Appendix A

Date:	Wednesday, November 13, 2019
Project:	Integrated Columbus Part II Planning Act and Municipal Class Environmental Assessment Act Study
To:	City of Oshawa
From:	HDR
Subject:	Phase 2 Transportation Report Appendix A – Traffic Analysis

The following memorandum documents the traffic analysis methodology and results providing input to the Phase 2 Transportation Report for the Integrated Columbus Part II Planning Act and Municipal Class Environmental Assessment Act Study.

Methodology

To assess the traffic impacts of the three land use and road alternatives presented in the Phase 2 Transportation Report, the traditional four-step travel forecasting approach was followed involving trip generation, modal share, trip distribution, and assignment.

The following subsections document the approach and results at each step in the process.

Land Use and Road Alternatives

The three land use and road alternatives are illustrated in **Exhibit 1**, **Exhibit 2** and **Exhibit 3**.

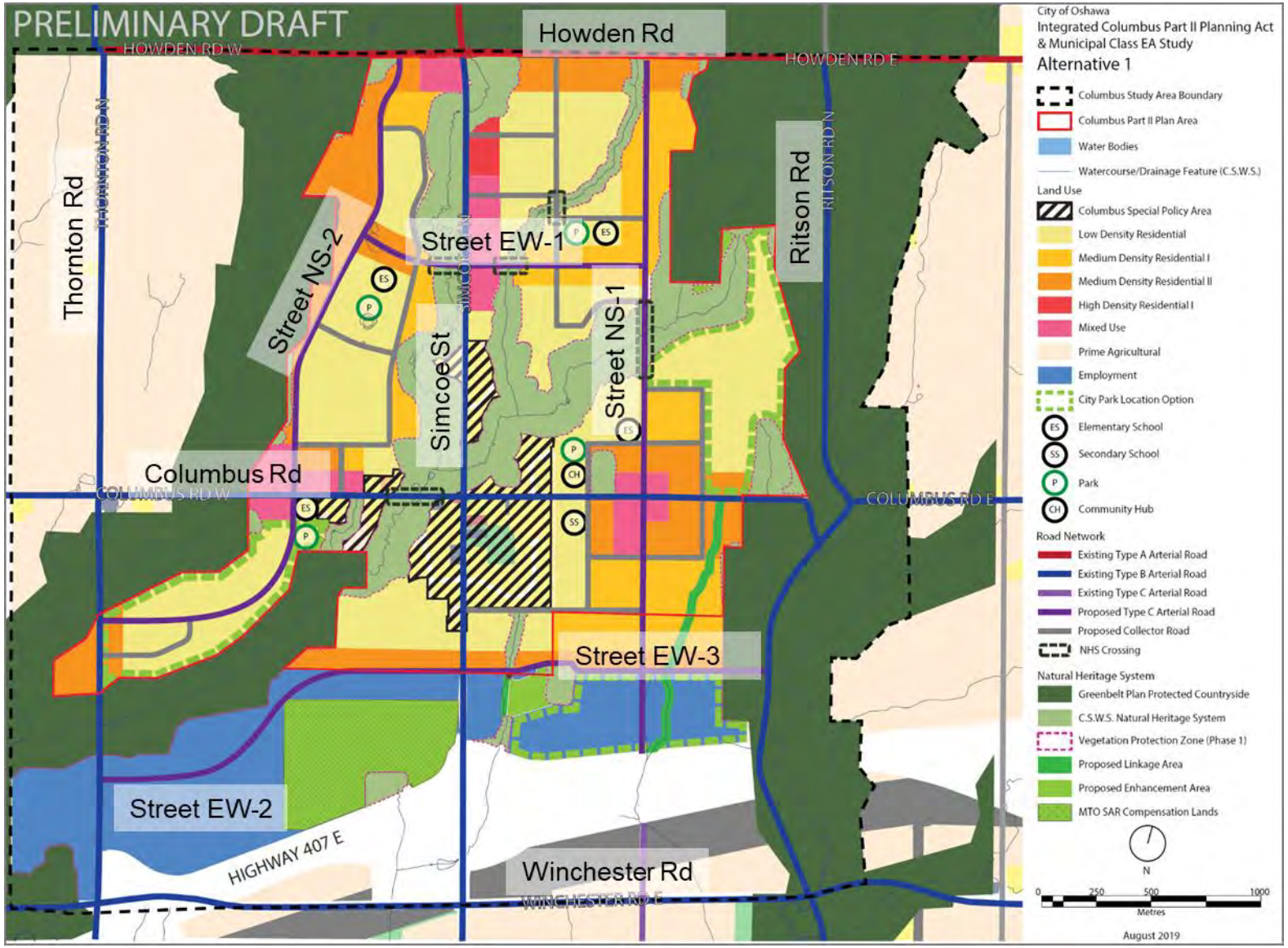

Exhibit 1: Land Use and Road Alternative 1

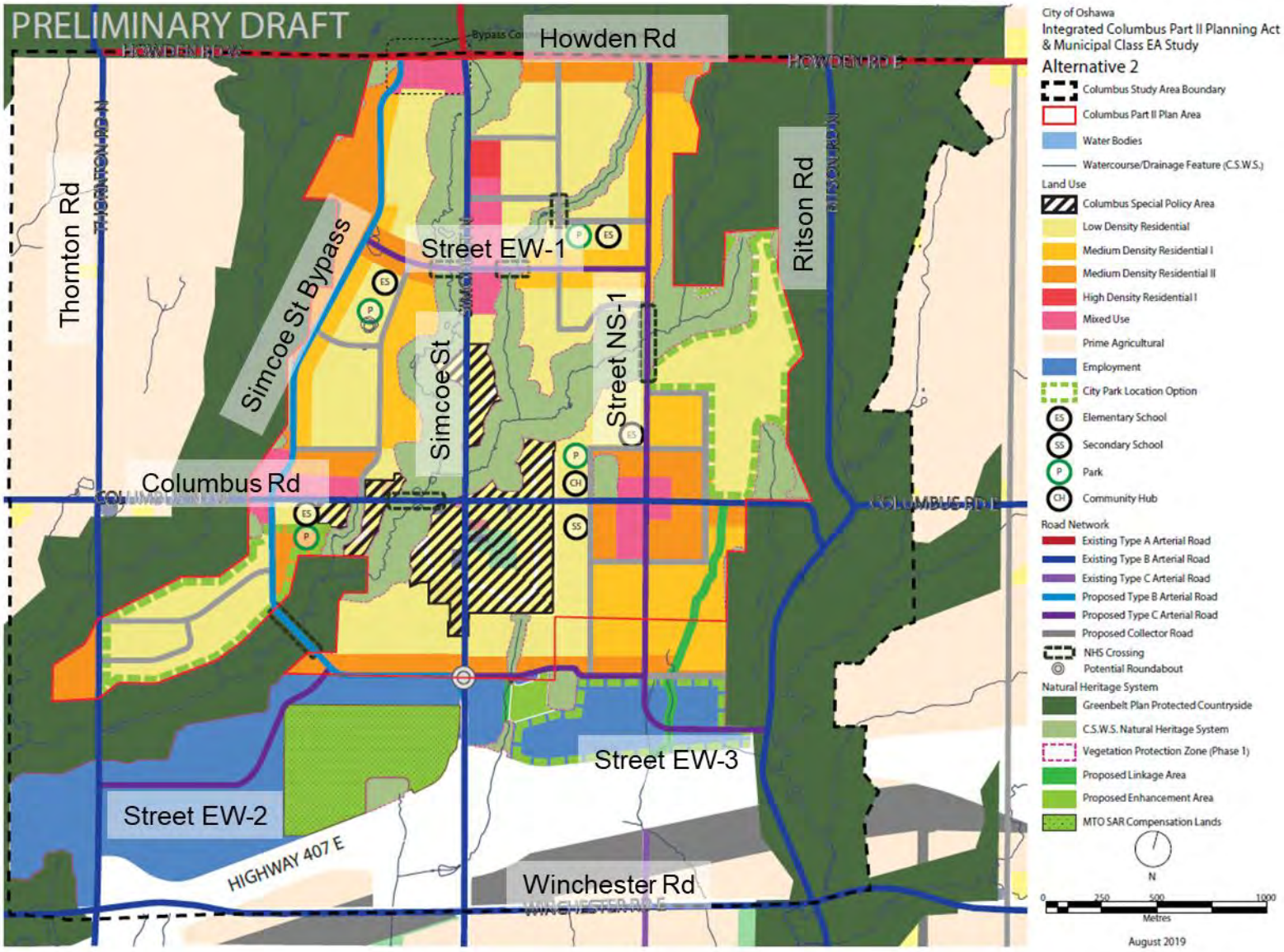

Exhibit 2: Land Use and Road Alternative 2

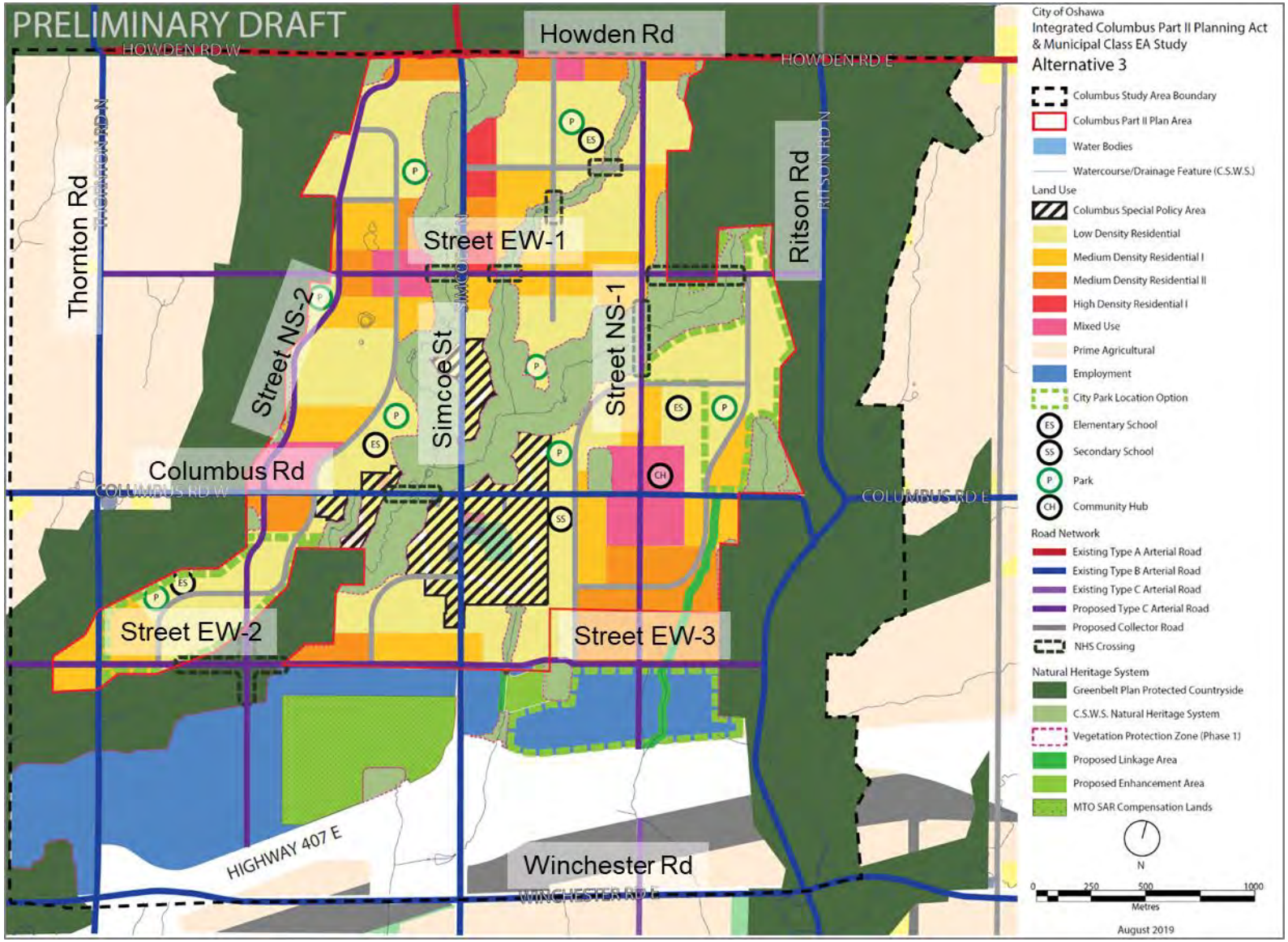

Exhibit 3: Land Use and Road Alternative 3

Background Diversion

Prior to applying the four-step approach to the Part II Plan land use and road alternatives, 2031 background traffic documented in the Phase 1 Transportation Report requires updating to match the new road patterns. Diversion patterns based on the Durham Region Emme model are applied for each of the three land use and road alternatives to develop new background traffic volumes for each of the three scenarios.

It is assumed that no new background traffic is induced in the area based on the proposed networks and the total background traffic volumes were based on the 2031 Background Traffic developed in Phase 1.

For the PM distribution, the distribution was applied in the opposite direction of the AM movements, i.e. percentage of traffic distributed EB in the AM are applied to the WB direction in the PM.

The following screenlines were used to assess the traffic volumes:

- North of Highway 407
- East of Thornton Road
- South of Howden Road
- West of Ritson Road

Table 1 compares the screenline background traffic volumes between Phase 1 (no diversion) and the three alternatives. The total traffic at each screenline remains the same between each alternative, but the distribution across the road network changes based on the developed Emme models for each alternative.

Table 1: 2031 Screenline Background Traffic Volumes (AM Peak Hour)

Screenline	Phase 1 - 2031 Background	Phase 2 - 2031 Background		
		Alt 1	Alt 2	Alt 3
PEAK DIRECTION – SOUTHBOUND AND WESTBOUND				
North of 407 (Southbound – Trips Out)				
Thornton	277	326	296	319
Simcoe	791	681	758	759
Ritson	83	144	97	73
Total	**1151**	**1151**	**1151**	**1151**
South of Howden (Southbound – Trips In)				
Thornton	195	211	115	256
Simcoe St Bypass or Street NS-2	-	33	763	32
Simcoe	746	694	47	652
Street NS-1	-	22	31	21
Ritson	44	26	29	24
Total	**985**	**985**	**985**	**985**

Screenline	Phase 1 - 2031 Background	Phase 2 - 2031 Background		
		Alt 1	Alt 2	Alt 3
East of Thornton (Westbound – Trips Out)				
Howden	57	43	57	57
Street EW-1*	-	-	-	20
Columbus Rd	246	269	299	276
Collector Rd*	-	70	143	-
Street EW-2*	-	-	17	70
Total	**303**	**382**	**515**	**422**
West of Ritson (Westbound – Trips In)				
Howden	61	84	88	32
Street EW-1	-	-	-	32
Columbus Rd	150	127	123	146
Street EW-3*	-	16	21	10
Total	**211**	**227**	**232**	**221**
OFF-PEAK DIRECTION – NORTHBOUND AND EASTBOUND				
North of 407 (Northbound – Trips In)				
Thornton	109	129	243	218
Simcoe	607	607	513	523
Ritson	146	126	106	121
Total	**862**	**862**	**862**	**862**
South of Howden (Northbound – Trips Out)				
Thornton	83	16	138	86
Simcoe St Bypass or Street NS-2	-	83	496	84
Simcoe	603	638	59	549
Street NS-1	-	19	46	20
Ritson	93	23	39	41
Total	**779**	**779**	**779**	**779**
East of Thornton (Eastbound – Trips In)				
Howden	16	16	16	16
Street EW-1*	-	-	-	48
Columbus Rd	129	144	161	158
Collector Rd*	-	45	87	-
Street EW-2*	-	-	9	39
Total	**145**	**205**	**272**	**261**
West of Ritson (Eastbound – Trips Out)				
Howden	29	20	18	15
Street EW-1	-	-	-	15
Columbus Rd	74	83	85	72
Street EW-3*	-	94	49	8
Total	**103**	**197**	**152**	**111**
Total Trips In	**2203**	**2279**	**2352**	**2329**
Total Trips Out	**2336**	**2509**	**2597**	**2463**

*These values are double counted since they contr bute to multiple screenlines (e.g. North of 407 (SB) and east of Thornton (WB))

The Emme plots informing the background traffic diversion estimates are provided in **Exhibit 4**, **Exhibit 5**, and **Exhibit 6**. It is noted that only the relative traffic patterns are utilized from the Emme model. As documented in the Phase 1 Transportation Report, traffic volumes in the Columbus Study Area are significantly under-simulated relative to observed traffic volumes, and as such the model is only utilized as an input to traffic assignment and diversion.

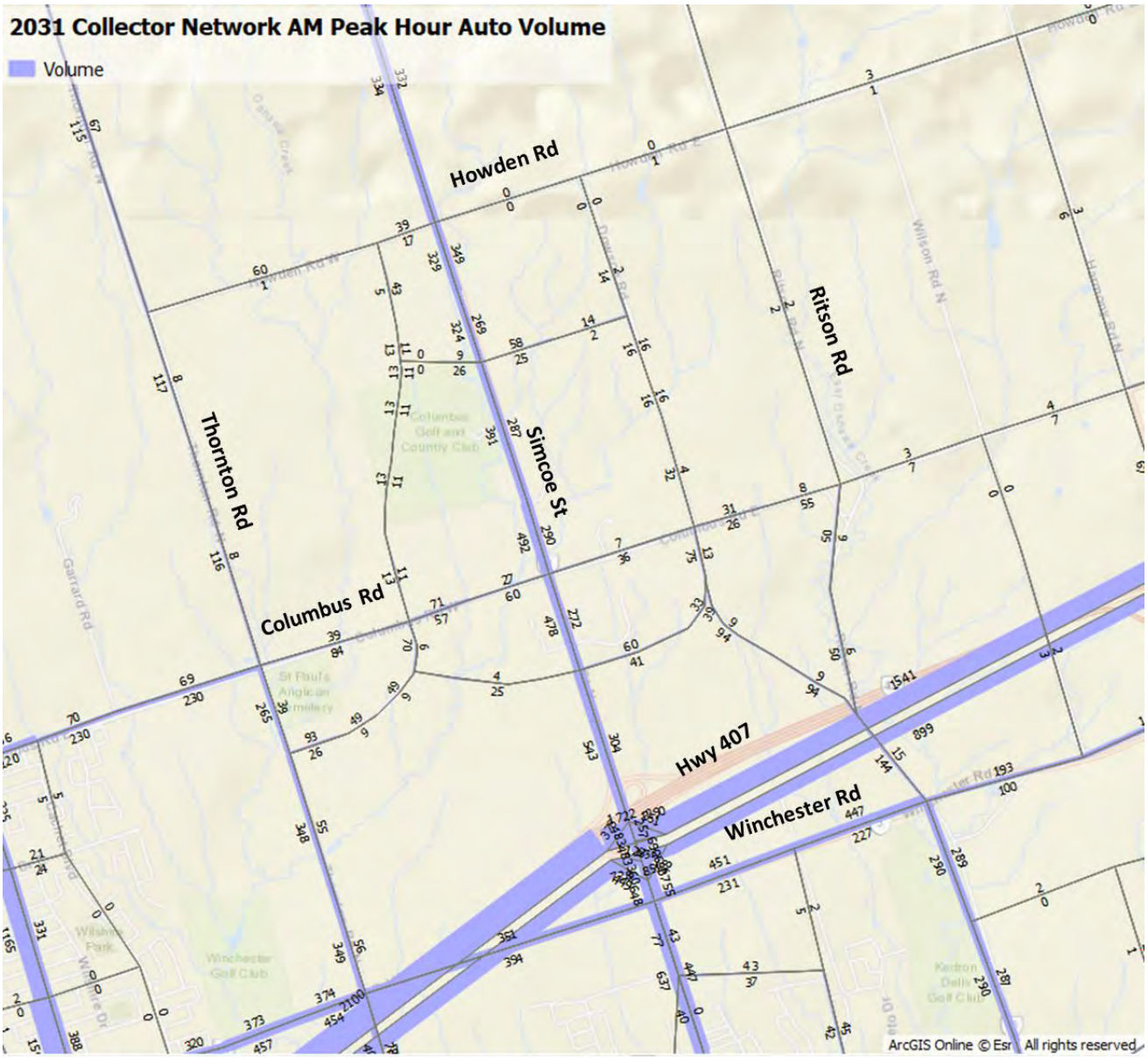

Exhibit 4: Land Use and Road Alternative #1: 2031 Emme Traffic Forecast

Exhibit 5: Land Use and Road Alternative #2: 2031 Emme Traffic Forecast

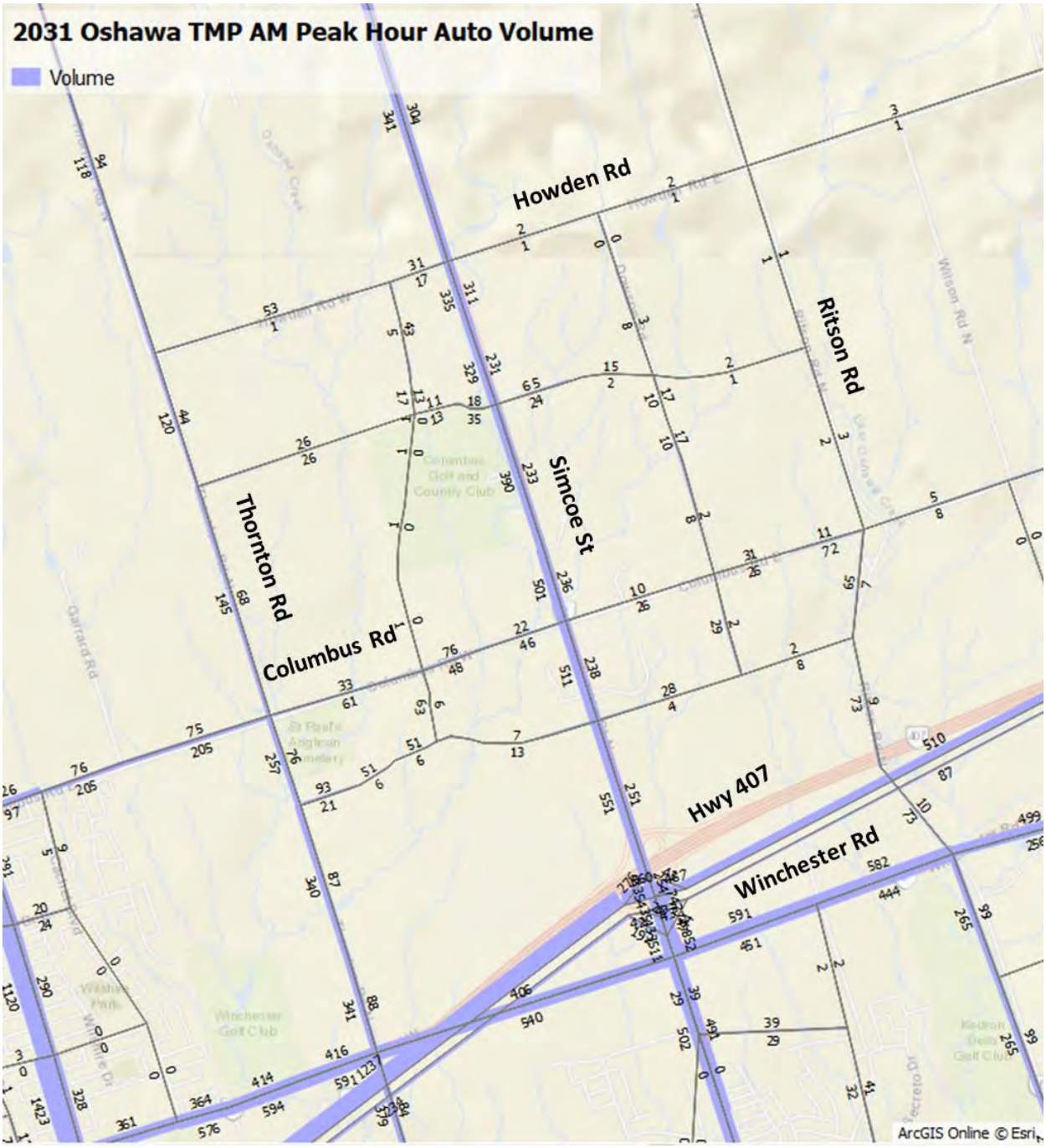

Exhibit 6: Land Use and Road Alternative #3: 2031 Emme Traffic Forecast

Trip Generation

Travel demands of the 2031 horizon year are assessed based on the full build out of the Columbus Part II Planning Area. The future travel demands consist of background traffic growth from surrounding areas, plus projected site traffic.

Based on the Institute of Transportation Engineers (ITE) Trip Generation Informational Report (10th edition), trip generation rates for the following land uses were applied:

- Single-Detached Homes (Land Use Code 210)
- Multifamily Housing Low-Rise (Land Use Code 220)
- Multifamily Housing Mid-Rise (Land Use Code 221)
- Recreational Community Center (Land Use Code 495)
- Elementary School (Land Use Code 520)
- High School (Land Use Code 530)
- Junior/Community College (Land Use Code 540)
- General Office Building (Land Use Code 710)
- Shopping Center (Land Use Code 820)
- Warehousing (Land Use Code 150)

Table 2 highlights each proposed land use and the trip rates applied.

Table 2: ITE Trip Generation Rates

Land Use	ITE Land Use Code	AM Peak Hour Trip Rate			PM Peak Hour Trip Rate		
		Total Rate Unit	Trips In (%)	Trips Out (%)	Total Rate	Trips In (%)	Trips Out (%)
Special Policy Area	Single-Detached Homes (210)	0.74 trips/unit	25%	75%	0.99 trips/unit	63%	37%
Low Density Residential	Single-Detached Homes (210)	0.74 trips/unit	25%	75%	0.99 trips/unit	63%	37%
Medium Density Residential I	Multifamily Housing Low-Rise (220)	0.46 trips/unit	23%	77%	0.56 trips/unit	63%	37%
Medium Density Residential II	Multifamily Housing Low-Rise (220)	0.46 trips/unit	23%	77%	0.56 trips/unit	63%	37%
High Density Residential	Multifamily Housing Mid-Rise (221)	0.36 trips/unit	26%	74%	0.44 trips/unit	63%	37%
Mixed Use - Commercial	Shopping Center (820)	0.55 trips/employees	64%	36%	1.62 trips/employees	50%	50%
Mixed Use - Residential	Multifamily Housing Low-Rise (220)	0.46 trips/unit	25%	75%	0.56 trips/unit	63%	37%
Community Hub	Recreational Community Center (495)	2.00 trips/employees	67%	33%	2.66 trips/employees	44%	56%
Public Elementary School	Elementary School (520)	7.21 trips/employees	53%	47%	1.78 trips/employees	48%	52%
Separate Elementary School	Elementary School (520)	7.21 trips/employees	53%	47%	1.78 trips/employees	48%	52%
High School	High School (530)	5.36 trips/employees	70%	30%	1.62 trips/employees	53%	47%
Community Hub	High School (530)	5.36 trips/employees	70%	30%	1.62 trips/employees	53%	47%
Institutional	Junior/Community College (540)	1.49 trips/employees	77%	23%	1.34 trips/employees	50%	50%
Retail	Shopping Center (820)	0.55 trips/employees	64%	36%	1.62 trips/employees	50%	50%
Office	General Office Building (710)	0.37 trips/employees	83%	17%	0.4 trips/employees	20%	80%
Industrial	Warehousing (150)	0.61 trips/employees	72%	28%	0.66 trips/employees	36%	64%

The following assumptions were applied to estimate the land use density:

- Schools and Community Hubs have an assumed size of 45 employees,
- Low density housing includes single and semi-detached units of 30 units per net hectare,
- Medium I density housing includes townhouse and apartment units of 60 units per net hectare,
- Medium II density housing includes townhouse and apartment units of 85 units per net hectare,
- High density housing includes apartment units of 150 units per net hectare, and
- Community College and Warehousing rates were used for Institutional and Industrial land uses to be conservative since they are higher rates than comparable land uses.

Table 3 summarizes the land use density for each of the three alternative. **Table 4** and **Table 5** presents the resulting trips generated for each zone based on the land use density.

Table 3: Land Use Size Comparison

Land Use	Units	Number of Dwelling Units or Employees (Emp)		
		Alt. 1	Alt. 2	Alt. 3
Special Policy Area	Units	149	151	150
Low Density Residential	Units	3662	3719	3592
Medium Density Residential I	Units	2516	2822	3053
Medium Density Residential II	Units	3985	3585	2533
High Density Residential	Units	390	316	906
Mixed Use - Residential	Units	1274	1229	1314
Community Hub	Emp	90	90	90
Public/Separate Elementary School	Emp	180	180	180
High School	Emp	45	45	45
Institutional	Emp	106	101	105
Retail	Emp	457	437	451
Office	Emp	2285	2184	2256
Industrial	Emp	2158	2062	2130

Table 4: Trip Generation by Durham Traffic Zone (AM Peak Hour Trips)

Durham Traffic Zone	Alt. 1		Alt. 2		Alt. 3	
AM Trips	IN	OUT	IN	OUT	IN	OUT
7591	180	583	187	598	151	474
7592	375	777	369	776	363	746
7601	488	1143	484	1131	523	1226
7602	406	560	406	560	120	374
7604	223	687	220	676	462	735
7623	167	517	161	494	286	514
7630	193	213	198	230	50	153

7641	230	269	230	269	240	302
7642	73	243	71	236	75	244
7651	322	106	322	106	322	106
7652	877	290	806	267	828	275
7660	237	311	230	291	241	274
7671	193	180	196	184	194	170
7672	521	460	510	456	548	525
Total	**4485**	**6339**	**4390**	**6274**	**4403**	**6118**

Table 5: Trips Generation by Durham Traffic Zone (PM Peak Hour Trips)

Durham Traffic Zone	Alt. 1		Alt. 2		Alt. 3	
PM Trips	IN	OUT	IN	OUT	IN	OUT
7591	597	351	618	362	505	296
7592	708	434	689	424	665	410
7601	1073	651	1062	644	1179	713
7602	521	398	521	398	398	235
7604	747	439	740	435	713	510
7623	561	330	538	316	421	267
7630	106	81	123	92	167	98
7641	240	153	241	153	273	172
7642	243	143	236	139	245	143
7651	189	348	189	348	189	348
7652	516	946	474	869	487	892
7660	368	329	345	315	328	319
7671	225	243	235	250	224	244
7672	569	647	566	635	641	693
Total	**6663**	**5493**	**6577**	**5380**	**6435**	**5340**

Many of the land uses will primarily serve local residents (schools, community hub, shopping centre etc.), and a percentage of the trips out from dwelling units will be trips to other land uses (e.g. schools, offices, etc.). Because the screenline volumes represent trips that cross the study area boundary, the following trips were removed from the trips generated to represent internal trips generated (i.e. trips not part of the screenline volumes):

- Shopping Center
- Recreational Community Center
- Schools/Institutions
- 30% of trips to/from homes
- 30% of trips to/from General Office/Warehousing

Subtracting the above trips results in a 44% reduction of the trips generated at the screenline. To be conservative, a 40% reduction in the site trips has been applied.

Although the commercial developments may attract a percentage of external trips, it is expected that a significant portion of trips will be internal. As a result, these trips have been excluded from the screenline volume distribution. In addition to these reductions,

trips were reduced based on the internal residential/office trips. This rate was determined through a review of information within the Transportation Tomorrow Survey (TTS) using the 2016 survey results with expansion factors. The Transportation Tomorrow Survey is a survey of households within the Greater Golden Horseshoe including the Greater Toronto Area that summarizes travel patterns and other related transportation information that can be used to aid in planning, such as trip patterns.

TTS data was used to determine origin-destination patterns for local trips within the expected catchment area to/from the subject site for the AM peak hour time periods 7am – 9am. **Table 6** summarizes the trip patterns based on TTS data for trips by households in the area and shows that 25% of the trips made are internal trips. It is expected that with more development in the area, there will be more internal trips, and so a conservative increase to 30% was used to reduce residential/office/warehouse trips.

Table 6: Internal Trip Patterns from TTS

Origin	Destination	Count	Type
1148	1160	6	Internal
1148	1212	6	External
1160	1148	13	Internal
1160	1181	32	External
1161	1154	17	External
1161	1300	16	External
1164	1135	6	External
1164	1148	10	Internal
1167	1208	8	External
Total Internal Trips		**29**	**25%**
Total External Trips		**85**	**75%**

2006 GTA Zones used for origin and destination

Table 7 shows the resultant site traffic volumes generated at the screenlines.

Table 7: Summary of External Trips Generated

External Trips	Alt. 1		Alt. 2		Alt. 3	
	IN	OUT	IN	OUT	IN	OUT
AM Peak Hour	2691	3803	2634	3764	2642	3671
PM Peak Hour	3998	3296	3946	3228	3861	3204

Modal Share

No deductions for non-auto modal share were made for this analysis. It is recognized that potential future improvements such as higher-order transit on Simcoe Street may provide additional non-auto travel choice, and as such the findings of this analysis should be considered conservative.

Trip Distribution and Assignment

Using the distribution from the Emme models for the total traffic conditions, the site traffic trip was distributed to each link based on the same distribution. **Table 8** shows the distribution and the additional volume at each link due to the site traffic.

Table 8: Trip Distribution of Site Traffic (AM Peak Hour)

Screenline	Distribution In/Out			Site Traffic		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
PEAK DIRECTION – SOUTHBOUND AND WESTBOUND						
North of 407 (Southbound – Trips Out)						
Thornton	14%	12%	13%	528	466	495
Simcoe	29%	32%	32%	1105	1194	1177
Ritson	6%	4%	3%	234	153	113
Total	**49%**	**48%**	**49%**	**1867**	**1813**	**1785**
South of Howden (Southbound – Trips In)						
Thornton	10%	5%	11%	256	135	303
Simcoe St Bypass or Street NS-2	1%	34%	1%	40	899	38
Simcoe	31%	2%	29%	842	55	771
Street NS-1	1%	1%	1%	26	37	25
Ritson	1%	1%	1%	32	34	28
Total	**44%**	**44%**	**44%**	**1196**	**1160**	**1165**
East of Thornton (Westbound – Trips Out)						
Howden	2%	2%	2%	69	90	88
Street EW-1 *	-	-	1%	-	-	30
Columbus Rd	11%	13%	12%	437	471	428
Collector Rd*	3%	6%	-	113	225	-
Street EW-2 *	-	1%	3%	-	26	108
Total	**16%**	**22%**	**18%**	**619**	**812**	**654**
West of Ritson (Westbound – Trips In)						
Howden	4%	4%	1%	102	104	38
Street EW-1	-	-	1%	-	-	38
Columbus Rd	6%	6%	7%	154	145	173
Street EW-3*	1%	1%	0%	20	25	12
Total	**10%**	**10%**	**10%**	**276**	**274**	**261**
OFF-PEAK DIRECTION – NORTHBOUND AND EASTBOUND						
North of 407 (Northbound – Trips In)						
Thornton	6%	11%	10%	156	286	258
Simcoe	27%	23%	23%	736	605	619
Ritson	6%	5%	5%	153	125	144
Total	**39%**	**39%**	**39%**	**1045**	**1016**	**1021**
South of Howden (Northbound – Trips Out)						
Thornton	1%	6%	4%	25	218	133
Simcoe St Bypass or Street NS-2	4%	21%	4%	135	782	130
Simcoe	27%	2%	23%	1034	93	851
Street NS-1	1%	2%	1%	31	73	30
Ritson	1%	2%	2%	38	62	64
Total	**33%**	**33%**	**33%**	**1263**	**1228**	**1208**
East of Thornton (Eastbound – Trips In)						
Howden	1%	1%	1%	19	19	19
Street EW-1 *	-	-	2%	-	-	57
Columbus Rd	6%	7%	7%	175	190	187

Screenline	Distribution In/Out			Site Traffic		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Collector Rd*	2%	4%	-	54	102	-
Street EW-2 *	-	0%	2%	-	11	46
Total	**9%**	**12%**	**12%**	**248**	**322**	**309**
West of Ritson (Eastbound – Trips Out)						
Howden	1%	1%	1%	33	29	24
Street EW-1	-	-	1%	-	-	24
Columbus Rd	4%	4%	3%	134	133	112
Street EW-3*	4%	2%	0%	152	77	12
Total	**8%**	**6%**	**5%**	**319**	**239**	**172**
Total Site Trips In	**100%**	**100%**	**100%**	**2765**	**2772**	**2756**
Total Site Trips Out	**100%**	**100%**	**100%**	**4068**	**4092**	**3819**

*These values are double counted since they contr bute to multiple screenlines (e.g. North of 407 (SB) and east of Thornton (WB))

To inform site trip distribution and assignment, select link analysis was conducted using the Emme model. Study area site trips and broad site trip patterns are illustrated in **Exhibit 7** and **Exhibit 8**.

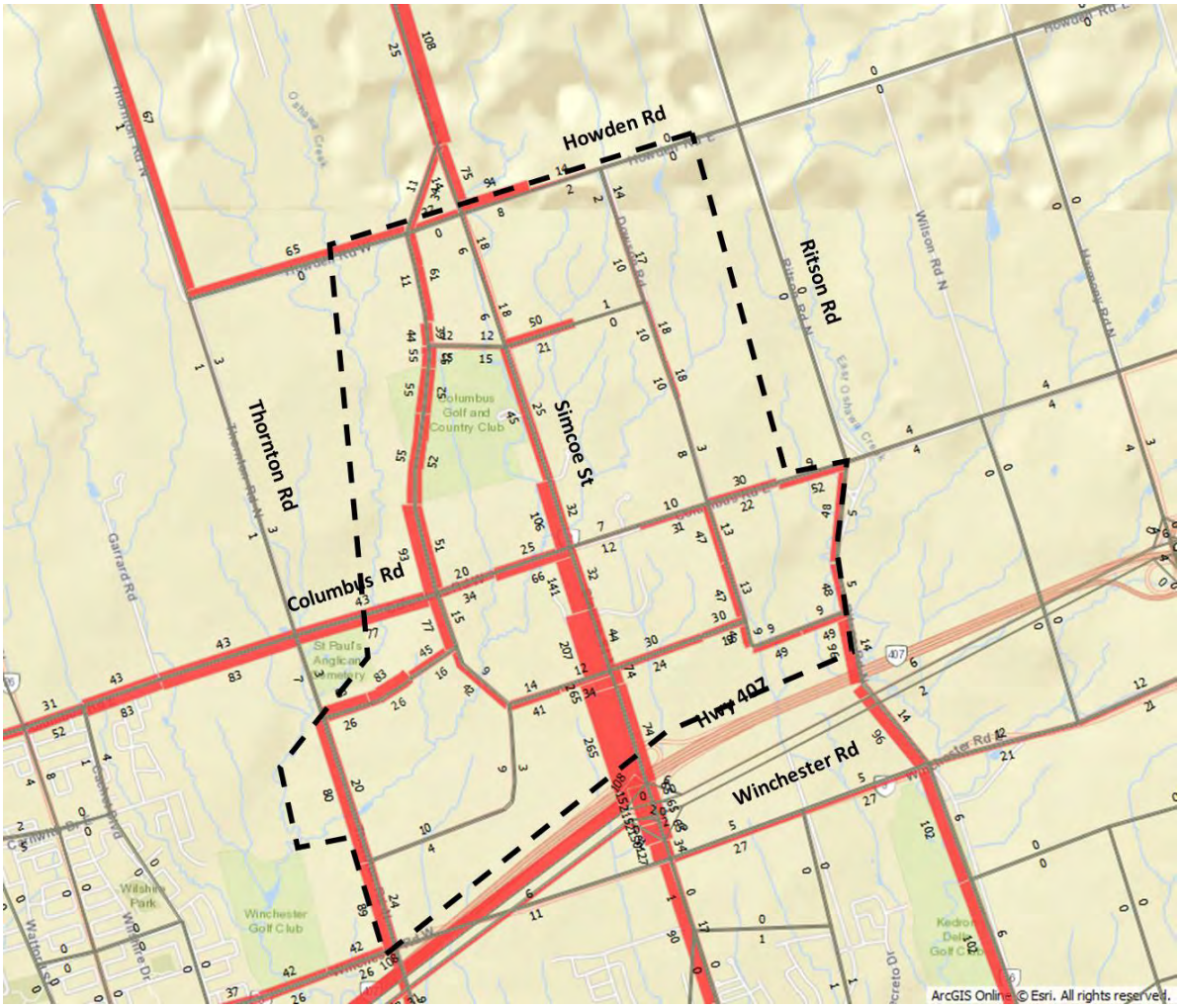

Exhibit 7: Site Trip Distribution – Study Area

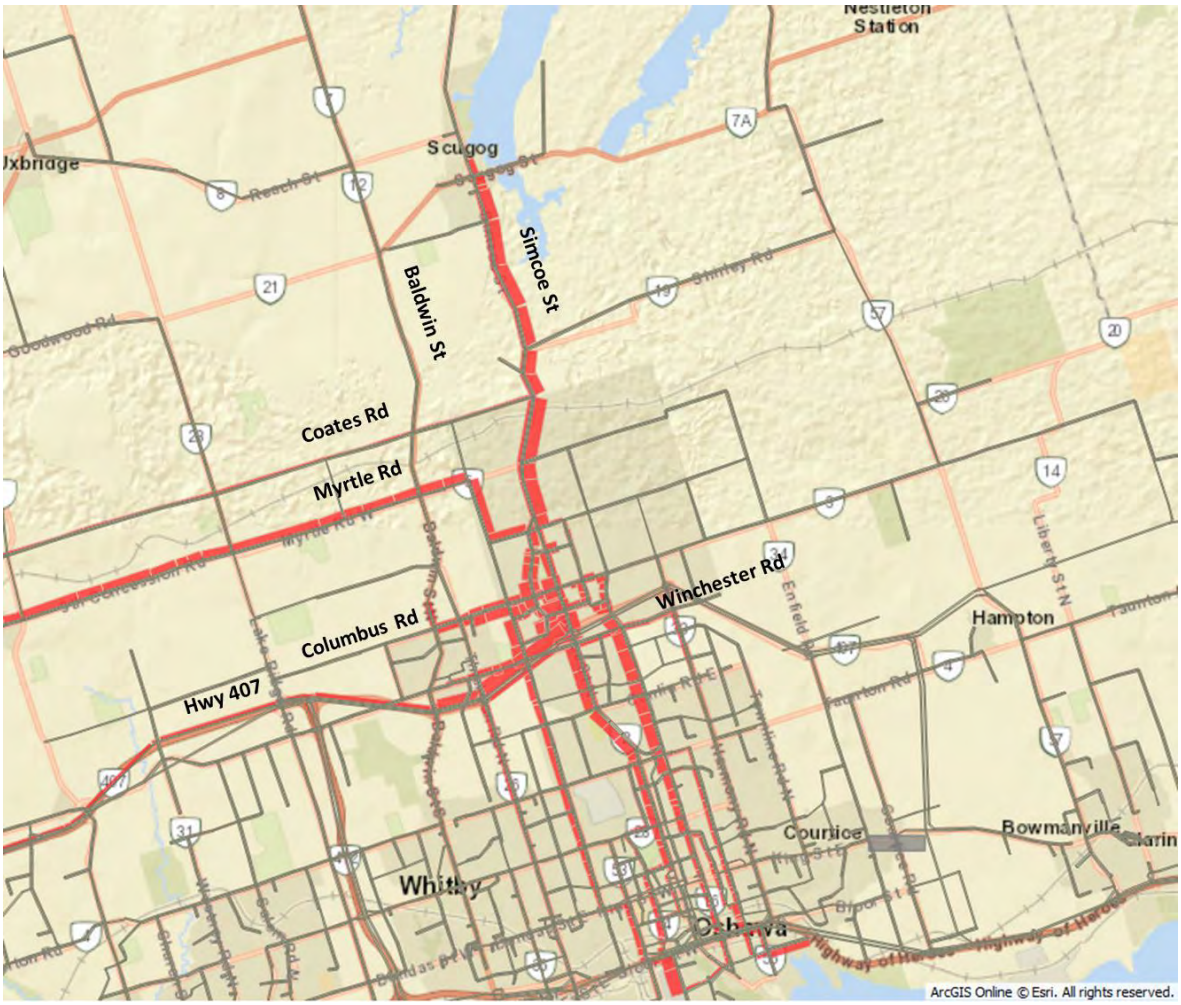

Exhibit 8: Site Trip Distribution - Regional

Screenline Traffic Analysis

Table 9 summarizes the background, site, and total traffic conditions for each of the three alternatives. The future total volumes are a sum of the background volumes and the site traffic.

Screenline analysis considers the total travel demand crossing an imaginary line to understand transportation infrastructure requirements for a specified area. Four screenlines are assessed in this analysis, generally bounding the study area, and these are illustrated in **Exhibit 9**.

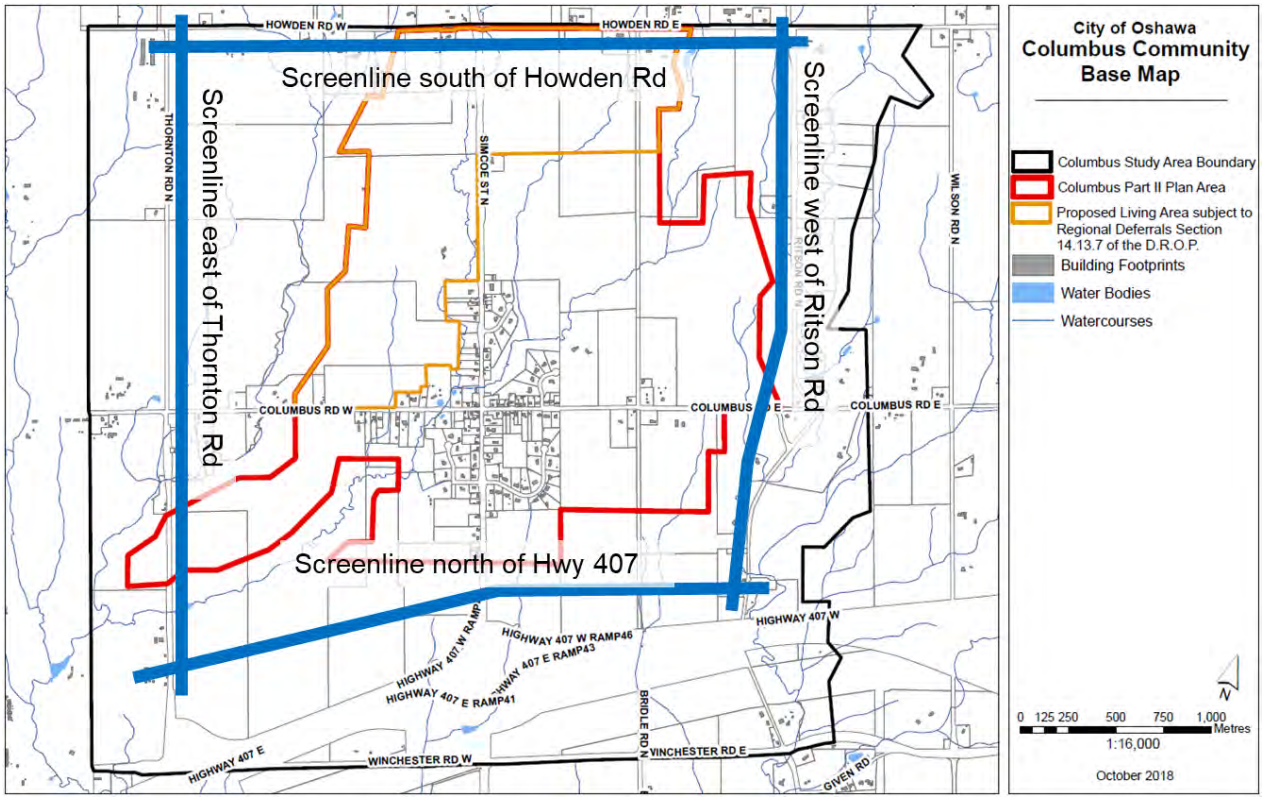

Exhibit 9: Traffic Screenline Locations

To identify infrastructure needs, the predicted peak hour traffic demands are compared against theoretical roadway capacity per hour, consistent with the G.T.A Network Coding Standard and the Durham Region Emme model. The capacity assumptions are as follows:

- Type A Arterial Road: 900-1000 vehicles per hour per lane.
    - Howden Road is the only Type A arterial road in the study area, however it is noted that the Durham Emme model assumes a capacity of 500 due to the existing of the roadway which includes residential accesses with a narrow rural road platform (i.e. no shoulders).
- Type B Arterial Road: 800-900 vehicles per hour per lane.
    - Columbus Road, Winchester Road, Simcoe Street and Ritson Road. It is noted that the Durham Emme model assumes a 400-500 capacity for Columbus Road and Ritson Road due to existing conditions.
- Type C Arterial Road: 700 vehicles per hour per lane
- Collector Road: 500 vehicles per hour per lane

Based on the anticipated demand considering the full build out of the study area relative to the current condition of existing roadways in the study area, roadway improvements

are required through the study area, which are reflected in **Table 10.** This includes the following improvements:

- Operational improvements to Thornton Road through the study area, including intersection lane configuration improvements to increase capacity
- Widening of Simcoe Street from 2 to 4 lanes through the study area (aligned with the Durham Region T.M.P. recommendation for a road widening beyond 2031)
- Operational improvements to Ritson Road from Street E.W.-3 to the southern limits of the study area
- Operational improvements to Columbus Road west of Street N.S.-2 or Simcoe Street Bypass to western limits of the study area

Table 10 shows the expected volume to capacity ratio of the links at the screenlines. Based on the capacity for each link (with assumptions made for new links), it is expected that there will be residual capacity at the boundary of the site with the exception of Simcoe Street. Simcoe Street demand significantly exceeds capacity in all scenarios and it is assumed that the proposed 4-lane widening of Simcoe Street in the Durham Region T.M.P. study beyond 2031 will be required to serve the full build-out of Columbus.

Table 9: 2031 Screenline Volumes – Background, Site, and Total Traffic (AM Peak Hour)

Screenline	2031 Background			Site Traffic			2031 Total Traffic		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
PEAK DIRECTION SOUTHBOUND AND WESTBOUND									
North of 407 (Southbound – Trips Out)									
Thornton	326	296	319	528	466	495	854	762	814
Simcoe	681	758	759	1105	1194	1177	1786	1952	1936
Ritson	144	97	73	234	153	113	378	250	186
Total	**1151**	**1151**	**1151**	**1867**	**1813**	**1785**	**3018**	**2964**	**2936**
South of Howden (Southbound – Trips In)									
Thornton	211	115	256	256	135	303	467	250	559
Simcoe St Bypass or Street NS-2	33	763	32	40	899	38	73	1662	70
Simcoe	694	47	652	842	55	771	1536	102	1423
Street NS-1	22	31	21	26	37	25	48	68	46
Ritson	26	29	24	32	34	28	58	63	52
Total	**985**	**985**	**985**	**1196**	**1160**	**1165**	**2182**	**2145**	**2150**
East of Thornton (Westbound – Trips Out)									
Howden	43	57	57	69	90	88	112	147	145
Street EW-1 *	-	-	20	-	-	30	-	-	50
Columbus Rd	269	299	276	437	471	428	706	770	704
Collector Rd*	70	143	-	113	225	-	183	368	-
Street EW-2 *	-	17	70	-	26	108	-	43	178
Total	**382**	**515**	**422**	**619**	**812**	**654**	**1001**	**1328**	**1077**
West of Ritson (Westbound – Trips In)									
Howden	84	88	32	102	104	38	186	192	70
Street EW-1	-	-	32	-	-	38	-	-	70
Columbus Rd	127	123	146	154	145	173	281	268	319
Street EW-3*	16	21	10	20	25	12	36	46	22
Total	**227**	**232**	**221**	**276**	**274**	**261**	**503**	**506**	**481**
OFF PEAK DIRECTION NORTHBOUND AND EASTBOUND									
North of 407 (Northbound – Trips In)									
Thornton	129	243	218	156	286	258	285	529	476
Simcoe	607	513	523	736	605	619	1343	1118	1142
Ritson	126	106	121	153	125	144	279	231	265
Total	**862**	**862**	**862**	**1045**	**1016**	**1021**	**1907**	**1878**	**1883**
South of Howden (Northbound – Trips Out)									
Thornton	16	138	86	25	218	133	41	356	219
Simcoe St Bypass or Street NS-2	83	496	84	135	782	130	218	1278	214

Screenline	2031 Background			Site Traffic			2031 Total Traffic		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Simcoe	638	59	549	1034	93	851	1672	152	1400
Street NS-1	19	46	20	31	73	30	50	119	50
Ritson	23	39	41	38	62	64	61	101	105
Total	**779**	**779**	**779**	**1263**	**1228**	**1208**	**2042**	**2006**	**1988**
East of Thornton (Eastbound – Trips In)									
Howden	16	16	16	19	19	19	35	35	35
Street EW-1 *	-	-	48	-	-	57	-	-	105
Columbus Rd	144	161	158	175	190	187	319	351	345
Collector Rd*	45	87	-	54	102	-	99	189	-
Street EW-2 *	-	9	39	-	11	46	-	20	85
Total	**205**	**272**	**261**	**248**	**322**	**309**	**453**	**595**	**570**
West of Ritson (Eastbound – Trips Out)									
Howden	20	18	15	33	29	24	53	47	39
Street EW-1	-	-	15	-	-	24	-	-	39
Columbus Rd	83	85	72	134	133	112	217	218	184
Street EW-3*	94	49	8	152	77	12	246	126	20
Total	**197**	**152**	**111**	**319**	**239**	**172**	**516**	**391**	**282**
Total Site Trips In	**2279**	**2352**	**2329**	**2765**	**2772**	**2756**	**5044**	**5124**	**5085**
Total Site Trips Out	**2509**	**2597**	**2463**	**4068**	**4092**	**3819**	**6577**	**6689**	**6282**

*These values are double counted since they contribute to multiple screenlines (e.g. North of 407 (SB) and east of Thornton (WB))

Table 10: 2031 Screenline Volumes, Capacities, and v/c Ratios (AM Peak Hour)

Screenline	2031 Total Traffic			Capacity			Volume to Capacity Ratio		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
PEAK DIRECTION SOUTHBOUND AND WESTBOUND									
North of 407 (Southbound – Trips Out)									
Thornton	854	762	814	900	900	900	0.95	0.85	0.90
Simcoe	1,786	1,952	1,936	1,800	1,800	1,800	0.99	1.08	1.08
Ritson	378	250	186	900	900	900	0.42	0.28	0.21
Total	**3,018**	**2,964**	**2,936**	**3,600**	**3,600**	**3,600**	**0.84**	**0.82**	**0.82**
South of Howden (Southbound – Trips In)									
Thornton	467	250	559	900	900	900	0.52	0.28	0.62
Simcoe St Bypass or Street NS-2	73	1,662	70	700	1,800	700	0.10	0.92	0.10
Simcoe	1,536	102	1,423	1,800	700	1,800	0.85	0.15	0.79
Street NS-1	48	68	46	700	700	700	0.07	0.10	0.07

Screenline	2031 Total Traffic			Capacity			Volume to Capacity Ratio		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Ritson	58	63	52	400	400	400	0.15	0.16	0.13
Total	**2,182**	**2,145**	**2,150**	**4,500**	**4,500**	**4,500**	**0.48**	**0.48**	**0.48**
East of Thornton (Westbound – Trips Out)									
Howden	112	147	145	500	500	500	0.22	0.29	0.29
Street EW-1 *	0	0	50			700			0.07
Columbus Rd	706	770	704	900	900	900	0.78	0.86	0.78
Collector Rd*	183	368	0	500	500		0.37	0.74	
Street EW-2 *	0	43	178	700	700	700	0.00	0.06	0.25
Total	**1,001**	**1,328**	**1,077**	**2,600**	**2,600**	**2,800**	**0.39**	**0.51**	**0.38**
West of Ritson (Westbound – Trips In)									
Howden	186	192	70	500	500	500	0.37	0.38	0.14
Street EW-1	0	0	70			700			0.10
Columbus Rd	281	268	319	500	500	500	0.56	0.54	0.64
Street EW-3*	36	46	22	700	700	700	0.05	0.07	0.03
Total	**503**	**506**	**481**	**1,700**	**1,700**	**2,400**	**0.30**	**0.30**	**0.20**
OFF PEAK DIRECTION NORTHBOUND AND EASTBOUND									
North of 407 (Northbound – Trips In)									
Thornton	285	529	476	900	900	900	0.32	0.59	0.53
Simcoe	1,343	1,118	1,142	1,800	1,800	1,800	0.75	0.62	0.63
Ritson	279	231	265	900	900	900	0.31	0.26	0.29
Total	**1,907**	**1,878**	**1,883**	**3,600**	**3,600**	**3,600**	**0.53**	**0.52**	**0.52**
South of Howden (Northbound – Trips Out)									
Thornton	41	356	219	900	900	900	0.05	0.40	0.24
Simcoe St Bypass or Street NS-2	218	1,278	214	700	1,800	700	0.31	0.71	0.31
Simcoe	1,672	152	1,400	1,800	700	1,800	0.93	0.22	0.78
Street NS-1	50	119	50	700	700	700	0.07	0.17	0.07
Ritson	61	101	105	400	400	400	0.15	0.25	0.26
Total	**2,042**	**2,006**	**1,988**	**4,500**	**4,500**	**4,500**	**0.45**	**0.45**	**0.44**
East of Thornton (Eastbound – Trips In)									
Howden	35	35	35	500	500	500	0.07	0.07	0.07
Street EW-1 *	0	0	105			700			0.15
Columbus Rd	319	351	345	900	900	900	0.35	0.39	0.38
Collector Rd*	99	189	0	500	500		0.20	0.38	
Street EW-2 *	0	20	85	700	700	700	0.00	0.03	0.12

Screenline	2031 Total Traffic			Capacity			Volume to Capacity Ratio		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Total	**453**	**595**	**570**	**2,600**	**2,600**	**2,800**	**0.17**	**0.23**	**0.20**
Howden	53	47	39	500	500	500	0.11	0.09	0.08
Street EW-1	0	0	39			700			0.06
Columbus Rd	217	218	184	500	500	500	0.43	0.44	0.37
Total	**516**	**391**	**282**	**1,700**	**1,700**	**2,400**	**0.30**	**0.23**	**0.12**
Legend:									
Volume to capacity ratio	< 0.85	0.85 to 1.00	> 1.00						

*These values are double counted since they contr bute to multiple screenlines (e.g. North of 407 (SB) and east of Thornton (WB))

Conclusion

Based on this analysis, screenlines at the west, north and east boundaries of the study area are not anticipated to be congested with sufficient capacity to meet demand across all alternatives. While the screenline at the southern boundary is just under the threshold of 0.85 in all scenarios, there are high traffic demands anticipated on Thornton Road and Simcoe Street.

This analysis informs the specific infrastructure needs identified in previous studies. This includes:

- Deferred Highway 407 midblock crossings D5, east and west of Simcoe Street, Official Plan Schedule 'B'
- Proposed Type C Arterial Road west of Thornton Road (Whitby connection to Carnwith Drive) Official Plan Schedule 'B'

With spare capacity on Ritson Road in all scenarios, it is anticipated that congestion on Simcoe Street will divert traffic to Ritson Road during peak times. Based on this finding, the deferred midblock crossings (D5) of Highway 407 identified in the Oshawa Official Plan Schedule 'B' are not required based on the projected build-out of the study area by the year 2031, especially when considering the anticipated costs associated with providing grade separated crossings.

Similarly, the Type C Arterial Road is not required to serve east-west traffic demands between Whitby and Oshawa based on this analysis. The east of Thornton Road screenline has spare capacity and a new crossing of the Natural Heritage System is unlikely to be justified based on the projected build-out of the study area by 2031.

Future Work

Based on the selected land use and road alternative selected, Synchro analysis of the total traffic conditions for the preferred alternative will be completed at key intersections to review intersection capacity and delay. This will guide any conceptual design of major intersections in the new road network including intersection lane configurations and storage requirements.