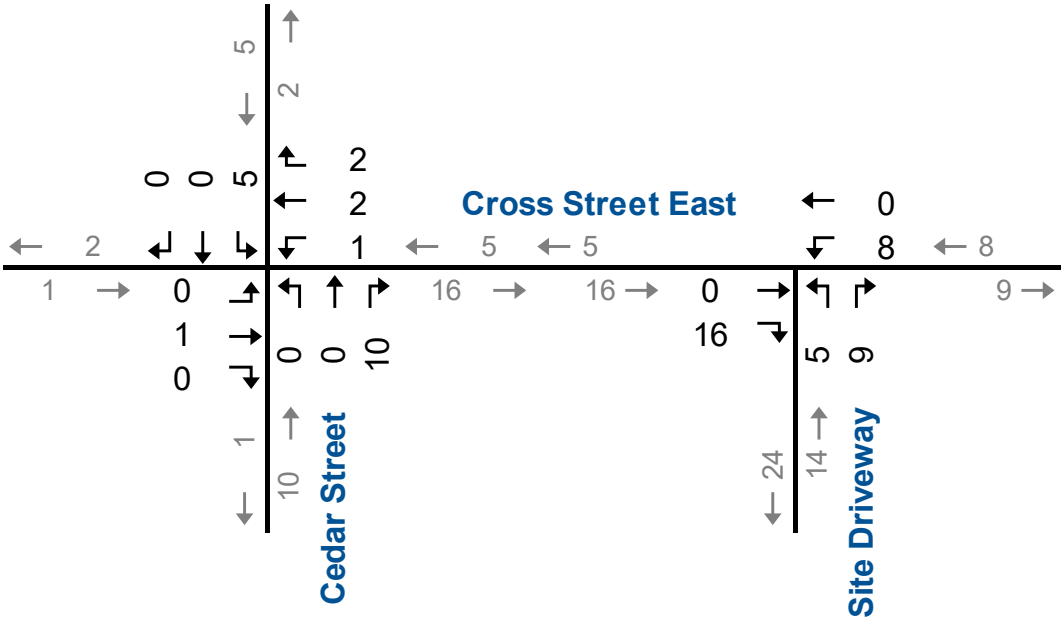


Site Concept Plan

AM Peak Hour



PM Peak Hour



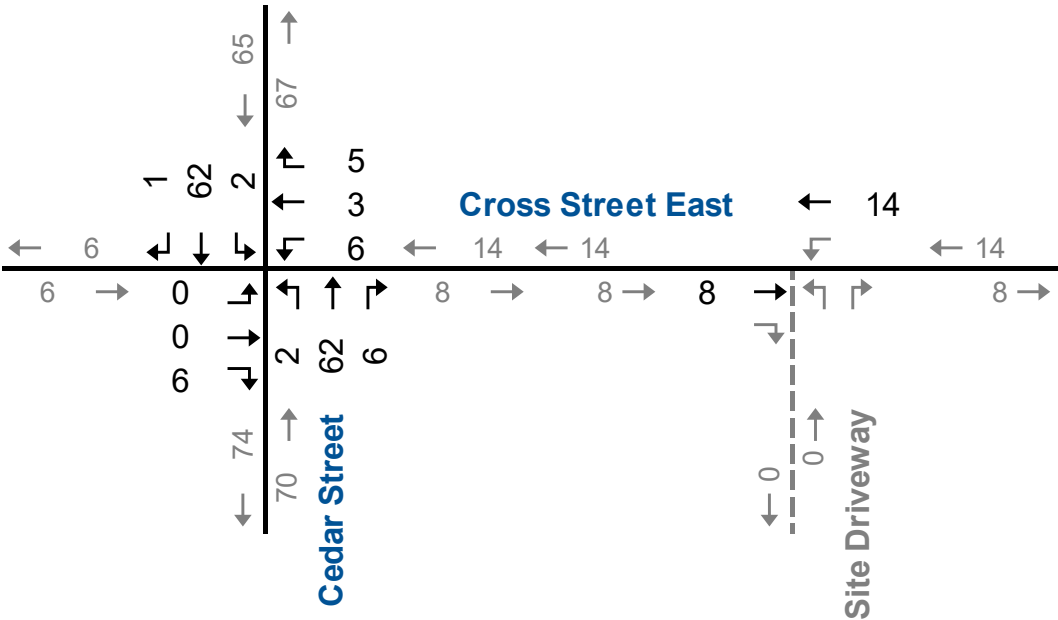
NTS



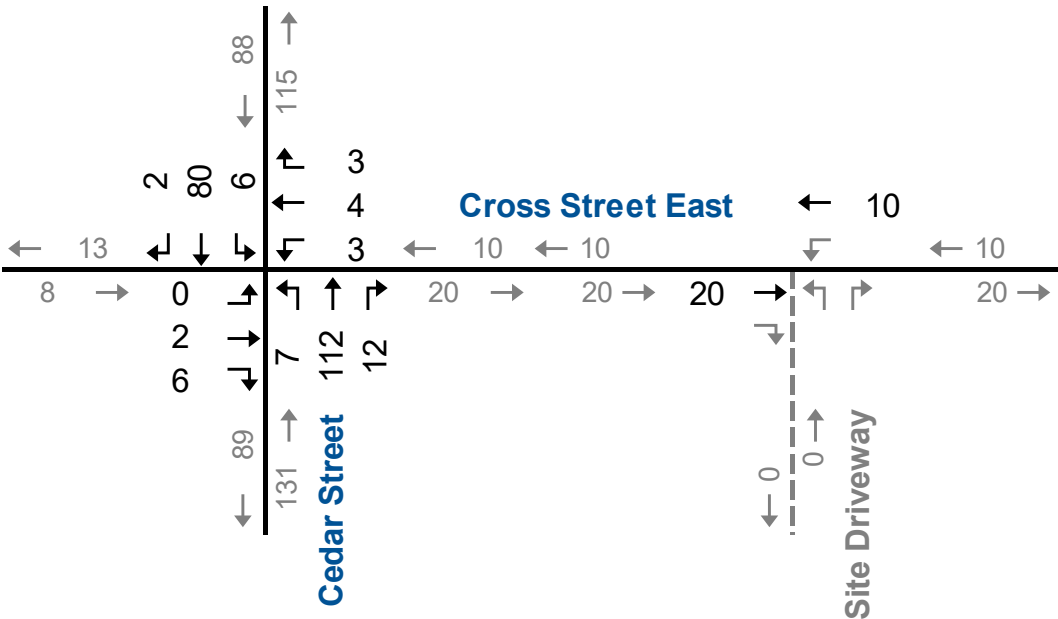
Forecast Site Generated Traffic

Figure 3

AM Peak Hour



PM Peak Hour

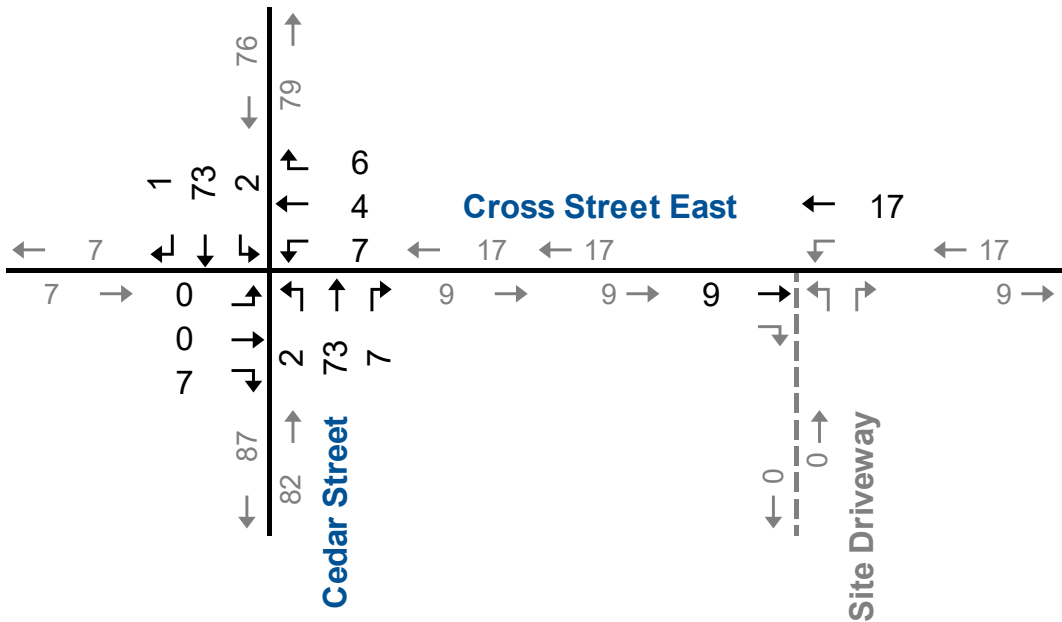


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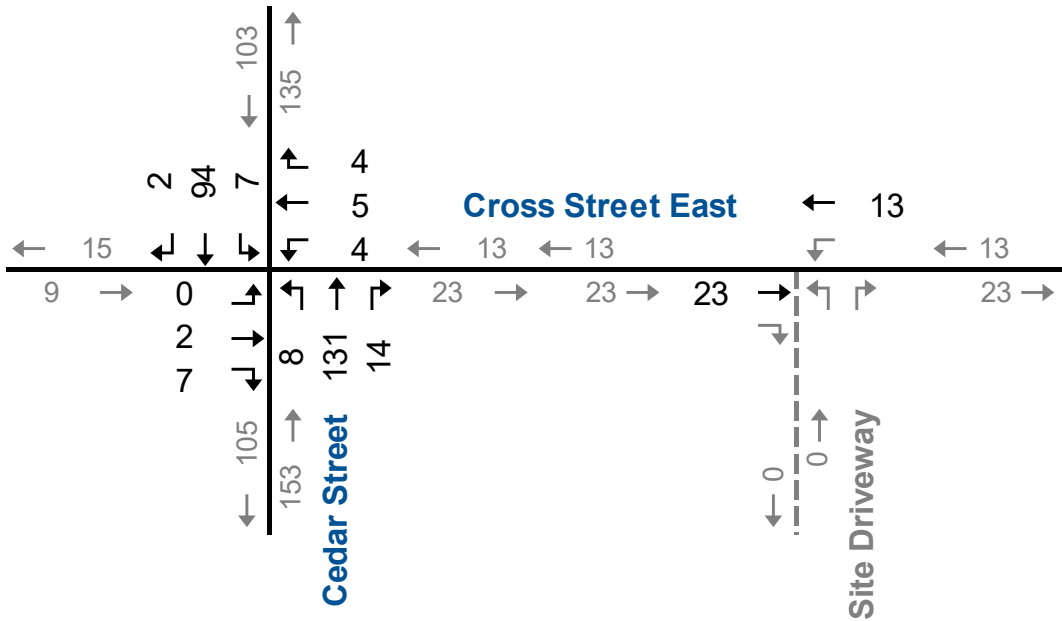


Existing Traffic Volumes

AM Peak Hour



PM Peak Hour

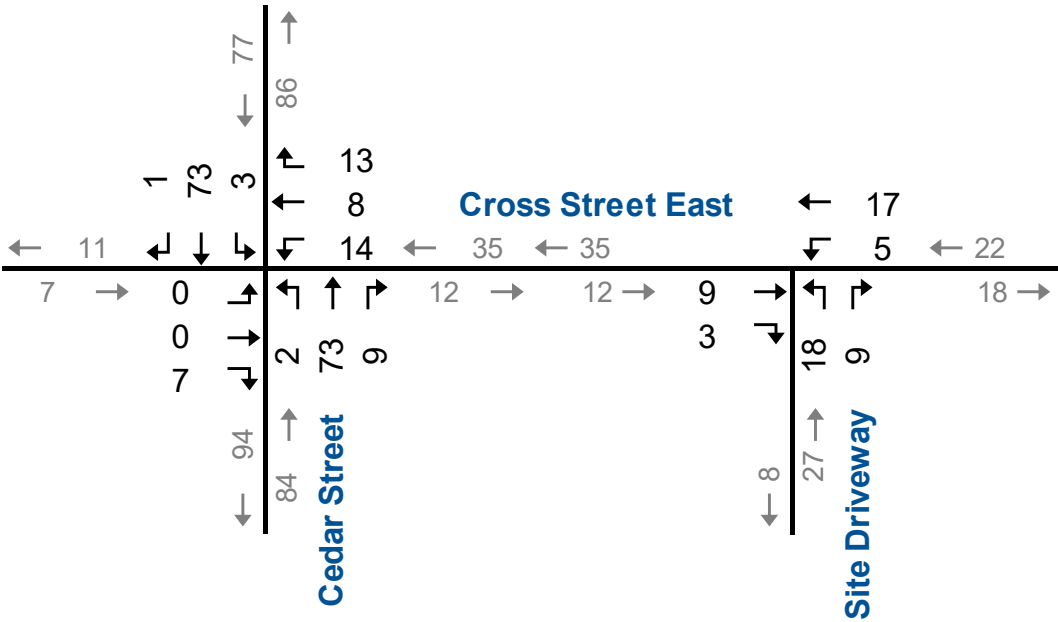


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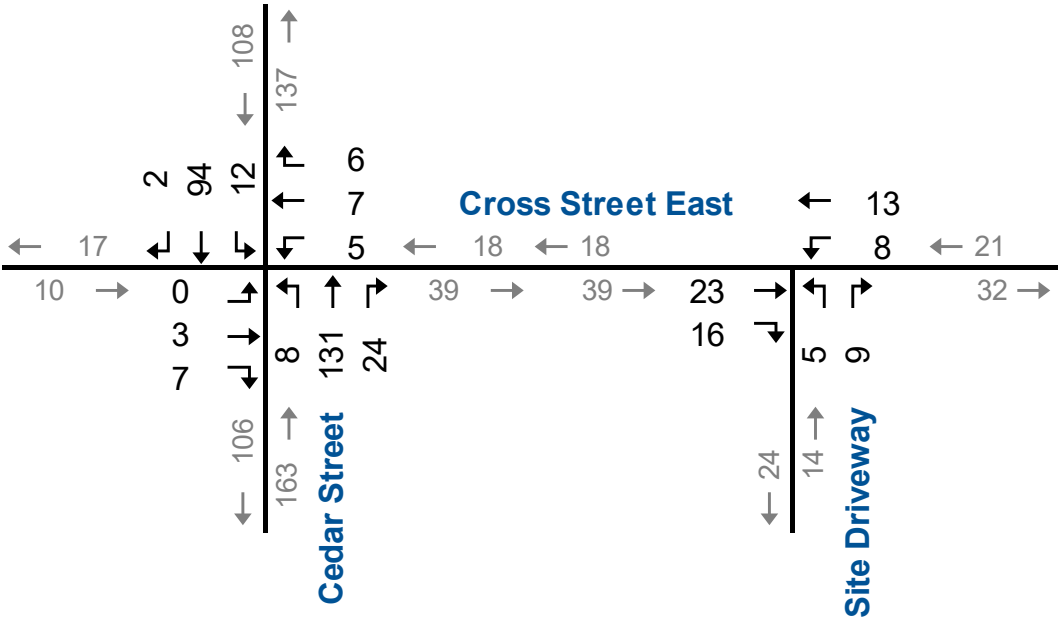


Forecast Background Traffic

AM Peak Hour



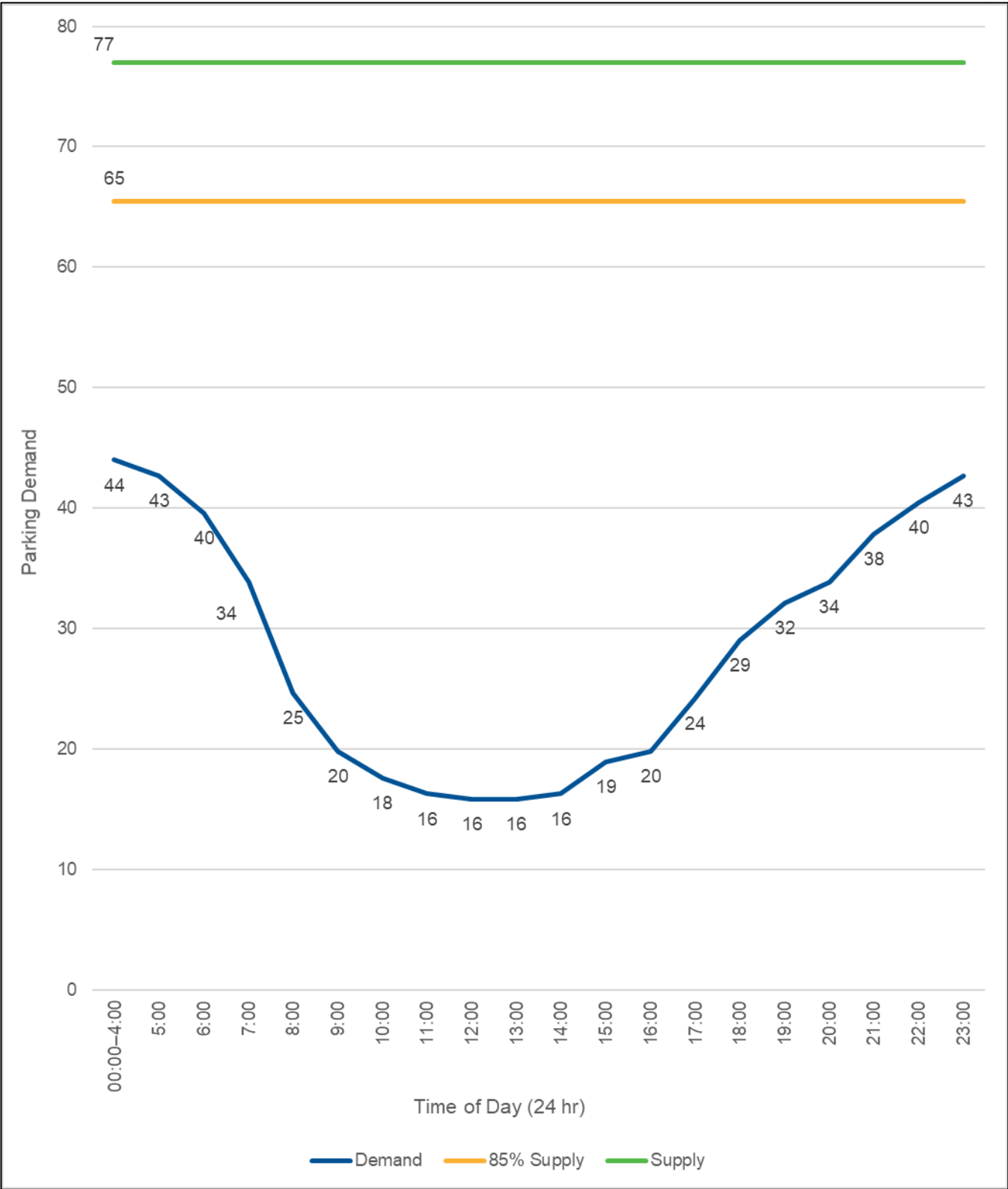
PM Peak Hour



NTS



Forecast Total Traffic



Temporal Parking Demand

Figure 7

Appendix A

Existing Data





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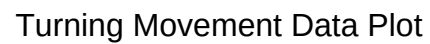
Count Name: East Cross Street & Cedar Street
Site Code: 210753
Start Date: 12/14/2021
Page No: 1

Turning Movement Data

Start Time	East Cross Street Eastbound						East Cross Street Westbound						Cedar Street Northbound						Cedar Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	0	0	0	1	0	1	0	0	0	0	1	1	4	0	0	0	5	0	6	0	0	0	6	12
7:15 AM	0	1	0	0	0	1	2	1	0	0	0	3	0	11	0	0	0	11	1	13	0	0	0	14	29
7:30 AM	0	0	2	0	0	2	0	1	0	0	2	1	1	5	2	0	0	8	0	11	0	0	0	11	22
7:45 AM	0	0	3	0	1	3	3	0	1	0	0	4	0	13	2	0	1	15	0	15	0	0	1	15	37
Hourly Total	0	1	5	0	2	6	6	2	1	0	2	9	2	33	4	0	1	39	1	45	0	0	1	46	100
8:00 AM	0	0	2	0	1	2	2	0	1	0	0	3	0	7	2	0	0	9	1	6	0	0	1	7	21
8:15 AM	0	0	0	0	1	0	2	1	2	0	0	5	2	19	1	0	0	22	0	13	0	0	0	13	40
8:30 AM	0	0	1	0	3	1	1	1	0	0	0	2	0	16	2	0	0	18	0	24	0	0	1	24	45
8:45 AM	0	0	3	0	1	3	1	1	2	0	5	4	0	20	1	0	1	21	1	19	1	0	0	21	49
Hourly Total	0	0	6	0	6	6	6	3	5	0	5	14	2	62	6	0	1	70	2	62	1	0	2	65	155
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	1	0	2	0	2	3	1	0	2	0	2	3	2	15	1	0	0	18	0	16	0	0	1	16	40
11:45 AM	0	0	0	0	0	0	2	0	0	0	1	2	1	16	3	0	0	20	0	11	0	0	0	11	33
Hourly Total	1	0	2	0	2	3	3	0	2	0	3	5	3	31	4	0	0	38	0	27	0	0	1	27	73
12:00 PM	0	2	1	0	0	3	5	0	2	0	3	7	2	21	1	0	0	24	0	11	0	0	0	11	45
12:15 PM	0	0	1	0	0	1	3	0	2	0	0	5	3	15	1	0	0	19	1	17	1	0	0	19	44
12:30 PM	0	1	2	0	0	3	0	0	1	0	0	1	1	13	2	0	0	16	0	15	0	0	0	15	35
12:45 PM	1	0	2	0	2	3	5	2	0	0	0	7	1	17	2	0	0	20	0	15	0	0	0	15	45
Hourly Total	1	3	6	0	2	10	13	2	5	0	3	20	7	66	6	0	0	79	1	58	1	0	0	60	169
1:00 PM	0	0	0	0	0	0	2	0	1	0	0	3	1	17	2	0	0	20	0	18	0	0	0	18	41
1:15 PM	0	0	0	0	1	0	0	0	0	0	1	0	3	12	1	0	0	16	0	15	0	0	0	15	31
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	1	0	2	0	1	0	1	3	4	29	3	0	0	36	0	33	0	0	0	33	72
3:00 PM	0	0	2	0	3	2	2	1	2	0	1	5	4	25	3	0	0	32	2	24	0	0	0	26	65
3:15 PM	0	4	2	0	5	6	1	1	2	0	11	4	2	23	2	0	1	27	0	18	0	0	0	18	55
3:30 PM	0	2	1	0	2	3	4	0	2	0	3	6	1	19	2	0	0	22	1	16	1	0	0	18	49
3:45 PM	0	0	3	0	0	3	3	4	0	0	2	7	3	25	2	0	0	30	0	25	0	0	2	25	65
Hourly Total	0	6	8	0	10	14	10	6	6	0	17	22	10	92	9	0	1	111	3	83	1	0	2	87	234
4:00 PM	0	1	3	0	1	4	0	0	1	0	1	1	3	28	1	0	0	32	2	15	0	0	1	17	54
4:15 PM	0	3	1	0	1	4	1	5	0	0	3	6	2	24	5	0	1	31	0	11	0	0	0	11	52
4:30 PM	0	1	1	0	2	2	2	1	0	0	1	3	2	24	4	0	0	30	2	15	0	0	0	17	52
4:45 PM	0	0	0	0	0	0	0	0	0	0	3	0	1	30	3	0	0	34	0	21	0	0	0	21	55
Hourly Total	0	5	5	0	4	10	3	6	1	0	8	10	8	106	13	0	1	127	4	62	0	0	1	66	213
5:00 PM	0	1	3	0	1	4	0	3	1	0	2	4	3	28	4	0	0	35	0	23	1	0	0	24	67
5:15 PM	0	0	2	0	1	2	1	0	2	0	0	3	1	30	1	0	0	32	4	21	1	0	0	26	63

5:30 PM	0	0	0	0	2	0	3	1	1	0	4	5	2	26	1	0	0	29	0	17	0	0	0	17	51
5:45 PM	0	0	2	0	1	2	3	0	0	0	1	3	1	23	3	0	0	27	0	19	0	0	0	19	51
Hourly Total	0	1	7	0	5	8	7	4	4	0	7	15	7	107	9	0	0	123	4	80	2	0	0	86	232
Grand Total	2	16	39	0	32	57	50	23	25	0	46	98	43	526	54	0	4	623	15	450	5	0	7	470	1248
Approach %	3.5	28.1	68.4	0.0	-	-	51.0	23.5	25.5	0.0	-	-	6.9	84.4	8.7	0.0	-	-	3.2	95.7	1.1	0.0	-	-	-
Total %	0.2	1.3	3.1	0.0	-	4.6	4.0	1.8	2.0	0.0	-	7.9	3.4	42.1	4.3	0.0	-	49.9	1.2	36.1	0.4	0.0	-	37.7	-
Motorcycles	0	1	0	0	-	1	0	0	0	0	-	0	0	1	0	0	-	1	0	1	0	0	-	1	3
% Motorcycles	0.0	6.3	0.0	-	-	1.8	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	-	-	0.2	0.0	0.2	0.0	-	-	0.2	0.2
Cars & Light Goods	2	14	36	0	-	52	45	18	23	0	-	86	39	519	50	0	-	608	14	441	5	0	-	460	1206
% Cars & Light Goods	100.0	87.5	92.3	-	-	91.2	90.0	78.3	92.0	-	-	87.8	90.7	98.7	92.6	-	-	97.6	93.3	98.0	100.0	-	-	97.9	96.6
Buses	0	0	0	0	-	0	0	1	0	0	-	1	1	3	0	0	-	4	1	4	0	0	-	5	10
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	4.3	0.0	-	-	1.0	2.3	0.6	0.0	-	-	0.6	6.7	0.9	0.0	-	-	1.1	0.8
Single-Unit Trucks	0	1	0	0	-	1	1	0	2	0	-	3	1	2	2	0	-	5	0	3	0	0	-	3	12
% Single-Unit Trucks	0.0	6.3	0.0	-	-	1.8	2.0	0.0	8.0	-	-	3.1	2.3	0.4	3.7	-	-	0.8	0.0	0.7	0.0	-	-	0.6	1.0
Articulated Trucks	0	0	0	0	-	0	2	0	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	2
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	4.0	0.0	0.0	-	-	2.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	0	0	3	0	-	3	2	4	0	0	-	6	2	1	2	0	-	5	0	1	0	0	-	1	15
% Bicycles on Road	0.0	0.0	7.7	-	-	5.3	4.0	17.4	0.0	-	-	6.1	4.7	0.2	3.7	-	-	0.8	0.0	0.2	0.0	-	-	0.2	1.2
Bicycles on Crosswalk	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	6.3	-	-	-	-	-	2.2	-	-	-	-	-	0.0	-	-	-	-	-	14.3	-	-
Pedestrians	-	-	-	-	30	-	-	-	-	-	45	-	-	-	-	-	4	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	93.8	-	-	-	-	-	97.8	-	-	-	-	-	100.0	-	-	-	-	-	85.7	-	-

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Paradigm Transportation Solutions Limited
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Turning Movement Peak Hour Data (8:00 AM)

Start Time	East Cross Street Eastbound						East Cross Street Westbound						Cedar Street Northbound						Cedar Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:00 AM	0	0	2	0	1	2	2	0	1	0	0	3	0	7	2	0	0	9	1	6	0	0	1	7	21
8:15 AM	0	0	0	0	1	0	2	1	2	0	0	5	2	19	1	0	0	22	0	13	0	0	0	13	40
8:30 AM	0	0	1	0	3	1	1	1	0	0	0	2	0	16	2	0	0	18	0	24	0	0	1	24	45
8:45 AM	0	0	3	0	1	3	1	1	2	0	5	4	0	20	1	0	1	21	1	19	1	0	0	21	49
Total	0	0	6	0	6	6	6	3	5	0	5	14	2	62	6	0	1	70	2	62	1	0	2	65	155
Approach %	0.0	0.0	100.0	0.0	-	-	42.9	21.4	35.7	0.0	-	-	2.9	88.6	8.6	0.0	-	-	3.1	95.4	1.5	0.0	-	-	-
Total %	0.0	0.0	3.9	0.0	-	3.9	3.9	1.9	3.2	0.0	-	9.0	1.3	40.0	3.9	0.0	-	45.2	1.3	40.0	0.6	0.0	-	41.9	-
PHF	0.000	0.000	0.500	0.000	-	0.500	0.750	0.750	0.625	0.000	-	0.700	0.250	0.775	0.750	0.000	-	0.795	0.500	0.646	0.250	0.000	-	0.677	0.791
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	1
% Motorcycles	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.6	0.0	-	-	1.5	0.6
Cars & Light Goods	0	0	6	0	-	6	6	3	5	0	-	14	2	59	5	0	-	66	2	60	1	0	-	63	149
% Cars & Light Goods	-	-	100.0	-	-	100.0	100.0	100.0	100.0	-	-	100.0	100.0	95.2	83.3	-	-	94.3	100.0	96.8	100.0	-	-	96.9	96.1
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	3	0	0	-	3	0	0	0	0	-	0	3
% Buses	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	4.8	0.0	-	-	4.3	0.0	0.0	0.0	-	-	0.0	1.9
Single-Unit Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	1	0	-	1	0	0	0	0	-	0	1
% Single-Unit Trucks	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	16.7	-	-	1.4	0.0	0.0	0.0	-	-	0.0	0.6
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	1
% Bicycles on Road	-	-	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.6	0.0	-	-	1.5	0.6
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	6	-	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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	East Cross Street Eastbound						East Cross Street Westbound						Cedar Street Northbound						Cedar Street Southbound						
Start Time																									Int. Total
	Left	Thru	Right	U-Turn	Peds	App.Total	Left	Thru	Right	U-Turn	Peds	App.Total	Left	Thru	Right	U-Turn	Peds	App.Total	Left	Thru	Right	U-Turn	Peds	App.Total	
12:00 PM	0	2	1	0	0	3	5	0	2	0	3	7	2	21	1	0	0	24	0	11	0	0	0	11	45
12:15 PM	0	0	1	0	0	1	3	0	2	0	0	5	3	15	1	0	0	19	1	17	1	0	0	19	44
12:30 PM	0	1	2	0	0	3	0	0	1	0	0	1	1	13	2	0	0	16	0	15	0	0	0	15	35
12:45 PM	1	0	2	0	2	3	5	2	0	0	0	7	1	17	2	0	0	20	0	15	0	0	0	15	45
Total	1	3	6	0	2	10	13	2	5	0	3	20	7	66	6	0	0	79	1	58	1	0	0	60	169
Approach %	10.0	30.0	60.0	0.0	-	-	65.0	10.0	25.0	0.0	-	-	8.9	83.5	7.6	0.0	-	-	1.7	96.7	1.7	0.0	-	-	-
Total %	0.6	1.8	3.6	0.0	-	5.9	7.7	1.2	3.0	0.0	-	11.8	4.1	39.1	3.6	0.0	-	46.7	0.6	34.3	0.6	0.0	-	35.5	-
PHF	0.250	0.375	0.750	0.000	-	0.833	0.650	0.250	0.625	0.000	-	0.714	0.583	0.786	0.750	0.000	-	0.823	0.250	0.853	0.250	0.000	-	0.789	0.939
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	1	2	6	0	-	9	12	2	4	0	-	18	6	65	5	0	-	76	1	56	1	0	-	58	161
% Cars & Light Goods	100.0	66.7	100.0	-	-	90.0	92.3	100.0	80.0	-	-	90.0	85.7	98.5	83.3	-	-	96.2	100.0	96.6	100.0	-	-	96.7	95.3
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	0	1	0	0	-	1	0	0	1	0	-	1	1	0	1	0	-	2	0	2	0	0	-	2	6
% Single-Unit Trucks	0.0	33.3	0.0	-	-	10.0	0.0	0.0	20.0	-	-	5.0	14.3	0.0	16.7	-	-	2.5	0.0	3.4	0.0	-	-	3.3	3.6
Articulated Trucks	0	0	0	0	-	0	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	1
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	7.7	0.0	0.0	-	-	5.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.6
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.5	0.0	-	-	1.3	0.0	0.0	0.0	-	-	0.0	0.6
Bicycles on Crosswalk	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	50.0	-	-	-	-	-	0														

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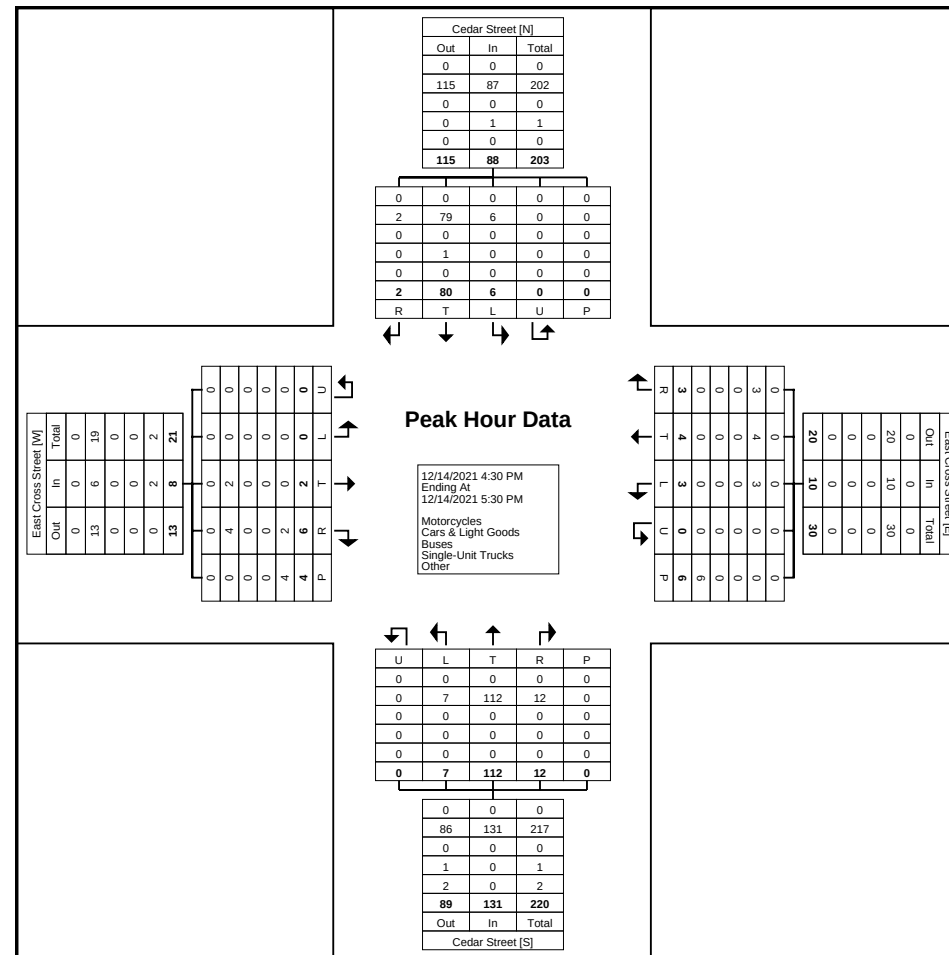
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Turning Movement Peak Hour Data Plot (4:30 PM)

Appendix B

Traffic Operations



Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

Base Year AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	6	6	3	5	2	62	6	2	62	1
Future Volume (vph)	0	0	6	6	3	5	2	62	6	2	62	1
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
Ped Bike Factor												
Frt		0.865			0.955			0.988			0.998	
Flt Protected					0.978			0.998			0.998	
Satd. Flow (prot)	0	1589	0	0	1715	0	0	1784	0	0	1829	0
Flt Permitted					0.978			0.998			0.998	
Satd. Flow (perm)	0	1589	0	0	1715	0	0	1784	0	0	1829	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)	2		1	1		2	6		5	5		6
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	0%	0%
Adj. Flow (vph)	0	0	8	8	4	6	3	78	8	3	78	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	8	0	0	18	0	0	89	0	0	82	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

Base Year AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	6	6	3	5	2	62	6	2	62	1
Future Volume (Veh/h)	0	0	6	6	3	5	2	62	6	2	62	1
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	8	8	4	6	3	78	8	3	78	1
Pedestrians	6			5			1			2		
Lane Width (m)	3.3			3.3			3.3			3.3		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	188	188	86	186	184	89	85				91	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	188	188	86	186	184	89	85				91	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	99	99	99	99	100				100	
cM capacity (veh/h)	756	702	974	761	705	969	1517				1511	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	8	18	89	82								
Volume Left	0	8	3	3								
Volume Right	8	6	8	1								
cSH	974	805	1517	1511								
Volume to Capacity	0.01	0.02	0.00	0.00								
Queue Length 95th (m)	0.2	0.5	0.0	0.0								
Control Delay (s)	8.7	9.6	0.3	0.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	8.7	9.6	0.3	0.3								
Approach LOS	A	A										
Intersection Summary												
Average Delay				1.5								
Intersection Capacity Utilization				19.2%	ICU Level of Service			A				
Analysis Period (min)				15								

Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

Base Year PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2	6	3	4	3	7	112	12	6	80	2
Future Volume (vph)	0	2	6	3	4	3	7	112	12	6	80	2
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
Ped Bike Factor												
Frt		0.895			0.963			0.987			0.997	
Flt Protected					0.987			0.997			0.997	
Satd. Flow (prot)	0	1644	0	0	1746	0	0	1807	0	0	1809	0
Flt Permitted					0.987			0.997			0.997	
Satd. Flow (perm)	0	1644	0	0	1746	0	0	1807	0	0	1809	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)							4		6	6		4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Adj. Flow (vph)	0	2	7	3	5	3	8	127	14	7	91	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	0	0	11	0	0	149	0	0	100	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

Base Year PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	6	3	4	3	7	112	12	6	80	2
Future Volume (Veh/h)	0	2	6	3	4	3	7	112	12	6	80	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	2	7	3	5	3	8	127	14	7	91	2
Pedestrians		4			6							
Lane Width (m)		3.3			3.3							
Walking Speed (m/s)		1.2			1.2							
Percent Blockage		0			0							
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	266	273	96	270	267	140	97			147		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	266	273	96	270	267	140	97			147		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	99	100	99			100		
cM capacity (veh/h)	674	626	963	668	631	909	1504			1441		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	9	11	149	100								
Volume Left	0	3	8	7								
Volume Right	7	3	14	2								
cSH	860	700	1504	1441								
Volume to Capacity	0.01	0.02	0.01	0.00								
Queue Length 95th (m)	0.2	0.3	0.1	0.1								
Control Delay (s)	9.2	10.2	0.4	0.6								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.2	10.2	0.4	0.6								
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.2									
Intersection Capacity Utilization			19.5%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

2029 Background AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	7	7	3	5	2	72	7	2	72	1
Future Volume (vph)	0	0	7	7	3	5	2	72	7	2	72	1
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
Ped Bike Factor												
Frt		0.865			0.957			0.988			0.999	
Flt Protected					0.977			0.999			0.998	
Satd. Flow (prot)	0	1589	0	0	1717	0	0	1786	0	0	1831	0
Flt Permitted					0.977			0.999			0.998	
Satd. Flow (perm)	0	1589	0	0	1717	0	0	1786	0	0	1831	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)	2		1	1		2	6		5	5		6
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	0%	0%
Adj. Flow (vph)	0	0	9	9	4	6	3	91	9	3	91	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	0	0	19	0	0	103	0	0	95	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

2029 Background AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	7	7	3	5	2	72	7	2	72	1
Future Volume (Veh/h)	0	0	7	7	3	5	2	72	7	2	72	1
Sign Control	Stop				Stop				Free		Free	
Grade	0%				0%				0%		0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	9	9	4	6	3	91	9	3	91	1
Pedestrians	6				5				1		2	
Lane Width (m)	3.3				3.3				3.3		3.3	
Walking Speed (m/s)	1.2				1.2				1.2		1.2	
Percent Blockage	0				0				0		0	
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	215	214	98	214	210	102	98				105	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	215	214	98	214	210	102	98				105	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	99	99	99	99	100				100	
cM capacity (veh/h)	726	678	958	730	682	953	1501				1493	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	9	19	103	95								
Volume Left	0	9	3	3								
Volume Right	9	6	9	1								
cSH	958	776	1501	1493								
Volume to Capacity	0.01	0.02	0.00	0.00								
Queue Length 95th (m)	0.2	0.5	0.0	0.0								
Control Delay (s)	8.8	9.8	0.2	0.2								
Lane LOS	A	A	A	A								
Approach Delay (s)	8.8	9.8	0.2	0.2								
Approach LOS	A	A										
Intersection Summary												
Average Delay			1.4									
Intersection Capacity Utilization			20.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

2029 Background PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	2	7	3	4	3	8	131	14	7	93	2
Future Volume (vph)	0	2	7	3	4	3	8	131	14	7	93	2
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
Ped Bike Factor												
Frt		0.892			0.963			0.988			0.998	
Flt Protected					0.987			0.997			0.997	
Satd. Flow (prot)	0	1638	0	0	1746	0	0	1809	0	0	1811	0
Flt Permitted					0.987			0.997			0.997	
Satd. Flow (perm)	0	1638	0	0	1746	0	0	1809	0	0	1811	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)							4		6	6		4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Adj. Flow (vph)	0	2	8	3	5	3	9	149	16	8	106	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	10	0	0	11	0	0	174	0	0	116	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

2029 Background PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	2	7	3	4	3	8	131	14	7	93	2
Future Volume (Veh/h)	0	2	7	3	4	3	8	131	14	7	93	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	2	8	3	5	3	9	149	16	8	106	2
Pedestrians		4			6							
Lane Width (m)		3.3			3.3							
Walking Speed (m/s)		1.2			1.2							
Percent Blockage		0			0							
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	308	316	111	313	309	163	112			171		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	308	316	111	313	309	163	112			171		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	99	100	99			99		
cM capacity (veh/h)	631	592	945	624	597	883	1486			1412		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	10	11	174	116								
Volume Left	0	3	9	8								
Volume Right	8	3	16	2								
cSH	844	663	1486	1412								
Volume to Capacity	0.01	0.02	0.01	0.01								
Queue Length 95th (m)	0.3	0.4	0.1	0.1								
Control Delay (s)	9.3	10.5	0.4	0.6								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.3	10.5	0.4	0.6								
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.1									
Intersection Capacity Utilization			20.6%		ICU Level of Service				A			
Analysis Period (min)			15									

Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

2029 Total AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	7	14	7	12	2	72	9	3	72	1
Future Volume (vph)	0	0	7	14	7	12	2	72	9	3	72	1
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
Ped Bike Factor												
Frt		0.865			0.952			0.986			0.999	
Flt Protected					0.979			0.999			0.998	
Satd. Flow (prot)	0	1589	0	0	1712	0	0	1777	0	0	1831	0
Flt Permitted					0.979			0.999			0.998	
Satd. Flow (perm)	0	1589	0	0	1712	0	0	1777	0	0	1831	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)	2		1	1		2	6		5	5		6
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	0%	0%
Adj. Flow (vph)	0	0	9	18	9	15	3	91	11	4	91	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	0	0	42	0	0	105	0	0	96	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

2029 Total AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	7	14	7	12	2	72	9	3	72	1
Future Volume (Veh/h)	0	0	7	14	7	12	2	72	9	3	72	1
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	0	0	9	18	9	15	3	91	11	4	91	1
Pedestrians	6			5			1			2		
Lane Width (m)	3.3			3.3			3.3			3.3		
Walking Speed (m/s)	1.2			1.2			1.2			1.2		
Percent Blockage	0			0			0			0		
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	230	218	98	217	214	104	98				107	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	230	218	98	217	214	104	98				107	
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	100	100	99	98	99	98	100				100	
cM capacity (veh/h)	700	674	958	726	679	952	1501				1491	
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	9	42	105	96								
Volume Left	0	18	3	4								
Volume Right	9	15	11	1								
cSH	958	780	1501	1491								
Volume to Capacity	0.01	0.05	0.00	0.00								
Queue Length 95th (m)	0.2	1.2	0.0	0.1								
Control Delay (s)	8.8	9.9	0.2	0.3								
Lane LOS	A	A	A	A								
Approach Delay (s)	8.8	9.9	0.2	0.3								
Approach LOS	A	A										
Intersection Summary												
Average Delay				2.2								
Intersection Capacity Utilization				22.3%	ICU Level of Service				A			
Analysis Period (min)				15								

Lanes, Volumes, Timings

2: Site Driveway & Cross Street East

2029 Total AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↘	
Traffic Volume (vph)	9	3	5	17	18	9
Future Volume (vph)	9	3	5	17	18	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.969				0.955	
Flt Protected				0.989	0.968	
Satd. Flow (prot)	1745	0	0	1781	1665	0
Flt Permitted				0.989	0.968	
Satd. Flow (perm)	1745	0	0	1781	1665	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.8			243.3	99.2	
Travel Time (s)	5.7			17.5	7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	3	5	18	20	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	13	0	0	23	30	0
Intersection Summary						
Area Type:	Other					

HCM Unsignalized Intersection Capacity Analysis

2: Site Driveway & Cross Street East

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	9	3	5	17	18	9
Future Volume (Veh/h)	9	3	5	17	18	9
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)	10	3	5	18	20	10
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			13		40	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			13		40	12
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		98	99
cM capacity (veh/h)			1606		969	1069
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	13	23	30			
Volume Left	0	5	20			
Volume Right	3	0	10			
cSH	1700	1606	1000			
Volume to Capacity	0.01	0.00	0.03			
Queue Length 95th (m)	0.0	0.1	0.6			
Control Delay (s)	0.0	1.6	8.7			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.6	8.7			
Approach LOS			A			
Intersection Summary						
Average Delay			4.5			
Intersection Capacity Utilization			15.2%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

1: Cross Street West/Cross Street East & Cedar Street

2029 Total PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	3	7	4	6	5	8	131	24	12	93	2
Future Volume (vph)	0	3	7	4	6	5	8	131	24	12	93	2
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
Ped Bike Factor												
Frt		0.902			0.955			0.980			0.998	
Flt Protected					0.986			0.998			0.994	
Satd. Flow (prot)	0	1657	0	0	1729	0	0	1796	0	0	1806	0
Flt Permitted					0.986			0.998			0.994	
Satd. Flow (perm)	0	1657	0	0	1729	0	0	1796	0	0	1806	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		143.9			79.8			220.7			206.2	
Travel Time (s)		10.4			5.7			15.9			14.8	
Confl. Peds. (#/hr)							4		6	6		4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Adj. Flow (vph)	0	3	8	5	7	6	9	149	27	14	106	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	18	0	0	185	0	0	122	0
Intersection Summary												
Area Type:	Other											

HCM Unsignalized Intersection Capacity Analysis

1: Cross Street West/Cross Street East & Cedar Street

2029 Total PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	3	7	4	6	5	8	131	24	12	93	2
Future Volume (Veh/h)	0	3	7	4	6	5	8	131	24	12	93	2
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	0	3	8	5	7	6	9	149	27	14	106	2
Pedestrians		4			6							
Lane Width (m)		3.3			3.3							
Walking Speed (m/s)		1.2			1.2							
Percent Blockage		0			0							
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	329	339	111	331	326	168	112			182		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	329	339	111	331	326	168	112			182		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	99	99	99	99	99	99			99		
cM capacity (veh/h)	605	572	945	605	581	877	1486			1399		
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	11	18	185	122								
Volume Left	0	5	9	14								
Volume Right	8	6	27	2								
cSH	802	663	1486	1399								
Volume to Capacity	0.01	0.03	0.01	0.01								
Queue Length 95th (m)	0.3	0.6	0.1	0.2								
Control Delay (s)	9.6	10.6	0.4	0.9								
Lane LOS	A	B	A	A								
Approach Delay (s)	9.6	10.6	0.4	0.9								
Approach LOS	A	B										
Intersection Summary												
Average Delay			1.4									
Intersection Capacity Utilization			21.6%		ICU Level of Service					A		
Analysis Period (min)			15									

Lanes, Volumes, Timings

2: Site Driveway & Cross Street East

2029 Total PM Peak Hour

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	23	16	8	13	5	9
Future Volume (vph)	23	16	8	13	5	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.945				0.910	
Flt Protected				0.981	0.984	
Satd. Flow (prot)	1702	0	0	1766	1612	0
Flt Permitted				0.981	0.984	
Satd. Flow (perm)	1702	0	0	1766	1612	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	79.8			243.3	99.2	
Travel Time (s)	5.7			17.5	7.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	17	9	14	5	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	42	0	0	23	15	0
Intersection Summary						
Area Type:	Other					

HCM Unsignalized Intersection Capacity Analysis

2: Site Driveway & Cross Street East

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↱	↘	
Traffic Volume (veh/h)	23	16	8	13	5	9
Future Volume (Veh/h)	23	16	8	13	5	9
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)	25	17	9	14	5	10
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			42		66	34
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			42		66	34
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		99	99
cM capacity (veh/h)			1567		935	1040
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	42	23	15			
Volume Left	0	9	5			
Volume Right	17	0	10			
cSH	1700	1567	1002			
Volume to Capacity	0.02	0.01	0.01			
Queue Length 95th (m)	0.0	0.1	0.3			
Control Delay (s)	0.0	2.9	8.6			
Lane LOS		A	A			
Approach Delay (s)	0.0	2.9	8.6			
Approach LOS			A			
Intersection Summary						
Average Delay		2.5				
Intersection Capacity Utilization		17.8%	ICU Level of Service	A		
Analysis Period (min)		15				