

5455 Boundary Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Prepared for:

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May 2020

PN: 2019-79

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1 Screening

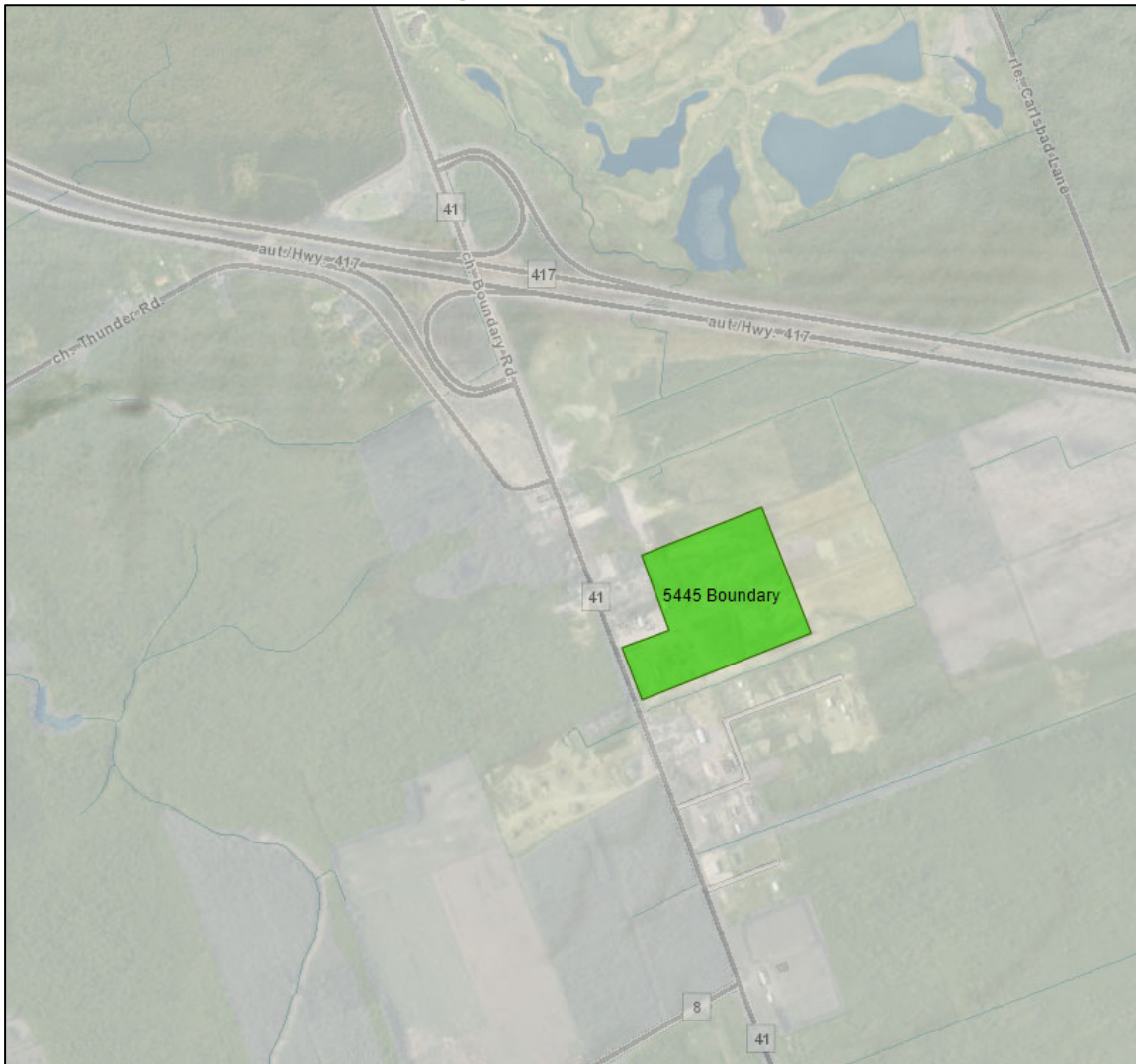
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, the safety trigger was met solely due to the 80km/h posted speed limit. Therefore, a Step 2 Scoping Report was required to review existing conditions and determine the need for a full TIA.

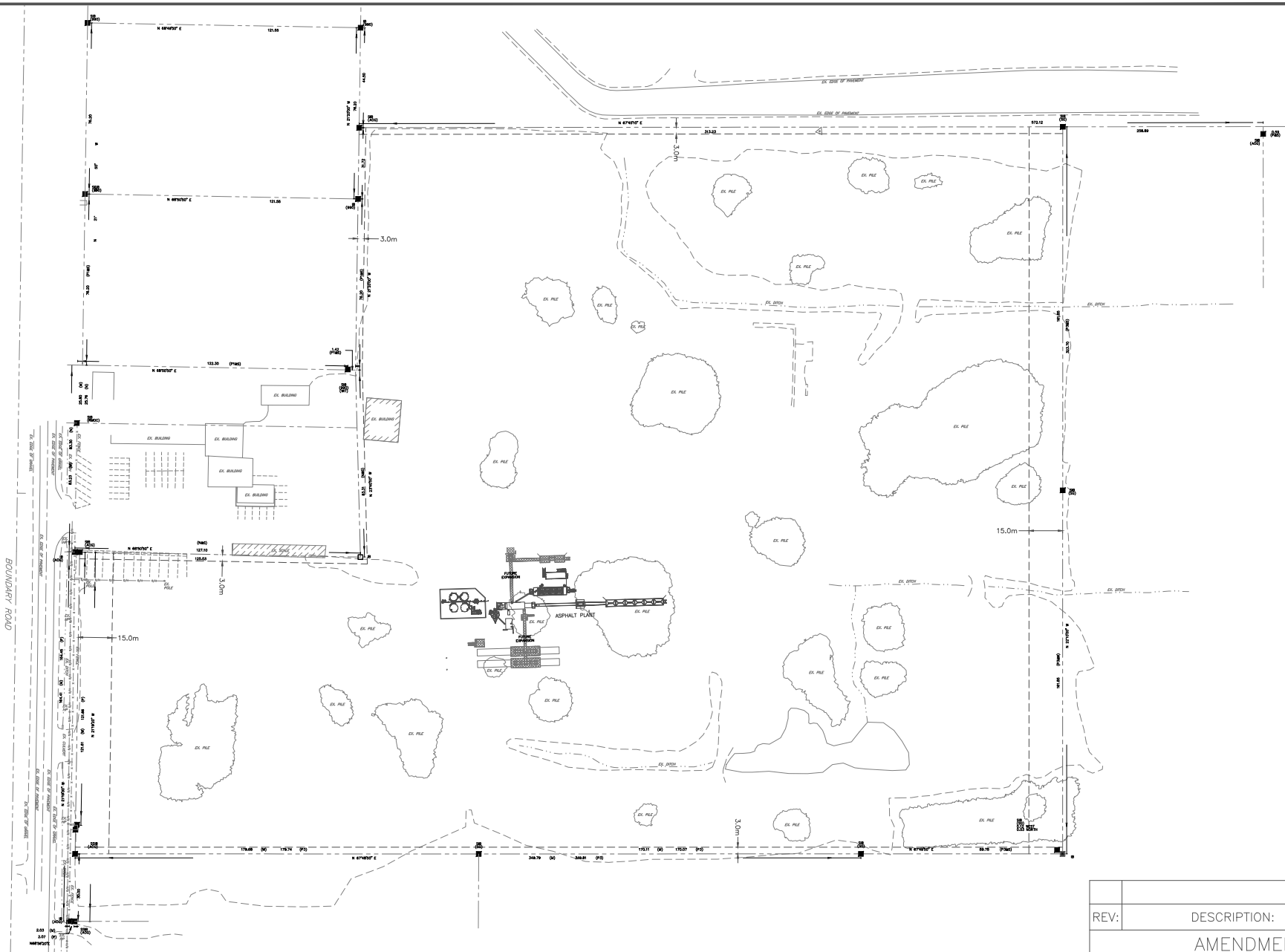
2 Existing and Planned Conditions

2.1 Proposed Development

The proposed development, located at 5455 Boundary Road, is currently a storage yard and is zoned a Rural Heavy Industrial Zone (RH). The site plan application is for a mobile small batch asphalt plant, with a total of 4 employees and 2 trucks scheduled per hour for deliveries. A single access would be provided to Boundary Road. The anticipated operation start date is 2020. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan





REV:	DESCRIPTION:	BY:	DATE:
AMENDMENTS:			

SITE:	5455 Boundary Road	001 DRAWING NO.		2019-79 PROJECT NO.	20/02/12 DATE.	 CGH Transportation Inc. 13 Markham Drive, Ottawa ON K2G 3Z1
TITLE:	Site Plan	NTS SCALE AT A4.	RCII DRAWN.	CHECKED.	- REVISION.	

2.2 Existing Conditions

2.2.1 Area Road Network

Boundary Road: Boundary Road is a City of Ottawa arterial road with a two-lane rural cross-section with a posted speed limit of 80 km/h. No sidewalks or cycling facilities are provided along the roadway and the existing right-of-way south of Highway 417 is approximately 26.0 to 28.0 metres. Boundary Road is a truck route.

Thunder Road: Thunder Road is a City of Ottawa collector road with a two-lane rural cross-section and a posted speed limit of 60 km/h. No sidewalks or cycling facilities are provided and the existing right-of-way varies with the MTO property from 26.0 to 48.0 metres.

Highway 417: Highway 417 is a provincial 400-series highway with a divided four-lane cross-section. The posted speed limit is 110 km/h and the right-of-way is approximately 105.0 metres with additional property provided for the on/off-ramps and other structures. Highway 417 is a truck route.

2.2.2 Existing Intersections

The existing area intersections adjacent to the proposed site and additional signalized intersections within 1.0 kms of the site have been summarized below:

<i>Boundary Road & Highway 417 West Ramp</i>	The intersection of Boundary Road and Highway 417 West Ramp is a signalized intersection. The northbound approach consists of a left-turn and a two through lane, the southbound approach consists of a shared through/right-turn lane, and the eastbound approach consists of a left-turn lane and a channelized right-turn lane. No turn restrictions are noted.
<i>Boundary Road & Thunder Road</i>	The intersection of Boundary Road and Thunder Road is a signalized intersection. The northbound approach consists of a left-turn lane, through lane and right-turn lane, the southbound approach consists of a left-turn lane and shared through/right-turn lane, the eastbound approach consists of a shared all movements lane, and the westbound approach consists of a shared left-turn/through lane and a right-turn lane. No turn restrictions are noted.

2.2.3 Existing Driveways

Existing driveways are located within 200 metres of the proposed site access. These driveways are private approaches for adjacent rural industrial sites. None of the driveways would provide access to significant traffic generators or have any geometric limitations on sight triangles. Therefore, there is no impact on the proposed site.

2.2.4 Cycling and Pedestrian Facilities

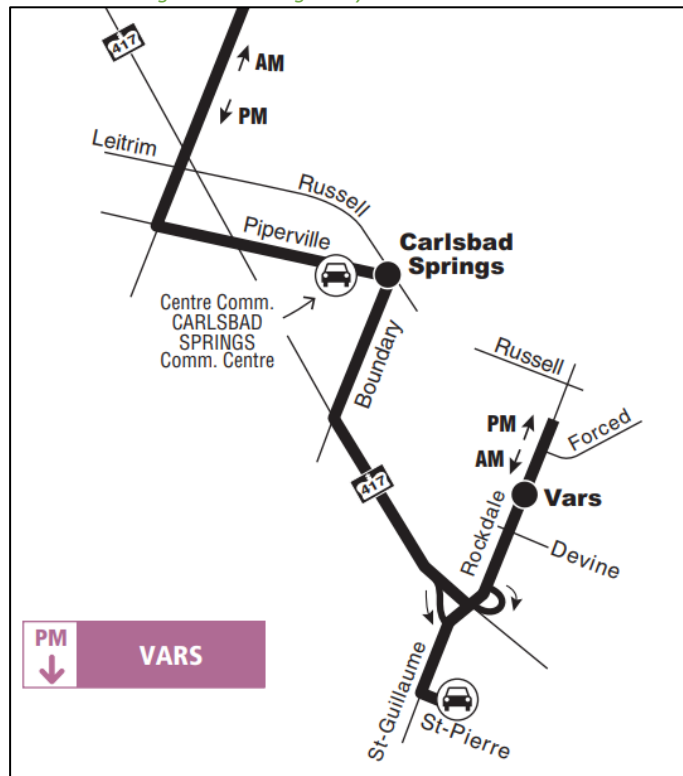
Mitch Owens Road, Boundary Road between Mitch Owens Road and Devine Road is designated as a City spine route for cycling. No other facilities are noted for pedestrians or cyclist in the area.

2.2.5 Existing Transit

Within the study area, the route #222 travels along Highway 417 and north along Boundary Road during the peak hours between Blair Station and Vars/Russell-Embrun St Pierre Park & Ride. Route #222 makes three trips during the AM peak to Blair Station and three returning trips during the PM peak.

Figure 3 illustrates the route map in the study area and Figure 4 illustrates nearby transit stops.

Figure 3: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: February 13, 2020

Figure 4: Existing Study Area Transit Stops



Source: <http://www.octranspo.com/> Accessed: February 13, 2020

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the Study Area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from manual counts for the existing Study Area intersection. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date	Source
Boundary Road & Highway 417 West Ramp	Tuesday January 7, 2020	The Traffic Specialist
Boundary Road & Thunder Road	Tuesday January 7, 2020	The Traffic Specialist

Figure 5 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on the TIA Guidelines for volume to capacity ratio of the lane movements and HCM average delay for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 5: Existing Traffic Counts

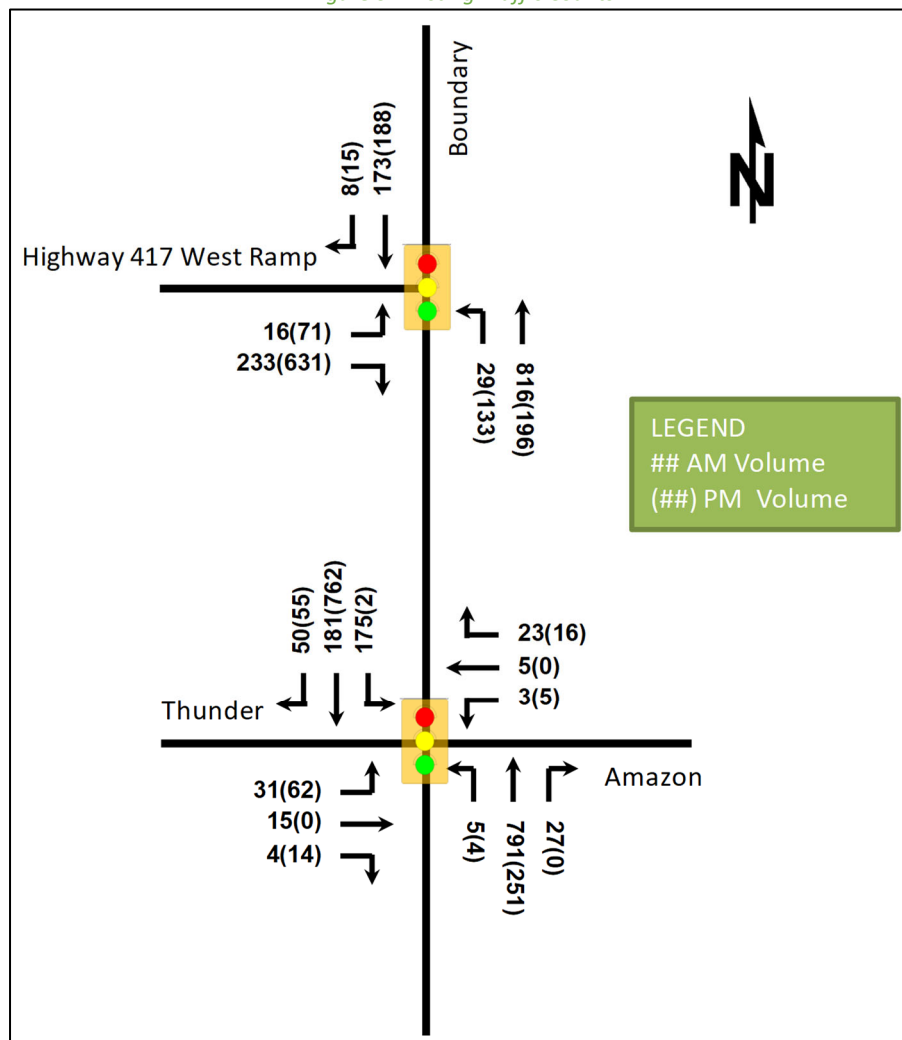


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Boundary Road & Highway 417 West Ramp Signalized	EBL	A	0.08	30.8	7.9	A	0.30	30.8	20.8
	EBR	B	0.63	11.7	19.3	D	0.88	17.0	#63.6
	NBL	A	0.25	45.0	m8.8	B	0.69	56.9	#64.1
	NBT	C	0.77	10.1	50.7	A	0.20	4.9	16.8
	SBT/R	A	0.19	8.1	27.0	A	0.30	14.6	34.8
	Overall	B	-	11.2	-	B	-	19.8	-
Boundary Road & Thunder Road Signalized	EB	A	0.31	34.6	17.1	A	0.42	24.2	17.8
	WBL/T	A	0.05	30.8	5.1	A	0.03	30.0	4.0
	WBR	A	0.12	6.3	4.0	A	0.08	3.3	2.0
	NBL	A	0.01	3.4	1.2	A	0.01	3.8	1.0
	NBT	B	0.63	7.9	116.3	A	0.22	4.2	22.4
	NBR	A	0.03	1.1	1.7	A	0.00	0.0	0.0
	SBL	A	0.51	10.6	31.2	A	0.00	3.5	m0.2
	SBT/R	A	0.19	2.5	12.9	C	0.71	9.5	m125.1
	Overall	A	-	8.3	-	A	-	9.3	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 0.90

The existing intersection operations operate well during the peak hours. Queuing at the Highway 417 West Ramp in the northbound left-turn movement may exceed the storage length during the PM peak

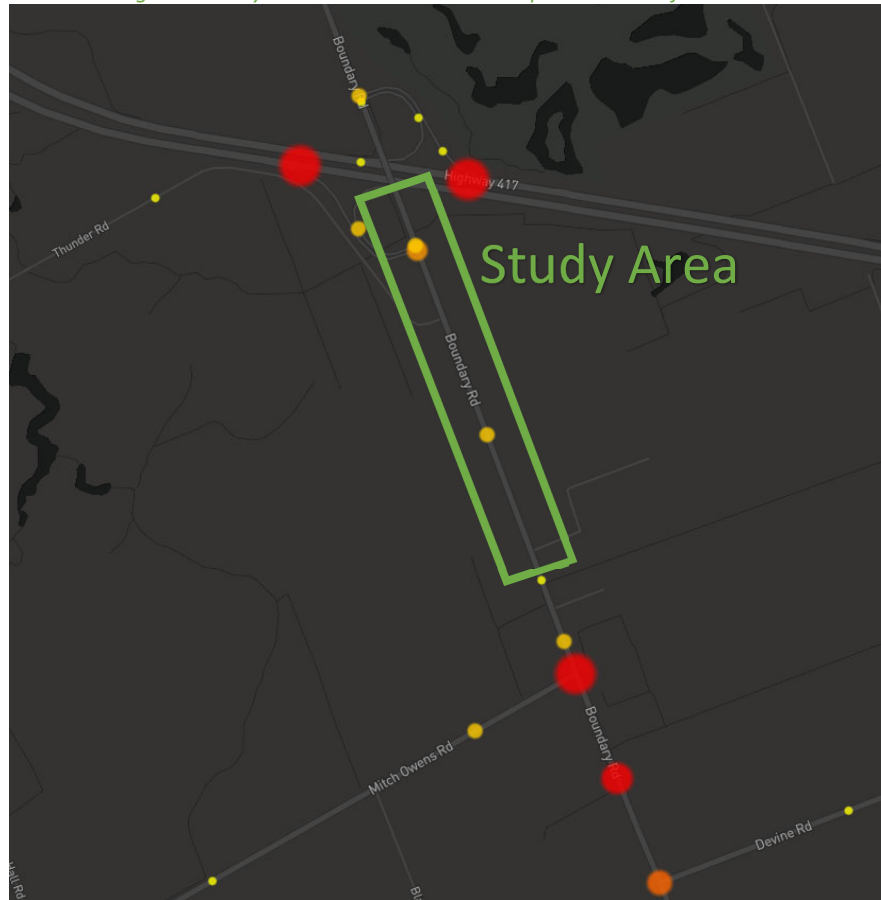
2.2.8 Collision Analysis

Collision data has been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 6 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data is included in Appendix D.

Table 3: Study Area Collision Summary, 2014-2018

		Number	%
Total Collisions		18	100%
Classification	Fatality	1	6%
	Non-Fatal Injury	4	22%
	Property Damage Only	13	72%
Initial Impact Type	Approaching	1	6%
	Angled	2	11%
	Rear end	9	50%
	Sideswipe	1	6%
	Turning Movement	3	17%
	SMV Unattended	1	6%
	SMV Other	1	6%
Road Surface Condition	Dry	14	78%
	Wet	3	17%
	Loose Snow	1	6%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 6: Study Area Collision Records – Representation of 2014-2016



Source: <http://www.octranspo.com/> Accessed: February 13, 2020

Table 4: Summary of Collision Locations, 2014-2018

Intersections / Segments	Number	%
	18	100%
Boundary Rd @ Highway 417 EB	2	11%
Boundary Rd @ Hwy 417 Boundary IC96R15	3	17%
Boundary Rd @ Hwy 417 Boundary IC96R51	7	39%
Boundary Rd @ Indcum Rd	1	6%
Boundary Rd @ Ninth Line Rd	2	11%
Boundary Rd Btwn Ninth Line Rd & Indcum Rd	3	17%

Within the study area, a low number of collisions are noted. The fatality occurred at night in wet conditions at the Highway 417 off-ramp. This intersection has been signalized, including light standards, which should improve the safety of this intersection.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

No planned changes to Boundary Road are included in the Transportation Master Plan. The recent signalization of the Highway 417 West Ramp and Thunder Road intersections were completed as part of the Amazon Warehouse project.

2.3.2 Other Study Area Developments

100 Entrepreneur Crescent

Proposed industrial building with 465 sq. m. GFA for warehousing and office space. Site will be accessed by vehicle from Entrepreneur Crescent. No transportation study is available for this site.

5471, 5575, and 5613 Boundary Road, 5554, 5508, 5570, 5610 and 5800 Frontier Road

The City of Ottawa has received an Official Plan Amendment (OPA) and Zoning Bylaw Amendment (ZBA) to permit an integrated waste management site which includes facilities for the purpose of recovery and recycling of waste in addition to a land fill area. The site is approximately 175 hectares in size and for the most part is vacant. An EA is available for this site.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersection will include:

- Boundary Road at:
 - Highway 417 West Ramp
 - Thunder Road
 - Site Access

The boundary road is Boundary Road. No screenlines are present near the proposed site and none will be reviewed as part of this study.

3.2 Time Periods

The AM and PM peak hours will be examined for the proposed development.

3.3 Horizon Years

The anticipated build-out year is 2020. As a result, the full build-out plus five years horizon year is 2025.

4 Exemption Review

Table 5 summarizes the exemptions for this TIA.

Table 5: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required
	4.2.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Exempt
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Exempt

Module	Element	Explanation	Exempt/Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Exempt
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt

5 Conclusion

Following the review of the Step 2 Scoping Report, it was determined through consultation with the City of Ottawa that the TIA process has been satisfied with the review of the existing conditions. No traffic issues were noted with the existing volumes or safety issues with the collision review. It is recommended that site proceed from a transportation perspective.

Prepared By:



Andrew Harte, P.Eng.
Senior Transportation Engineer

Reviewed By:

A handwritten signature in blue ink, appearing to read "Chris Gordon".

Christopher Gordon, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

DRAFT

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 13-Dec-19
Project Number: 2019-79
Project Reference: 5455 Boundary Road

1.1 Description of Proposed Development	
Municipal Address	5455 Boundary Road
Description of Location	PIN 145580409, CUMBERLAND CON 11 PT LOT 22
Land Use Classification	Rural Heavy Industrial Zone (RH)
Development Size	Asphalt Plant
Accesses	Existing Access
Phase of Development	Single Phase
Buildout Year	2020
TIA Requirement	Design Review Component

1.2 Trip Generation Trigger	
Land Use Type	Asphalt Plant
Development Size	4 employees, 2 trucks per hour
Trip Generation Trigger	No Total of 8 trips per peak hr

1.3 Location Triggers	
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	No
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	No

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	Yes
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	No
Is the proposed driveway within auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger	Yes



TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check ☒ appropriate field(s)] is either transportation engineering ☒ or transportation planning ☐.

^{1,2} **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

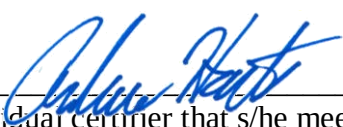
City Of Ottawa
Infrastructure Services and Community
Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d'infrastructure et Viabilité des
collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at Ottawa this 20 day of September, 2018.
(City)

Name: Andrew Harte
(Please Print)

Professional Title: Professional Engineer



Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com



Appendix B

Turning Movement Counts

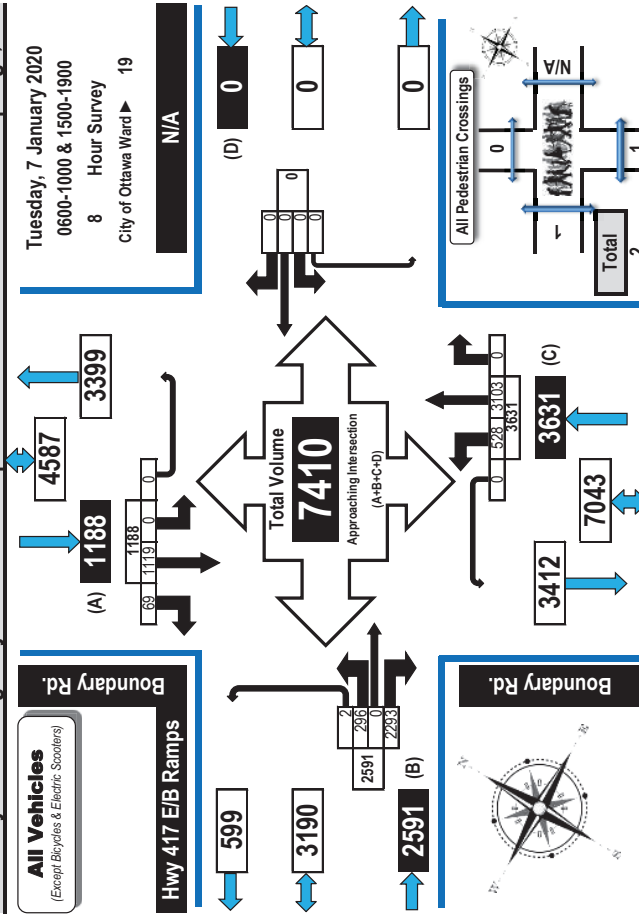
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Turning Movement Count Summary, AM and PM Peak Hour Flow Diagrams

Boundary Road & Highway 417 South Ramps

Tuesday, 7 January 2020
0600-1000 & 1500-1900
8 Hour Survey
City of Ottawa Ward 19

All Vehicles
(Except Bicycles & Electric Scooters)



AM Peak Hour Flow Diagram

Boundary Rd.

Hwy 417 E/B Ramps

Pedestrian Crossings During AM Peak Hour

0	+	0
0		0

Summary - AM Peak Hr

Peak Hr	0830-0930
Volume	1275
PHF	0.97

PM Peak Hour Flow Diagram

Boundary Rd.

Hwy 417 E/B Ramps

Pedestrian Crossings During PM Peak Hour

0	+	0
0		0

Summary - PM Peak Hr

Peak Hr	1815-1915
Volume	1234
PHF	0.93

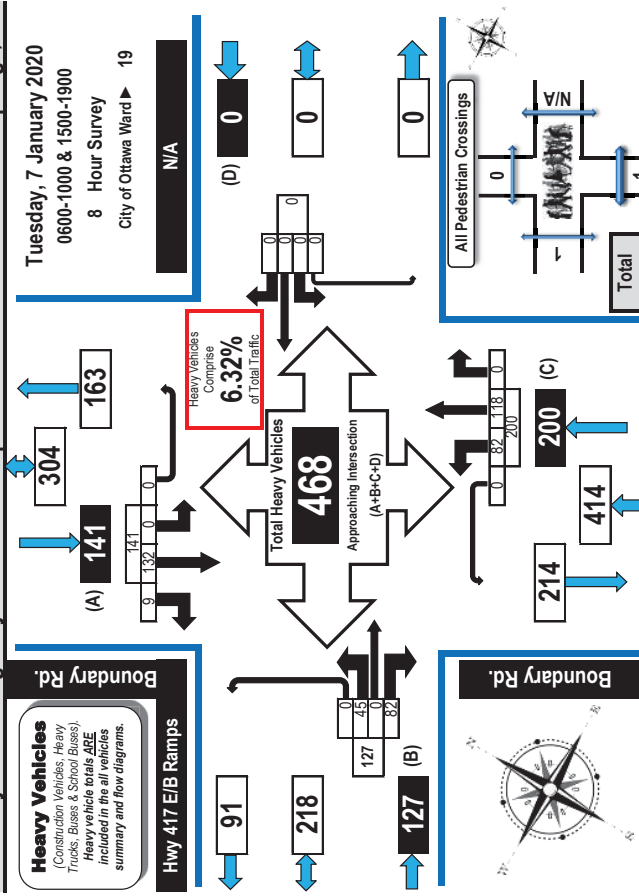
Printed on: 1/11/2020
Prepared by: thetrafficspecialist@gmail.com
Flow Diagrams: AM PM Peak

Turning Movement Count Heavy Vehicle Summary Flow Diagram

Boundary Road & Highway 417 South Ramps

Heavy Vehicles
(Construction Vehicles, Heavy Trucks, Buses & School Buses).
Heavy vehicle totals ARE included in the all vehicles summary and flow diagrams.

Tuesday, 7 January 2020
0600-1000 & 1500-1900
8 Hour Survey
City of Ottawa Ward 19

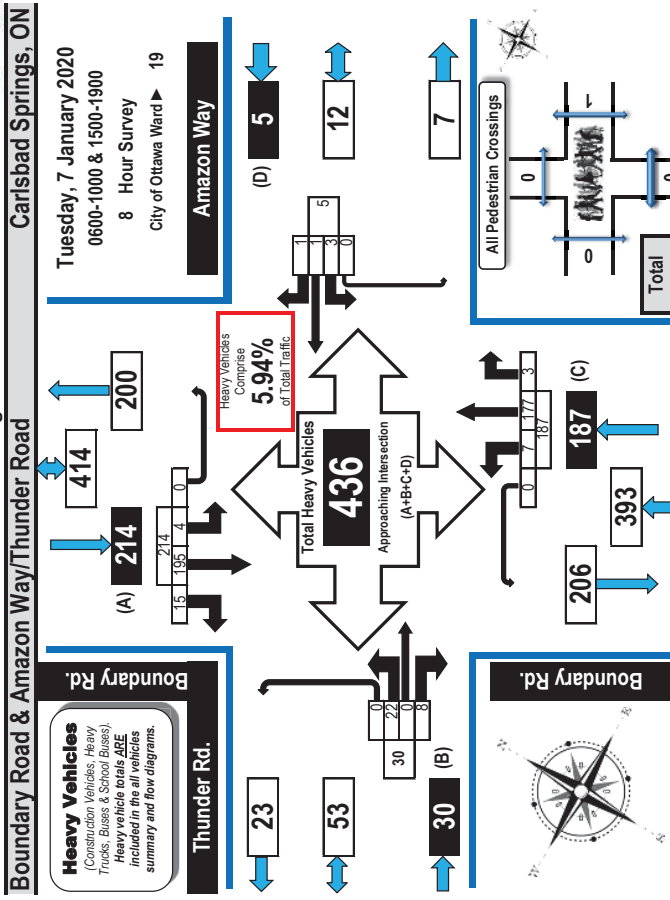
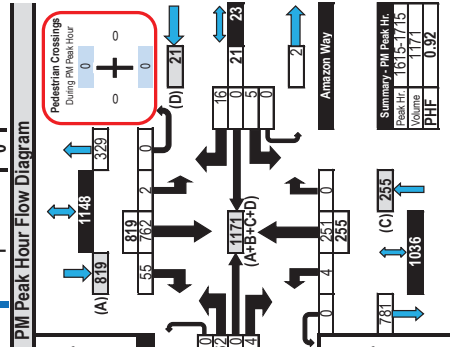
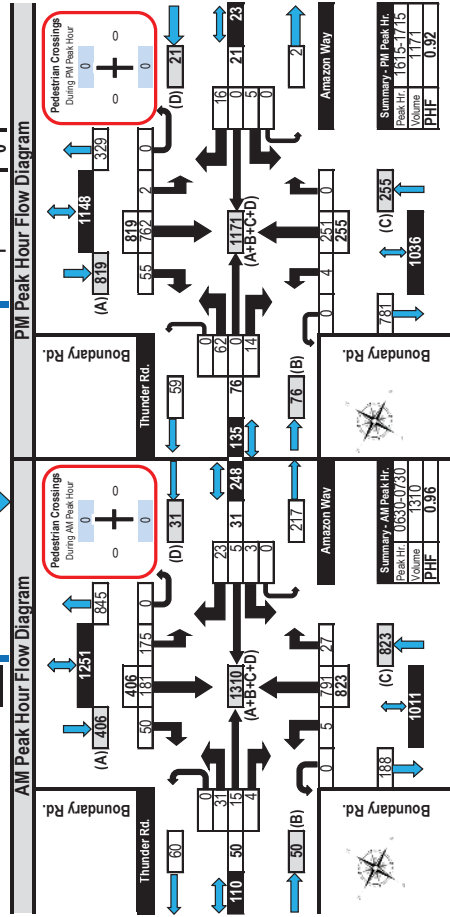
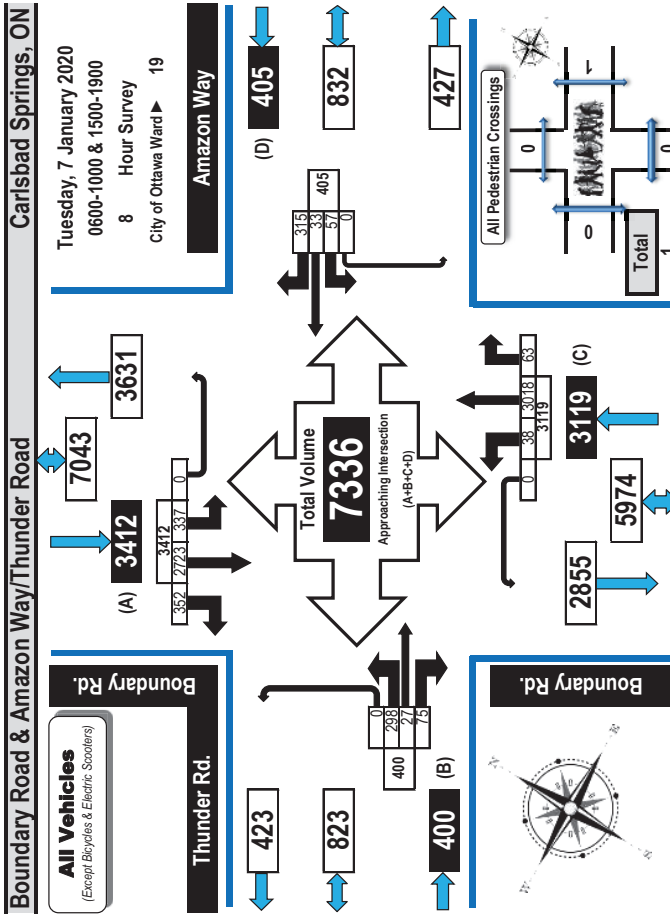


Hwy 417 EB Ramps										N/A						Boundary Rd.						Boundary Rd.					
Eastbound										Westbound						Northbound						Southbound					
Time Period	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot	LT	ST	RT	UT	S. Tot		
0600-0700	5	0	9	0	14	0	0	0	0	0	4	16	0	0	20	0	14	0	0	14	48	0	0	0	14		
0700-0800	5	0	14	0	19	0	0	0	0	0	9	16	0	0	25	0	19	1	0	20	64	0	0	0	20		
0800-0900	8	0	11	0	19	0	0	0	0	0	13	25	0	0	38	0	27	1	0	28	85	0	0	0	28		
0900-1000	9	0	6	0	15	0	0	0	0	0	13	26	0	0	39	0	15	2	0	17	71	0	0	0	17		
1500-1600	7	0	12	0	19	0	0	0	0	0	10	6	0	0	16	0	18	1	0	19	54	0	0	0	19		
1600-1700	6	0	16	0	22	0	0	0	0	0	13	13	0	0	26	0	20	1	0	21	69	0	0	0	21		
1700-1800	4	0	6	0	10	0	0	0	0	0	15	10	0	0	25	0	15	2	0	17	52	0	0	0	17		
1800-1900	1	0	8	0	9	0	0	0	0	0	5	6	0	0	11	0	4	1	0	5	25	0	0	0	5		
Totals	45	0	82	0	127	0	0	0	0	0	82	118	0	0	200	0	132	9	0	141	468	0	0	0	141		

Printed on: 1/11/2020

Prepared by: thetrafficsspecialist@gmail.com

Summary: Heavy Vehicles



Time Period	Thunder Rd. Eastbound				Amazon Way Westbound				Boundary Rd. Northbound				Boundary Rd. Southbound				Total
	LT	ST	RT	Tot	LT	ST	RT	Tot	LT	ST	RT	Tot	LT	ST	RT	Tot	
0600-0700	1	0	0	1	0	0	0	0	1	19	0	0	20	0	23	0	23
0700-0800	2	0	1	3	0	0	0	0	1	22	0	0	23	0	28	4	32
0800-0900	8	0	2	10	0	0	1	1	3	30	1	0	34	1	33	5	39
0900-1000	2	0	1	3	0	1	0	1	1	37	0	0	38	1	19	2	22
1500-1600	2	0	3	5	1	0	0	1	0	14	2	0	16	1	27	2	30
1600-1700	4	0	1	5	2	0	0	2	1	22	0	0	23	1	34	0	35
1700-1800	2	0	1	3	0	0	0	0	2	23	0	0	23	0	20	1	21
1800-1900	1	0	0	1	0	0	0	0	0	10	0	0	10	0	11	1	12
Totals	22	0	8	30	3	1	1	5	7	177	3	0	187	4	195	15	214

Appendix C

Synchro Intersection Worksheets – Existing Conditions

DRAFT

Lanes, Volumes, Timings

3: Boundary & Thunder/Amazon

02-18-2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group												
Lane Configurations	31	15	4	3	5	23	5	791	27	175	181	50
Traffic Volume (vph)	31	15	4	3	5	23	5	791	27	175	181	50
Future Volume (vph)	31	15	4	3	5	23	5	791	27	175	181	50
Satd. Flow (prot)	0	1613	0	0	1652	1427	1595	1679	1427	1595	1624	0
Flt Permitted	0.806				0.867		0.600			0.275		
Satd. Flow (perm)	0	1340	0	0	1455	1427	1008	1679	1427	462	1624	0
Satd. Flow (RTOR)	4				44		38			32		
Lane Group Flow (vph)	0	55	0	0	9	26	6	879	30	194	257	0
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8	2	2	2	2	6	6	
Permitted Phases	4	4		8	8	2	2	2	2	6	6	
Detector Phase	4	4		8	8	2	2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	24.8	24.8	24.8	24.8	24.2	24.2	24.2	24.2	24.2	24.2	24.2	
Total Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
Total Split (%)	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	
All-Red Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	
Act Effct Green (s)	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	
v/c Ratio	0.31	0.05	0.05	0.12	0.01	0.63	0.03	0.03	0.03	0.03	0.03	
Control Delay	34.6	30.8	6.3	3.4	7.9	1.1	10.6	2.5				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	34.6	30.8	6.3	3.4	7.9	1.1	10.6	2.5				
LOS	C	C	A	A	A	A	A	A	A	B	A	
Approach Delay	34.6	12.6										
Approach LOS	C	B										
Queue Length 50th (m)	7.2	1.2	0.0	0.2	62.4	0.0	10.0	8.9				
Queue Length 95th (m)	17.1	5.1	4.0	1.2	116.3	1.7	31.2	12.9				
Internal Link Dist (m)	77.4	135.4			964.2			227.9				
Turn Bay Length (m)			100.0	30.0		15.0	75.0					
Base Capacity (vph)	324	349	375	836	1394	1191	383	1354				
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.17	0.03	0.07	0.01	0.63	0.03	0.51	0.19				
Intersection Summary												
Cycle Length: 80												
Actuated Cycle Length: 80												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 90												
Control Type: Actuated-Coordinated												

5455 Boundary Road AM Peak Hour Existing

Synchro 10 Light Report
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Lanes, Volumes, Timings

3: Boundary & Thunder/Amazon

02-18-2020

Maximum v/c Ratio: 0.63	Intersection LOS: A
Intersection Signal Delay: 8.3	ICU Level of Service D
Intersection Capacity Utilization 78.9%	
Analysis Period (min) 15	
Description: As per City signal timings dated January 27 2020.	
Splits and Phases: 3: Boundary & Thunder/Amazon	

5455 Boundary Road AM Peak Hour Existing

Synchro 10 Light Report
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Lanes, Volumes, Timings 7: Boundary & HWY 417

02-18-2020

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	16	233	29	816	173	8
Future Volume (vph)	16	233	29	816	173	8
Satd. Flow (prot)	1595	1427	1595	1679	1669	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1595	1427	1595	1679	1669	0
Satd. Flow (RTOR)		259		4		
Lane Group Flow (vph)	18	259	32	907	201	0
Turn Type	Prot	Perm	Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases		4				
Detector Phase	4	4	5	2	6	
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	18.8	18.8	11.0	16.6	34.6	
Total Split (s)	20.0	20.0	12.0	60.0	48.0	
Total Split (%)	25.0%	25.0%	15.0%	75.0%	60.0%	
Yellow Time (s)	3.0	3.0	4.6	4.6	4.6	
All-Red Time (s)	3.8	3.8	1.4	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.8	6.8	6.0	6.6	6.6	
Lead/Lag			Lead	Lag		
Lead-Lag Optimize?			Yes	Yes		
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	10.6	10.6	6.5	56.0	50.8	
Actuated g/C Ratio	0.13	0.13	0.08	0.70	0.64	
v/c Ratio	0.08	0.63	0.25	0.77	0.19	
Control Delay	30.8	11.7	45.0	10.1	8.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	30.8	11.7	45.0	10.1	8.1	
LOS	C	B	D	B	A	
Approach Delay	13.0			11.3	8.1	
Approach LOS	B			B	A	
Queue Length 50th (m)	2.5	0.0	0.0	32.5	8.2	
Queue Length 95th (m)	7.9	19.3	m8.8	50.7	27.0	
Internal Link Dist (m)	104.8			227.9	380.8	
Turn Bay Length (m)			45.0			
Base Capacity (vph)	263	451	131	1174	1060	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.57	0.24	0.77	0.19	
Intersection Summary						
Cycle Length: 80						
Actuated Cycle Length: 80						
Offset: 11 (14%), Referenced to phase 2:NBT and 6:SBT, Start of Green						
Natural Cycle: 65						
Control Type: Actuated-Coordinated						

5455 Boundary Road AM Peak Hour Existing

Lanes, Volumes, Timings 7: Boundary & HWY 417

02-18-2020

Maximum v/c Ratio: 0.77	Intersection LOS: B
Intersection Signal Delay: 11.2	ICU Level of Service C
Intersection Capacity Utilization 64.8%	
Analysis Period (min) 15	
Description: As per City signal timings dated January 27 2020.	
m Volume for 95th percentile queue is metered by upstream signal.	
Splits and Phases: 7: Boundary & HWY 417	

5455 Boundary Road AM Peak Hour Existing

Lanes, Volumes, Timings

3: Boundary & Thunder/Amazon

02-18-2020

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	62	0	14	5	0	16	4	251	0	2	762	55
Traffic Volume (vph)	62	0	14	5	0	16	4	251	0	2	762	55
Future Volume (vph)	0	1573	0	0	1595	1427	1595	1679	1679	1595	1662	0
Satd. Flow (prot)	0.762	0	0	0.781	0	0.247	0.588	0.588	0.588	0.588	0.588	0
Flt Permitted	0	1248	0	0	1311	1427	415	1679	1679	987	1662	0
Satd. Flow (perm)	44	0	0	0	6	18	4	279	0	2	908	0
Lane Group Flow (vph)	0	85	0	0	6	18	4	279	0	2	908	0
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	NA
Protected Phases	4	4	8	8	8	2	2	2	2	6	6	6
Permitted Phases	4	4	8	8	8	2	2	2	2	6	6	6
Detector Phase	4	4	8	8	8	2	2	2	2	6	6	6
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	24.8	24.8	24.8	24.8	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
Minimum Split (s)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%	31.3%
Total Split (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Yellow Time (s)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Lead/Lag	Lead/Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	None	None	None	None	None
Act Effct Green (s)	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
Actuated g/C Ratio	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
v/c Ratio	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Control Delay	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
LOS	C	C	C	C	C	C	C	C	C	C	C	C
Approach Delay	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
Approach LOS	C	C	C	C	C	C	C	C	C	C	C	C
Queue Length 50th (m)	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Queue Length 95th (m)	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8
Internal Link Dist (m)	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4	77.4
Turn Bay Length (m)	332	332	332	332	332	332	332	332	332	332	332	332
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Intersection Summary												
Cycle Length: 80												
Actuated Cycle Length: 80												
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green												
Natural Cycle: 80												
Control Type: Actuated-Coordinated												

5455 Boundary Road PM Peak Hour Existing

Synchro 10 Light Report

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Lanes, Volumes, Timings

3: Boundary & Thunder/Amazon

02-18-2020

Maximum v/c Ratio: 0.71	Intersection LOS: A
Intersection Signal Delay: 9.3	ICU Level of Service C
Intersection Capacity Utilization 67.0%	
Analysis Period (min) 15	
Description: As per City signal timings dated January 27 2020.	
m Volume for 95th percentile queue is metered by upstream signal.	
Splits and Phases: 3: Boundary & Thunder/Amazon	

5455 Boundary Road PM Peak Hour Existing

Synchro 10 Light Report

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Lanes, Volumes, Timings 7: Boundary & HWY 417

02-18-2020

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	7	1	1	1	1	1
Traffic Volume (vph)	71	631	133	196	188	15
Future Volume (vph)	71	631	133	196	188	15
Satd. Flow (prot)	1595	1427	1595	1679	1662	0
Flt Permitted	0.950		0.950			
Satd. Flow (perm)	1595	1427	1595	1679	1662	0
Satd. Flow (RTOR)	675				7	
Lane Group Flow (vph)	79	701	148	218	226	0
Turn Type	Prot	Perm	Prot	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases	4					
Detector Phase	4	4	5	2	6	
Switch Phase						
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	
Minimum Split (s)	18.8	18.8	11.0	16.6	34.6	
Total Split (s)	25.0	25.0	12.0	55.0	43.0	
Total Split (%)	31.3%	31.3%	15.0%	68.8%	53.8%	
Yellow Time (s)	3.0	3.0	4.6	4.6	4.6	
All-Red Time (s)	3.8	3.8	1.4	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.8	6.8	6.0	6.6	6.6	
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	C-Max	C-Max	
Act Effct Green (s)	13.3	13.3	10.9	53.3	36.4	
Actuated g/C Ratio	0.17	0.17	0.14	0.67	0.46	
v/c Ratio	0.30	0.88	0.69	0.20	0.30	
Control Delay	30.8	17.0	56.9	4.9	14.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	30.8	17.0	56.9	4.9	14.6	
LOS	C	B	E	A	B	
Approach Delay	18.4		26.0	14.6		
Approach LOS	B		C	B		
Queue Length 50th (m)	11.2	3.6	18.4	8.4	20.1	
Queue Length 95th (m)	20.8	#63.6	#64.1	16.8	34.8	
Internal Link Dist (m)	104.8		227.9	380.8		
Turn Bay Length (m)			45.0			
Base Capacity (vph)	362	846	216	1117	760	
Starvation Cap Reductn	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	
Reduced v/c Ratio	0.22	0.83	0.69	0.20	0.30	
Intersection Summary						
Cycle Length: 80						
Actuated Cycle Length: 80						
Offset: 19 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green						
Natural Cycle: 75						
Control Type: Actuated-Coordinated						

5455 Boundary Road PM Peak Hour Existing

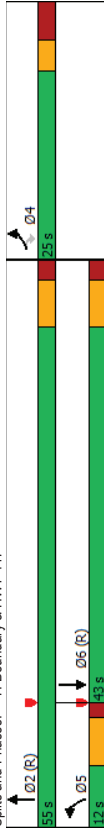
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Lanes, Volumes, Timings 7: Boundary & HWY 417

02-18-2020

Maximum v/c Ratio: 0.88	Intersection LOS: B
Intersection Signal Delay: 19.8	ICU Level of Service B
Intersection Capacity Utilization 63.8%	
Analysis Period (min) 15	
Description: As per City signal timings dated January 27 2020.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Boundary & HWY 417



5455 Boundary Road PM Peak Hour Existing

Synchro 10 Light Report
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Appendix D

Collision Data

DRAFT

Record	Location	X	Y	Date	Time	Environment	Road_Surface	Traffic_Control	Collision_Location	Light	Collision_Classification	Impact_type
8131	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387508.0399	5023595.313	2014-06-21	23:06	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	07 - Dark	03 - P.D. only	03 - Rear end
13223	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387509.2971	5023592.53	2014-08-22	16:15	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9660	BOUNDARY RD btwn NINTH LINE RD & INDCUM RD	387736.639	5023002.848	2015-08-02	13:35	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle
11345	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387507.8808	5023591.707	2015-05-27	18:10	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
2057	BOUNDARY RD @ HIGHWAY 417 EB	387397.8289	5023882.046	2016-12-09	17:08	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
2058	BOUNDARY RD @ HWY 417 BOUNDARY IC96R15	387502.7652	5023611.77	2016-05-01	22:14	02 - Rain	02 - Wet	10 - No control	03 - At intersection	07 - Dark	03 - P.D. only	07 - SMV other
2059	BOUNDARY RD @ HWY 417 BOUNDARY IC96R15	387506.4403	5023610.931	2016-11-13	11:05	01 - Clear	01 - Dry	10 - No control	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
2073	BOUNDARY RD btwn NINTH LINE RD & INDCUM RD	387608.0079	5023340.03	2016-03-26	15:14	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	02 - Non-fatal injury	05 - Turning movement
2136	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387512.30937	5023595.22263	2017-11-08	10:30	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
2137	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387508.82347	5023593.47706	2017-10-04	0:19	02 - Rain	02 - Wet	02 - Stop sign	02 - Intersection related	07 - Dark	01 - Fatal injury	02 - Angle
2138	BOUNDARY RD @ INDCUM RD	387909.43395	5022577.16281	2017-09-05	7:50	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
2141	BOUNDARY RD @ NINTH LINE RD	387602.42879	5023359.32927	2017-09-06	15:07	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
2142	BOUNDARY RD @ NINTH LINE RD	387598.82000	5023364.99359	2017-02-13	15:44	03 - Snow	03 - Loose snow	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
144	BOUNDARY RD @ HIGHWAY 417 EB	387397.00057	5023879.97516	2018-01-04	13:11	03 - Snow	02 - Wet	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8008	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387508.87774	5023593.54765	2018-09-06	15:10	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
8868	BOUNDARY RD btwn NINTH LINE RD & INDCUM RD	387646.62506	5023243.02885	2018-09-29	13:09	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	02 - Non-fatal injury	01 - Approaching
13302	BOUNDARY RD @ HWY 417 BOUNDARY IC96R15	387503.00847	5023610.53875	2018-03-22	14:00	01 - Clear	01 - Dry	10 - No control	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
13343	BOUNDARY RD @ HWY 417 BOUNDARY IC96R51	387509.11137	5023593.51094	2018-04-11	17:10	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end