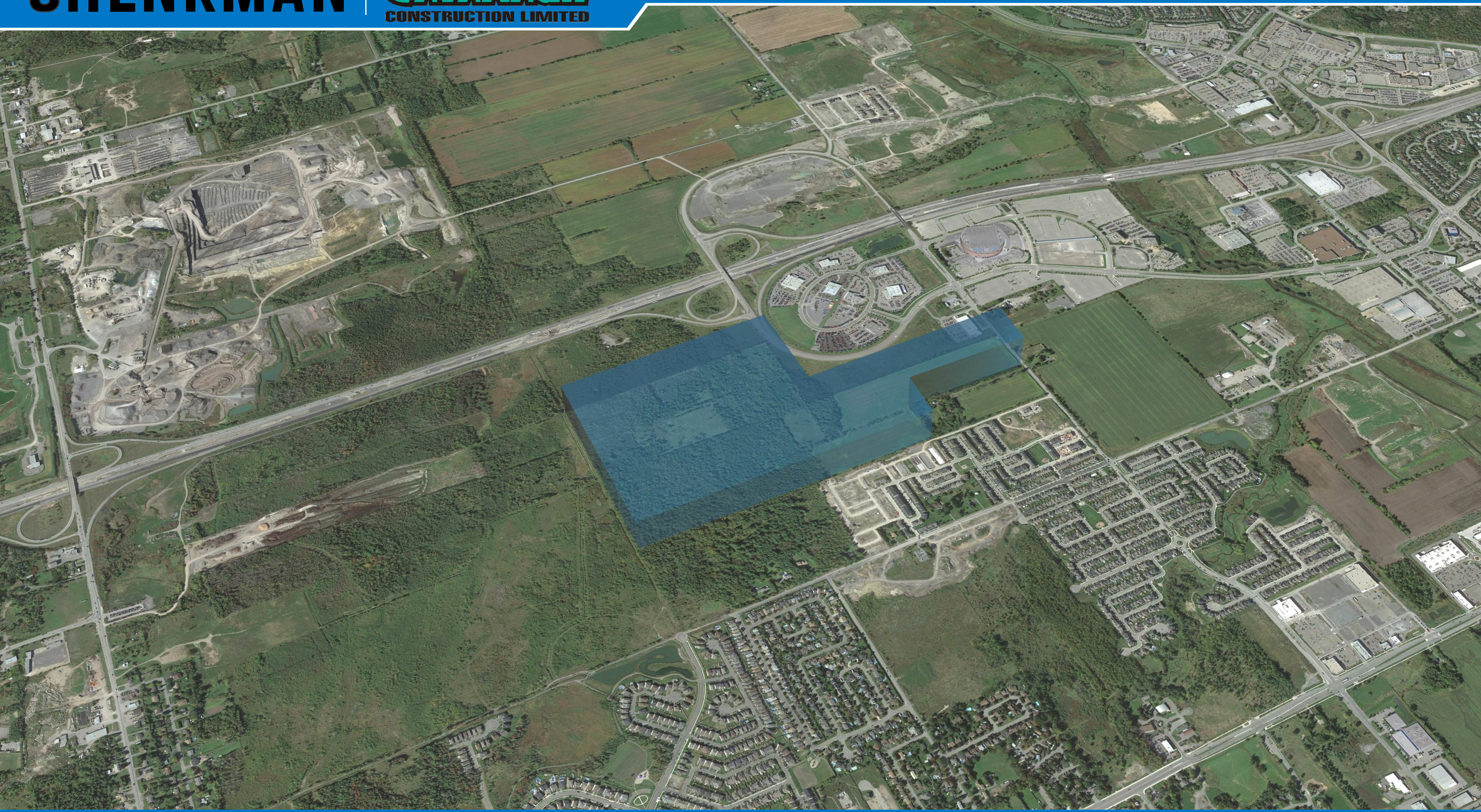
July 2016



Shenkman/Cavanagh Kanata West

Community Transportation Study

Shenkman/Cavanagh – Kanata West

Community Transportation Study

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July 26, 2016

602958-01000

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Community Transportation Study

INTRODUCTION

From the information provided, Shenkman/Cavanaugh is proposing a development consisting of approximately 1,237 residential dwelling units, an assumed 65,000 ft^2 of retail land use and three car dealerships on the property municipally known as 195 Huntmar Drive. The proposed site is located south of the Palladium/HWY 417 interchange and west of Huntmar Drive. The future North-South Arterial and Stittsville Main Street Extension will form part of the proposed development. The local context of the site is provided as Figure 1 and the proposed Concept Plan is provided as Figure 2.

Figure 1: Local Context

As part of the rezoning process, the City of Ottawa requires a submission of a formal Transportation Impact Assessment (TIA) consistent with their guidelines dated October 2006. With respect to these guidelines and for a rezoning application, a Community Transportation Study (CTS) is considered the appropriate type of study.

For the purpose of this assessment, the study area will consist of the signalized and unsignalized intersections of Palladium/HWY 417 WB Ramps, Palladium/HWY 417 EB Off Ramp, Palladium/Cyclone Taylor, Palladium/Huntmar and Palladium/Maple Grove and will assess the future North-South Arterial/Stittsville Main intersection. The most relevant Screenline (SL #44 at Terry Fox) will also be assessed.

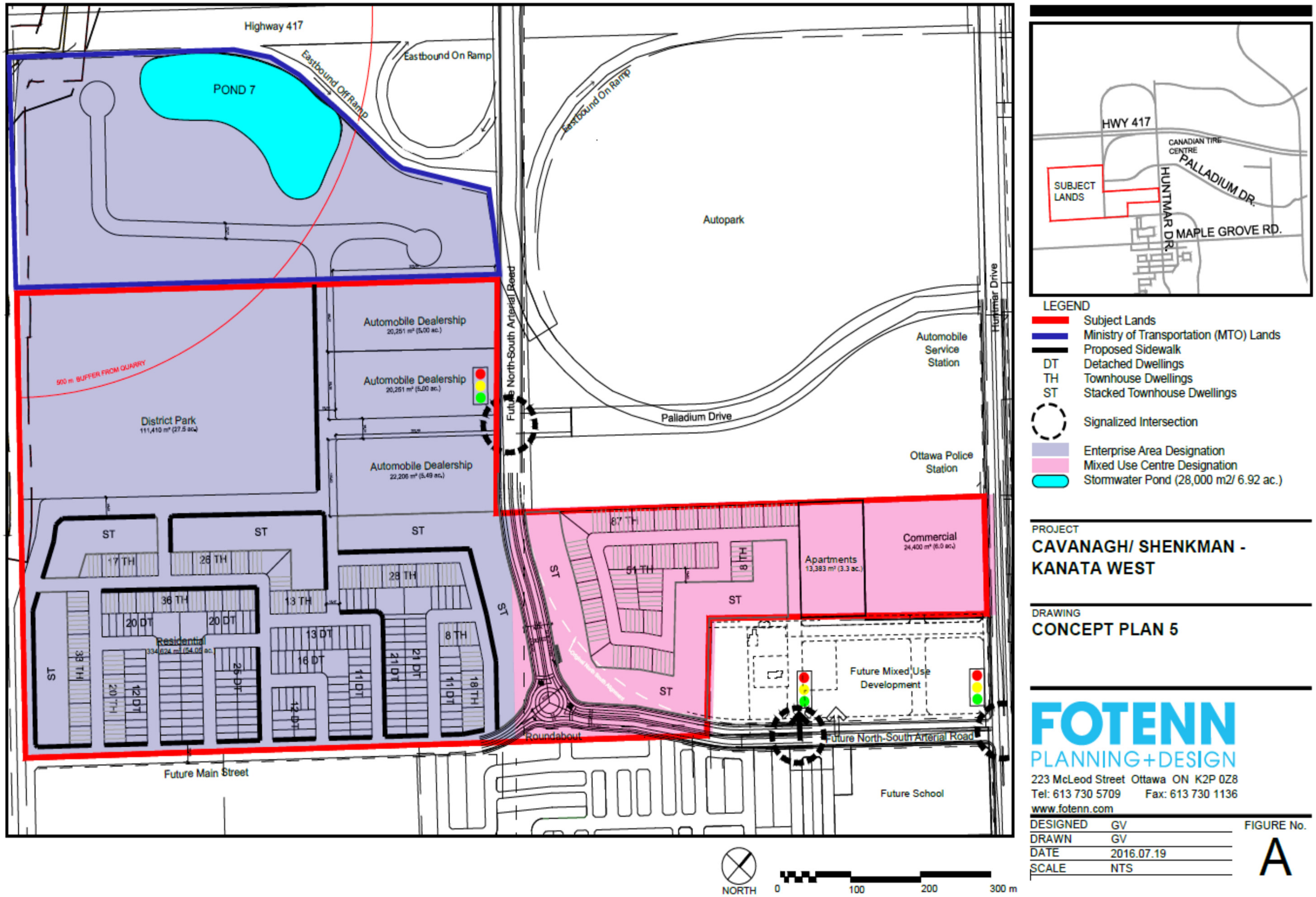

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Figure 2: Proposed Concept Plan

The Kanata West Transportation Master Plan (KWTMP) was developed in 2006 and updated in 2010 (by Parsons, formally Delcan). A significant amount of transportation planning within this area was undertaken and the results are included in the Kanata West TMP and the City of Ottawa's 2013 TMP. Within the vicinity of the site, the proposed North-South Arterial is planned as a four-lane arterial providing access to/from HWY 417, and acting, in part, as a Stittsville East By-Pass. As shown in Figure 2, this future roadway will form the southeastern boundary of the subject site and will curve north through the middle of the site.

The Stittsville Main Street Extension is planned as a two-lane collector roadway and will form the southwestern boundary of the subject site. Stittsville Main Street Extension will intersect with the North-South Arterial at a proposed 'T'-intersection. The extension of Stittsville Main Street north of the North-South Arterial to Palladium Drive is not included in the proposed plan given the potential ROW conflicts with the future transit corridor and given the available capacity along the North-South Arterial providing a similar connection to Palladium Drive. The proposed configuration of these roadways and their location with respect to the subject lands is shown in Figure 2.

Within the Kanata West TMP, the lands located at 195 Huntmar Drive were planned as 'business park', 'intensive employment area', and a 'major public park'. Given these assumed land uses within Kanata West, the road network was developed to support these future developments. The Kanata West Concept Plan from the Kanata West TMP is provided as Figure 3. The more detailed alignment and cross-sections that satisfy Phases 1 and 2 of the EA process are shown as Figures 4 and 5.

EXISTING CONDITIONS

AREA ROAD NETWORK

Palladium Drive is an arterial roadway, which extends from Huntmar Drive in the north, loops around and intersects with the HWY 417 interchange, and continues east past Huntmar Drive to Terry Fox Drive, where it continues as Katimavik Road. Within the study area, Palladium Drive has a four-lane cross-section with auxiliary turn lanes provided at major intersections. The posted speed limit through the Huntmar/Palladium intersection is 60 km/h, and increases to 70 km/h approximately 150 m east and west of the intersection.

Huntmar Drive is a north-south arterial, which extends from March Road in the north to Hazeldean Road in the south, where it continues as Iber Road. Within the study area, Huntmar Drive has a two-lane cross south of the Palladium/Huntmar South intersection and north of the Palladium/Cyclone Taylor intersection. Between these intersections, the cross-section of Palladium Drive is four-lanes with auxiliary turn lanes. Within the study area, the posted speed limit is 50 km/h.

Maple Grove Road is an arterial roadway, between Huntmar Drive and McIntosh Way and a major collector/local road between Huntmar Drive and Alon Street. Within the study area, Maple Grove Road has a two-lane cross-section. The posted speed limit is 50 km/h.

Autopark Private is a private roadway, which extends west from the signalized Huntmar/Cyclone Taylor intersection to serve commercial development. It has a two-lane cross-section.

Cyclone Taylor Boulevard is a local roadway extending from Huntmar Road to Palladium Drive. Its primary function is to serve the parking lots surrounding the Canadian Tire Centre. The road has a four-lane cross section.

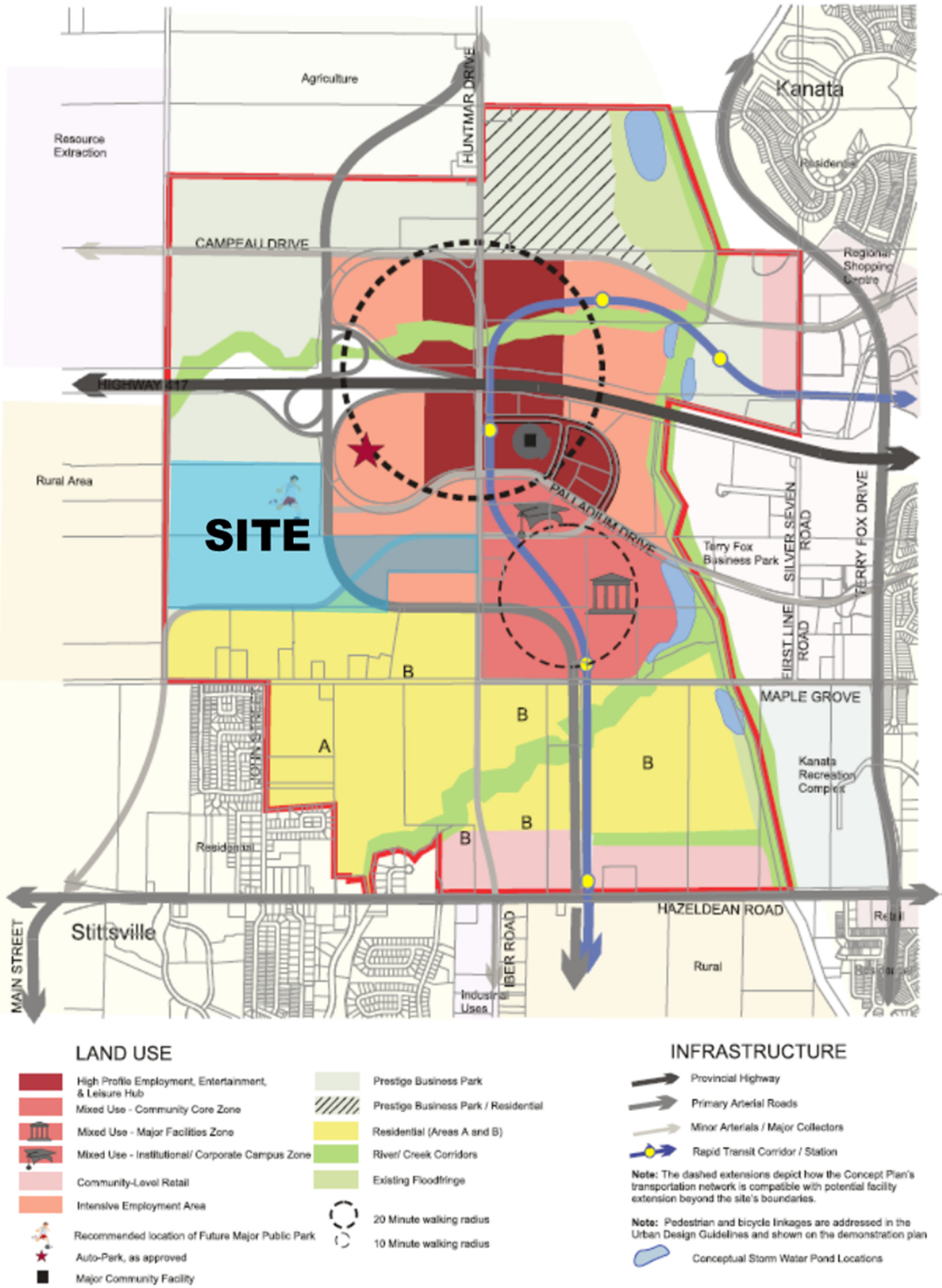

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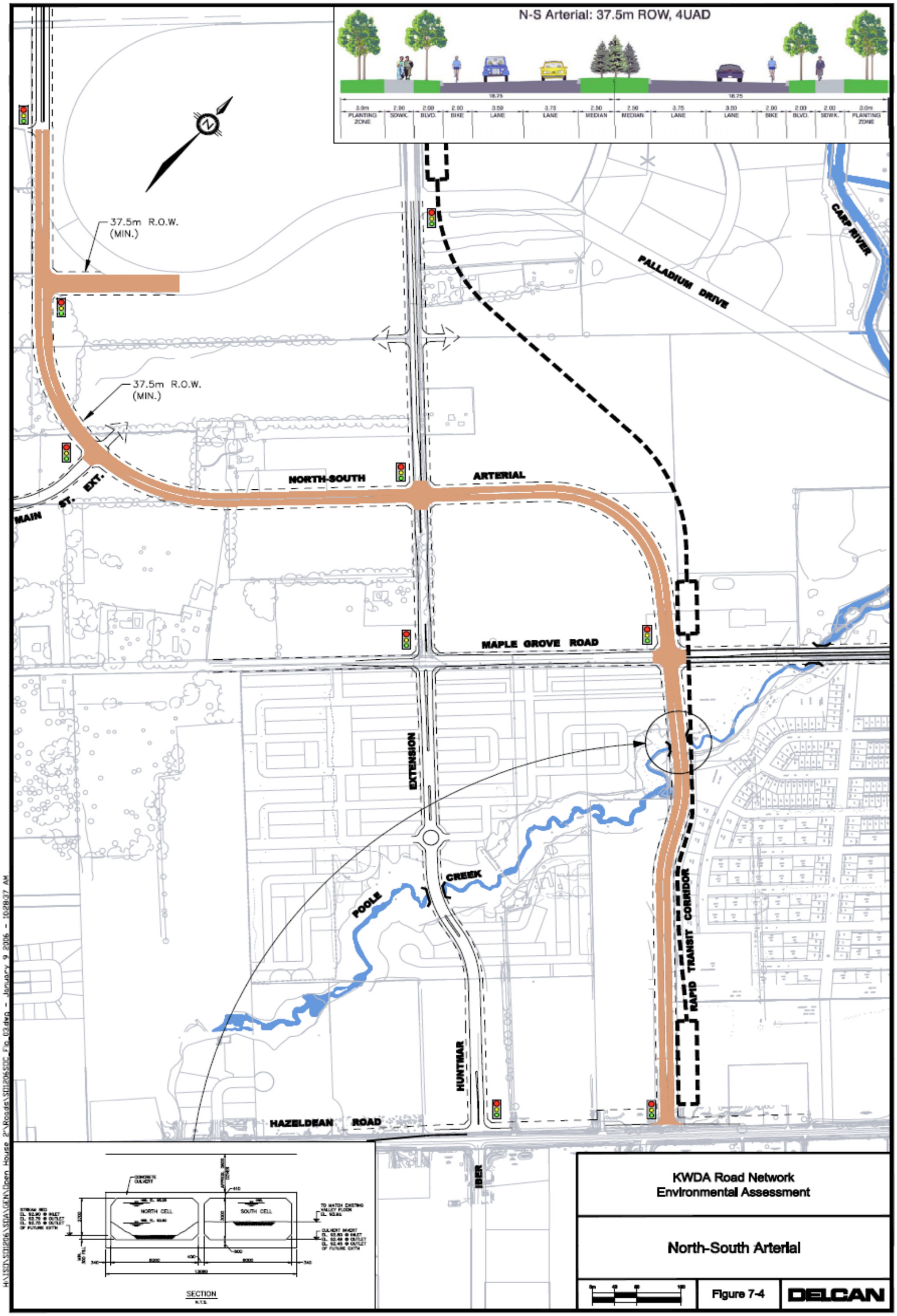
Figure 3: Kanata West Concept Plan



PARSONS **Figure 4: Proposed N-S Arterial Alignment and Cross-Section**

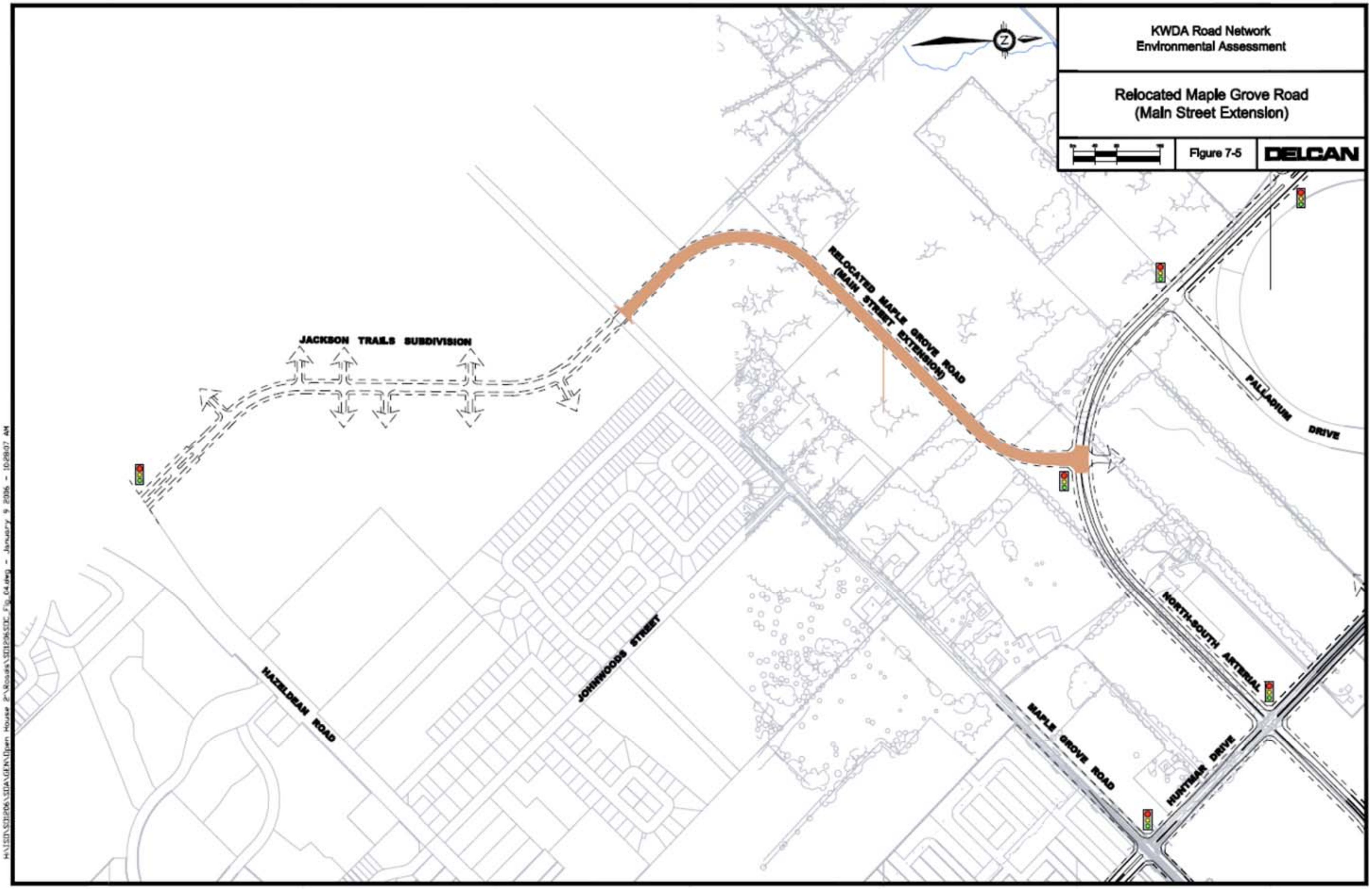


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Figure 5: Proposed Stittsville Main Street Extension

PEDESTRIAN/CYCLING NETWORK

Sidewalks are currently provided along both sides of Palladium Drive (east of Huntmar Drive) and along Maple Grove Road (just west of Huntmar Drive). There are currently no sidewalk facilities along Huntmar Drive within the vicinity of the site. Given the residential context of the southern portion of the site, sidewalks will likely be planned on major roadways adjacent to the site during the SPA phase of development.

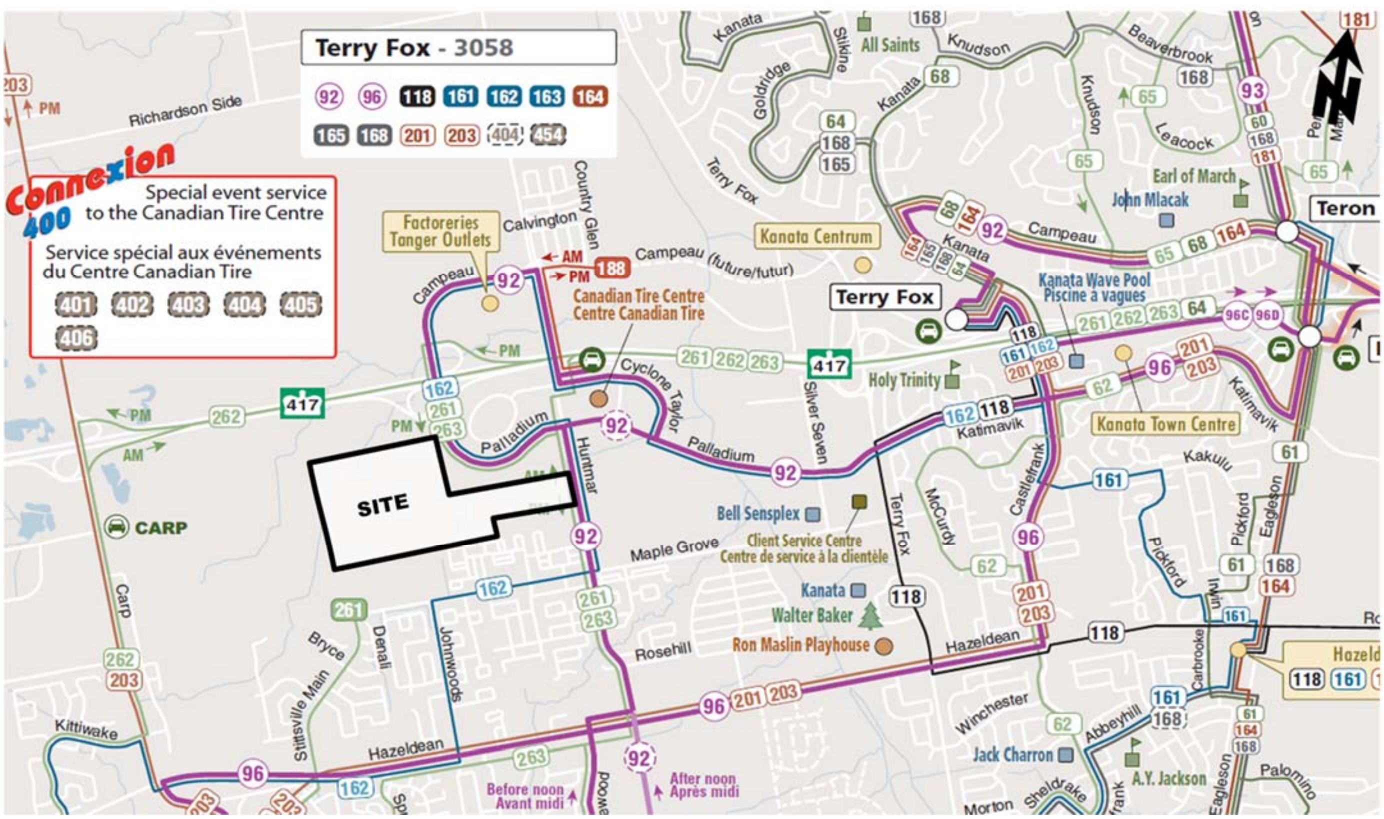
Dedicate bicycle facilities are currently provided in the form of cycle tracks in both directions along Huntmar Drive, south of Maple Grove Road. North of Maple Grove Road, paved shoulders exist along Huntmar Drive. According to the City's Cycling Plan, Huntmar Drive is classified as a "Spine Route" and Palladium Drive is classified as a "Local Route". In addition, a 'major pathway' is proposed between Maple Grove Road and Palladium Drive, adjacent to the future transit priority corridor.

TRANSIT NETWORK

Transit service within the vicinity of the site is currently provided by OC Transpo Regular Routes #92, 162, 261 and 263. Bus stops for Routes #92 and 162 operate along Palladium Drive, which then continue onto Huntmar Drive and Campeau Drive. Both Routes then re-emerge back onto Huntmar Drive via the Palladium/Huntmar intersection. Bus Routes #261 and 263 access Palladium Drive via Highway 417. Routes #261 and 263 are express routes that travel between Stittsville and Hurdman Station, through the downtown core. Bus stops for the four routes are located at the Maple Grove/Huntmar and Palladium/Huntmar intersections, and are approximately 500-600 metres from the proposed development.

A transit priority corridor is recommended from Palladium Drive to Fernbank Road, east of Huntmar Drive, within the City's 2031 Affordable Network. The City's 2031 Network Concept plan identifies this route as Bus Rapid Transit (BRT) with grade-separated and at-grade crossings.

Figure 6: Area Transit Network



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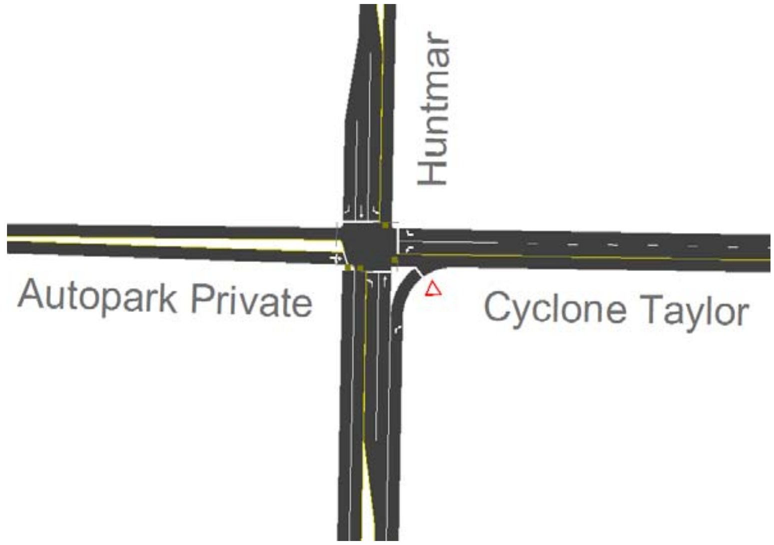
EXISTING STUDY AREA INTERSECTIONS

Autopark Private and Cyclone Taylor/Huntmar
The subject intersection is a signalized four-legged intersection.



Northbound

- Single through lane
- Single 50m left-turn lane
- Single channelized right-turn lane

Southbound

- Single through lane
- Single 50m left-turn lane
- Single 30m right-turn lane

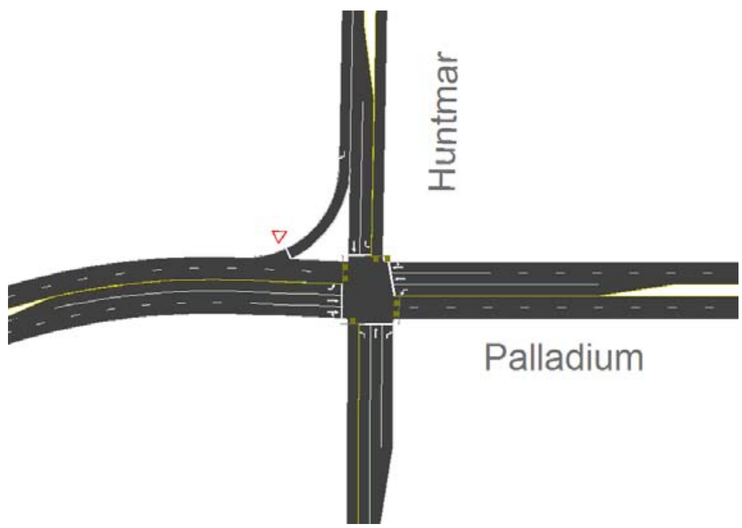
Eastbound

- Single full movement lane

Westbound

- Single right-turn lane
- Single left-turn lane

Palladium/Huntmar
The Palladium/Huntmar intersection is signaled four-legged intersection.



Northbound

- Single through lane
- Single 100m left-turn lane
- Single 40m right-turn lane

Southbound

- Single through lane
- Single 50m left-turn lane
- Single channelized right-turn lane

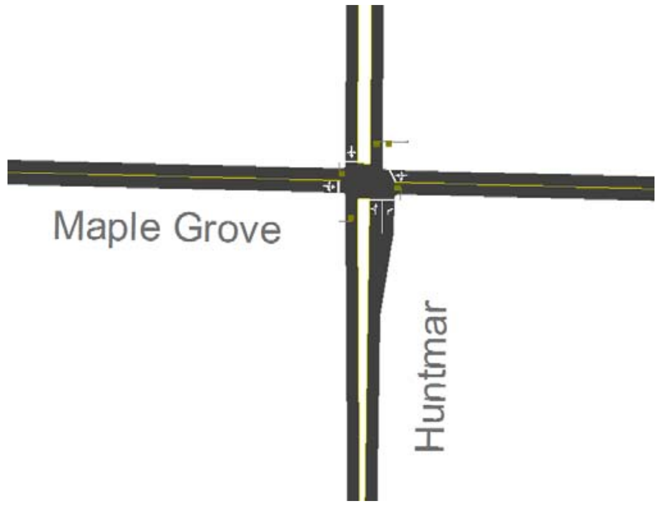
Eastbound

- Single through lane
- Single through/right-turn lane
- Single 95m left-turn lane

Westbound

- Single through lane
- Single through/right-turn lane
- Single 65m left-turn lane

Maple Grove/Huntmar
The Maple Grove/Huntmar intersection is a signalized four-legged intersection with dedicated bike lanes on the south leg.



Northbound

- Single through/left-turn lane
- Single right-turn lane

Southbound

- Single full movement lane

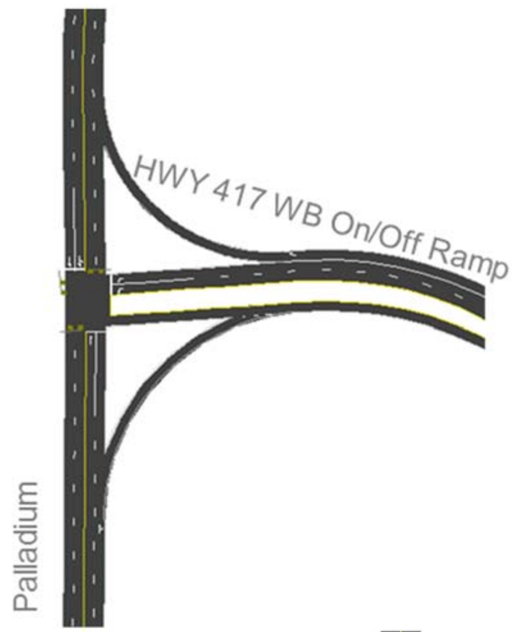
Eastbound

- Single full movement lane

Westbound

- Single full movement lane

Palladium/Highway 417 Westbound Ramp
The subject intersection is a signalized 'T' intersection.



Northbound

- Two through lanes
- Single channelized right-turn lane

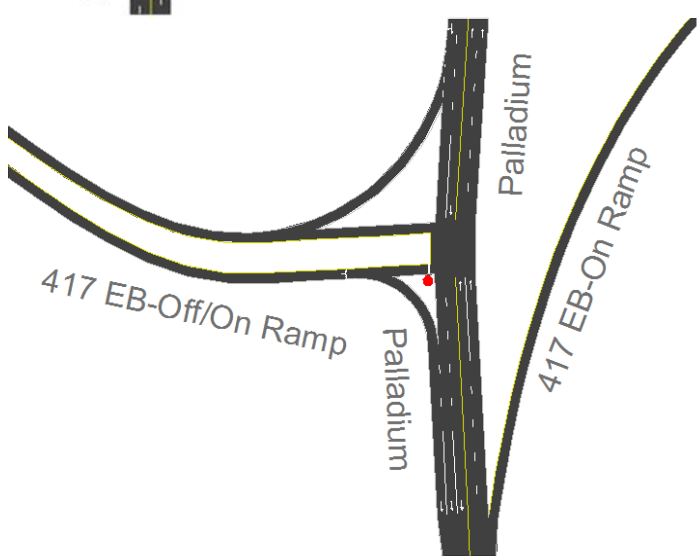
Southbound

- Single through lane
- Single through/left-turn lane

Westbound

- Two left-turn lanes
- Single channelized right-turn lane

Palladium/Highway 417 Eastbound Ramp
The subject intersection is a signalized 'T' intersection.



Northbound

- Two through lanes
- Single channelized right-turn lane

Southbound

- Two through lane
- Single channelized right-turn lane

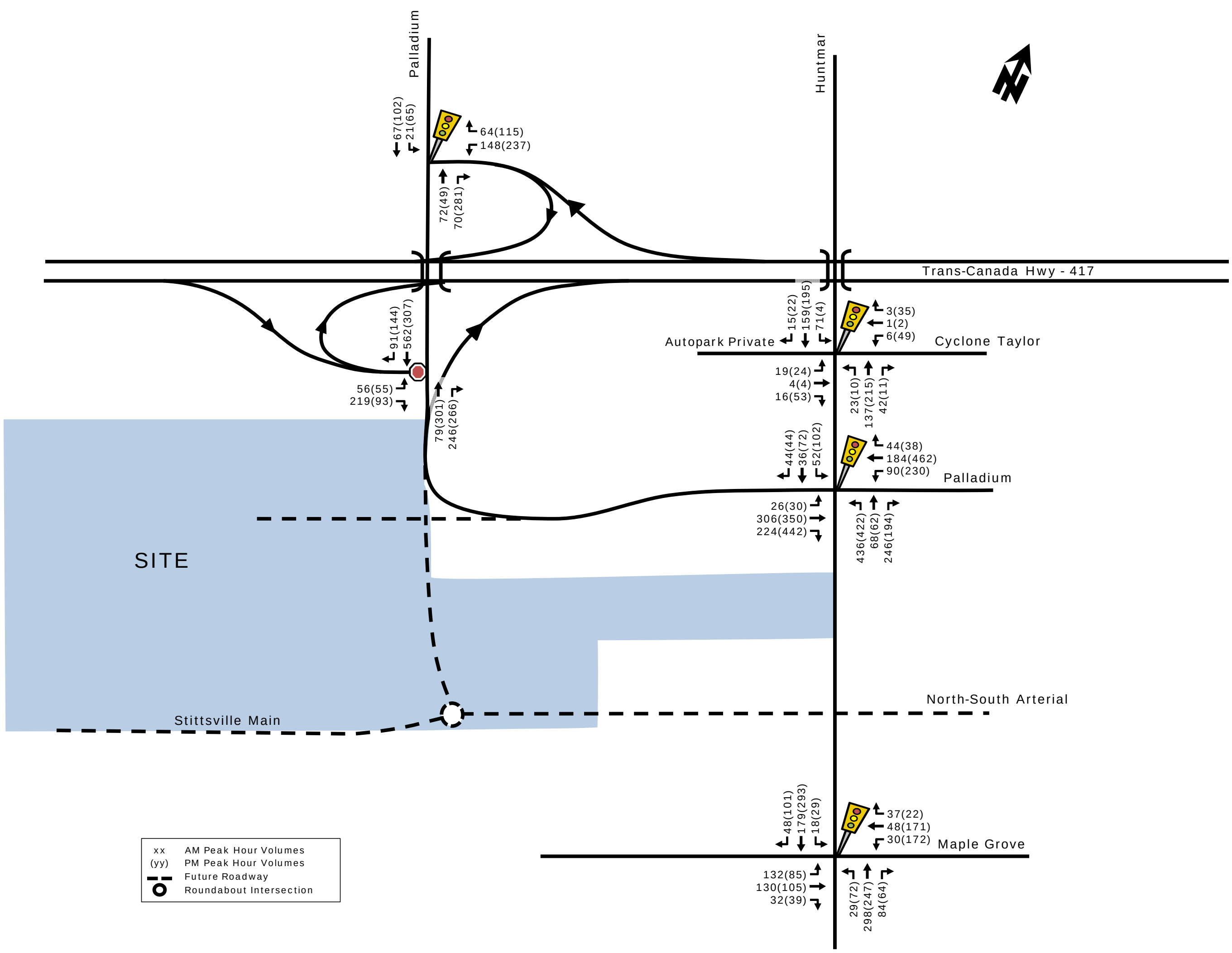
Eastbound

- Single left-turn lane
- Single channelized right-turn lane

EXISTING INTERSECTION OPERATIONS

Illustrated as Figure 7, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa for the Huntmar/Autopark, Huntmar/Palladium, Huntmar/Maple Grove, and Palladium/HWY417 WB Ramps intersections. The Palladium/HWY417 WB Ramps intersection, also illustrated in Figure 7, was counted by Parsons in June 2016. These peak hour traffic volumes are included as Appendix A. The future road network, as per the proposed Concept Plan, is included in Figure 7 as 'dashed' lines.

Figure 7: Existing Weekday Peak Hour Traffic Volumes



It is noteworthy that the subject site is in close proximity to the Canadian Tire Centre and the Tanger Outlet Mall. Both of these developments attract high volumes of traffic outside of the traditional commuter peak hours (Monday-Friday, 7-9 AM and 4-6 PM). Specifically, the Canadian Tire Centre attracts high traffic volumes before and after an event (i.e. Sens game) and Tanger Outlets attracts high traffic during the weekend peak hours. However, given the proposed development consist of mostly residential land use, with some retail, the proposed site will generate the highest volume of traffic during the weekday commuter peak hours, and as such, the event traffic and Saturday peak hour traffic are not included herein.

The following Table 1 provides a summary of existing traffic operations at study area intersections based on the SYNCHRO (V9) traffic analysis software. The subject intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject intersections 'as a whole' were assessed based on a weighted v/c ratio. The unsignalized intersections were assessed in terms of delay and the corresponding Level of Service. The SYNCHRO model output of existing conditions is provided within Appendix B.

Table 1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
417 WB Ramp/Palladium	A(A)	0.21(0.38)	WBL(NBT)	9.5(8.1)	A(A)	0.17(0.31)
417 EB Ramp/Palladium	C(B)	17.6(12.9)	EBL(EBL)	4.8(2.1)	-	-
Huntmar/Autopark Private	A(A)	0.30(0.41)	SBT(NBT)	8.7(10.7)	A(A)	0.23(0.31)
Huntmar/Palladium	C(F)	0.77(1.22)	NBL(WBL)	13.6(30.3)	A(C)	0.60(0.73)
Huntmar/Maple Grove	B(C)	0.63(0.74)	EBT(SBT)	14.6(20.7)	A(B)	0.52(0.66)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 1, the study area intersections 'as a whole' are currently operating at an acceptable LoS 'C' or better during the weekday morning and afternoon peak hours. The 'critical movements' are also projected to operate at an acceptable LoS 'C' or better during peak hours, with the exception of the westbound left-turn movement at the Huntmar/Palladium intersection, which is projected to operate above capacity (LoS 'F').

Providing a protected/permitted phase for the westbound left-turn movement at this intersection and adjusting signal timing accordingly, will result in an acceptable LoS 'D' or better for all movements at this intersection. The SYNCHRO model output of this modification is provided within Appendix B.

EXISTING SCREENLINE ANALYSIS

The most relevant screenline (SL) to the study area is SL #44 (Terry Fox Drive) and its existing performance is summarized below in Table 2.

Table 2: Existing Screenline Performance – SL#44

Screenline #44 Station	Peak Directional Demand (PCU)[1]		Directional Capacity[2] (PCU)	v/c
	AM Peak	PM Peak		
Palladium	936	898	2,000	0.47
Maple Grove	398	324	900	0.44
Hazeldean	1,220	1,317	2,000	0.66
SL 44 at Palladium, Maple Grove and Hazeldean	**2,287**	**2,539**	**4,900**	**0.52**

1. PCU (Passenger Car Units) were assumed to be the sum of autos and 2x heavy vehicles
2. Directional capacities were obtained from the 2008 Road Infrastructure Needs Study and assumed for Hazeldean Road given the recent road widening.

Currently, SL #44 within the vicinity of the site (Stations: Palladium, Maple Grove and Hazeldean) is operating with an excellent LoS 'A' (v/c ≤ 0.60), which is well within the City's operating standard of LoS 'D' or better.

DEMAND FORCASTING

As mentioned previously, the Kanata West TMP was prepared (by Parsons, formally Delcan) in June 2006 and updated in July 2010. The Kanata West TMP assumed total development within the area to consist of a population of approximately 17,000 persons in 6,300 dwelling units, 24,000 employees, and 1.0 million square metres of office and retail space by

2021. Based on these development plans, a significant amount transportation network planning has been developed and is outlined herein.

PLANNED STUDY AREA TRANSPORTATION NETWORK CHANGES

The following are several major planned transportation network changes identified in the City's Transportation Master Plan (TMP) Affordable Road and Transit Networks, which are depicted as Figure 8.

Phase 1 (2014 to 2019)

- The re-alignment of Palladium Drive in the vicinity of Huntmar Drive;
- Kanata West North-South Arterial from Abbott Street to Fernbank Road;
- Campeau Drive Extension – new four lane road between Didsbury Road and Huntmar Drive (that continues west to Palladium Drive);
- Widening of Palladium Drive to 4-lanes, from HWY 417 to Campeau Drive Extension;
- New roundabout intersection at future Palladium/Campeau intersection;

Phase 2 (2020 to 2025)

- Kanata West North-South Arterial extension connecting the re-aligned Palladium Drive to the North-South Arterial at Abbott Street;

Phase 3 (2026 to 2031)

- Kanata West Main Street linking the west end of Maple Grove Road to the east end of Palladium Drive; and
- Widening of Huntmar Drive to 4-lanes from the Campeau Extension south to Maple Grove Road.

The 2031 Network Concept Plan and the Kanata West TMP identify the widening of Maple Grove Road from Huntmar Drive to Terry Fox Drive.

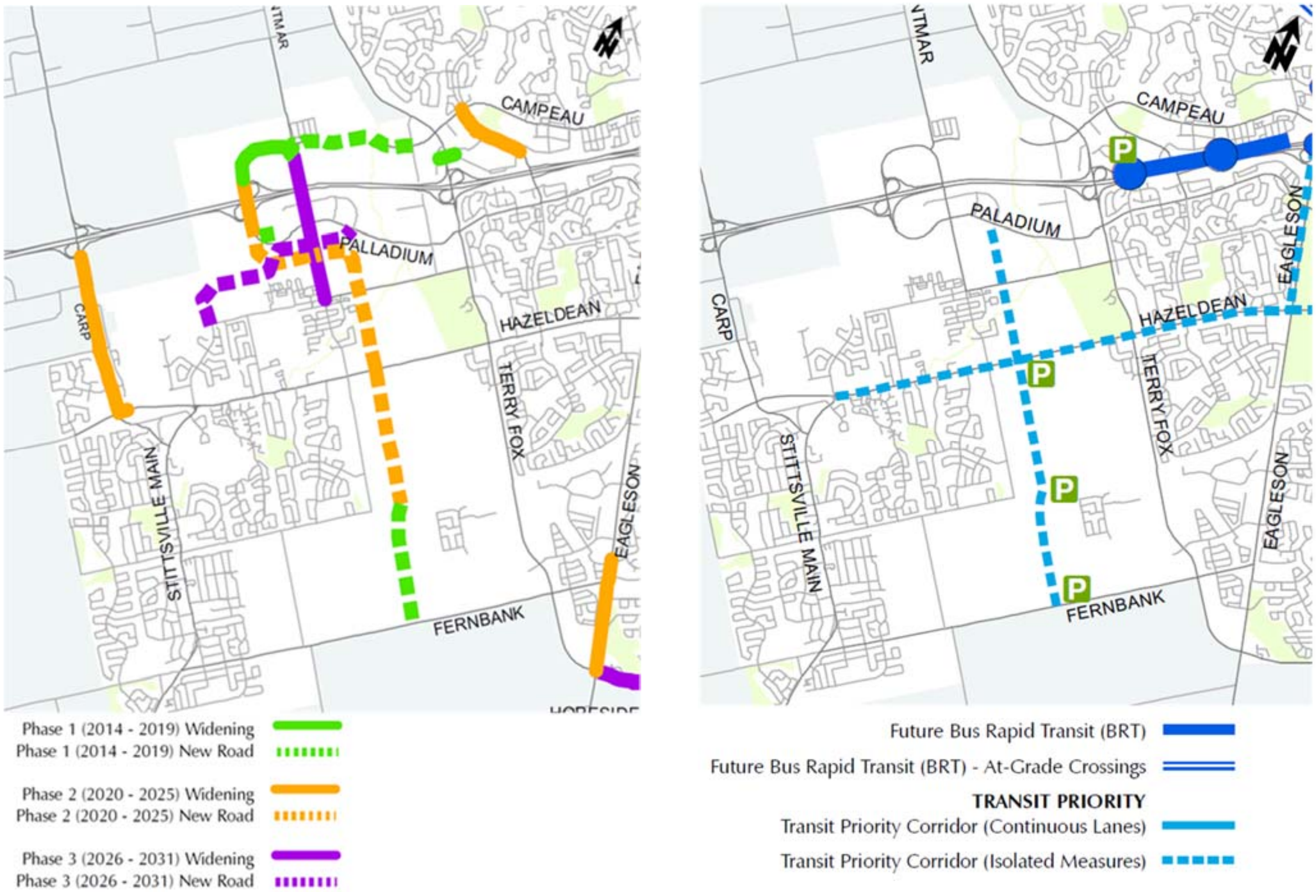
From a transit perspective, the TMP's affordable network identifies a transit priority corridor from Fernbank Road to Palladium Drive, located east of Huntmar Drive. The 2031 Network Concept Plan identifies grade separated BRT from HWY 417 to Hazeldean Road, located east of Huntmar Drive, which continues as at-grade BRT to Fernbank Road.

STITTSVILLE MAIN STREET EXTENSION

As shown in Figure 8, the Stittsville Main Street Extension extends from the existing Stittsville Main Street (at Maple Grove Road), intersects with the North-South Arterial and continues to Palladium Drive. As shown in the proposed Concept Plan (Figure 2), Stittsville Main Street is proposed to intersect at North-South Arterial as a 'T' intersection and is not proposed to continue through to Palladium Drive. The proposed design is considered acceptable given the following:

- There will be a major arterial (North-South Arterial) providing a link between Stittsville Main Street Extension and Huntmar Drive, which continues north to Palladium Drive. These arterial roads can provide sufficient capacity for the traffic travelling between Stittsville Main Street Extension and Palladium Drive;
- We are advised that a bus turn around area is desired for the transit priority corridor and would require land that would likely conflict with the ROW for the Stittsville Main Street Extension's intersection with Palladium Drive.

Figure 8: Affordable Road and Transit Networks (2013 TMP)



LOCAL AREA DEVELOPMENTS

With respect to other area development, the following development applications have been prepared and/or submitted to the City of Ottawa in the vicinity of the proposed site:

333 Huntmar Drive – Tanger Outlets Phase 2

Taggart is proposing the construction of Phase 2 of the Tanger Outlets located at the above-noted address. The development is expected to consist of a hotel and approximately 30,000 ft^2 of restaurant type land uses. The Addendum #1 to the Tanger Retail Outlets CTS/TIS (prepared by Parsons) projects a two-way total of 60 veh/h and 240 veh/h during the morning and afternoon peak hours, respectively.

370 Huntmar Drive – Arcadia Retail

Minto Commercial Properties is proposing to construct a retail development at the above-noted address consisting of approximately 109,000 ft^2 of retail. The Transportation Impact Study (prepared by Parsons) projected an increase in two-way vehicle traffic of approximately 90 and 350 veh/h during the morning and afternoon peak hours, respectively.

375 Didsbury Road - RONA

RONA is proposing to construct an approximate 153,000 ft^2 retail centre at the above-noted address. The Transportation Impact Study (by Parsons) was completed in 2007 and projected 290 and 540 veh/h two-way traffic during the afternoon and weekend peak hours, respectively.

8201 Campeau Drive – Taggart/Loblaws

Taggart is proposing to construct a commercial development at the above-noted address. Phase 1 of the development will consists of two hotels and a restaurant and Phase 2 will consist of approximately 70,000 ft^2 of retail and an 180,000 ft^2 Loblaws and gas-bar. The Transportation Impact Study and subsequent Addendum (prepared by Parsons) project an increase in two-way vehicle traffic of approximately 615 and 1,015 veh/h during the morning and afternoon peak hours, respectively.

2500 Palladium Drive (unit 10) – Myers Nissan

Zena Investment Corporation is proposing the construction of an automobile dealership located at 2500 Palladium Drive (Unit 10). The total GFA of the building is approximately 3,022 m^2 and approximately 82 visitor/employee parking spaces are proposed along with an additional 125 storage parking spaces (inventory).

675 Autopark Private

Superior Lodging Corporation is planning the construction of a development at the above-noted address that will consist of two hotels and two restaurants. The Transportation Impact Study (prepared by Parsons) projects an increase in two-way vehicle traffic of approximately 200 veh/h during both the morning and afternoon peak hours.

173 Huntmar Drive

A mixed-use development is being proposed at the above-noted address, which is located adjacent to the subject development. The proposed 173 Huntmar Drive development will consist of approximately 65,000 ft^2 of retail/office, and 200 dwelling units. The Community Transportation Study (prepared by Parsons) and its subsequent Addendum #1, projected approximately 185 and 255 veh/h two-way traffic during the morning and afternoon peak hours, respectively.

180 Huntmar Drive

A two to three storey private school and separate medical facility are being proposed at the above-noted address.

1560, 1620 and 1636 Maple Grove Road

Richcraft is proposing the construction of a subdivision located at the above-noted address. The subdivision will consist of approximately 1,250 residential units. The Transportation Impact Study and its subsequent Addendums (prepared by Parsons) projected an increase in two-way vehicle traffic of approximately 260 and 320 veh/h during the morning and afternoon peak hours, respectively. The TIS also indicates that the adjacent Richcraft retail development (not part of the application) is likely to generate an increase of 80 and 225 veh/h two-way traffic during the weekday morning and afternoon peak hours, respectively.

The following Figure 9 highlights the location of each planned development within the Kanata West area and identifies its development stage.

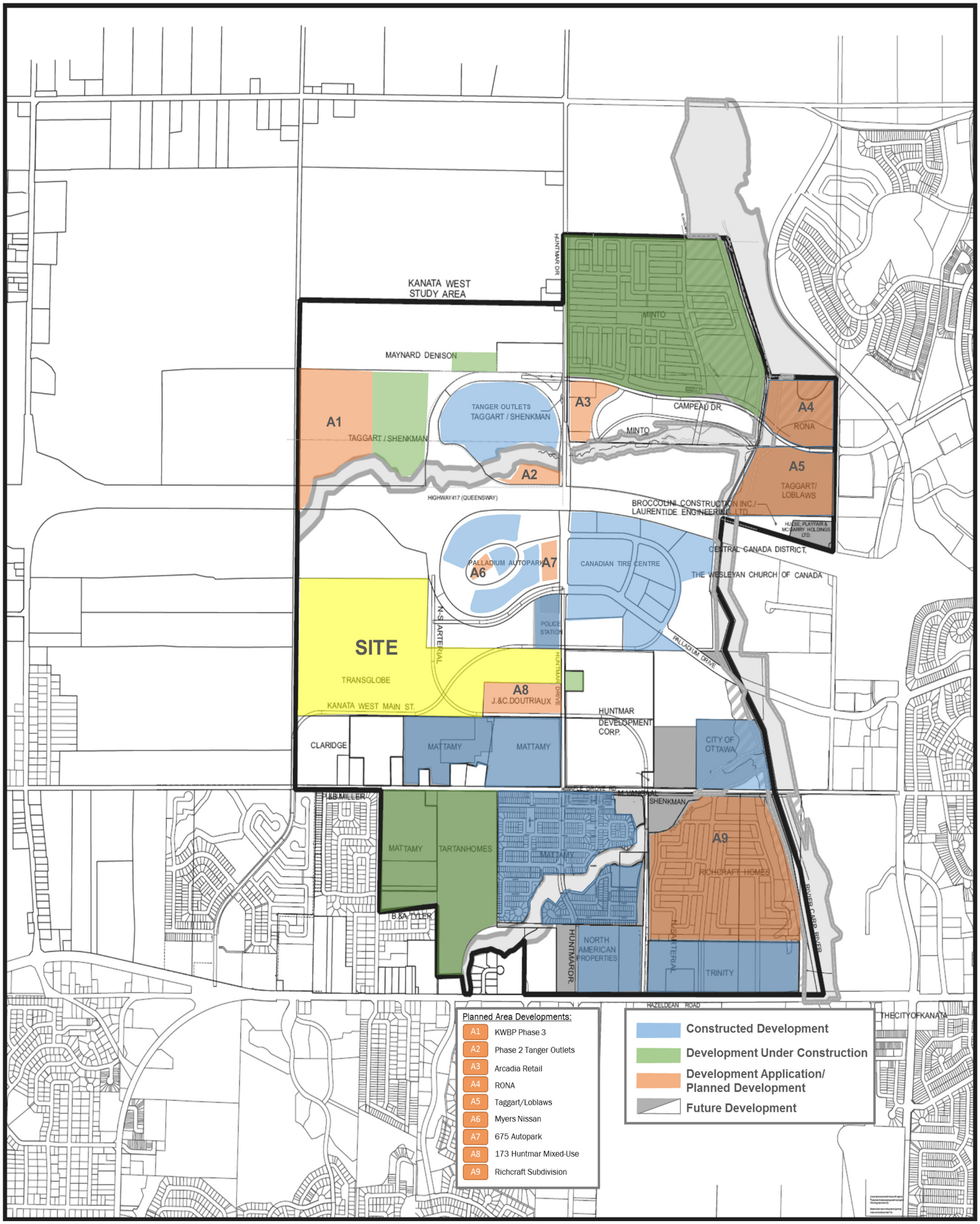


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Figure 9: Kanata West Developments

BACKGROUND TRAFFIC

The following Table 3 is an excerpt from the Kanata West TMP (Table 4-1) that outlines the range of projected traffic generated from Kanata West developments (including the subject site).

Table 3: Projected Range of Traffic Generation from Kanata West Developments

	Projected "Base" Traffic Volumes				Projected "Conservative" Traffic Volumes				Projected "Optimistic" Traffic Volumes			
	Eastbound		Westbound		Eastbound		Westbound		Eastbound		Westbound	
	Vehs	Pcus	Vehs	Pcus	Vehs	Pcus	Vehs	Pcus	Vehs	Pcus	Vehs	Pcus
Projected Site Generated Traffic	5945	6835	2980	3425	7315	8400	3665	4215	4815	5535	2415	2775
Projected Background Traffic Volumes at 2021	6955	8000	8700	10,000	6955	8000	8700	10,000	6955	8000	8700	10,000
Total Traffic Volume at 2021	12,900	14,835	11,680	13,425	14,270	16,400	12,365	14,215	11,770	13,535	11,115	12,775

Given the assumptions made within the Kanata West TMP, the area road network was established to accommodate the related increase in traffic volume. Given the size and development potential of Kanata West lands, it in understandable that the increase in vehicle traffic will be significant, as shown in Table 3. It is noteworthy that some of the development planned for this area and included in the Kanata West TMP has been constructed and the associated traffic traveling to/from these built developments is captured within the existing traffic volumes. A summary of the planned and constructed developments within Kanata West is included in the *Local Area Development Section (Figure 9)*.

BACKGROUND TRAFFIC GROWTH

Background traffic growth through the immediate study area was determined from the available historical count data (years 2006 to 2014) provided by the City of Ottawa at the Huntmar/Palladium intersection. The average annual background growth is summarized in Table 4 and detailed analysis is attached as Appendix C.

Table 4: Huntmar/Palladium Intersection Historical Trends

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	11.57%	30.49%	17.33%	24.73%	**22.71%**
AM Peak	7.73%	28.43%	12.96%	22.28%	**20.27%**
PM Peak	8.20%	25.68%	16.54%	22.35%	**20.17%**

As show in Table 4, the Huntmar/Palladium intersection has experienced an approximate overall (weighted average) 22% annual growth in traffic volumes in recent years and 20% during the morning and afternoon peak hours. Given that volumes are low initially and recently there has been significant growth within the study area, traffic growth will not continue at such a high rate. There are several planned transportation network changes that will significantly impact study area travel patterns. The timing of these planned changes to the study area network are mostly dependent on area development. Background traffic volumes for key study area locations are developed in the ensuing sections.

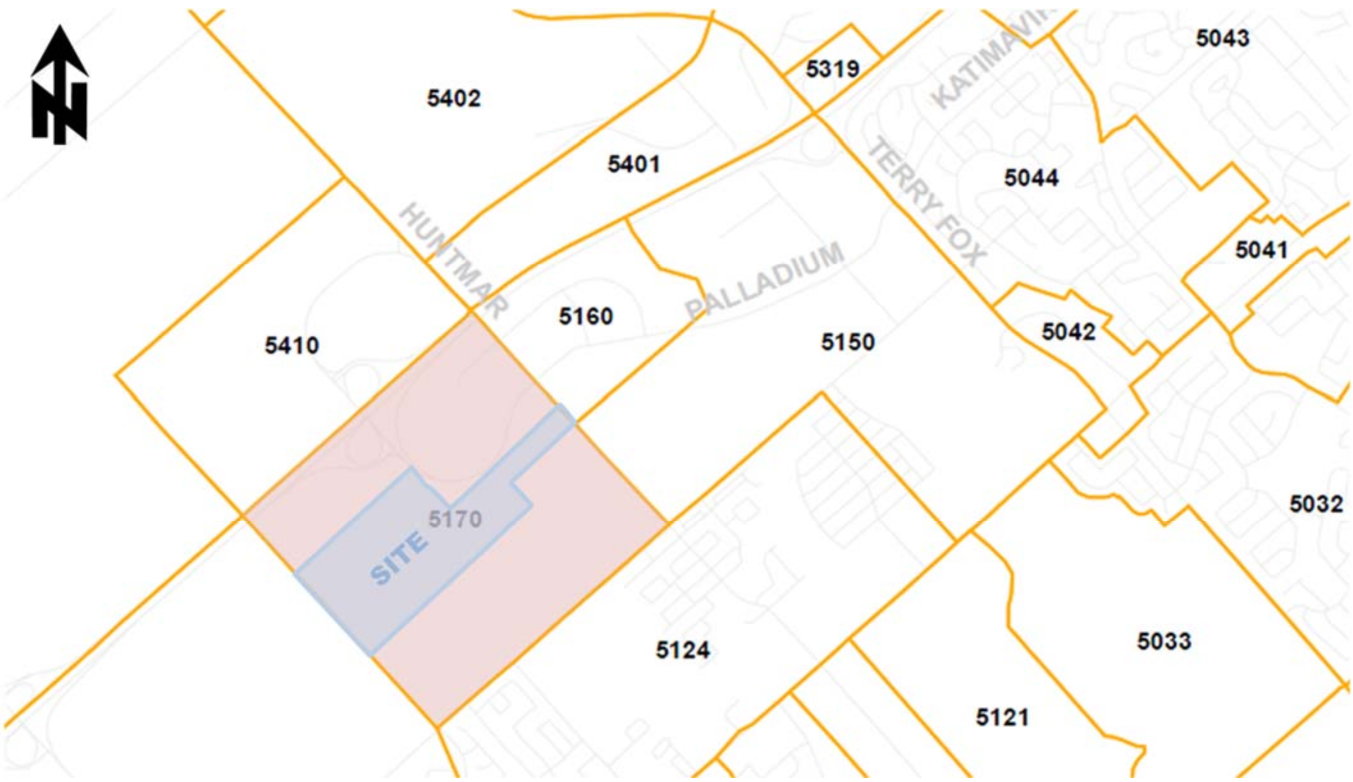
TRANS MODEL DATA

The TRANS Model is a regional travel demand forecasting model maintained by the City of Ottawa to reflect existing trip patterns and travel choices, and to simulate the effects of future scenarios featuring varying growth, alternative transportation facilities, services and policies. The model is currently calibrated to the AM peak hour only. It is important to note that regional models are typically calibrated to the screenline level, and therefore using the model to simulate volumes on individual links (or individual turning movements) must be done so understanding the model's limitations/constraints.

Land Use Assumptions

Household and employment data are used as the basis for the travel demand within the TRANS regional model. The demographic data assumptions assumed as part of the TMP are summarized in Table 5 for Traffic Zone 5170, which includes the subject lands. The Traffic Zone and subject site are illustrated in Figure 10.

Figure 10: TRANS Model Traffic Zones



As shown in Table 5, the projected increase of employment assumed within the TRANS model in Traffic Zone 5170 is approximately 330 jobs and the increase in households is approximately 500 units. The existing developments within this Traffic Zone are relatively consistent with the 2011 TRANS model assumptions. However, based on the planned area developments (including the subject site), the increase in both households and employment is significantly higher than the 2031 TRANS model assumptions. The assumed land uses and their corresponding employment and dwelling unit values are shown in Figure 11.

Table 5: TRANS Model Land Use Assumptions (TAZ 5170) and Total Planned Land Use Assumptions

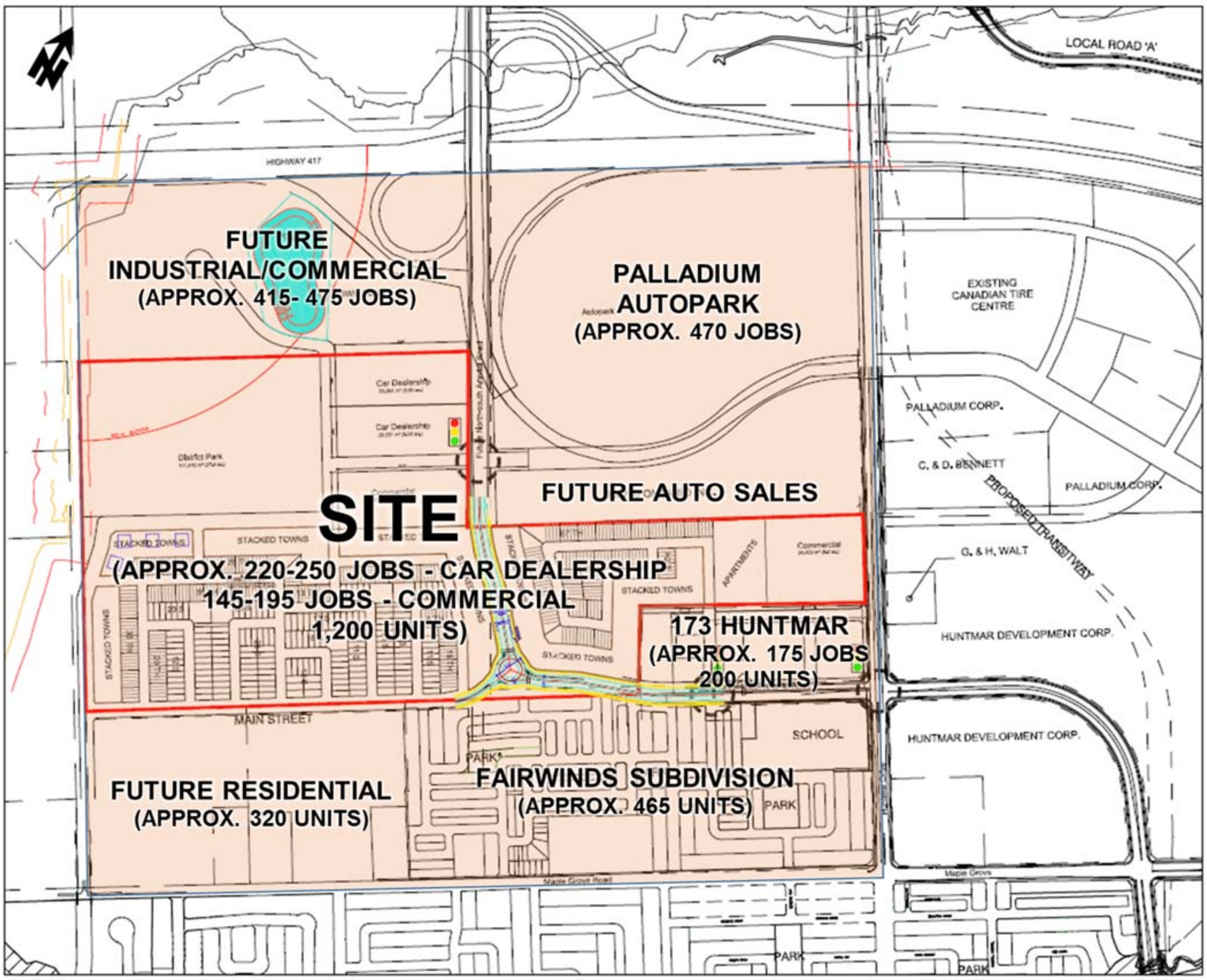
Characteristic	Time Horizon		Difference	Existing 2016	Subject Site	Total Planned (including Existing + Site)
	2011	2031				
Employment	470	800	330	470 (estimate)	365 - 450	1,425 - 1,565
Households	300	789	489	465	1,200	2,185

It can be seen in Table 5 that based on the planned development within this Traffic Zone, including the subject site, the estimated increase in employment is understood to be 955 to 1,095 jobs (approximately 625 to 765 more jobs than estimated in the 2031 TRANS model).

Similarly, the planned increase in household is estimated to be 1,720, for a total of 2,185 units, approximately 1,400 units more than estimated in the 2031 TRANS model. Given the subject lands are designated as 'Enterprise Area', the 1,200 units proposed for the subject site are not accounted for in the TRANS model.

The assumptions (according to development plans) of the lands within TAZ 5170 and their related employment and household projections are included as Figure 11. These values are assumed based on currently planned and built developments.

Figure 11: Assumed Land Use Plans for TAZ 5170



NORTH-SOUTH ARTERIAL TRAFFIC PROJECTIONS

The future traffic projections for the North-South Arterial, between Hazeldean Road and Palladium Drive are outlined in Table 6. These projected volumes are derived from two sources: the TRANS model (2031 projections) and the Kanata West TMP (2021 projections). The TRANS model projections are based on the land use assumption outlined above. The Kanata West TMP projections assume the land uses outlined in Figure 3 and estimate the traffic volumes along North-

South Arterial based on the projected volumes crossing the assumed Screenlines L2 and L3 (Tables 4-7 and 4-8 from KWTMP, included as Appendix D herein).

Table 6: TRANS Model and Kanata West TMP Projections

Road	Link	2031 (TRANS Model)* AM Peak Hour (veh/h)		2021 (KWTMP) PM Peak Hour (pcus/hr)	
		NB	SB	NB	SB
North-South Arterial	Huntmar – Palladium	126	0	2,115	1,650
	Maple Grove – Huntmar	21	11		
	Hazeldean – Maple Grove	122	11	1,115	940
Note: pcus - passenger car units *Trans model calibrated to Screenline level – individual link projections to be used with caution					

As shown in Table 6, there is a discrepancy between the traffic projections for the North-South Arterial between the TRANS model AM Peak Hour and the Kanata West TMP PM Peak Hour. This can be partially attributed to the land use assumptions outlined in Table 5 that show a greater growth in employment and households planned for Traffic Zone 5170 than assumed in the TRANS model data. As mentioned previously, the TRANS model is calibrated to the Screenline level and should be used with caution when considering traffic volumes along specific links.

REFINEMENT TO THE BACKGROUND TRAFFIC PROJECTIONS

Given there is currently a considerable amount of development that is planned for Kanata West, background traffic growth is expected to be significant. Traffic studies for each individual development assess the traffic impacts on the road network immediately adjacent to the developments. However, analysis of each development generally does not include a broader assessment of the network, trips are generally not distributed to future roads (i.e. North-South Arterial), and multi-purpose trips within the Kanata West area are not accounted for. As such, estimating background traffic based on the planned developments within the area can be challenging and may not represent an accurate account of the future traffic. Therefore, for the purposes of this analysis, a more theoretical approach was applied to estimate background traffic volumes within the vicinity.

As shown in Table 6, the traffic projections along the North-South Arterial within the Kanata West TMP reveal that the North-South Arterial will be operating at or above capacity at full build-out of Kanata West. The capacity of the proposed four-lane North-South Arterial is assumed to be 2,000 to 2,200 veh/h (1,000 to 1,100 veh/h/lane). Based on this assumption, three background traffic scenarios have been developed for future traffic volumes along the North-South Arterial (north of Stittsville Main Street Extension) and are summarized as follows:

Table 7: Background Traffic Scenarios on North-South Arterial

Volume Scenario	Traffic Projections: North-South Arterial				Assumptions
	AM Peak Hour (veh/h)		PM Peak Hour (veh/h)		
	NB	SB	NB	SB	
Scenario A	885	650	885	1000	• 50% of capacity in peak direction during PM peak • 45% of capacity in peak direction during AM peak
Scenario B	1150	850	1150	1300	• 65% of capacity in peak direction during PM peak • 60% of capacity in peak direction during AM peak
Scenario C	1420	1050	1415	1600	• 80% of capacity in peak direction during PM peak • 70% of capacity in peak direction during AM peak

The traffic projection scenarios outlined in Table 7, offer background traffic volumes along the future North-South Arterial ranging from 50% to 80% of the roadway's theoretical capacity. Using these volumes and the projected site-generated traffic volumes (developed in the ensuring section), key study area intersections can be assessed.

SITE TRIP GENERATION

The proposed development will consist of approximately 190 apartments, 345 townhouses, 520 stacked townhouses, 182 single family homes, an approximate 65,000 ft² of retail and three car dealerships of approximately 30,000 ft² each. The appropriate trip generation rates for the proposed land uses were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 8.

Table 8: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Apartment	ITE 223	T = 0.30(du); T = 0.41(du) – 13.06	T = 0.39(du); T = 0.48(du) – 11.07
Residential Townhouse	ITE 230	T = 0.44(du); Ln(T) = 0.80 Ln(du) + 0.26	T = 0.52(du); Ln(T) = 0.82 Ln(du) + 0.32
Stacked Townhome	ITE 232	T = 0.34(du); T = 0.29(du) + 28.86	T = 0.38(du); T = 0.34(du) + 15.47
Single-Family Detached Housing	ITE 210	T = 0.75(du); T = 0.70(du) + 9.74	T = 1.00(du); Ln(T) = 0.90 Ln(du) +0.51
Car Dealership	ITE 841	T = 1.92(X);	T = 2.62(X); T = 1.91(X) + 23.74
Specialty Retail	ITE 826	T = 1.36(X); T = 1.20(X) + 10.74	T = 2.71(X); T = 2.40(X) + 21.48

Notes: T = Average Vehicle Trip Ends
du = Dwelling Units
X = 1000 ft² Gross Floor Area
Specialty Retail AM Peak is assumed to be 50% of the PM Peak

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the Kanata West study area context were applied to attain estimates of person trips for the proposed development.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of the available literature suggests that a combined factor of approximately 1.3 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The person trip generation for the proposed site is summarized in Table 9.

Table 9: Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Apartment	190 du	14	41	55	41	27	68
Residential Townhouse	345 du	45	136	181	125	91	216
Stacked Townhome	520 du	44	190	234	155	95	250
Single-Family Detached Housing	182 du	44	134	178	147	87	234
Car Dealership	90,000 ft²	168	57	225	101	153	254
Specialty Retail	65,000 ft²	64	51	115	101	130	231
Total Person Trips		386	631	1,017	692	597	1,289

Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%

The person trips shown in Table 9 for the proposed site were then reduced by modal share values, including a reduction for 'pass-by' trips for the retail land use based on the site's location and proximity to adjacent communities, employment, other shopping uses and transit availability. Modal share values were derived from the 2011 OD survey that reveal auto driver splits in the range of 55% to 75% and transit rider splits in the range of 10% to 25% for the 'Kanata - Stittsville' area. In addition, future transit modal splits are likely to be even greater as the proposed Transit Priority Corridor within Kanata West is completed. Modal share and 'pass-by' values for residential, retail and car dealership land uses within the proposed development are summarized in Tables 10, 11, and 12, respectively, with the total site-generated vehicle traffic summarized in Table 13.

Table 10: Residential Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	65%	102	342	444	320	206	526
Auto Passenger	15%	24	80	104	75	48	123
Transit	15%	21	77	98	72	46	118
Non-motorized	5%	7	24	31	23	14	37
Total Person Trips	100%	154	523	677	490	314	804
Total 'New' Auto Trips (veh/h)		**102**	**342**	**444**	**320**	**206**	**526**

Table 11: Specialty Retail Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	39	31	70	61	78	139
Auto Passenger	25%	16	13	29	25	33	58
Transit	10%	6	5	11	10	13	23
Non-motorized	5%	3	2	5	5	6	11
Total Person Trips	100%	64	51	115	101	130	231
Less Retail Pass-by (30%)		-11	-11	-22	-21	-21	-42
Total 'New' Auto Trips (veh/h)		**28**	**20**	**48**	**40**	**57**	**97**

Table 12: Car Dealership Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	70%	118	40	158	71	108	179
Auto Passenger	20%	34	12	46	20	31	51
Transit	5%	8	3	11	5	7	12
Non-motorized	5%	8	2	10	5	7	12
Total Person Trips	100%	168	57	225	101	153	254
Total 'New' Auto Trips (veh/h)		**118**	**40**	**158**	**71**	**108**	**179**

The following Table 13 provides a summary of potential two-way vehicle trips to/from the proposed development.

Table 13: Total Site Vehicle Trip Generation

Land Use	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Residential Trip Generation	102	342	444	320	206	526
Specialty Retail Trip Generation	39	31	70	61	78	139
Car Dealership Trip Generation	118	40	158	71	108	179
Less Retail Pass-by (30%)	-11	-11	-22	-21	-21	-42
Total 'New' Auto Trips	**248**	**402**	**650**	**431**	**371**	**802**

As shown in Table 13, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 650 and 800 veh/h during the weekday morning and afternoon peak hours, respectively.

TRAFFIC DISTRIBUTION AND ASSIGNMENT

Traffic distribution was based on the location of existing and future developed areas, the site's connection to adjacent proposed major roadways, the proximity of Highway 417, the types of land uses, and our knowledge of the surrounding area. The resultant distribution is outlined as follows:

Residential

- 60% to/from the east via Highway 417;
- 5% to/from the west via Highway 417;
- 15% to/from the east via Palladium Drive;
- 15% to/from the south via Stittsville Main and Maple Grove Road; and
- 5% to/from the north via Campeau Drive;

100%

Retail/Car Dealership

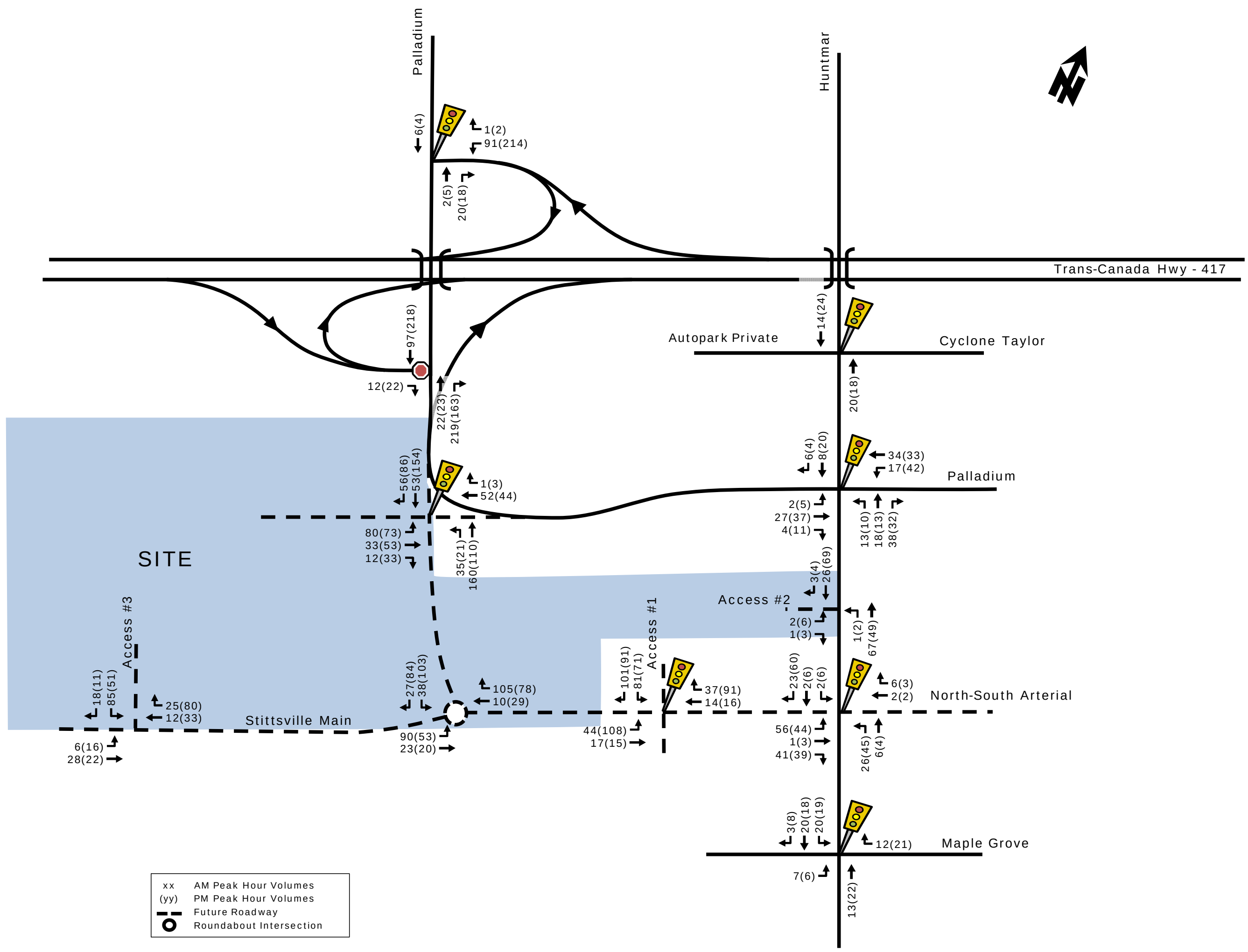
- 20% to/from the east via Highway 417;
- 5% to/from the west via Highway 417;
- 25% to/from the east via Palladium Drive;
- 40% to/from the south via Stittsville Main and Maple Grove Road; and
- 10% to/from the north via Campeau Drive;

100%

With regard to site access/egress, for the purpose of this initial zoning analysis (i.e CTS level analysis), we assumed one unsignalized roadway connection (Access #2) to Huntmar Drive and one roadway connection (Access #3) to Stittsville Main Street to access the residential and commercial lands. At the Site Plan Application stage, access to the proposed lands will be defined and the traffic requirements will be determined. The 'new' and 'pass-by' site-generated vehicle trips assigned to these site connections and to the study area network are illustrated as Figure 12.

PARSONS

Figure 12: 'New' and 'Pass-by' Site Generated Traffic Volumes



FUTURE TRAFFIC OPERATIONS

As mentioned previously, an extensive amount of transportation work has been done within the vicinity of the site and the future road network has been developed based on this transportation planning work. As shown on the Concept Plan, the North-South Arterial and Stittsville Main Street Extension are the two future roadways that will provide access/egress to the site. Signalized or roundabout intersections will be constructed at the major intersections with these future roads, those being Huntmar/North-South Arterial, Palladium/North-South Arterial, Stittsville Main/North-South Arterial and a potential signalized site access to North-South Arterial between Huntmar Drive and Stittsville Main Street (all shown on Figure 12).

For the purposes of this analysis, the future traffic operations will be evaluated based the proposed future road network and the currently proposed land uses. Given the extensive transportation planning already completed for Kanata West, the following section will evaluate the difference in traffic impact between the proposed site's land uses and the land uses originally planned. In addition, as shown on the Concept Plan (Figure 2), a roundabout intersection is being considered at the Stittsville Main/North-South Arterial intersection. An analysis of future traffic operations at this intersection is provided herein to determine the suitability of a roundabout intersection, compared to a signalized intersection, at this location.

SITE GENERATED TRAFFIC IMPACT

As outlined in the *Site Trip Generation Section* of this report, the total amount of vehicle traffic generated by the proposed development is approximately 650 and 800 veh/h during the weekday morning and afternoon peak hours, respectively. This amount of traffic is estimated based on the commercial, residential and park land uses that are illustrated in the Concept Plan (Figure 2).

The subject parcel of land is currently zoned as 'Development Reserve' and is designated as 'Enterprise Area', west of the North-South Arterial and 'Mixed Use Centre' east of the North-South Arterial in Schedule B of the Official Plan. The Kanata West TMP identifies this land as 'Prestige Business Park' west of the North-South Arterial, and 'Intensive Employment Area' east of the North-South Arterial. A 'major public park' was also identified for this parcel of land within the Kanata West TMP.

The following zoning is proposed for the subject site:

- *Mixed-Use Centre* for commercial block along Huntmar Drive;
- *Business Park Industrial* for the three automobile dealerships;
- *Residential* for townhouses and single family homes; and
- *Parks and Open Space* for park.

The Business Park Industrial and Park are consistent with the Kanata West TMP assumed land uses, and as such, the road network planned within the Kanata West TMP accounts for these uses. The proposed concept plan replaces part of the 'Business Park' and all of the 'Intensive Employment Area' with approximately 82.5 acres of residential. To assess the difference of traffic impact by 'business park/employment' land use versus 'residential' land use, for the same size area, a vehicle site trip generation for this parcel of land was calculated using 'business park/employment' as the assumed land use. This represents what was originally planned for this portion of the site.

The following trip generation analysis, summarized in Table 14 (detail analysis included as Appendix E), assumes approximately 82.5 acres of 'office park' land use. 'Office Park' is defined in the ITE Trip Generation Manual as *"suburban subdivisions or planned unit developments containing general office buildings and support services, such as banks, restaurants and service station, arranged in a park or campus-like atmosphere".*

Table 14: Trip Generation for Originally Planned Land Use

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	977	86	1,063	195	1,106	1,301
Auto Passenger	15%	244	21	265	49	276	325
Transit	15%	244	21	265	49	276	325
Non-motorized	10%	162	14	176	32	184	216
Total Person Trips	100%	1,627	142	1,769	325	1,842	2,167
Total 'New' Auto Trips (veh/h)		**977**	**86**	**1,063**	**195**	**1,106**	**1,301**
Retail Auto Trips (veh/h)–Table 11		*28*	*20*	*48*	*40*	*57*	*97*
Auto Dealerships Auto Trips (veh/h)–Table 12		*118*	*40*	*158*	*71*	*108*	*179*
Total Site Generated Traffic with Office Park		***1,123***	***146***	***1,269***	***306***	***1,271***	***1,577***

As shown in Table 14, if the currently proposed residential lands were to be developed as 'office park' instead of the proposed residential land use, the total site trip-generation is estimated to be approximately 1,270 to 1,580 veh/h during the morning and afternoon peak hours. When compared to the total projected site-generated traffic for the proposed development (approximately 650 to 800 veh/h), it can be seen that the proposed land uses are expected to generate less traffic than what would have been assumed for the originally planned lands (office park).

Given the Kanata West TMP assumes 'Business Park' for this parcel of land, the planned roads developed to support these lands would have assumed a higher trip generation for the subject site than currently proposed. As such, it can be assumed that the proposed North-South Arterial, Stittsville Main Street Extension and local area roads are sufficient to support the developments projected traffic. This will be further evaluated during the Site Plan Approval stage for each development phase and to assess the specific access requirements and intersection controls within the study area.

INTERSECTION ANALYSIS AT STITTSVILLE MAIN/NORTH-SOUTH ARTERIAL

As shown on the proposed Concept Plan (Figure 2), a roundabout intersection is being considered at the Stittsville Main/North-South Arterial intersection. The North-South Arterial will be the main arterial providing access to/from HWY 417 and as such is expected to have high traffic volumes. To accommodate these volumes, the TMP planned roadway alignment includes a large curve through the subject lands from the east-west alignment to the north-south alignment (heading towards the highway). This alignment typically results in less efficient land use and lotting patterns. However, as shown in the proposed concept plan, this intersection has been slightly 'squared off' to accommodate a more desirable development parcel in the northeast quadrant of the Stittsville Main/North-South Arterial intersection. In contrast to the signalized intersection, a roundabout facilitates a more desirable land use plan. To facilitate this proposed alignment, a roundabout intersection is being considered at the Stittsville Main/North-South Arterial intersection. The following analysis assesses both roundabout control and signalization at this location. Background traffic volumes are developed within this section at this location to assess the different types of intersection control.

BACKGROUND TRAFFIC AT STITTSVILLE MAIN/NORTH-SOUTH ARTERIAL

As mentioned in the *Background Traffic Section*, background traffic along the North-South Arterial was determined using three different scenarios, representing approximately 50%, 65% and 80% of the capacity of the roadway. Similar scenarios have been developed for the Stittsville Main/North-South Arterial intersection and are illustrated as Figures 13, 14 and 15. These were derived given the following assumptions:

- Road capacity along North-South Arterial is assumed to be 2,000 veh/h (1,000 veh/h/lane);
- Road capacity along Stittsville Main Street Extension is assumed to be 1,000 veh/h/lane;
- Peak directional split is 60% to/from HWY 417;
- Three scenarios of traffic volumes are presented:
  - Scenario A assumes 50% of the roadway capacity in the PM peak in the peak direction;
  - Scenario B assumes 65% of the roadway capacity in the PM peak in the peak direction;
  - Scenario C assumes 80% of the roadway capacity in the PM peak in the peak direction;
    - None of the background traffic scenarios include site-generated traffic volumes, these will be added in the next section; and
- Turning movements are assumed based on the time of day, the location of the HWY 417 on/off ramps and our understanding of the future road network.

Figure 13: Background – Scenario A

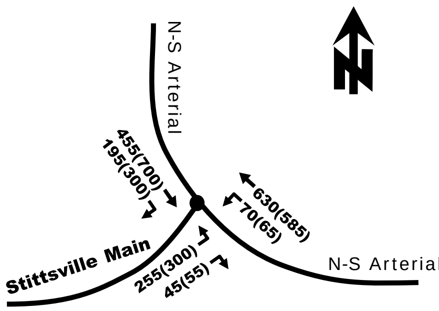


Figure 14: Background – Scenario B

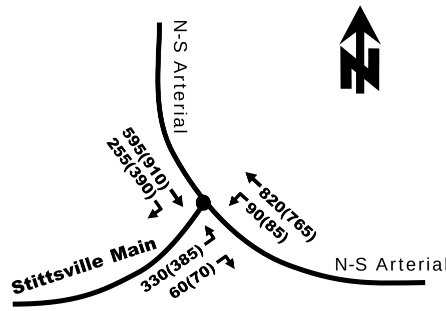
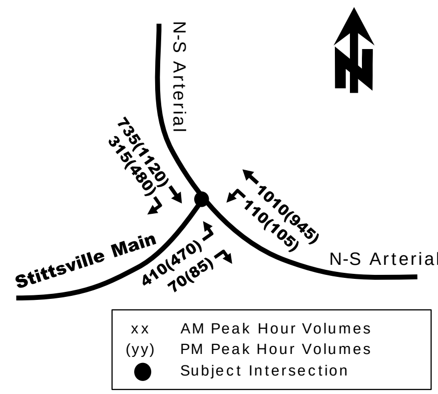


Figure 15: Background – Scenario C



TOTAL PROJECTED TRAFFIC

The total projected traffic volumes for the Stittsville Main/North-South Arterial intersection were derived by superimposing the site-generated traffic volumes (Figure 10) onto the three background traffic scenarios (Figures 13-15). The resulting total projected traffic volume scenarios are illustrated as Figures 16, 17 and 18. Based on these three scenarios, intersection analysis is provided assuming a signalized intersection or a roundabout intersection.

Figure 16: Total Projected – Scenario A

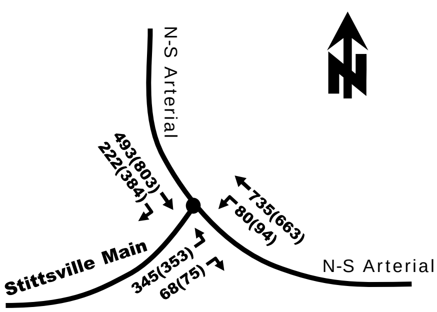


Figure 17: Total Projected – Scenario B

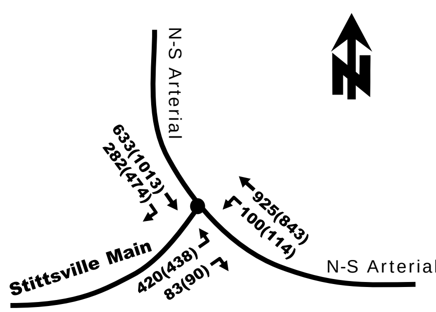
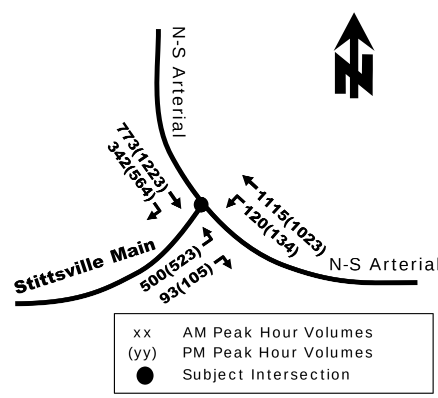


Figure 18: Total Projected – Scenario C

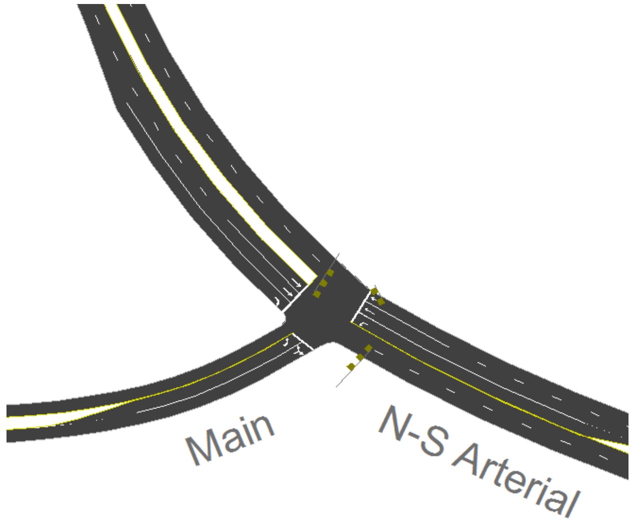


Signalized Intersection

The geometry of the proposed intersection is illustrated in Figure 19. It assumed the North-South Arterial as the main roadway (curving from an east-west alignment to a north-south alignment) and Stittsville Main Street Extension intersects North-South Arterial at a 'T' intersection. The following assumptions were applied to the SYNCHRO analysis:

- 90 second cycle length;
- Auxiliary turn lanes along North-South Arterial;
- Protected/permitted northbound left-turn phase along North-South Arterial; and
- Double left-turn lanes along Stittsville Main Street (may need to restrict pedestrian crossing on northwest leg to accommodate double northbound left-turn).

Figure 19: Proposed Signalized Stittsville Main/North-South Arterial Intersection



The following Table 15 summarizes the signalized intersection projected performance based on the SYNCHRO (V9) intersection capacity software and the three volumes scenarios outlined above. The SYNCHRO model output is included as Appendix F.

Table 15: Projected Stittsville Main/North-South Arterial Signalized Intersection Performance

Stittsville Main/ North-South Arterial	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Scenario A	A(B)	0.51(0.63)	SBT(SBT)	14.2(15.0)	A(A)	0.48(0.58)
Scenario B	B(C)	0.62(0.72)	EBL(SBT)	15.6(17.1)	A(B)	0.56(0.69)
Scenario C	B(D)	0.70(0.86)	EBL(SBT)	17.9(21.4)	B(D)	0.66(0.83)
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

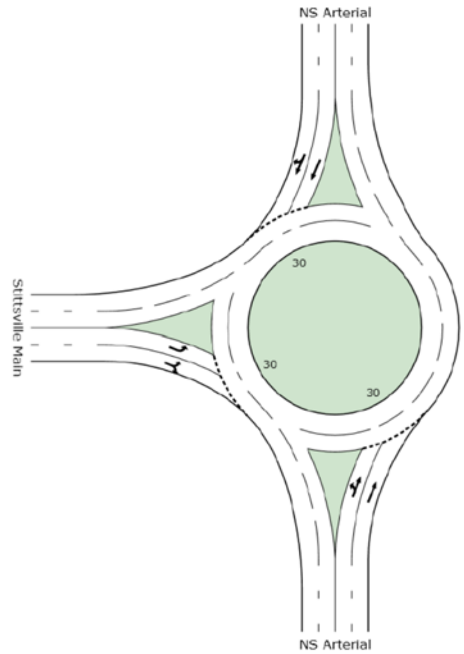
As shown in Table 15, depending on the background traffic volumes, the signalized Stittsville Main/North-South Arterial is projected to operate at an acceptable LoS 'D' or better during peak hours. The 95th percentile queues are projected to range from 50 to 150 m in the north and southbound directions. In the eastbound direction, the 95th percentile queues are projected to range from 40 to 65 m.

Roundabout Intersection

The geometry of the proposed roundabout intersection is illustrated in Figure 20. It assumed the North-South Arterial as the main roadway and Stittsville Main Street Extension intersects North-South Arterial at a 'T' intersection. The following assumptions were applied to the SIDRA analysis:

- Double left-turn lanes on Stittsville Main Street; and
- Two-lane roundabout.

Figure 20: Proposed Roundabout Stittsville Main/North-South Arterial Intersection



The following Table 16 summarizes the roundabout intersection projected performance based on the SIDRA (V5) intersection capacity software. The SIDRA model output is included as Appendix G.

Table 16: Projected Stittsville Main/North-South Arterial Roundabout Intersection Performance

Stittsville Main/ North-South Arterial	Weekday AM Peak (PM Peak)				
	Critical Movement			Intersection 'as a whole'	
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS
Scenario A	B(B)	11.4(12.0)	NBT(SBT)	9.2(11.6)	A(B)
Scenario B	C(C)	17.4(19.1)	NBT(EBL)	12.9(18.0)	B(C)
Scenario C	D(E)	33.8(38.7)	NBT(SBT)	21.4(35.4)	C(E)
Note: Analysis of roundabout intersection assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane. Intersection level of service based on delay.					

As shown in Table 16, depending on the background traffic volumes, the proposed roundabout is projected to operate at an acceptable LoS 'C' or better during peak hours, with the exception of the afternoon peak hour for Scenario C, which is projected to operate at capacity (LoS 'E'). The volume projections for Scenario C are approaching full capacity of the roadways and as such, it is understandable that the intersection capacity would be close to or at capacity (LoS 'E'). The 95th percentile queues are projected to range from 20 to 180 m in the north and southbound directions. In the eastbound direction, the 95th percentile queues are projected to range from 10 to 30 m.

To increase the capacity of the northbound movement along the North-South Arterial, a 'slip lane' could be constructed that by-passes the roundabout and merges with the traffic north of the intersection. The SIDRA analysis for this configuration is not included herein.

Roundabout and Signalized Intersection Conclusions

Based on the foregoing, roundabout and signal control at the Stittsville Main/North-South Arterial intersection are projected to operate acceptably at this location. However, given the location of the highway to the north, the traffic flow is expected to be heavy in the northbound direction in the morning peak hour and heavy in the southbound direction during the afternoon peak hour. Roundabout intersections are expected to operate best when the flow on each leg approaching the intersection is relatively balanced. Given the expected unbalanced flow because of the proximity to HWY 417, a signalized intersection will likely operate more effectively at this location, particularly as volumes increase.

However, a roundabout has been included in the Concept Plan, as it provides a more 'squared off' alignment of the land use parcels to more effectively develop the site. In addition, roundabout intersections can be used as gateway features or entry points, designed to alert drivers that they are entering a new environment. Roundabout and signalized intersections can accommodate pedestrians and cyclist effectively and modern design standards should be implemented as appropriate (i.e. cycle tracks and full protected intersections) to promote the use of non-motorized modes.

Appendix H provides a Roundabout Feasibility Checklist that evaluates the suitability of a roundabout at this location. Based on this evaluation, a roundabout is feasible, however, from a traffic operations perspective; a signalized intersection will operate more effectively given the projected traffic volumes.

TRANSPORTATION DEMAND MANAGEMENT

Depending on the nature of a development, Transportation Demand Management (TDM) strategies have the potential to be an integral part of a planned development in order to address and support the City of Ottawa policies with regard to TDM. A number of TDM measures could be considered, including:

- Improving the quality and safety of pedestrian facilities, such as providing sidewalks with adequate lighting;
- Improving bicycle facilities, such as provision of on-site bicycle storage and on-road bicycle lanes; and
- Providing change/shower facilities in workplace buildings for use by on-site staff.

These are important strategies to help encourage active modes of transportation to/from the site.

SITE PLANNING AND ACCESS REQUIREMENTS

Through the planning process, each phase of this development will require a Transportation Impact Study or Brief to evaluate the existing conditions and the proposed accesses and intersection control within the vicinity of the site. Given the major network changes proposed within Kanata West, the traffic volumes and distributions will likely significantly change with the construction of the North-South Arterial and the Stittsville Main Street Extension. As such, for the purpose of this assessment, it is assumed that the road network will accommodate the proposed Concept Plan acceptably based on a comparison with the previous transportation planning work (*Site Generated Traffic Impact Section).* Future traffic projections at all study area intersections are not included herein given these significant future changes, however, these will be included during the SPA stage when the Kanata West road network will likely be more established.

Given the proposed Concept Plan, all site access will be to/from future roads (i.e. North-South Arterial, Stittsville Main Street Extension). Given these roads do not exist today, parts of these future roadways will have to be constructed by the proponent as part of their SPA. To access the proposed car dealerships, the extension of Palladium Drive and a portion of the North-South Arterial will have to be constructed. Similarly, the southern portion of the North-South Arterial (and possibly part of the Stittsville Main Street Extension) will need to be constructed to provide access to the commercial and residential portions of the site. This is similar to the adjacent 173 Huntmar site, where the proponent is proposing the construction of part of the North-South Arterial to access their site.

CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis of the proposed development, the following transportation-related findings, conclusions and recommendations are offered:

EXISTING CONDITIONS

- Study area intersections currently operate, 'as a whole', with an acceptable LoS 'C' or better during the weekday morning and afternoon peak hours;
- With regard to 'critical movements' at study area intersections, they are currently operating at an acceptable LoS 'C' or better during the morning and afternoon peak hours, with the exception of the westbound left-turn movement the Huntmar/Palladium intersection. A protected/permitted signal phase is recommended to improve this movement's operation;
- The existing Screenline at Terry Fox is currently operating at an acceptable LoS 'A' based on the data available from the City;
- A significant amount of transportation planning has previously been prepared within the Kanata West TMP;

PROJECTED CONDITIONS

- Based on historic traffic counts the study area has experienced an approximate overall (weighted average) 20% to 22% annual growth in traffic volumes in recent years. Given that volumes are low initially and recently there has been significant growth within the study area, traffic growth will not continue at such a high rate;
- As this growth rate will not continue, background traffic volumes along the future North-South Arterial and Stittsville Main Street Extension were developed based on the land use plans, the Kanata West TMP traffic projections, and the assumed roadway capacities;
- The proposed development is projected to generate a total of 650 and 800 veh/h during the weekday morning and afternoon peak hours, respectively. These volumes are approximately 600 to 800 veh/h less than what would have been generated by the currently assumed/zoned land uses;
- The planned road network changes identified in the City's TMP, based on the Kanata West TMP projections, will provide sufficient roadway capacity for the projected site-generated traffic travelling to/from the proposed development. This was determined based on a comparison of projected site-traffic from the originally planned land uses and the proposed land uses;
- Based on the background traffic projections and the site-generated trip assignment, the proposed Stittsville Main/North-South Arterial intersection is projected to operate acceptably with signal control or roundabout control;
- From a traffic operations perspective, a signalized intersection will operate more effectively than a roundabout given the projected traffic volumes that reveal an unbalanced flow heading to/from HWY 417 and the desire to provide vehicle priority along the North-South Arterial;
- A roundabout intersection allows for a more 'squared off' alignment as shown in the proposed concept plan. In addition, a roundabout can be designed as a 'gateway' feature to help calm traffic as it enters a more residential area;

- A possible northbound slip lane could be provided for the roundabout option to improve operations and increase northbound capacity along the North-South Arterial;

- Given the significant road network changes planned for Kanata West, Transportation Impact Studies will likely be required for each stage of development and will access the requirements for site access and local roadway capacity; and

- Depending on the timing of development, the proponent may be required to construct portions of the future roadways to provide access to the developments.

Therefore based on the foregoing, the proposed 195 Huntmar Drive development is recommended from a transportation perspective.

Prepared by:

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Transportation Analyst

Reviewed by:

Christopher Gordon, P.Eng
Senior Project Manager

Appendix A

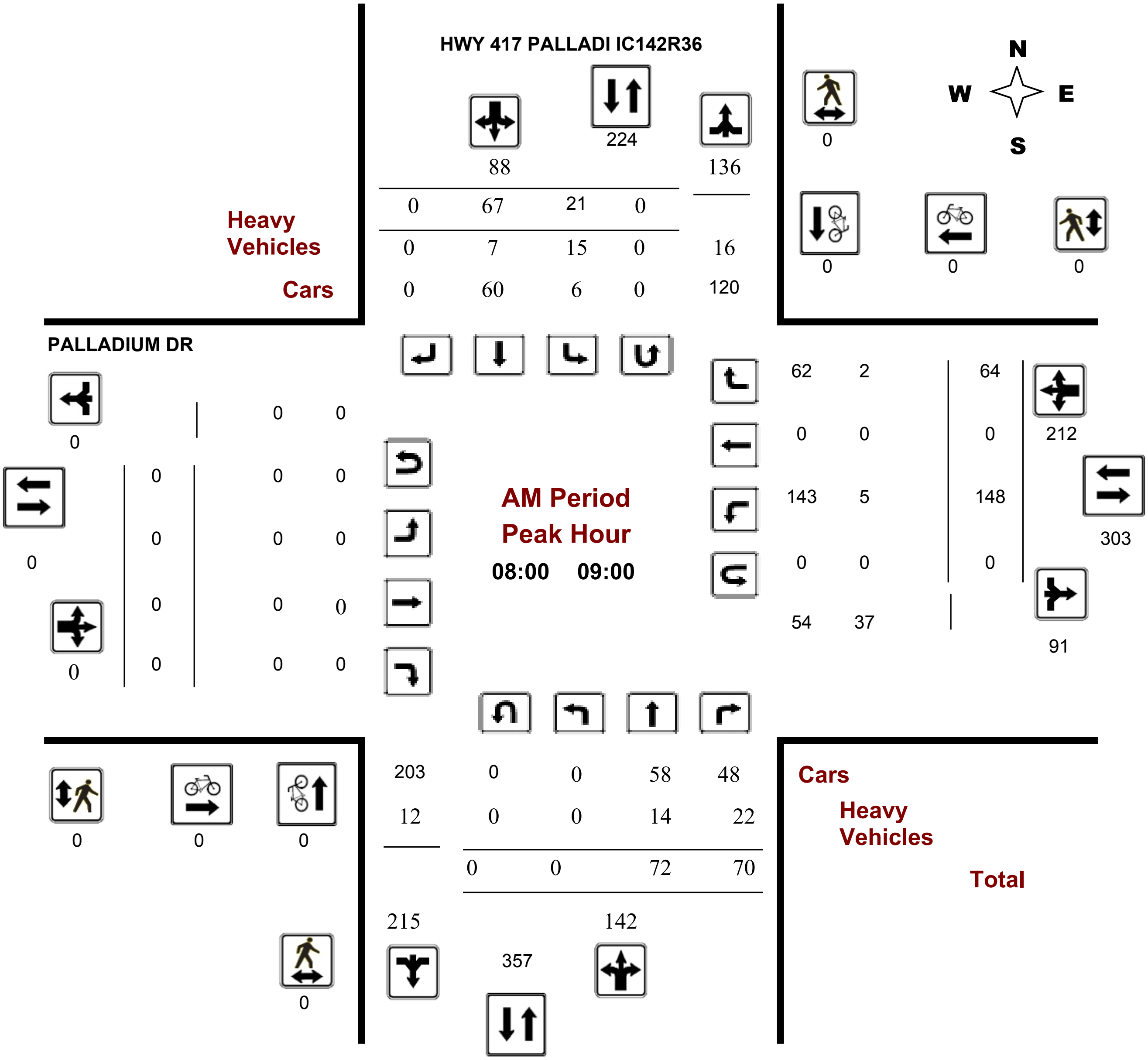
Existing Traffic Volumes

Turning Movement Count - Peak Hour Diagram

HWY 417 PALLADI IC142R36 @ PALLADIUM DR

Survey Date: Wednesday, March 04, 2015 **WO No:** 34399

Start Time: 07:00 **Device:** Miovision



Comments

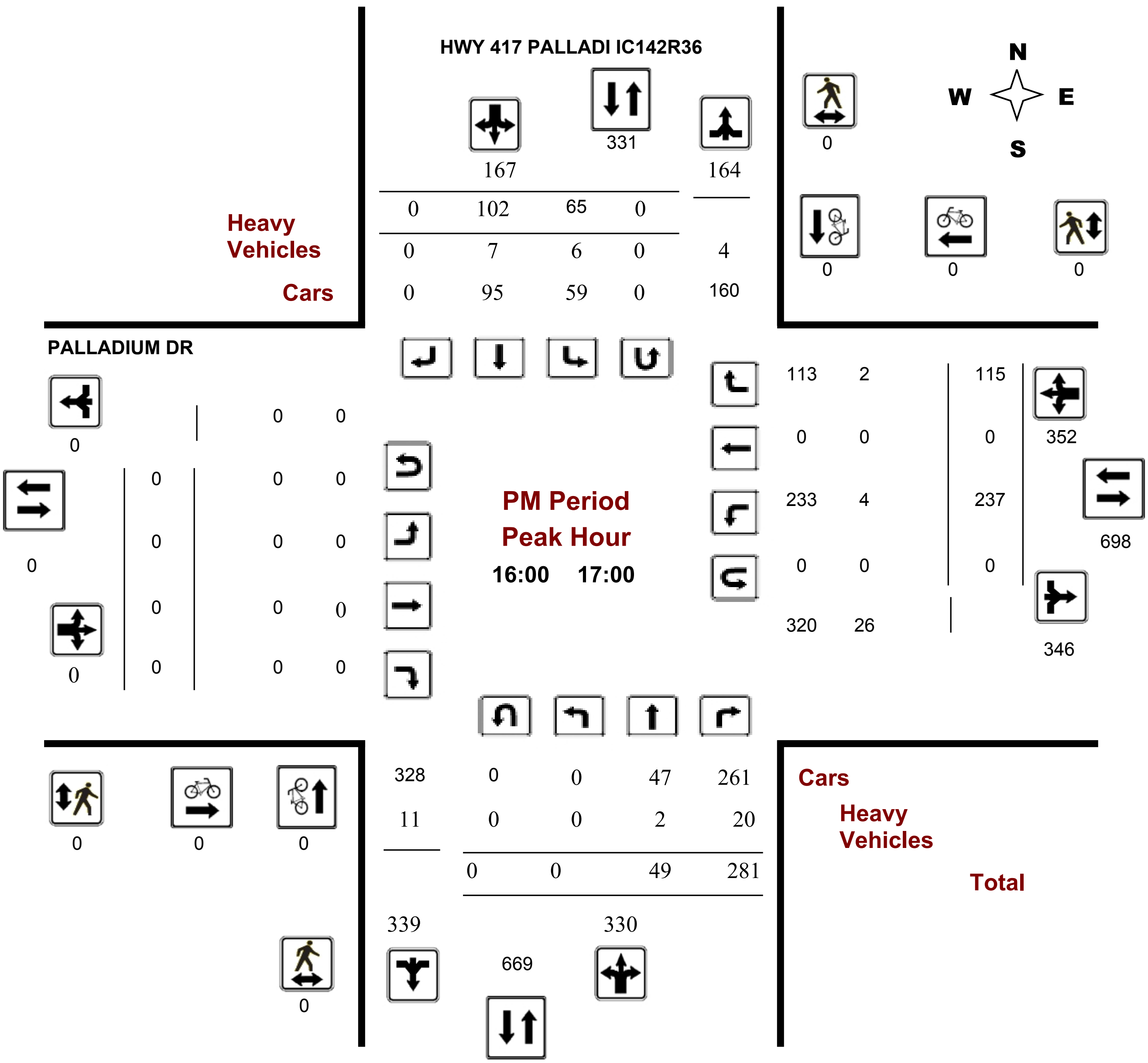
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

HWY 417 PALLADI IC142R36 @ PALLADIUM DR

Survey Date: Wednesday, March 04, 2015 **WO No:** 34399

Start Time: 07:00 **Device:** Miovision



Comments

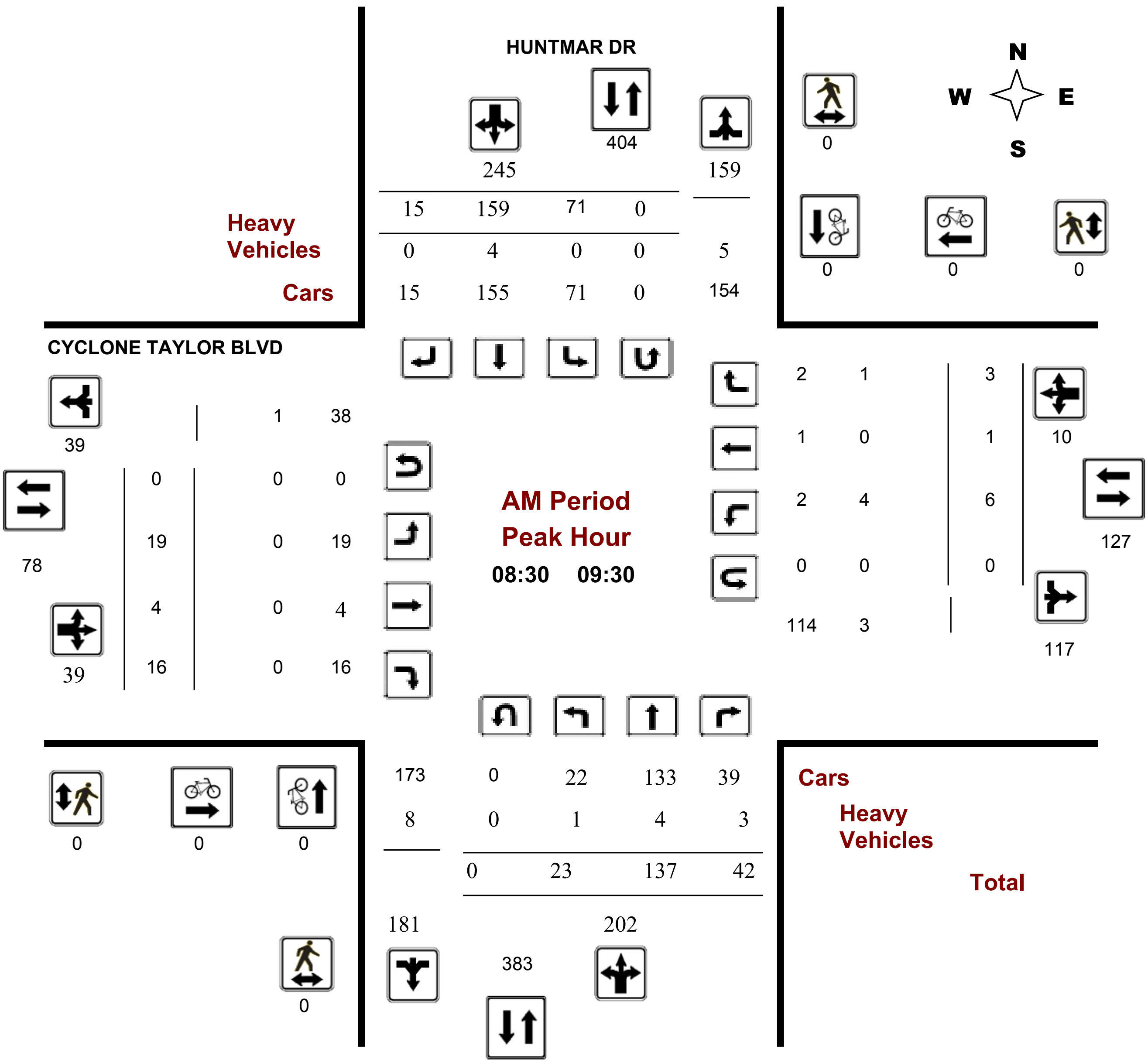
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

CYCLONE TAYLOR BLVD @ HUNTMAR DR

Survey Date: Friday, May 24, 2013 **WO No:** 31236

Start Time: 07:00 **Device:**



Comments

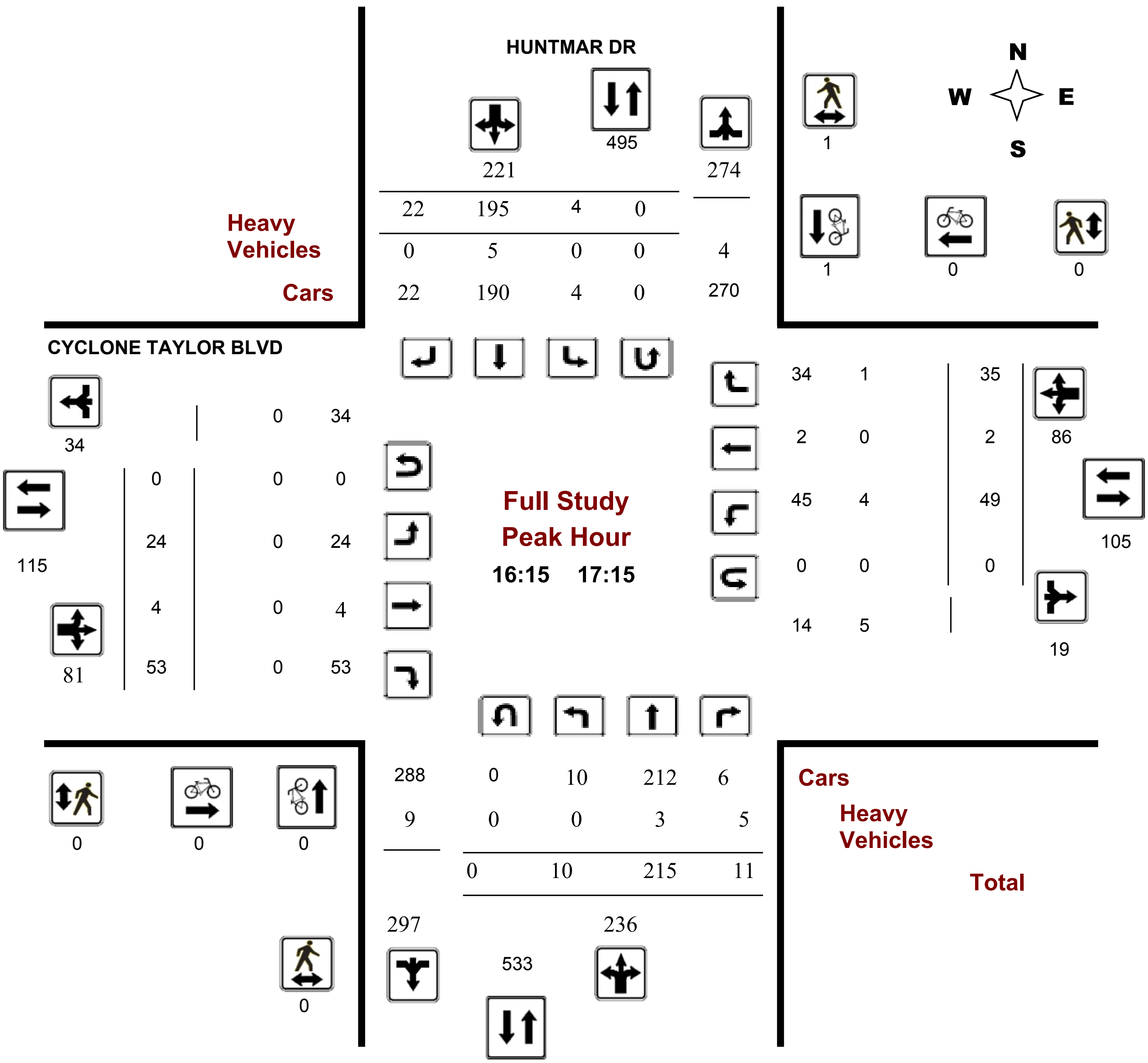
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

CYCLONE TAYLOR BLVD @ HUNTMAR DR

Survey Date: Friday, May 24, 2013 **WO No:** 31236

Start Time: 07:00 **Device:**



Comments

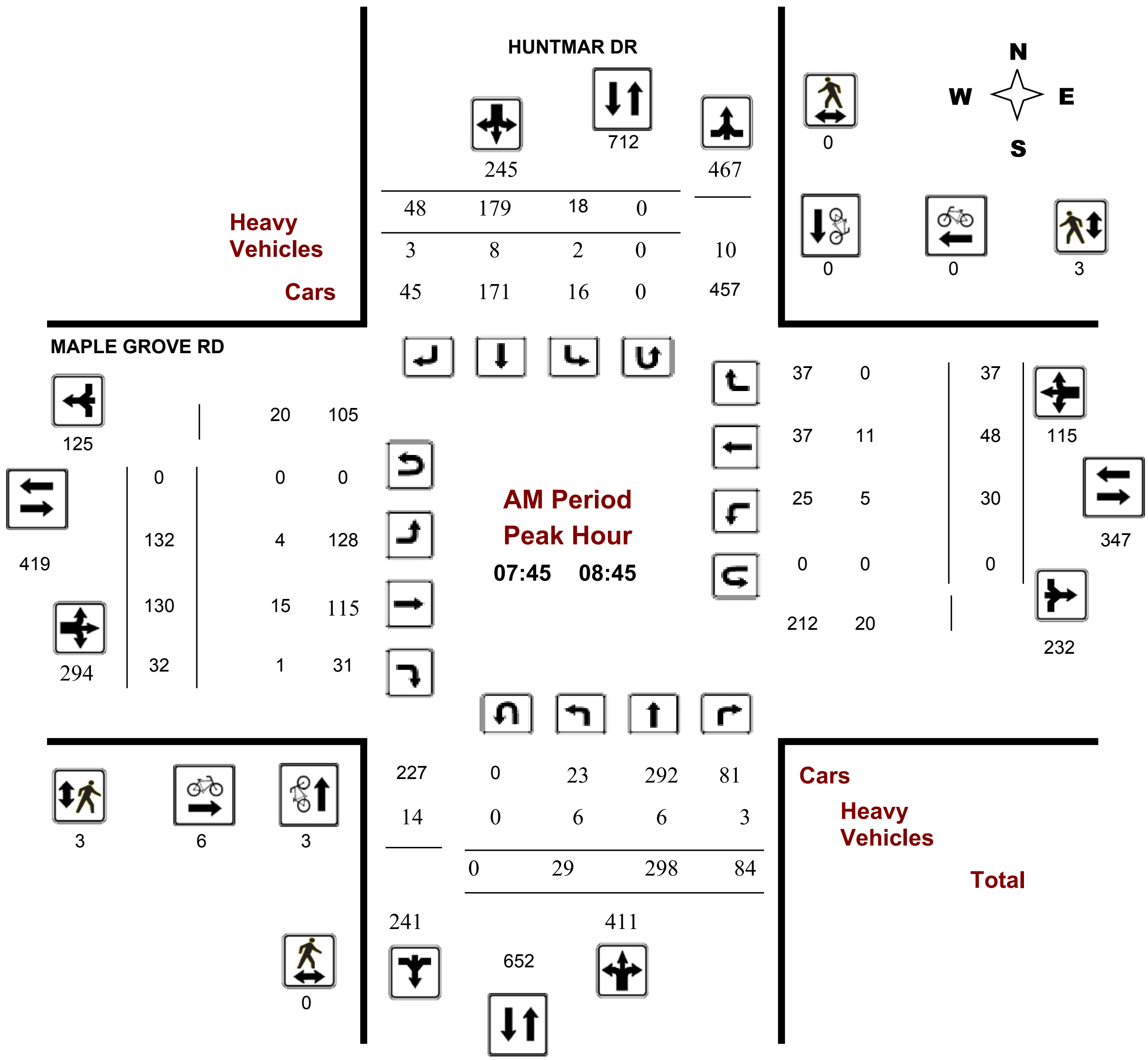
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

HUNTMAR DR @ MAPLE GROVE RD

Survey Date: Wednesday, June 24, 2015 **WO No:** 34817

Start Time: 07:00 **Device:** Miovision



Comments

Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

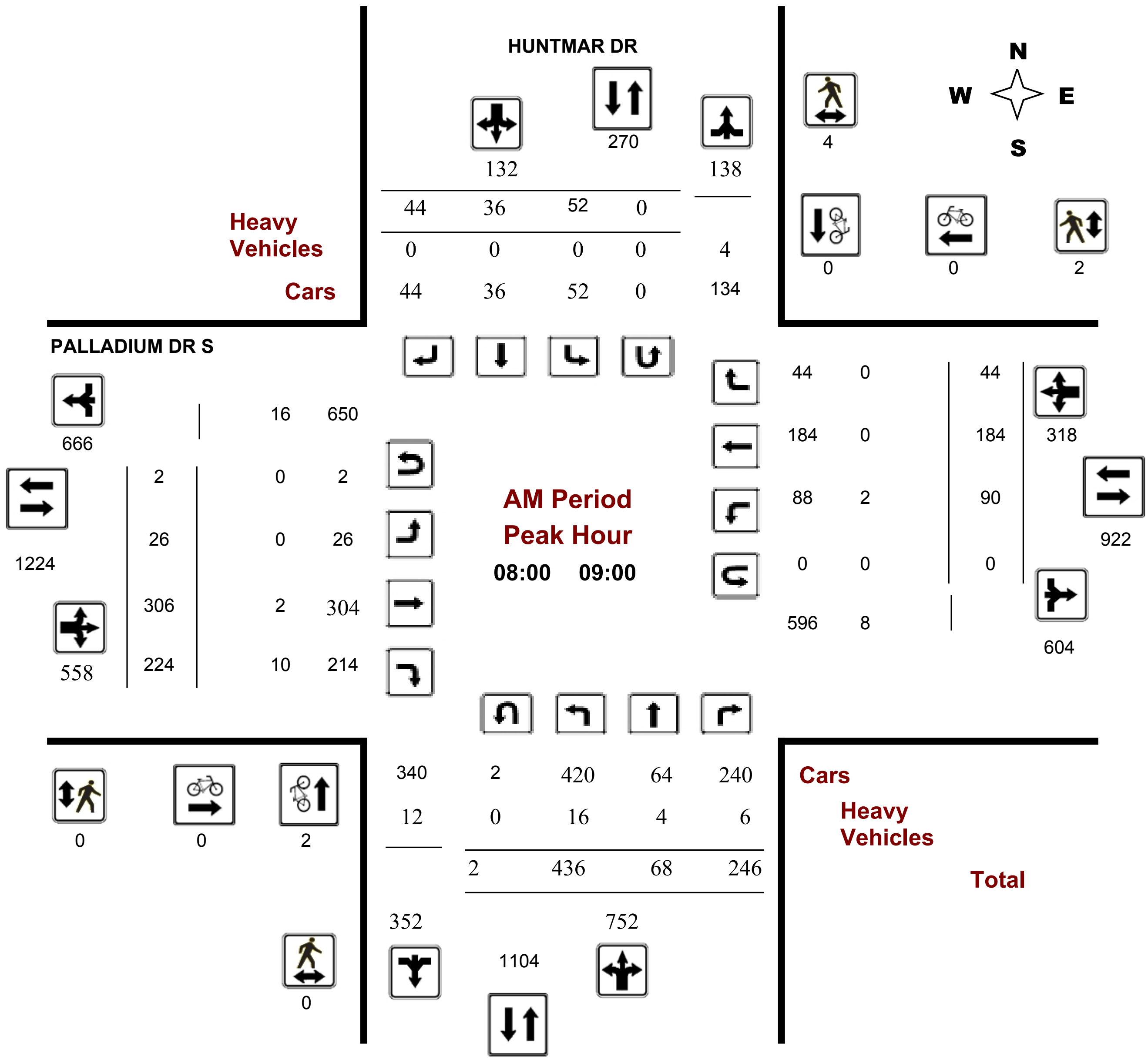
HUNTMAR DR @ PALLADIUM DR S

Survey Date: Friday, May 16, 2014

Start Time: 07:00

WO No: 1217

Device: Jamar Technologies, Inc



Comments

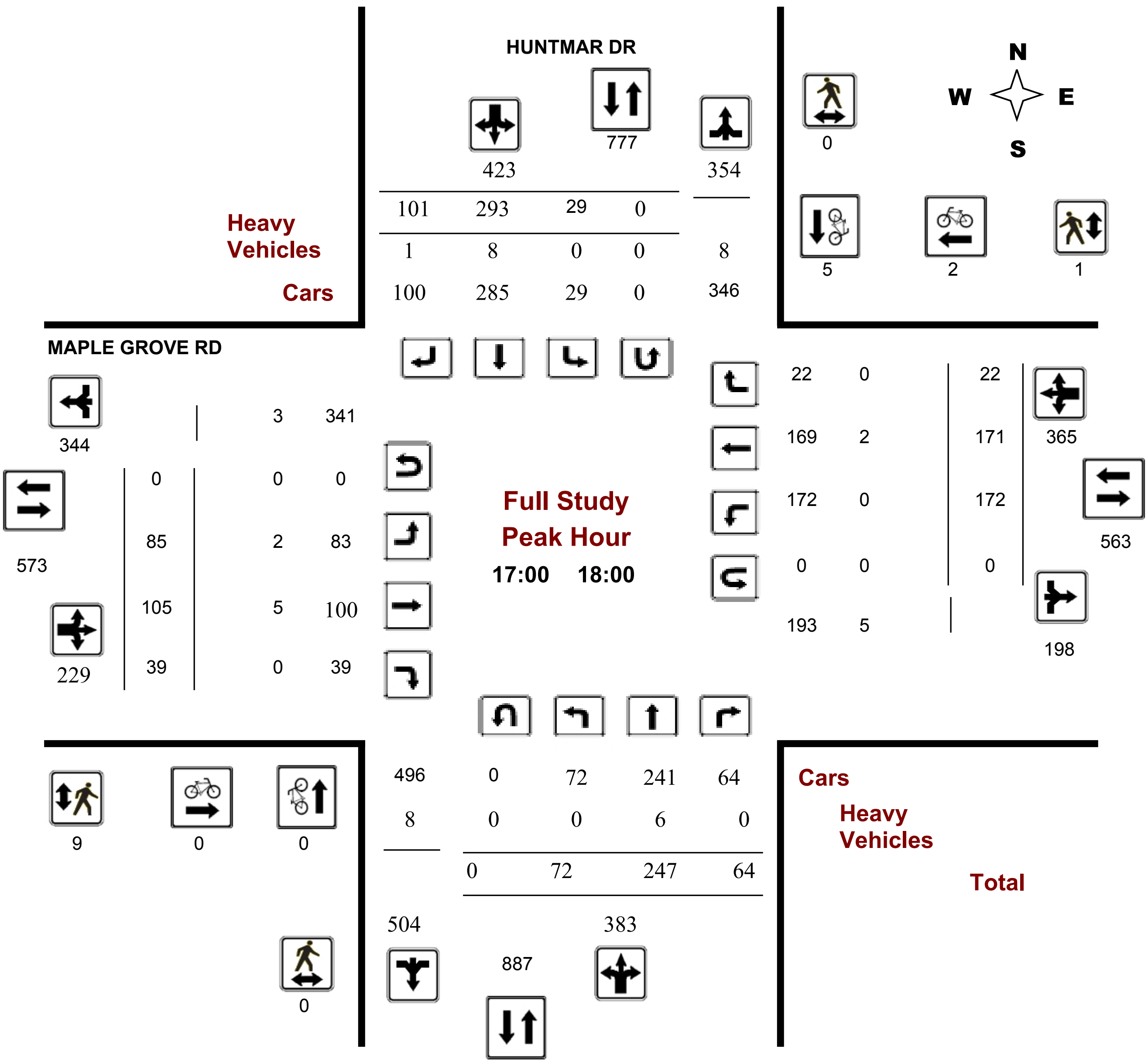
Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

HUNTMAR DR @ MAPLE GROVE RD

Survey Date: Wednesday, June 24, 2015 **WO No:** 34817

Start Time: 07:00 **Device:** Miovision



Comments

Public Works - Traffic Services

Turning Movement Count - Peak Hour Diagram

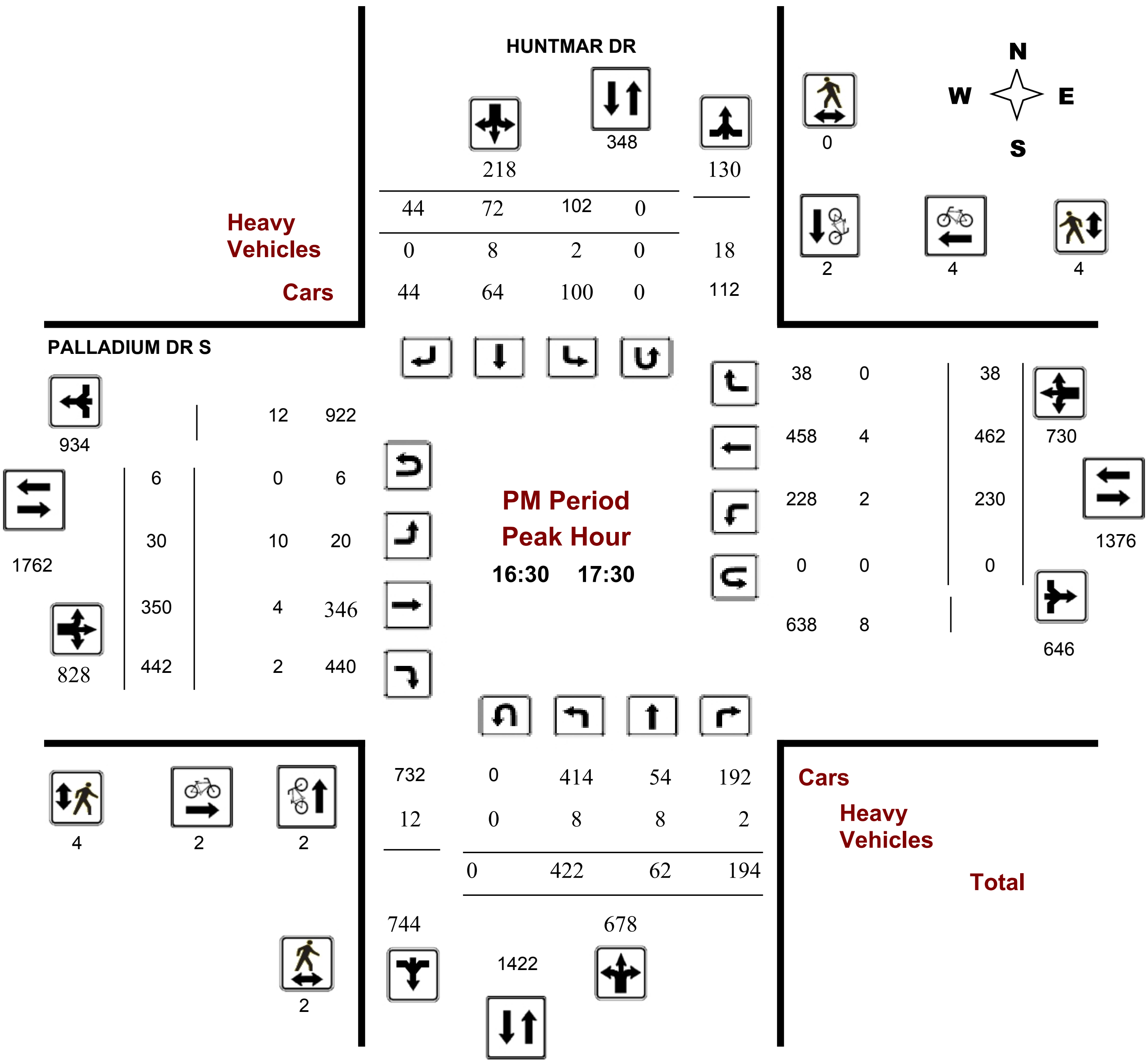
HUNTMAR DR @ PALLADIUM DR S

Survey Date: Friday, May 16, 2014

Start Time: 07:00

WO No: 1217

Device: Jamar Technologies, Inc

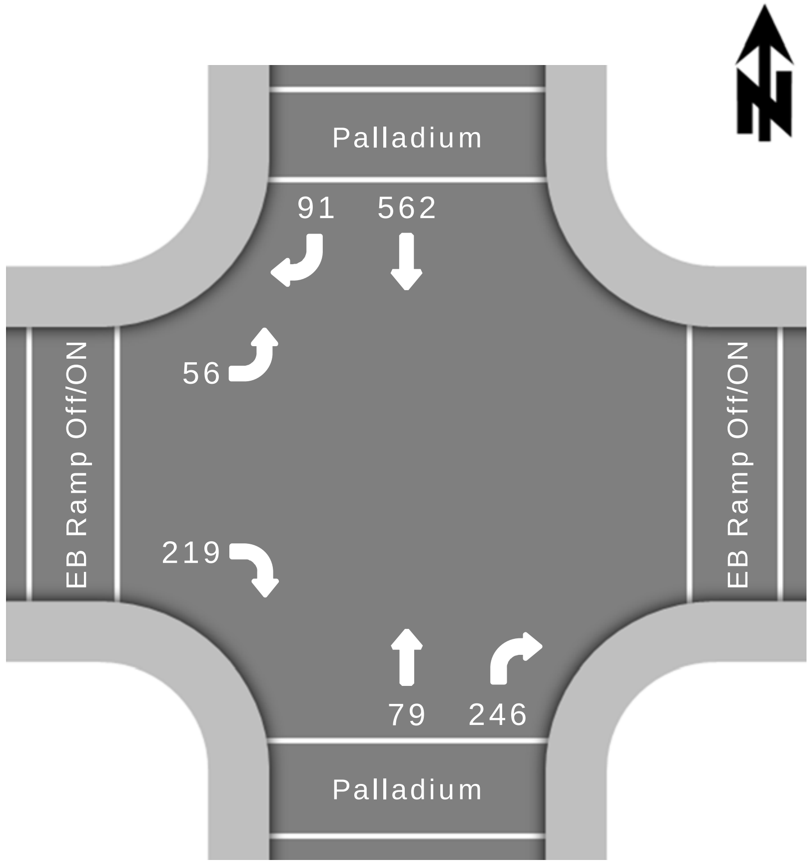


Comments

PARSONS

1223 Michael Street, Suite 100 · Ottawa, Ontario K1J 7T2 · (613) 738-4160 · Fax: (613) 739-7105 · www.parsons.com

Intersection: EB Ramp Off/ON & Palladium
Date: Wednesday 22 June 2016
Compiled By: Sponder, Andre
Weather: Clear
Peak Hour: 8:15 AM - 9:15 AM



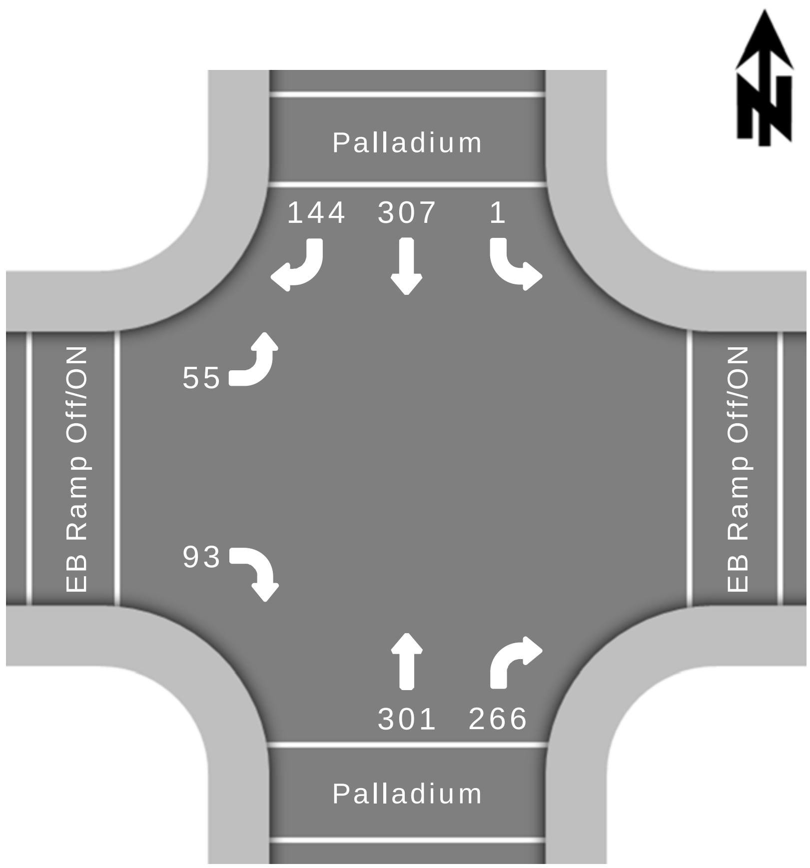
Start Time	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
8:15 AM	0	17	74	0	102	35	12	0	54	0	0	0
8:30 AM	0	25	73	0	169	22	15	0	55	0	0	0
8:45 AM	0	24	43	0	154	16	17	0	59	0	0	0
9:00 AM	0	13	56	0	137	18	12	0	51	0	0	0
Peak Hour		**79**	**246**		**562**	**91**	**56**		**219**			

Notes:

PARSONS

1223 Michael Street, Suite 100 · Ottawa, Ontario K1J 7T2 · (613) 738-4160 · Fax: (613) 739-7105 · www.parsons.com

Intersection: EB Ramp Off/ON & Palladium
Date: Monday 20 June 2016
Compiled By: Sponder, Andre
Weather: Clear
Peak Hour: 3:45 PM - 4:45 PM



Start Time	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
3:45 PM	0	78	49	0	85	34	17	0	28	0	0	0
4:00 PM	0	97	59	1	96	30	13	0	18	0	0	0
4:15 PM	0	79	117	0	77	57	19	0	30	0	0	0
4:30 PM	0	47	41	0	49	23	6	0	17	0	0	0
Peak Hour		**301**	**266**	**1**	**307**	**144**	**55**		**93**			

Notes:

Appendix B

SYNCHRO Capacity Analysis: Existing Conditions

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	148	64	72	21	67
Future Volume (vph)	148	64	72	21	67
Lane Group Flow (vph)	156	67	150	0	93
Turn Type	Prot	Perm	NA	pm+pt	NA
Protected Phases	8		2	1	6
Permitted Phases		8		6	
Detector Phase	8	8	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	5.0	10.0
Minimum Split (s)	21.2	21.2	28.3	11.3	16.3
Total Split (s)	35.2	35.2	36.6	31.3	67.9
Total Split (%)	34.1%	34.1%	35.5%	30.4%	65.9%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.2	5.2	6.3		6.3
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	
Recall Mode	Min	Min	Min	Min	Min
Act Effct Green (s)	10.0	10.0	10.0		21.8
Actuated g/C Ratio	0.23	0.23	0.23		0.50
v/c Ratio	0.21	0.17	0.19		0.06
Control Delay	14.3	5.9	8.6		5.7
Queue Delay	0.0	0.0	0.0		0.0
Total Delay	14.3	5.9	8.6		5.7
LOS	B	A	A		A
Approach Delay	11.8		8.6		5.7
Approach LOS	B		A		A
Queue Length 50th (m)	4.8	0.0	2.3		1.6
Queue Length 95th (m)	10.1	6.5	7.4		3.9
Internal Link Dist (m)	431.2		180.2		445.2
Turn Bay Length (m)		150.0			
Base Capacity (vph)	2278	1071	2218		3109
Starvation Cap Reductn	0	0	0		0
Spillback Cap Reductn	0	0	0		0
Storage Cap Reductn	0	0	0		0
Reduced v/c Ratio	0.07	0.06	0.07		0.03

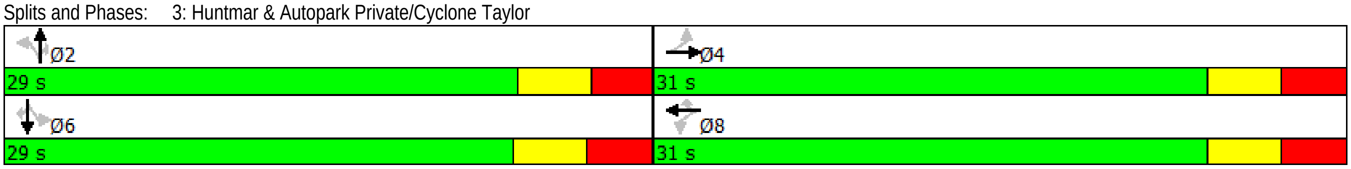
Intersection Summary	
Cycle Length: 103.1	
Actuated Cycle Length: 43.3	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.21	
Intersection Signal Delay: 9.5	Intersection LOS: A
Intersection Capacity Utilization 36.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Palladium & 417 WB-Off/On Ramp

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	19	4	6	1	3	23	137	42	71	159	15
Future Volume (vph)	19	4	6	1	3	23	137	42	71	159	15
Lane Group Flow (vph)	0	41	0	7	3	24	144	44	75	167	16
Turn Type	Perm	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8			2			6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	8	8	8	2	2	2	6	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)	30.3	30.3	30.3	30.3	30.3	27.1	27.1	27.1	27.3	27.3	27.3
Total Split (s)	31.0	31.0	31.0	31.0	31.0	29.0	29.0	29.0	29.0	29.0	29.0
Total Split (%)	51.7%	51.7%	51.7%	51.7%	51.7%	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	2.8	2.8	2.8	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	6.3	6.1	6.1	6.1	6.3	6.3	6.3
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		10.0		10.0	10.0	10.5	10.5	10.5	10.3	10.3	10.3
Actuated g/C Ratio		0.30		0.30	0.30	0.32	0.32	0.32	0.31	0.31	0.31
v/c Ratio		0.09		0.02	0.01	0.06	0.25	0.08	0.20	0.30	0.03
Control Delay		6.9		8.4	0.0	8.3	9.7	2.8	9.9	10.3	0.5
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		6.9		8.4	0.0	8.3	9.7	2.8	9.9	10.3	0.5
LOS		A		A	A	A	A	A	A	B	A
Approach Delay		6.9		5.9			8.1			9.5	
Approach LOS		A		A			A			A	
Queue Length 50th (m)		0.9		0.2	0.0	0.9	5.4	0.0	2.8	6.5	0.0
Queue Length 95th (m)		4.5		1.7	0.0	3.4	12.4	2.7	7.9	14.3	0.4
Internal Link Dist (m)		142.3		281.4			212.8			136.1	
Turn Bay Length (m)						50.0		110.0	50.0		30.0
Base Capacity (vph)		1092		1063	1154	809	1243	1075	819	1232	1066
Starvation Cap Reductn		0		0	0	0	0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.04		0.01	0.00	0.03	0.12	0.04	0.09	0.14	0.02

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 32.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.30	
Intersection Signal Delay: 8.7	Intersection LOS: A
Intersection Capacity Utilization 41.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Huntmar & Autopark Private/Cyclone Taylor

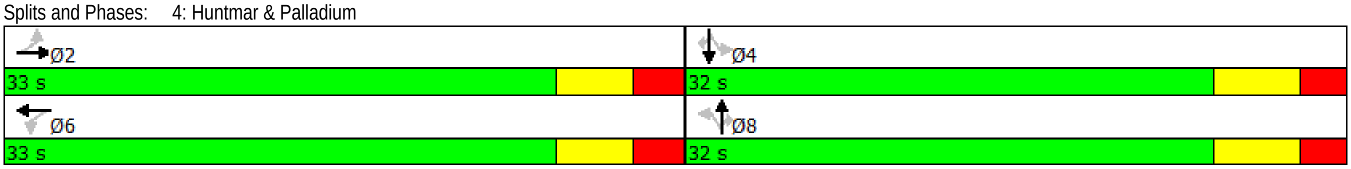


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	26	306	90	184	436	68	246	52	36	44
Future Volume (vph)	26	306	90	184	436	68	246	52	36	44
Lane Group Flow (vph)	27	558	95	240	459	72	259	55	38	46
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2		6		8			4	
Permitted Phases	2		6		8		8	4		4
Detector Phase	2	2	6	6	8	8	8	4	4	4
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
Minimum Split (s)	32.3	32.3	32.3	32.3	31.5	31.5	31.5	31.5	31.5	31.5
Total Split (s)	33.0	33.0	33.0	33.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	50.8%	50.8%	50.8%	50.8%	49.2%	49.2%	49.2%	49.2%	49.2%	49.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.6	2.6	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	13.9	13.9	13.9	13.9	22.7	22.7	22.7	22.7	22.7	22.7
Actuated g/C Ratio	0.28	0.28	0.28	0.28	0.46	0.46	0.46	0.46	0.46	0.46
v/c Ratio	0.09	0.53	0.45	0.25	0.77	0.09	0.31	0.10	0.05	0.06
Control Delay	14.1	10.5	22.8	12.0	24.6	9.5	3.1	9.8	9.4	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	10.5	22.8	12.0	24.6	9.5	3.1	9.8	9.4	3.5
LOS	B	B	C	B	C	A	A	A	A	A
Approach Delay		10.6		15.1		16.2			7.6	
Approach LOS		B		B		B			A	
Queue Length 50th (m)	1.9	12.8	7.4	7.4	27.4	2.9	0.0	2.2	1.5	0.0
Queue Length 95th (m)	6.1	22.8	17.8	13.6	#99.9	12.0	11.7	10.1	7.6	4.4
Internal Link Dist (m)		233.6		602.5		875.6			212.8	
Turn Bay Length (m)	95.0		65.0		100.0		40.0	50.0		105.0
Base Capacity (vph)	592	1861	417	1831	689	942	912	667	942	826
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.30	0.23	0.13	0.67	0.08	0.28	0.08	0.04	0.06

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 49.8
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 72.9% ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Huntmar & Palladium

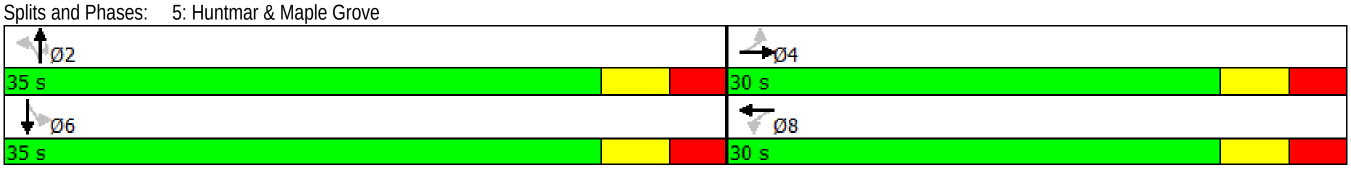


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	132	130	30	48	29	298	84	18	179
Future Volume (vph)	132	130	30	48	29	298	84	18	179
Lane Group Flow (vph)	0	310	0	122	0	345	88	0	258
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	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
Minimum Split (s)	24.2	24.2	24.2	24.2	24.1	24.1	24.1	24.1	24.1
Total Split (s)	30.0	30.0	30.0	30.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	46.2%	46.2%	46.2%	46.2%	53.8%	53.8%	53.8%	53.8%	53.8%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)		6.2		6.2		6.1	6.1		6.1
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Min	Min	Min	Min	Min
Act Effct Green (s)		14.9		14.9		15.0	15.0		15.0
Actuated g/C Ratio		0.35		0.35		0.35	0.35		0.35
v/c Ratio		0.63		0.23		0.58	0.16		0.43
Control Delay		18.5		9.2		16.5	6.0		12.7
Queue Delay		0.0		0.0		0.0	0.0		0.0
Total Delay		18.5		9.2		16.5	6.0		12.7
LOS		B		A		B	A		B
Approach Delay		18.5		9.2		14.3			12.7
Approach LOS		B		A		B			B
Queue Length 50th (m)		15.9		3.7		18.3	1.3		11.5
Queue Length 95th (m)		46.1		14.8		48.0	8.8		32.8
Internal Link Dist (m)		444.9		576.6		144.3			875.6
Turn Bay Length (m)							10.0		
Base Capacity (vph)		825		864		1201	1066		1177
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		0.38		0.14		0.29	0.08		0.22

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 42.9
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 63.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 5: Huntmar & Maple Grove



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	56	219	0	79	562	91
Future Volume (Veh/h)	56	219	0	79	562	91
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	59	231	0	83	592	96
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	682	344	592			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	682	344	592			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	65	100			
cM capacity (veh/h)	384	652	980			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	290	42	42	395	293
Volume Left	59	0	0	0	0
Volume Right	231	0	0	0	96
cSH	571	1700	1700	1700	1700
Volume to Capacity	0.51	0.02	0.02	0.23	0.17
Queue Length 95th (m)	21.8	0.0	0.0	0.0	0.0
Control Delay (s)	17.6	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	17.6	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Traffic Volume (vph)	237	115	49	65	102
Future Volume (vph)	237	115	49	65	102
Lane Group Flow (vph)	249	121	348	0	175
Turn Type	Prot	Perm	NA	pm+pt	NA
Protected Phases	8		2	1	6
Permitted Phases		8		6	
Detector Phase	8	8	2	1	6
Switch Phase					
Minimum Initial (s)	10.0	10.0	10.0	5.0	10.0
Minimum Split (s)	21.2	21.2	28.3	11.3	16.3
Total Split (s)	35.2	35.2	36.6	31.3	67.9
Total Split (%)	34.1%	34.1%	35.5%	30.4%	65.9%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	3.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.2	5.2	6.3		6.3
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	
Recall Mode	Min	Min	Min	Min	Min
Act Effct Green (s)	10.1	10.1	10.0		21.8
Actuated g/C Ratio	0.23	0.23	0.23		0.50
v/c Ratio	0.33	0.27	0.38		0.13
Control Delay	15.3	5.6	4.9		6.0
Queue Delay	0.0	0.0	0.0		0.0
Total Delay	15.3	5.6	4.9		6.0
LOS	B	A	A		A
Approach Delay	12.1		4.9		6.0
Approach LOS	B		A		A
Queue Length 50th (m)	7.9	0.0	1.6		3.1
Queue Length 95th (m)	15.0	8.6	9.0		6.5
Internal Link Dist (m)	431.2		315.2		445.2
Turn Bay Length (m)		150.0			
Base Capacity (vph)	2275	1087	2154		2600
Starvation Cap Reductn	0	0	0		0
Spillback Cap Reductn	0	0	0		0
Storage Cap Reductn	0	0	0		0
Reduced v/c Ratio	0.11	0.11	0.16		0.07

Intersection Summary	
Cycle Length: 103.1	
Actuated Cycle Length: 43.4	
Natural Cycle: 65	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 42.5%	ICU Level of Service A
Analysis Period (min) 15	

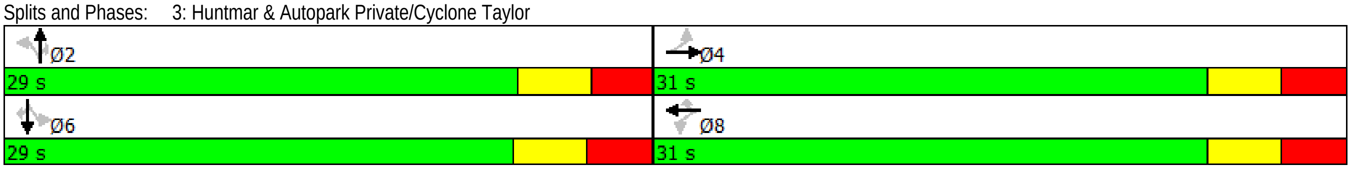
Splits and Phases: 2: Palladium & 417 WB-Off/On Ramp

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	24	4	49	2	35	10	215	11	4	195	22
Future Volume (vph)	24	4	49	2	35	10	215	11	4	195	22
Lane Group Flow (vph)	0	85	0	54	37	11	226	12	4	205	23
Turn Type	Perm	NA	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4		8			2			6	
Permitted Phases	4		8		8	2		2	6		6
Detector Phase	4	4	8	8	8	2	2	2	6	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)	30.3	30.3	30.3	30.3	30.3	27.1	27.1	27.1	27.3	27.3	27.3
Total Split (s)	31.0	31.0	31.0	31.0	31.0	29.0	29.0	29.0	29.0	29.0	29.0
Total Split (%)	51.7%	51.7%	51.7%	51.7%	51.7%	48.3%	48.3%	48.3%	48.3%	48.3%	48.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	3.0	3.0	3.0	3.0	3.0	2.8	2.8	2.8	3.0	3.0	3.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.3		6.3	6.3	6.1	6.1	6.1	6.3	6.3	6.3
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)		12.3		12.3	12.3	11.3	11.3	11.3	11.1	11.1	11.1
Actuated g/C Ratio		0.34		0.34	0.34	0.31	0.31	0.31	0.30	0.30	0.30
v/c Ratio		0.16		0.13	0.07	0.03	0.41	0.02	0.01	0.38	0.05
Control Delay		5.0		9.1	2.1	10.9	13.6	0.1	11.0	13.4	1.4
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		5.0		9.1	2.1	10.9	13.6	0.1	11.0	13.4	1.4
LOS		A		A	A	B	B	A	B	B	A
Approach Delay		5.0		6.2			12.8			12.2	
Approach LOS		A		A			B			B	
Queue Length 50th (m)		1.1		2.0	0.0	0.4	9.0	0.0	0.2	8.1	0.0
Queue Length 95th (m)		6.9		7.4	2.3	3.4	31.8	0.0	1.9	29.2	1.3
Internal Link Dist (m)		142.3		281.4			212.8			136.1	
Turn Bay Length (m)						50.0		110.0	50.0		30.0
Base Capacity (vph)		1045		862	1057	729	1159	1006	708	1149	998
Starvation Cap Reductn		0		0	0	0	0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0	0	0	0
Reduced v/c Ratio		0.08		0.06	0.04	0.02	0.19	0.01	0.01	0.18	0.02

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 36.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.41
Intersection Signal Delay: 10.7 Intersection LOS: B
Intersection Capacity Utilization 44.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Huntmar & Autopark Private/Cyclone Taylor



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	30	350	230	462	422	62	194	102	72	44
Future Volume (vph)	30	350	230	462	422	62	194	102	72	44
Lane Group Flow (vph)	32	833	242	526	444	65	204	107	76	46
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2		6		8			4	
Permitted Phases	2		6		8		8	4		4
Detector Phase	2	2	6	6	8	8	8	4	4	4
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
Minimum Split (s)	32.3	32.3	32.3	32.3	31.5	31.5	31.5	31.5	31.5	31.5
Total Split (s)	33.0	33.0	33.0	33.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	50.8%	50.8%	50.8%	50.8%	49.2%	49.2%	49.2%	49.2%	49.2%	49.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.6	2.6	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag										
Lead-Lag Optimize?										
Recall Mode	Min	Min	Min	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	26.7	26.7	26.7	26.7	24.3	24.3	24.3	24.3	24.3	24.3
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38	0.38
v/c Ratio	0.10	0.54	1.22	0.37	0.93	0.10	0.29	0.22	0.11	0.08
Control Delay	12.8	7.4	159.5	13.6	48.4	13.0	3.6	14.7	13.2	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.8	7.4	159.5	13.6	48.4	13.0	3.6	14.7	13.2	3.9
LOS	B	A	F	B	D	B	A	B	B	A
Approach Delay		7.6		59.6		32.3			12.0	
Approach LOS		A		E		C			B	
Queue Length 50th (m)	2.3	15.0	~37.2	21.6	48.5	4.8	0.0	8.3	5.6	0.0
Queue Length 95th (m)	7.0	28.4	#75.1	32.4	#99.2	11.4	10.7	17.9	12.9	4.5
Internal Link Dist (m)		233.6		602.5		875.6			212.8	
Turn Bay Length (m)	95.0		65.0		100.0		40.0	50.0		105.0
Base Capacity (vph)	335	1554	199	1413	504	713	720	509	713	630
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.54	1.22	0.37	0.88	0.09	0.28	0.21	0.11	0.07

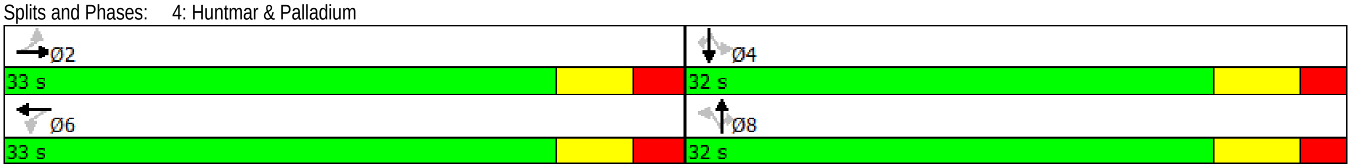
Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 63.8
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 30.3 — Intersection LOS: C
Intersection Capacity Utilization 86.1% — ICU Level of Service E
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

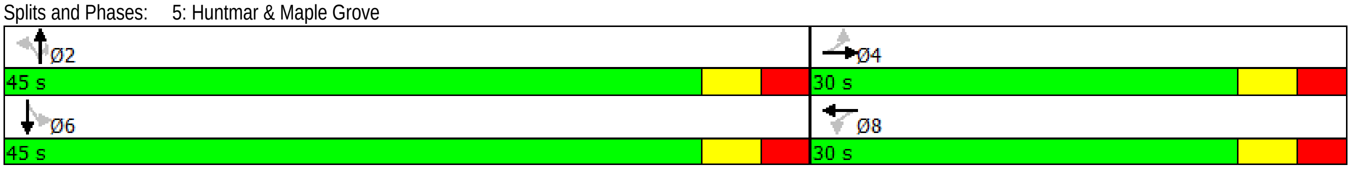
Splits and Phases: 4: Huntmar & Palladium



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	85	105	172	171	72	247	64	29	293
Future Volume (vph)	85	105	172	171	72	247	64	29	293
Lane Group Flow (vph)	0	241	0	384	0	336	67	0	445
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	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
Minimum Split (s)	29.2	29.2	29.2	29.2	24.1	24.1	24.1	24.1	24.1
Total Split (s)	30.0	30.0	30.0	30.0	45.0	45.0	45.0	45.0	45.0
Total Split (%)	40.0%	40.0%	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)		0.0		0.0		0.0	0.0		0.0
Total Lost Time (s)		6.2		6.2		6.1	6.1		6.1
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	Min	Min	Min	Min	Min
Act Effct Green (s)		21.9		21.9		19.2	19.2		19.2
Actuated g/C Ratio		0.41		0.41		0.36	0.36		0.36
v/c Ratio		0.44		0.70		0.67	0.12		0.74
Control Delay		15.5		24.0		21.7	6.0		22.1
Queue Delay		0.0		0.0		0.0	0.0		0.0
Total Delay		15.5		24.0		21.7	6.0		22.1
LOS		B		C		C	A		C
Approach Delay		15.5		24.0		19.1			22.1
Approach LOS		B		C		B			C
Queue Length 50th (m)		14.5		28.2		28.1	1.3		35.7
Queue Length 95th (m)		39.3		#82.3		49.7	7.0		61.8
Internal Link Dist (m)		444.9		576.6		144.3			875.6
Turn Bay Length (m)							10.0		
Base Capacity (vph)		616		613		1051	1114		1222
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		0.39		0.63		0.32	0.06		0.36

Intersection Summary	
Cycle Length: 75	
Actuated Cycle Length: 53.8	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.74	
Intersection Signal Delay: 20.7	Intersection LOS: C
Intersection Capacity Utilization 88.1%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 5: Huntmar & Maple Grove



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	93	0	301	307	144
Future Volume (Veh/h)	55	93	0	301	307	144
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	58	98	0	317	323	152
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	558	238	323			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	558	238	323			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	87	87	100			
cM capacity (veh/h)	460	764	1234			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	156	158	158	215	260
Volume Left	58	0	0	0	0
Volume Right	98	0	0	0	152
cSH	613	1700	1700	1700	1700
Volume to Capacity	0.25	0.09	0.09	0.13	0.15
Queue Length 95th (m)	7.6	0.0	0.0	0.0	0.0
Control Delay (s)	12.9	0.0	0.0	0.0	0.0
Lane LOS	B				
Approach Delay (s)	12.9	0.0		0.0	
Approach LOS	B				

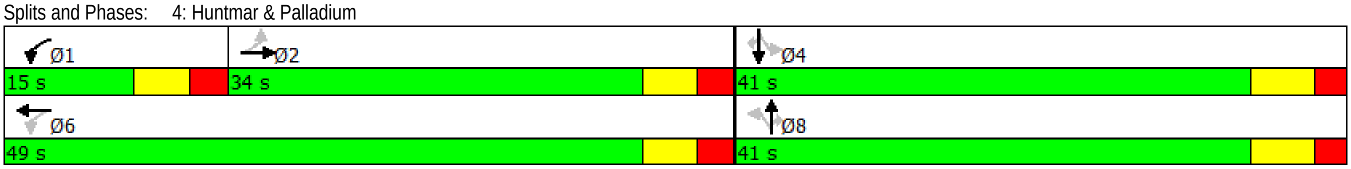
Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	30	350	230	462	422	62	194	102	72	44
Future Volume (vph)	30	350	230	462	422	62	194	102	72	44
Lane Group Flow (vph)	32	833	242	526	444	65	204	107	76	46
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2	1	6		8			4	
Permitted Phases	2		6		8		8	4		4
Detector Phase	2	2	1	6	8	8	8	4	4	4
Switch Phase										
Minimum Initial (s)	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	32.3	32.3	11.3	32.3	31.5	31.5	31.5	31.5	31.5	31.5
Total Split (s)	34.0	34.0	15.0	49.0	41.0	41.0	41.0	41.0	41.0	41.0
Total Split (%)	37.8%	37.8%	16.7%	54.4%	45.6%	45.6%	45.6%	45.6%	45.6%	45.6%
Yellow Time (s)	3.7	3.7	3.7	3.7	4.2	4.2	4.2	4.2	4.2	4.2
All-Red Time (s)	2.6	2.6	2.6	2.6	2.3	2.3	2.3	2.3	2.3	2.3
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lag	Lag	Lead							
Lead-Lag Optimize?	Yes	Yes	Yes							
Recall Mode	Min	Min	None	Min	Min	Min	Min	Min	Min	Min
Act Effct Green (s)	20.7	20.7	36.0	36.0	31.9	31.9	31.9	31.9	31.9	31.9
Actuated g/C Ratio	0.26	0.26	0.44	0.44	0.39	0.39	0.39	0.39	0.39	0.39
v/c Ratio	0.15	0.79	0.89	0.35	0.90	0.09	0.29	0.21	0.11	0.07
Control Delay	25.3	21.2	51.4	15.3	47.5	17.2	4.0	18.9	17.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	21.2	51.4	15.3	47.5	17.2	4.0	18.9	17.4	0.2
LOS	C	C	D	B	D	B	A	B	B	A
Approach Delay		21.3		26.7		32.3			14.6	
Approach LOS		C		C		C			B	
Queue Length 50th (m)	4.0	36.5	24.6	27.8	63.4	6.3	0.0	10.8	7.3	0.0
Queue Length 95th (m)	10.8	57.5	#66.3	38.9	#129.3	15.2	12.9	23.9	17.1	0.0
Internal Link Dist (m)		233.6		602.5		875.6			212.8	
Turn Bay Length (m)	95.0		65.0		100.0		40.0	50.0		105.0
Base Capacity (vph)	283	1307	273	1806	545	774	762	551	774	713
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.64	0.89	0.29	0.81	0.08	0.27	0.19	0.10	0.06

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 80.9
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 25.4   Intersection LOS: C
Intersection Capacity Utilization 86.1%   ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Huntmar & Palladium



Appendix C

Background Traffic Growth Analysis

Palladium / Huntmar
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Wednesday 7 June	652	624	764	914	1177	1178	1212	1089	7610
2007	Monday 18 June	755	571	744	898	1609	1549	1349	1439	8914
2008	Friday 18 July	997	796	1225	1267	1724	1713	1458	1628	10808
2009	Wednesday 5 August	991	900	1606	1834	1794	1865	1941	1733	12664
2010	Wednesday 14 July	1363	1013	1673	1921	2019	2131	2066	2056	14242
2012	Monday 25 June	1393	2550	2292	1412	2557	2005	2241	2516	16966
2014	Friday 16 May	1252	1066	4946	4276	4220	4412	4918	5582	30672

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	624	652	1276	7610				
2007	571	755	1326	8914	-8.5%	15.8%	3.9%	17.1%
2008	796	997	1793	10808	39.4%	32.1%	35.2%	21.2%
2009	900	991	1891	12664	13.1%	-0.6%	5.5%	17.2%
2010	1013	1363	2376	14242	12.6%	37.5%	25.6%	12.5%
2012	2550	1393	3943	16966	151.7%	2.2%	66.0%	19.1%
2014	1066	1252	2318	30672	-58.2%	-10.1%	-41.2%	80.8%

Regression Estimate	2006	574	758	1332
Regression Estimate	2014	1741	1457	3198
Average Annual Change		**14.87%**	**8.51%**	**11.57%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	1212	1089	2301	7610				
2007	1349	1439	2788	8914	11.3%	32.1%	21.2%	17.1%
2008	1458	1628	3086	10808	8.1%	13.1%	10.7%	21.2%
2009	1941	1733	3674	12664	33.1%	6.4%	19.1%	17.2%
2010	2066	2056	4122	14242	6.4%	18.6%	12.2%	12.5%
2012	2241	2516	4757	16966	8.5%	22.4%	15.4%	19.1%
2014	4918	5582	10500	30672	119.5%	121.9%	120.7%	80.8%

Regression Estimate	2006	798	649	1447
Regression Estimate	2014	3997	4483	8480
Average Annual Change		**22.31%**	**27.33%**	**24.73%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	1178	1177	2355	7610				
2007	1549	1609	3158	8914	31.5%	36.7%	34.1%	17.1%
2008	1713	1724	3437	10808	10.6%	7.1%	8.8%	21.2%
2009	1865	1794	3659	12664	8.9%	4.1%	6.5%	17.2%
2010	2131	2019	4150	14242	14.3%	12.5%	13.4%	12.5%
2012	2005	2557	4562	16966	-5.9%	26.6%	9.9%	19.1%
2014	4412	4220	8632	30672	120.0%	65.0%	89.2%	80.8%

Regression Estimate	2006	1008	1019	2027
Regression Estimate	2014	3606	3675	7282
Average Annual Change		**17.27%**	**17.40%**	**17.33%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	764	914	1678	7610				
2007	744	898	1642	8914	-2.6%	-1.8%	-2.1%	17.1%
2008	1225	1267	2492	10808	64.7%	41.1%	51.8%	21.2%
2009	1606	1834	3440	12664	31.1%	44.8%	38.0%	17.2%
2010	1673	1921	3594	14242	4.2%	4.7%	4.5%	12.5%
2012	2292	1412	3704	16966	37.0%	-26.5%	3.1%	19.1%
2014	4946	4276	9222	30672	115.8%	202.8%	149.0%	80.8%

Regression Estimate	2006	269	613	882
Regression Estimate	2014	4058	3357	7414
Average Annual Change		**40.37%**	**23.69%**	**30.49%**

Palladium / Huntmar
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Wednesday 7 June	90	89	148	72	57	249	202	87	994
2007	Monday 18 June	92	78	136	86	116	287	227	120	1142
2008	Friday 18 July	128	111	209	147	127	282	236	160	1400
2009	Wednesday 5 August	136	133	256	157	108	313	285	183	1571
2010	Wednesday 14 July	202	117	269	207	146	356	271	208	1776
2012	Monday 25 June	173	221	408	244	138	281	299	272	2036
2014	Friday 16 May	132	138	752	352	318	604	558	666	3520

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	89	90	179	994				
2007	78	92	170	1142	-12.4%	2.2%	-5.0%	14.9%
2008	111	128	239	1400	42.3%	39.1%	40.6%	22.6%
2009	133	136	269	1571	19.8%	6.3%	12.6%	12.2%
2010	117	202	319	1776	-12.0%	48.5%	18.6%	13.0%
2012	221	173	394	2036	88.9%	-14.4%	23.5%	14.6%
2014	138	132	270	3520	-37.6%	-23.7%	-31.5%	72.9%

Regression Estimate	2006	87	108	195
Regression Estimate	2014	180	174	354
Average Annual Change		**9.55%**	**6.10%**	**7.73%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	202	87	289	994				
2007	227	120	347	1142	12.4%	37.9%	20.1%	14.9%
2008	236	160	396	1400	4.0%	33.3%	14.1%	22.6%
2009	285	183	468	1571	20.8%	14.4%	18.2%	12.2%
2010	271	208	479	1776	-4.9%	13.7%	2.4%	13.0%
2012	299	272	571	2036	10.3%	30.8%	19.2%	14.6%
2014	558	666	1224	3520	86.6%	144.9%	114.4%	72.9%

Regression Estimate	2006	170	29	199
Regression Estimate	2014	467	526	993
Average Annual Change		**13.49%**	**43.58%**	**22.28%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	249	57	306	994				
2007	287	116	403	1142	15.3%	103.5%	31.7%	14.9%
2008	282	127	409	1400	-1.7%	9.5%	1.5%	22.6%
2009	313	108	421	1571	11.0%	-15.0%	2.9%	12.2%
2010	356	146	502	1776	13.7%	35.2%	19.2%	13.0%
2012	281	138	419	2036	-21.1%	-5.5%	-16.5%	14.6%
2014	604	318	922	3520	114.9%	130.4%	120.0%	72.9%

Regression Estimate	2006	224	59	283
Regression Estimate	2014	492	258	750
Average Annual Change		**10.34%**	**20.26%**	**12.96%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	148	72	220	994				
2007	136	86	222	1142	-8.1%	19.4%	0.9%	14.9%
2008	209	147	356	1400	53.7%	70.9%	60.4%	22.6%
2009	256	157	413	1571	22.5%	6.8%	16.0%	12.2%
2010	269	207	476	1776	5.1%	31.8%	15.3%	13.0%
2012	408	244	652	2036	51.7%	17.9%	37.0%	14.6%
2014	752	352	1104	3520	84.3%	44.3%	69.3%	72.9%

Regression Estimate	2006	67	64	131
Regression Estimate	2014	636	336	972
Average Annual Change		**32.44%**	**23.00%**	**28.43%**

Palladium / Huntmar
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Wednesday 7 June	144	95	97	268	330	113	203	298	1548
2007	Monday 18 June	162	80	86	191	341	182	174	310	1526
2008	Friday 18 July	159	116	166	228	338	198	178	298	1681
2009	Wednesday 5 August	178	137	196	398	390	216	301	314	2130
2010	Wednesday 14 July	243	226	259	445	493	278	383	429	2756
2012	Monday 25 June	276	268	329	507	545	335	425	465	3150
2014	Friday 16 May	218	130	678	744	730	646	828	934	4908

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	95	144	239	1548				
2007	80	162	242	1526	-15.8%	12.5%	1.3%	-1.4%
2008	116	159	275	1681	45.0%	-1.9%	13.6%	10.2%
2009	137	178	315	2130	18.1%	11.9%	14.5%	26.7%
2010	226	243	469	2756	182.5%	50.0%	93.8%	80.6%
2012	268	276	544	3150	18.6%	13.6%	16.0%	14.3%
2014	130	218	348	4908	-51.5%	-21.0%	-36.0%	55.8%

Regression Estimate	2006	102	150	252
Regression Estimate	2014	214	260	474
Average Annual Change		**9.69%**	**7.10%**	**8.20%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	203	298	501	1548				
2007	174	310	484	1526	-14.3%	4.0%	-3.4%	-1.4%
2008	178	298	476	1681	2.3%	-3.9%	-1.7%	10.2%
2009	301	314	615	2130	69.1%	5.4%	29.2%	26.7%
2010	383	429	812	2756	120.1%	38.4%	67.8%	80.6%
2012	425	465	890	3150	11.0%	8.4%	9.6%	14.3%
2014	828	934	1762	4908	94.8%	100.9%	98.0%	55.8%

Regression Estimate	2006	98	193	291
Regression Estimate	2014	700	759	1459
Average Annual Change		**27.92%**	**18.68%**	**22.35%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	113	330	443	1548				
2007	182	341	523	1526	61.1%	3.3%	18.1%	-1.4%
2008	198	338	536	1681	8.8%	-0.9%	2.5%	10.2%
2009	216	390	606	2130	9.1%	15.4%	13.1%	26.7%
2010	278	493	771	2756	52.7%	44.6%	47.4%	80.6%
2012	335	545	880	3150	20.5%	10.5%	14.1%	14.3%
2014	646	730	1376	4908	92.8%	33.9%	56.4%	55.8%

Regression Estimate	2006	82	279	361
Regression Estimate	2014	546	683	1230
Average Annual Change		**26.71%**	**11.84%**	**16.54%**

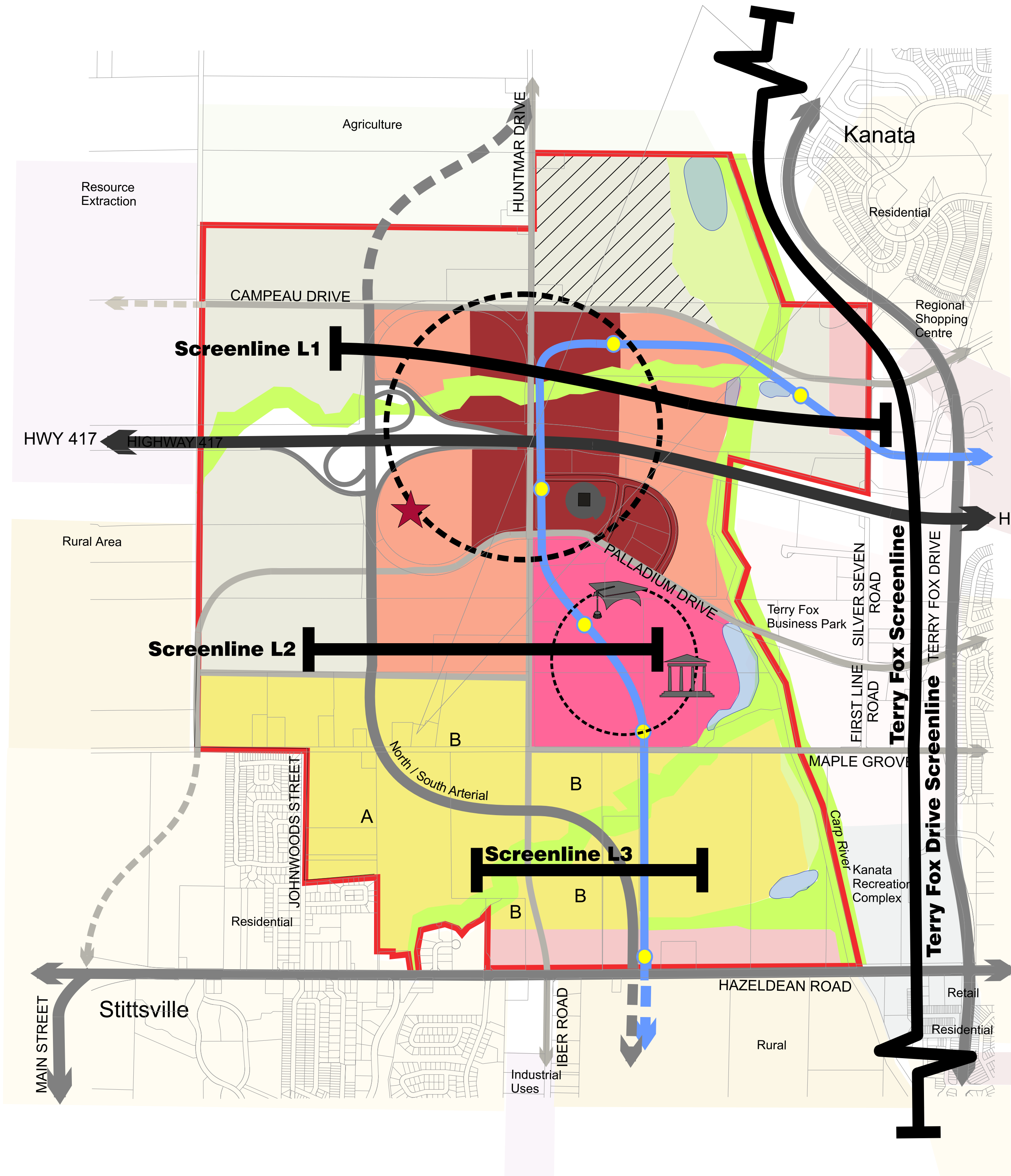
South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	97	268	365	1548				
2007	86	191	277	1526	-11.3%	-28.7%	-24.1%	-1.4%
2008	166	228	394	1681	93.0%	19.4%	42.2%	10.2%
2009	196	398	594	2130	18.1%	74.6%	50.8%	26.7%
2010	259	445	704	2756	32.1%	11.8%	18.5%	29.4%
2012	329	507	836	3150	27.0%	13.9%	18.8%	14.3%
2014	678	744	1422	4908	106.1%	46.7%	70.1%	55.8%

Regression Estimate	2006	27	176	203
Regression Estimate	2014	568	692	1261
Average Annual Change		**46.65%**	**18.68%**	**25.68%**

Appendix D

Kanata West TMP: Screenline L2 and L3 Analysis



DELCAN

Figure 3-2: Screenline Locations

4.2 Future North-South Travel Demands

The approved KWCP had identified two major north-south road corridors within Kanata West for additional capacity which would be internal to the development area. These two corridors are the upgrading and southward extension of Huntmar Drive between the future Campeau Drive north of Highway 417 and Hazeldean Road and the North-South Arterial between the Palladium Drive Interchange and Hazeldean Road. These two proposed north-south corridors intersect south of Palladium Drive, between it and Hazeldean Road.

As there are no east-west screenlines developed by the City of Ottawa for analysis purposes within the study area and no reliable corresponding traffic model results, it is again considered appropriate, as has been done for the verification of long-term east-west roadway needs, to upgrade the earlier Kanata West transportation analysis to reflect the most recent 2004 City of Ottawa land use assumptions.

As the two proposed north-south corridors are internal to the KWDA, they are primarily required to carry internal traffic generated by the Kanata West development, along with some “through” traffic using the proposed connectivity to the external road network as a means of transferring between existing major east-west and north-south corridors such as Highway 417, Hazeldean Road, Iber Road (part of a future bypass of Stittsville and its growing congestion problems on Main Street) and Terry Fox Drive.

4.2.1 Revised Internal Screenline Analysis

As has been shown on Table 4-5, the projected distribution of the KWDA site generated traffic to/from the east-west road corridors at the Terry Fox Drive Screenline totals 8220 pcus/hr eastbound and 4110 pcus/hr westbound shared in accordance with the distribution detailed in the table.

The distributed flows to each of the east-west corridors will now be analyzed to determine the amount of Kanata West site generated traffic anticipated to cross each of the three internal screenlines identified for analysis purposes and shown on Figure 3-2.

4.2.1.1 Screenline L1 Analysis

As shown on Figure 3-2, Screenline L1 is located north of Highway 417 and intersects existing Palladium Drive, Huntmar Drive and Didsbury Road within the KWDA.

Palladium Drive, the north leg of the Palladium Interchange, currently has four lanes crossing Highway 417, reducing to two lanes as it approaches the intersection with Huntmar Drive, while both Huntmar Drive and Didsbury Road are each two-lane rural roads.

Screenline L1 will be impacted by future traffic volumes primarily generated from the development lands north of Highway 417 to/from the Palladium Interchange/Highway 417, Campeau Drive and Richardson Side Road.

The majority of the future traffic impact on Screenline L1 is expected to arise from the scale of development within Kanata West north of Highway 417 with a minor amount of non-local traffic also likely to be involved.

Shown on Table 4-6 is the estimated breakdown of p.m. peak hour traffic volumes to/from the relevant east-west corridors of travel, as per Table 4-5, that are likely to affect Screenline L1.

Table 4-6: Estimated Traffic Volumes Crossing Screenline L1: P.M. Peak Hour 2021

East-West Traffic Source	Projected Kanata West Generated Traffic: Terry Fox Screenline: pcus/hr		% Crossing Screenline L1	Factored % to Reflect Volumes to/from West of KWDA	Projected Screenline Traffic: pcus/hr	
	Eastbound	Westbound			Northbound	Southbound
Richardson Side Road	320	50	80%	84%	268	42
Campeau Drive	1400	500	60%	63%	882	315
Highway 417	3600	2100	40%	42%	882	1512
Palladium Drive	1200	460	20%	21%	96	252
Maple Grove Road	1000	400	15%	16%	64	160
Hazeldean Road	700	600	5%	6%	36	42
Fernbank Road	0	0	-	-	-	-
Internally generated peak hour traffic remaining within the KWDA					200	200
Current Peak Hour Traffic Volumes Factored to 2021					260	430
Additional Non-Local Traffic Attracted to 2021 Road Network					112	97
Total Projected Traffic Volumes at 2021					2800	3050

Future traffic volumes to/from the west are also taken into consideration by applying a factor (1.05) to the projected volumes at the Terry Fox Drive Screenline, as 95% of Kanata West traffic is assumed to be to/from the east.

The second component of traffic affecting the L1 Screenline results from internally generated trips within the KWDA in the p.m. peak hour. The earlier Delcan Corporation analysis had concluded that there would be a total of 920 pcus generated internally during the p.m. peak, and remaining internal to the KWDA.

Reflecting the changes in land use assumptions detailed earlier, the earlier projection of 920 pcus can be expected to grow by a factor of 1.2 to approximately 1100 pcus, by 2021. These local vehicle trips will be spread over the internal road network, representing, in the p.m. peak, local traffic to/from work, home and shopping.

For the purpose of this analysis, it is assumed that the distribution of 1100 pcus/hr over the entire internal road network could result in a peak hour traffic volume of no more than 200 pcus/hr per direction across each screenline. Accordingly, this value has also been included in Table 4-6 to reflect the total projection of internally generated traffic volumes in both directions at Screenline L1.

In addition to the projected externally generated traffic crossing the L1 screenline, the existing traffic volumes on Palladium Drive and Huntmar Drive have been factored by 1.71 to 2021 and added to the projected internal volume along with an assumed modest increase in non-local traffic that is likely to be attracted to the completed Kanata West road network, when greater continuity is in place, from north of Richardson Side Road to south of Hazeldean Road.

As shown on Table 4-6, the resultant p.m. peak traffic volume estimated to cross Screenline L1 amounts to 3050 pcus/hr in the peak direction. On the basis of approximately 1100 pcus/lane a total of three arterial lanes are required in each direction at the L1 screenline to service the projected future traffic volume.

Although Didsbury Road will provide access to some of the retail and office development south of the future Campeau Road alignment, it will provide a very localized access of limited value to the overall screenline capacity, and consequently the extension of the existing four-lane cross-section on existing Palladium Drive connected with the proposed four-lane Campeau Drive, with existing Huntmar Drive, remaining as a two-lane arterial, but upgraded to urban standards, is all that is required at Screenline L1.

This finding, that there is no need, by 2021, to four-lane Huntmar Drive north of the existing four-lane cross-section at Cyclone Taylor Boulevard, thereby avoiding the need to four-lane the existing Highway 417 overpass, is of major significance. Protection of the right-of-way for widening beyond 2021, however, is recommended.

4.2.1.2 Screenline L2 Analysis

A similar exercise was carried out at Screenline L2, which is located, as shown on Figure 3-2, south of Palladium Drive, intersecting both the existing Huntmar Drive and the proposed North-South Arterial corridors.

Screenline L2 will be primarily affected by traffic volumes moving north and south within the KWDA to all the east-west travel corridors crossing the Terry Fox Drive Screenline. There would be minimal affect from the two extreme east-west corridors, Richardson Side Road and Fernbank Road, and the assumptions regarding the likely percentage of traffic affecting the screenline and the resultant peak hour volumes are detailed in Table 4-7.

Table 4-7: Estimated Traffic Volumes Crossing Screenline L2

East-West Traffic Source	Projected Kanata West Generated Traffic: Terry Fox Screenline: pcus/hr		% Crossing Screenline L2	Factored % to Reflect Volumes to/from West	Projected Screenline Traffic: pcus/hr	
	Eastbound	Westbound			Northbound	Southbound
Richardson Side Road	320	50	5%	6%	19	3
Campeau Drive	1400	500	40%	42%	588	210
Highway 417	3600	2100	40%	42%	1512	882
Palladium Drive	1200	460	40%	42%	504	193
Maple Grove Road	1000	400	50%	53%	211	530
Hazeldean Road	700	600	30%	31%	186	217
Fernbank Road	0	0	-	-	-	-
Internally generated peak hour traffic within Kanata West					200	200
Current Peak Hour Traffic Volumes Factored to 2021					360	300
Additional Non-Local Traffic Attracted to 2021 Road Network within the KWDA					650	800
Total Projected Traffic Volumes at 2021					4230	3335

Table 4-7 also includes the impact of internally generated traffic volumes (as before), site-generated traffic volumes to/from the west (factored as before), and the existing traffic volumes factored to 2021. Also reflected in Table 4-7 is a detailed estimate of the likely amount of non-local traffic that would be attracted to the Kanata West road system upon its completion in 2021.

The total amount of non-local traffic assigned to the Kanata West road system, and which impacts Screenlines L2 and L3, has been determined from the current turning traffic volumes at the Hazeldean Road/Terry Fox Drive, Hazeldean Road/Johnwoods Street and Hazeldean Road/Carp Road intersections.

Currently at Terry Fox Drive/Hazeldean Road, there are approximately 130 vph turning from southbound to westbound and a corresponding volume of 300 vph turning from westbound to northbound.

On the basis of the total Hazeldean Road traffic volume growing to fill the capacity of the projected four-lane arterial by 2021, a growth to approximately 200 pcus/hr in the southbound to westbound and to 400 pcus/hr in the westbound to northbound could be anticipated by 2021 without the Kanata West road network in place.

Assuming that 50% of these volumes will transfer from the Terry Fox Drive Corridor to the Kanata West corridors results in a projected non-local traffic volume of 100 pcus/hr southbound and 200 pcus/hr northbound in the p.m. peak hour transferred to the future Kanata West road network.

Traffic currently using the Johnwoods Street link between Maple Grove Road and Hazeldean Road, and which would not have influenced the turning volumes at Hazeldean/Terry Fox Drive will also be attracted to the Kanata West internal road network, and indeed the reduction in this traffic is one of the reasons for the early implementation of the Huntmar Drive Extension to assist in the removal of the non-local through traffic component from Johnwoods Street.

The non-local traffic currently using Johnwoods Street in the p.m. peak hour amounts to approximately 150 vph southbound and approximately 80 vph northbound. These volumes could be expected to transfer to the Kanata West road network by 2021, as it will be completed to include the relocation of Maple Grove Road west of Huntmar Drive and the creation of a very indirect linkage between Johnwoods Street and the Kanata West road network itself.

Based on the previously assumed growth rate of background traffic, these volumes are estimated to grow to 250 pcus/hr southbound and 140 pcus/hr northbound by 2021.

The third source of potential non-local traffic transferring to the Kanata West internal road system will come from the volumes currently turning to/from Carp Road south of Highway 417, from/to Highway 417 east, and which are destined both to Stittsville and Hazeldean Road east. Currently, these volumes are estimated to total 450 vph southbound and 300 vph northbound in the p.m. peak hour.

Assuming that 50% of these volumes will find the Kanata West road network more attractive by 2021, the potential traffic volumes transferred are expected to grow to approximately 500 pcus/hr southbound and 300 pcus/hr northbound with the application of the appropriate growth factor.

As a result of the above assumptions, the total non-local traffic volumes anticipated to use the Kanata West road network at 2021 from the three potential sources is estimated to be 800 pcus/hr southbound and 650 pcus/hr northbound. These projected volumes will impact Screenlines L2 and L3, only (a minor amount of non-local traffic has been included at Screenline L1 also).

As shown in Table 4-7, the resultant projected traffic volumes crossing Screenline L2 in the p.m. peak hour are 3335 vph southbound and 4230 vph northbound. These projected volumes are to be spread over the two new north-south corridors, i.e., Huntmar Drive and the North-South Arterial. Based on a likely lane capacity of approximately 1100 pcus/hr up to four arterial lanes are required per direction resulting in the justification of Huntmar Drive to be widened from its current two-lane configuration to four lanes south of Palladium Drive and a new four-lane North-South Arterial, extending south from the existing Palladium Drive interchange at Highway 417 to Hazeldean Road.

4.2.1.3 Screenline L3 Analysis

A similar exercise was carried out to estimate future potential traffic volumes crossing Screenline L3 at 2021. As shown on Figure 3-2, the L3 Screenline is located north of Hazeldean Road and intersects both the future North-South Arterial and Huntmar Drive Extension. Table 4-8 details the estimated p.m. peak hour traffic volumes from the various sources that are likely to impact Screenline L3 by 2021.

In addition to the assumed proportions of externally generated traffic to/from all the east-west arterials, the table includes the assumed amount of internally generated traffic volumes spread throughout the network (200 pcus/hr), and the estimated non-local traffic volumes as estimated above that are expected to be attracted to the internal road network and to impact Screenline L3.

Table 4-8: Estimated Traffic Volumes Crossing Screenline L3

East-West Traffic Source	Projected Kanata West Generated Traffic: Terry Fox Screenline: pcus/hr		% Crossing Screenline L3	Factored % to Reflect Volumes to/from West	Projected Screenline Traffic: pcus/hr	
	Eastbound	Westbound			Northbound	Southbound
Richardson Side Road	320	50	15%	16%	51	8
Campeau Drive	1400	500	15%	16%	224	80
Highway 417	3600	2100	15%	16%	576	336
Palladium Drive	1200	460	15%	16%	192	73
Maple Grove Road	1000	400	20%	21%	210	84
Hazeldean Road	700	600	40%	42%	252	294
Fernbank Road	-	-	-	-	-	-
Internally generated peak hour traffic within Kanata West					200	200
Current Peak Hour Traffic Volumes Factored to 2021					-	-
Additional Non-Local Traffic Attracted to 2021 Road Network					650	800
Total Projected Traffic Volumes at 2021					2355	1875

As there are currently no internal traffic volumes crossing Screenline L3, unlike Screenline L2 no projected traffic volume is added under this category.

The resultant projected peak traffic volume crossing Screenline L3 amounts to approximately 2355 pcus/hr in the peak direction.

On the basis of approximately 1100 pcus/hr lane capacity, a total of three additional arterial lanes are warranted, per direction. In conjunction with the lane requirements generated at Screenline L2, it is therefore concluded that the North-South Arterial should continue with a four-lane cross-section southwards to its future intersection with Hazeldean Road while the Huntmar Drive Extension south of its intersection with the North-South Arterial could transition to a two-lane cross-section at Maple Grove Road. However, due to the anticipated early construction of the Huntmar Drive Extension and the attractiveness of the Iber Road/Huntmar Drive corridor for non-local traffic, a right-of-way for a four-lane undivided minor arterial has been recommended within the proposed Mattamy Homes subdivision south of existing Maple Grove Road. In addition, due to the considerable traffic that will be generated by the proposed commercial development along the north side of Hazeldean Road, a right-of-way for a four-lane cross-section will most likely be required and should be protected for within the commercial lands.

4.3 Summary of Road Network Needs

As the updated needs analysis shows, the projected east-west p.m. peak hour traffic volumes within Kanata West, immediately west of Terry Fox Drive coupled with a realistic utilization of future Highway 417 capacity west of Kanata, justify the proposed extension of existing Campeau Drive as a four-lane divided arterial to service the development lands north of Highway 417 and the upgrading of existing Maple Grove Road west of Terry Fox Drive also as a four-lane urban arterial.

These two east-west arterials, in conjunction with MTO's proposed eight-laning of Highway 417 and the City of Ottawa proposed four-laning of Hazeldean Road will be adequate to satisfactorily meet the east-west arterial needs of the proposed Kanata West development to 2021.

It has been demonstrated that the six-laning of Hazeldean Road between Iber Road and Terry Fox Drive is unlikely to be needed by 2021 and is, therefore, not being recommended. However, the City of Ottawa may wish to continue to protect the corridor for such a widening to service future urban growth beyond 2021.

In view of the amount of potential residential and commercial development proposed within the KWDA north of Highway 417, along with the fact that Campeau Drive, to the east, within Kanata Centrum is planned to have a four to six-lane cross-section, and that Campeau Drive will extend westerly to link with the existing Palladium Drive Interchange, west of Huntmar Drive, it is recommended that the four-lane cross-section be continued all the way between Terry Fox Drive and Palladium Drive.

It is noteworthy that should development proposals arise for the lands west of Huntmar Drive and north of or internal to the Palladium Drive interchange, access could be provided to/from the existing road network, (Huntmar Drive/Palladium Drive) or by way of the westerly extension of Campeau Drive and/or the realignment of Huntmar Drive as has been indicated on the Kanata West Concept Plan. Note that Palladium Drive from its Campeau/Huntmar intersection west and south to its connection to the North-South Arterial is proposed to be a four-lane divided arterial. As noted in the KWDA concept plan, the corners of the loop ramps can/will be squared off as required by the construction of new roads, or access requirements to adjacent lands.

Again, due to the fact that there will be considerable residential, commercial and institutional development served by Maple Grove Road, the proposed four-lane cross-section is recommended to extend from Terry Fox Drive to Huntmar Drive.

Due to the commitment to protect the Bryanston Gate Community (Johnwoods Street) from traffic generated by the KWDA, the relocation of Maple Grove Road north of its current alignment west of Huntmar Drive has been identified as a necessity. With the anticipated dramatic change in traffic volumes on the road network from east to west of Huntmar Drive, however, it is recommended that the four-laning of Maple Grove Road extend only between Huntmar Drive and Terry Fox Drive and

Appendix E

Trip Generation Analysis: ‘Office Park’ Land Use

Trip Generation - Designated Land Uses

ITE Vehicle Trip Generation Rates

Land Use	Data Source	Trip Rate	
		AM Peak	PM Peak
Office Park	ITE 750	25.65	28.28

Modified Person Trip Generation Rates

Land Use	Data Source	Person Trip Rate	
		AM Peak	PM Peak
Office Park	ITE 750	33.35	36.76

Note: 1.3 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%

ITE Fitted Curve Equations

Land Use	Data Source	Fitted Curve Equation					
		AM Peak			PM Peak		
Office Park	ITE 750	T=	12.73(x)	+ 317.28	Ln(T)=	0.71Ln(x)	+ 4.29

Modified Person Trip Generation

Land Use	Data Source	Area	AM Peak (Person Trips/hr)			PM Peak (Person Trips/hr)		
			In	Out	Total	In	Out	Total
		Acres	92%	8%		15%	85%	
Office Park	ITE 750	ac82.	1,627	142	1,769	325	1,842	2,167
		Total	1,627	142	1,769	325	1,842	2,167

Total Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/hr)			PM Peak (Person Trips/hr)		
		In	Out	Total	In	Out	Total
Auto Driver	60%	977	86	1,063	195	1,106	1,301
Auto Passenger	15%	244	21	265	49	276	325
Transit	15%	244	21	265	49	276	325
Non-motorized	10%	162	14	176	32	184	216
Total Person Trips	100%	1,627	142	1,769	325	1,842	2,167
	Total 'New' Auto Trips	**977**	**86**	**1,063**	**195**	**1,106**	**1,301**

Total Site Vehicle Trip Generation

Travel Mode	AM Peak (veh/hr)			PM Peak (veh/hr)		
	In	Out	Total	In	Out	Total
Total Site Trip Generation	977	86	1,063	195	1,106	1,301
Total 'New' Auto Trips	**977**	**86**	**1,063**	**195**	**1,106**	**1,301**

Appendix F

SYNCHRO Capacity Analysis: Projected Stittsville Main/North-South Arterial Intersection

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	345	80	735	493	222
Future Volume (vph)	345	80	735	493	222
Lane Group Flow (vph)	435	84	774	519	234
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	36.0	15.0	54.0	39.0	39.0
Total Split (%)	40.0%	16.7%	60.0%	43.3%	43.3%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	14.6	27.5	27.5	16.7	16.7
Actuated g/C Ratio	0.26	0.49	0.49	0.30	0.30
v/c Ratio	0.50	0.19	0.47	0.51	0.38
Control Delay	20.0	9.2	10.5	19.9	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	9.2	10.5	19.9	5.1
LOS	B	A	B	B	A
Approach Delay	20.0		10.4	15.3	
Approach LOS	B		B	B	
Queue Length 50th (m)	18.6	3.6	21.6	22.8	0.0
Queue Length 95th (m)	35.9	13.3	51.4	47.4	14.5
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1849	461	2840	2118	1035
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	0.24	0.18	0.27	0.25	0.23

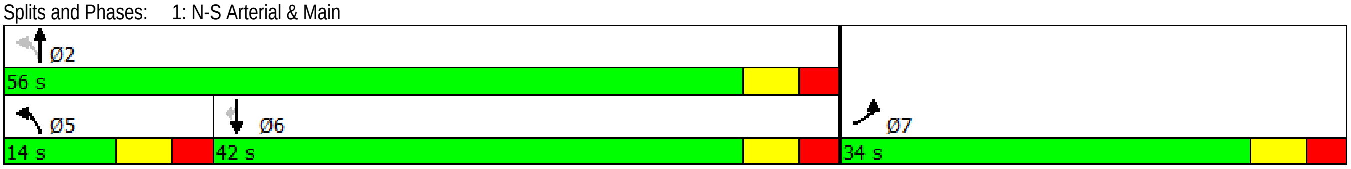
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 56.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 14.2	Intersection LOS: B
Intersection Capacity Utilization 48.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: N-S Arterial & Main

Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	353	94	663	803	384
Future Volume (vph)	353	94	663	803	384
Lane Group Flow (vph)	451	99	698	845	404
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	34.0	14.0	56.0	42.0	42.0
Total Split (%)	37.8%	15.6%	62.2%	46.7%	46.7%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	16.1	36.6	36.6	26.4	26.4
Actuated g/C Ratio	0.24	0.55	0.55	0.39	0.39
v/c Ratio	0.56	0.29	0.38	0.63	0.48
Control Delay	25.6	9.6	9.1	19.9	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	9.6	9.1	19.9	4.1
LOS	C	A	A	B	A
Approach Delay	25.6		9.2	14.8	
Approach LOS	C		A	B	
Queue Length 50th (m)	25.5	4.8	21.2	44.6	0.0
Queue Length 95th (m)	43.2	14.8	44.6	79.2	16.8
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1469	356	2514	1964	1049
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	0.31	0.28	0.28	0.43	0.39

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 67	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 15.0	Intersection LOS: B
Intersection Capacity Utilization 58.3%	ICU Level of Service B
Analysis Period (min) 15	

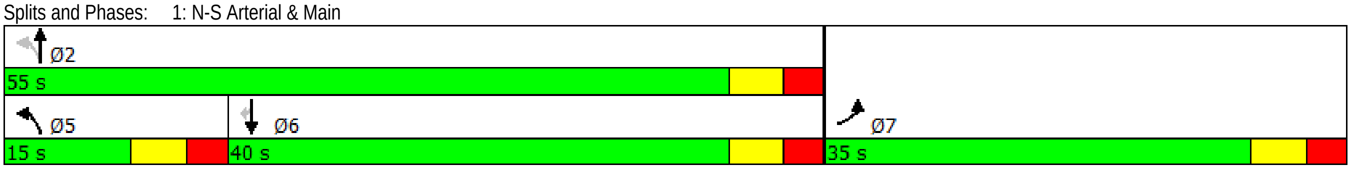
Splits and Phases: 1: N-S Arterial & Main



Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	420	100	925	633	282
Future Volume (vph)	420	100	925	633	282
Lane Group Flow (vph)	529	105	974	666	297
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	35.0	15.0	55.0	40.0	40.0
Total Split (%)	38.9%	16.7%	61.1%	44.4%	44.4%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	16.5	33.3	33.3	22.4	22.4
Actuated g/C Ratio	0.26	0.52	0.52	0.35	0.35
v/c Ratio	0.62	0.27	0.55	0.56	0.41
Control Delay	24.7	9.8	11.5	20.3	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	9.8	11.5	20.3	4.4
LOS	C	A	B	C	A
Approach Delay	24.7		11.3	15.4	
Approach LOS	C		B	B	
Queue Length 50th (m)	27.9	5.3	34.1	34.5	0.0
Queue Length 95th (m)	50.9	15.6	67.7	61.1	15.1
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1575	417	2594	1921	988
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	0.34	0.25	0.38	0.35	0.30

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 63.9	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 15.6	Intersection LOS: B
Intersection Capacity Utilization 56.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: N-S Arterial & Main

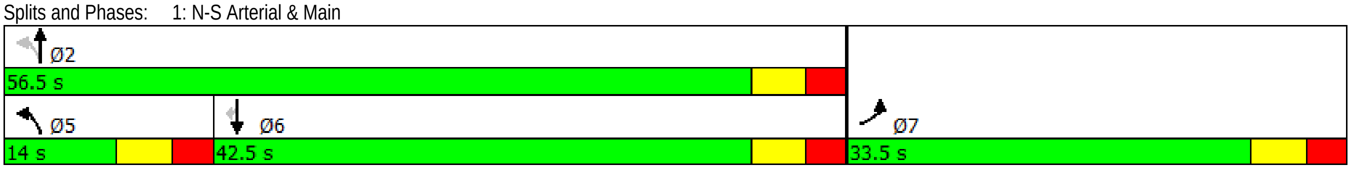


Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	438	114	843	1013	474
Future Volume (vph)	438	114	843	1013	474
Lane Group Flow (vph)	556	120	887	1066	499
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	33.5	14.0	56.5	42.5	42.5
Total Split (%)	37.2%	15.6%	62.8%	47.2%	47.2%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	18.7	43.7	43.7	33.3	33.3
Actuated g/C Ratio	0.25	0.58	0.58	0.44	0.44
v/c Ratio	0.68	0.43	0.46	0.72	0.53
Control Delay	30.3	12.7	10.4	22.4	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.3	12.7	10.4	22.4	4.0
LOS	C	B	B	C	A
Approach Delay	30.3		10.6	16.6	
Approach LOS	C		B	B	
Queue Length 50th (m)	39.3	6.9	33.7	67.9	0.0
Queue Length 95th (m)	55.1	17.3	59.6	107.7	18.0
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1220	288	2325	1680	1003
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	0.46	0.42	0.38	0.63	0.50

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 76
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 17.1 Intersection LOS: B
Intersection Capacity Utilization 68.6% ICU Level of Service C
Analysis Period (min) 15

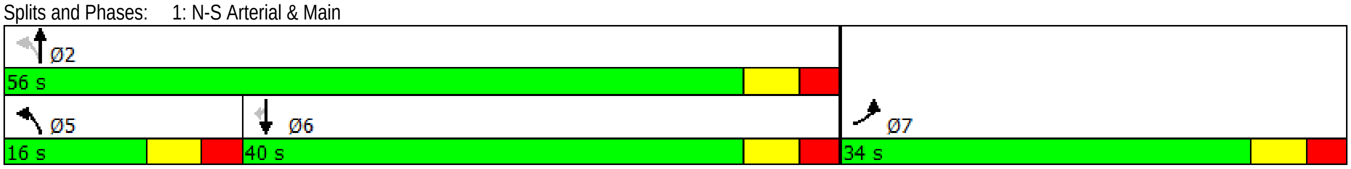
Splits and Phases: 1: N-S Arterial & Main



Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	500	120	1115	773	342
Future Volume (vph)	500	120	1115	773	342
Lane Group Flow (vph)	624	126	1174	814	360
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	34.0	16.0	56.0	40.0	40.0
Total Split (%)	37.8%	17.8%	62.2%	44.4%	44.4%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	19.5	39.0	39.0	27.5	27.5
Actuated g/C Ratio	0.27	0.54	0.54	0.38	0.38
v/c Ratio	0.70	0.36	0.64	0.63	0.45
Control Delay	28.9	11.5	13.6	22.5	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.9	11.5	13.6	22.5	4.3
LOS	C	B	B	C	A
Approach Delay	28.9		13.4	16.9	
Approach LOS	C		B	B	
Queue Length 50th (m)	40.4	7.6	52.7	50.2	0.0
Queue Length 95th (m)	62.6	18.3	89.0	79.6	16.6
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1329	379	2398	1674	931
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	0.47	0.33	0.49	0.49	0.39

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 72.3	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 17.9	Intersection LOS: B
Intersection Capacity Utilization 64.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: N-S Arterial & Main



Lane Group	EBL	NBL	NBT	SBT	SBR
Lane Configurations					
Traffic Volume (vph)	523	134	1023	1223	564
Future Volume (vph)	523	134	1023	1223	564
Lane Group Flow (vph)	662	141	1077	1287	594
Turn Type	Prot	pm+pt	NA	NA	Perm
Protected Phases	7	5	2	6	
Permitted Phases		2			6
Detector Phase	7	5	2	6	6
Switch Phase					
Minimum Initial (s)	10.0	5.0	10.0	10.0	10.0
Minimum Split (s)	33.5	11.5	31.5	31.5	31.5
Total Split (s)	33.5	12.0	56.5	44.5	44.5
Total Split (%)	37.2%	13.3%	62.8%	49.4%	49.4%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.8	2.8	2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5
Lead/Lag		Lead		Lag	Lag
Lead-Lag Optimize?		Yes		Yes	Yes
Recall Mode	None	None	Min	Min	Min
Act Effct Green (s)	21.5	49.3	49.3	37.2	37.2
Actuated g/C Ratio	0.26	0.59	0.59	0.44	0.44
v/c Ratio	0.78	0.72	0.54	0.86	0.59
Control Delay	34.7	34.8	12.3	28.7	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	34.7	34.8	12.3	28.7	4.3
LOS	C	C	B	C	A
Approach Delay	34.7		14.9	21.0	
Approach LOS	C		B	C	
Queue Length 50th (m)	49.1	9.3	50.2	93.5	0.0
Queue Length 95th (m)	67.4	#38.7	77.3	#148.8	18.5
Internal Link Dist (m)	357.4		899.5	800.6	
Turn Bay Length (m)	50.0	75.0			75.0
Base Capacity (vph)	1067	196	2031	1543	1014
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	0.62	0.72	0.53	0.83	0.59

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 83.8
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 21.4 Intersection LOS: C
Intersection Capacity Utilization 79.0% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: N-S Arterial & Main

Appendix G

SIDRA Capacity Analysis: Projected Stittsville Main/North-South Arterial Intersection

MOVEMENT SUMMARY

Site: NS Arterial & Main

AM Peak
Low Volumes
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: NS Arterial											
3	L	84	3.0	0.513	11.4	LOS B	2.3	17.7	0.51	0.97	40.4
8	T	774	3.0	0.513	11.3	LOS B	2.3	17.7	0.49	0.72	43.9
Approach		858	3.0	0.513	11.3	LOS B	2.3	17.7	0.49	0.75	43.5
North: NS Arterial											
4	T	519	3.0	0.365	7.3	LOS A	1.3	10.5	0.20	0.46	47.7
14	R	234	3.0	0.365	7.3	LOS A	1.3	9.9	0.20	0.55	46.5
Approach		753	3.0	0.365	7.3	LOS A	1.3	10.5	0.20	0.49	47.3
West: Stittsville Main											
5	L	363	3.0	0.292	8.3	LOS A	0.9	7.0	0.46	0.85	41.9
12	R	72	3.0	0.292	8.2	LOS A	0.9	6.7	0.44	0.72	45.3
Approach		435	3.0	0.292	8.3	LOS A	0.9	7.0	0.46	0.83	42.4
All Vehicles		2045	3.0	0.513	9.2	LOS A	2.3	17.7	0.38	0.67	44.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: NS Arterial & Main

PM Peak
Low Volumes
Roundabout

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
Movement Performance - Vehicles											
South: NS Arterial											
3	L	99	3.0	0.479	10.7	LOS B	2.0	15.5	0.49	0.96	40.7
8	T	698	3.0	0.479	10.6	LOS B	2.0	15.5	0.48	0.71	44.5
Approach		797	3.0	0.479	10.6	LOS B	2.0	15.5	0.48	0.74	43.9
North: NS Arterial											
4	T	845	3.0	0.613	12.0	LOS B	3.4	26.3	0.34	0.50	43.3
14	R	404	3.0	0.613	12.0	LOS B	3.2	24.8	0.32	0.57	42.4
Approach		1249	3.0	0.613	12.0	LOS B	3.4	26.3	0.33	0.52	43.0
West: Stittsville Main											
5	L	372	3.0	0.386	12.0	LOS B	1.3	10.1	0.59	0.92	39.4
12	R	79	3.0	0.386	11.7	LOS B	1.2	9.7	0.57	0.81	42.2
Approach		451	3.0	0.386	11.9	LOS B	1.3	10.1	0.58	0.90	39.9
All Vehicles		2497	3.0	0.613	11.6	LOS B	3.4	26.3	0.42	0.66	42.7

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: NS Arterial & Main

AM Peak
Med Volumes
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: NS Arterial											
3	L	105	3.0	0.684	17.4	LOS C	4.1	32.3	0.66	1.05	36.8
8	T	974	3.0	0.684	17.2	LOS C	4.1	32.3	0.65	0.87	39.4
Approach		1079	3.0	0.684	17.3	LOS C	4.1	32.3	0.65	0.88	39.1
North: NS Arterial											
4	T	666	3.0	0.475	9.1	LOS A	2.0	15.9	0.27	0.49	45.9
14	R	297	3.0	0.475	9.1	LOS A	1.9	14.9	0.26	0.56	44.9
Approach		963	3.0	0.475	9.1	LOS A	2.0	15.9	0.27	0.51	45.6
West: Stittsville Main											
5	L	442	3.0	0.397	10.9	LOS B	1.4	10.9	0.54	0.90	40.1
12	R	87	3.0	0.397	10.7	LOS B	1.3	10.4	0.53	0.79	43.0
Approach		529	3.0	0.397	10.9	LOS B	1.4	10.9	0.54	0.88	40.5
All Vehicles		2572	3.0	0.684	12.9	LOS B	4.1	32.3	0.48	0.74	41.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: NS Arterial & Main

PM Peak
Med Volumes
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: NS Arterial											
3	L	120	3.0	0.648	16.1	LOS C	3.6	28.1	0.64	1.03	37.5
8	T	887	3.0	0.648	15.9	LOS C	3.6	28.1	0.62	0.85	40.3
Approach		1007	3.0	0.648	16.0	LOS C	3.6	28.1	0.63	0.87	39.9
North: NS Arterial											
4	T	1066	3.0	0.780	18.9	LOS C	6.8	53.0	0.54	0.58	38.3
14	R	499	3.0	0.780	18.9	LOS C	6.4	50.2	0.52	0.63	37.6
Approach		1565	3.0	0.780	18.9	LOS C	6.8	53.0	0.54	0.60	38.1
West: Stittsville Main											
5	L	461	3.0	0.561	19.1	LOS C	2.2	17.1	0.73	1.00	35.4
12	R	95	3.0	0.561	18.6	LOS C	2.1	16.6	0.72	0.93	37.3
Approach		556	3.0	0.561	19.0	LOS C	2.2	17.1	0.73	0.99	35.7
All Vehicles		3128	3.0	0.780	18.0	LOS C	6.8	53.0	0.60	0.75	38.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: NS Arterial & Main

AM Peak
High Volumes
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: NS Arterial											
3	L	126	3.0	0.878	33.8	LOS D	8.6	67.0	0.88	1.21	29.7
8	T	1174	3.0	0.878	33.4	LOS D	8.6	67.0	0.87	1.13	30.7
Approach		1300	3.0	0.878	33.5	LOS D	8.6	67.0	0.87	1.14	30.6
North: NS Arterial											
4	T	814	3.0	0.588	11.6	LOS B	3.0	23.5	0.36	0.52	43.7
14	R	360	3.0	0.588	11.5	LOS B	2.8	22.1	0.34	0.59	42.8
Approach		1174	3.0	0.588	11.6	LOS B	3.0	23.5	0.35	0.54	43.4
West: Stittsville Main											
5	L	526	3.0	0.522	15.1	LOS C	2.1	16.3	0.63	0.95	37.5
12	R	98	3.0	0.522	14.8	LOS B	2.0	15.7	0.62	0.86	39.9
Approach		624	3.0	0.522	15.0	LOS C	2.1	16.3	0.63	0.94	37.9
All Vehicles		3098	3.0	0.878	21.4	LOS C	8.6	67.0	0.63	0.87	36.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

MOVEMENT SUMMARY

Site: NS Arterial & Main

PM Peak
High Volumes
Roundabout

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: NS Arterial											
3	L	141	3.0	0.837	29.4	LOS D	7.0	54.4	0.83	1.16	31.2
8	T	1077	3.0	0.837	29.1	LOS D	7.0	54.4	0.82	1.06	32.6
Approach		1218	3.0	0.837	29.1	LOS D	7.0	54.4	0.82	1.07	32.4
North: NS Arterial											
4	T	1287	3.0	0.953	38.7	LOS E	21.0	163.6	1.00	0.88	28.6
14	R	594	3.0	0.953	38.6	LOS E	20.1	156.8	1.00	0.87	28.3
Approach		1881	3.0	0.953	38.7	LOS E	21.0	163.6	1.00	0.88	28.5
West: Stittsville Main											
5	L	551	3.0	0.787	37.9	LOS E	3.9	30.7	0.87	1.15	27.8
12	R	111	3.0	0.787	36.7	LOS E	3.9	30.1	0.87	1.11	28.6
Approach		661	3.0	0.787	37.7	LOS E	3.9	30.7	0.87	1.14	27.9
All Vehicles		3760	3.0	0.953	35.4	LOS E	21.0	163.6	0.92	0.99	29.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Model used. Geometric Delay not included.

SIDRA INTERSECTION

Appendix H

Roundabout Feasibility Checklist

Roundabout Feasibility Checklist

Sites Where Roundabouts Are Often Advantageous: *roundabouts are often advantageous over other traffic control at the following locations and conditions*

Legend:
○ *Not applicable* ⦿ *Somewhat applicable* ● *Very applicable*

Location/Condition	Applicability to Apple Orchard/ Stagecoach	Notes
Intersections with historical safety problems	○	N/A – Future intersection
Intersections with relatively balanced traffic volumes	⦿	Higher north-south
Intersections with a high percentage of turning movements	●	Yes in east-west direction
Intersections with high traffic volumes at peak hours but relatively low traffic volumes during non-peak hours	●	Yes
Existing two-way stop-controlled intersections with high side-street delays (particularly those that do not meet signal warrants).	○	N/A – Future intersection
Intersections that must accommodate U-turns	○	Not critical here
Intersections at a gateway or entry point to a campus, neighborhood, commercial development, or urban area	●	Yes
Intersections where a community enhancement may be desirable	○	N/A – Future intersection
Intersections or corridors where traffic calming is a desired outcome of the project	⦿	Slower speeds could be desirable
Intersections where widening one or more approach may be difficult or cost-prohibitive, such as at bridge terminals	○	N/A – Future intersection
Intersections where traffic growth is expected to be high and future traffic patterns are uncertain	●	Yes
Locations where the speed environment of the road changes (for instance, at the fringe of an urban environment)	⦿	Possible consideration here
Locations with a need to provide a transition between land use environments (such as between residential and commercial uses).	⦿	Somewhat
Roads with a historical problem of excessive speeds	○	N/A – Future intersection

Sites At Which Caution Should Be Exercised With Roundabouts: *There are a number of locations and site conditions that often present complications or difficulties for installing roundabouts.*

Legend:
○ *Not applicable* ⦿ *Somewhat applicable* ● *Very applicable*

Location/Condition	Applicability to Apple Orchard/ Stagecoach	Notes
Intersections in close proximity to a signalized intersection where queues may spill back into the roundabout	○	No
Intersections located within a coordinated arterial signal system	●	Likely coordination for future signals
Intersections with a heavy flow of through traffic on the major street opposed by relatively light traffic on the minor street	⦿	Heavy north-south flow
Intersections with physical or geometric complications	⦿	Some complications with land use parcels
Locations with steep grades and unfavorable topography that may limit visibility and complicate construction	○	Not applicable
Intersections with heavy bicycle volumes	⦿	Potential for high bike vols
Intersections with heavy pedestrian volumes	⦿	Potential for high ped vols