OTY RESIDENTIAL DEVELOPMENT
200, 230 & 260 STEAMLINE STREET
OTTAWA, ONTARIO

TRANSPORTATION IMPACT ASSESSMENT
REVISED

Prepared for:

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June 22, 2018

117-669
TIA Report_2.doc

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MODULE 1 - SCREENING

A Screening Form has been prepared which is included as Exhibit 1 in the Appendix. The Trip Generation Trigger has been satisfied in the Screening Form, with the City of Ottawa staff review recommending that the assessment study proceed to the Scoping Form. The following will address the requirements of the Scoping Form.

MODULE 2 - SCOPING

MODULE 2.1 – Existing and Planned Conditions

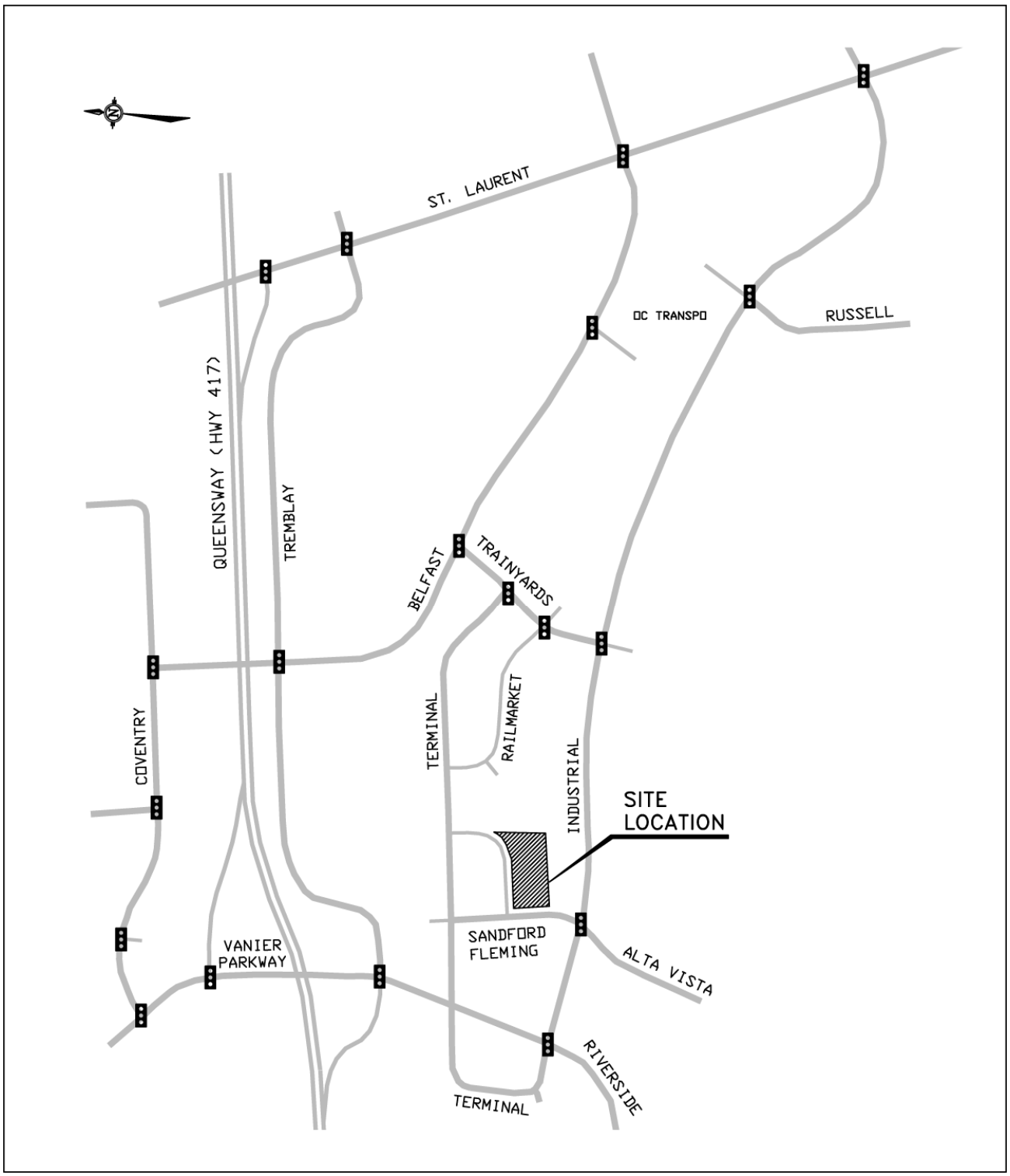
A Site Plan has been prepared for the development of land along Steamline Street which is part of the Ottawa Train Yards land. The proposed development is located along the south side of Steamline Street, between Sandford Fleming Avenue and Terminal Avenue. The location of the development is shown in Figure 2.1.

Element 2.1.1 – Proposed Development

The Site Plan proposes the development to consist of the construction of seven apartment buildings on a 3.529 ha parcel of land. The development will be constructed in three phases with the following showing the building number, number of units, and anticipated completion date.

PHASE 1		
Buildings 100 & 200	420 units	2021 completion
PHASE 2		
Buildings 300, 400 & 500	865 units	2027 completion
PHASE 3		
Buildings 600 & 700	605 units	2031 completion
Total Apartment Units	1,890 units	

FIGURE 2.1
SITE LOCATION PLAN



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The land currently has one commercial/industrial use building. The surrounding land uses consist of the Canada Post office complex to the west, retail shopping to the east, office development to the north, and commercial/industrial to the south. Steamline Street currently exists with a connection to Sandford Fleming Avenue. The street provides access to the commercial/industrial properties on both the north and south sides of Steamline Street.

The land is currently zoned "Transit Oriented Development Zone" (TOD) TD2[1979] which will support the proposed development. Amendments to the zoning may be required for the development.

The proposed development will have two access points onto Steamline Street. Steamline Street currently connects to Sandford Fleming Avenue approximately 125 m south of Terminal Avenue, and will be extended during Phase 3 of the development to Terminal Avenue approximately 320 m east of Sandford Fleming Avenue. A drop-off is proposed on Sandford Fleming Avenue for passengers and deliveries. The drop-off will have two access points onto Sandford Fleming Avenue which will have a separation of 35 m (centreline to centreline) and be restricted to one-way traffic.

The Site Plan provides 2,097 parking spaces for tenants and visitors for 1,890 dwelling units which is a 1.11 space per unit parking ratio. The number of parking spaces provided is below the 1.75 spaces per dwelling unit rate stipulated for a TOD site in the Zoning By-law. Access to both the surface and underground parking will be from the two proposed accesses onto Steamline Street. Figure 2.2 shows a plan of the proposed development.

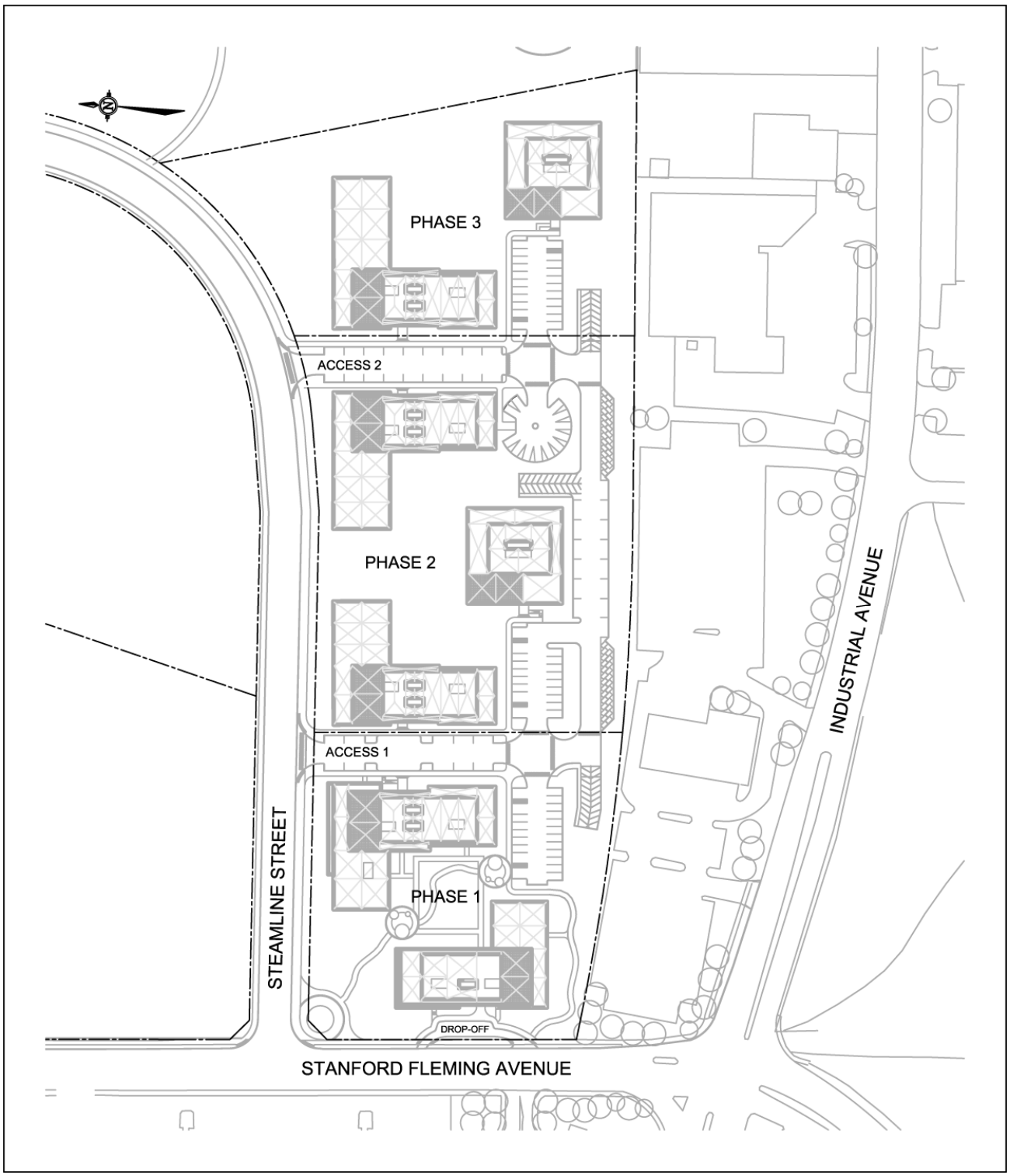
Element 2.1.2 – Existing Conditions

The apartment development will be located along Steamline Street which will connect to both Sandford Fleming Avenue and Terminal Avenue. Sandford Fleming Avenue is a two lane urban collector road with an unposted speed limit of 50 km./h. The pavement width is approximately 14 metres, with sidewalks along both sides of the roadway. Paid parking is permitted along the east side of the road with parking prohibited along the west side. There are no designated cycling lanes along the road.

The City of Ottawa *Transportation Master Plan* (TMP) has identified a "Major Pathway" in the Cycling Network - Primary Urban plan which would connect Industrial Avenue to Terminal Avenue. The pathway would then travel north along a route which has yet to be established. The land between the site's south property limit and Industrial Avenue is not owned by Ottawa Train Yards Inc. and any north-south pathway would not be able to connect to Industrial Avenue. The site plan has provided for a 3.0 m multi-use pathway along the south side of Steamline Street connecting to the existing sidewalks on both Sandford Fleming Avenue and Terminal Avenue.

Terminal Avenue is designated in the TMP as a collector road. The road is a two lane urban roadway with a posted speed limit of 50 km./h. The pavement is approximately 11 metres in width with parking restricted along the south side of the road. There is a sidewalk along the south side of the roadway which extends across the frontage of Walmart from Steamline Street to Railmarket Private. A sidewalk exists along the north side of Terminal Avenue from Sandford Fleming Avenue to the point where the south sidewalk terminates at the west limit of Walmart.

FIGURE 2.2
CONCEPTUAL SITE PLAN



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There are no cycling lanes along this portion of Terminal Avenue. In the fall of 2013 Terminal Avenue was open to two-way traffic between Sandford Fleming Avenue and Riverside Drive. In 2015 the traffic was changed back to bus only traffic westbound from Sandford Fleming Avenue to Riverside Drive as part of the construction of the Transitway/LRT.

Belfast Road is designated as a collector road with an unposted speed of 50 km./h. The road has a two lane cross-section east and west of the Belfast/Trainyards intersection, and a four lane urban cross-section at the approaches to Trainyards Drive. There is a sidewalk along the north side of the road. There are no cycling lanes along the road, but Belfast Road between Trainyards Drive and Coventry Road is identified as a "Major Pathway" in the Cycling Network - Primary Urban in the City of Ottawa *Transportation Master Plan* (TMP).

Trainyards Drive is a two lane urban roadway linking Belfast Road to Industrial Avenue. The road has an unposted speed limit of 50 km./h., with a sidewalk along the west side of the roadway and a multi-use pathway along the east side. Trainyards Drive is designated as a "Major Pathway" in the TMP.

Railmarket Private is a two lane private urban road which passes through the retail site linking Terminal Avenue to Trainyards Drive.

Industrial Avenue is designated in the *Transportation Master Plan* as a four lane undivided arterial roadway. The posted speed limit along Industrial Avenue is 60 km./h. There is a pedestrian sidewalk along the north side of the road. There are no designated cycling lanes along the road. Industrial Avenue is identified as a "Spine Route" in the TMP.

Riverside Drive is a four lane divided arterial road with a posted speed limit of 60 km./h. The road has pedestrian sidewalks along both sides of the road. Riverside Drive is identified as a "Spine Route" in the TMP, with no designated cycling lanes.

The intersection of Terminal Avenue and Sandford Fleming Avenue is controlled by all-way stop signs. The Terminal/Sandford Fleming intersection is a "T" intersection, with Terminal Avenue forming the eastbound and westbound approaches to the intersection, and Sandford Fleming Avenue the northbound approach. The southbound approach to the intersection is a private approach to the Canada Post parking lot. The following is the lane configuration:

NB Sandford Fleming Approach -	One shared left/through/right lane
Southbound Canada Post Driveway -	One shared left/through/right lane
Eastbound Terminal Approach -	One shared left/through lane
	One right turn lane
Westbound Terminal Approach -	One shared left/through/right lane

Note: Currently all westbound movements on Terminal Avenue west of Sandford Fleming Avenue is restricted to Buses Only. The NB approach functions as an exclusive right turn lane and a shared left/through lane due to the pavement width of the road

The Terminal/Railmarket intersection is a “T” intersection controlled by a stop sign at the northbound Railmarket Private approach. The eastbound and westbound Terminal Avenue approaches are single lanes with no exclusive turn lanes, and the northbound Railmarket Private approach consists of an exclusive left turn and right turn lane.

The Terminal/Trainyards intersection is essentially a “T” intersection with Trainyards Drive forming the northbound and southbound approaches, and Terminal Avenue the eastbound approach. A private driveway forms the westbound approach. The intersection is controlled by traffic signals with the following lane configuration:

Northbound Trainyards Approach -	One left turn lane
	One through lane
	One right turn lane
Southbound Trainyards Approach -	One shared left/through lane
	One right turn lane
Eastbound Trainyards Approach -	Two left turn lanes
	One shared through/right lane
Westbound Private Driveway -	One shared left/through/right lane

The Trainyards/Belfast intersection is a “T” intersection with Belfast Road forming the eastbound and westbound approaches, and Trainyards Drive the northbound approach. The intersection is controlled by traffic signals with the following lane configuration:

Northbound Trainyards Approach -	Two left turn lanes
	One right turn lane
Eastbound Belfast Approach -	One through lane
	One right turn lane
Westbound Belfast Approach -	One left turn lane
	Two through lanes

The Trainyards/Railmarket intersection is controlled by traffic signals. The lane configuration of the intersection is as follows:

Northbound Trainyards Approach -	One left turn lane
	One shared through/right lane
Southbound Trainyards Approach -	One left turn lane
	One through lane
	One right turn lane
Eastbound Railmarket Approach -	One left turn lane
	One shared through/right lane
Westbound New Retail Entrance -	One left turn lane
	One shared through/right lane

The Industrial/Trainyards intersection is a signalized intersection with Industrial Avenue forming the eastbound and westbound approaches, Trainyards Drive the southbound approach, and a private driveway to a commercial site forms the northbound approach. The lane configuration of the intersection is as follows:

Northbound Private Driveway -	One shared left/through/right lane
Southbound Trainyards Approach -	One left turn lane
	One shared through/right lane
Eastbound Industrial Approach -	One left turn lane
	One through lane
	One shared through/right lane
Westbound Industrial Approach -	One left turn lane
	One through lane
	One shared through/right lane

The Industrial/Sandford Fleming (Alta Vista) intersection is controlled by traffic signals, with Industrial Avenue forming the eastbound and westbound approaches, Sandford Fleming Avenue the southbound approach, and Alta Vista Drive the northbound approach. The intersection has a continuous eastbound right turn lane from Riverside Drive to Sandford Fleming Avenue (Alta Vista Drive). The lane configuration of the intersection is as follows:

Northbound Alta Vista Approach -	Two left turn lanes
	One shared through/right lane
SB Sandford Fleming Approach -	One left turn lane
	One through lane
	One right turn lane (channelized)
Eastbound Industrial Approach -	One left turn lane
	Two through lanes
	One right turn lane (channelized)
Westbound Industrial Approach -	One left turn lane
	One through lane
	One shared through/right lane

The Industrial (Terminal)/Riverside intersection is controlled by traffic signals, with Riverside Drive forming the northbound and southbound approaches, Terminal Avenue the eastbound approach, and Industrial Avenue the westbound approach. The lane configuration of the intersection is as follows:

Northbound Riverside Approach -	One left turn lane
	Three through lanes
	One right turn lane (channelized)
Southbound Riverside Approach -	Two left turn lanes
	Two through lane
	One right turn lane
Eastbound Terminal Approach -	One left turn lane
	One through lane
	One right turn lane
Westbound Industrial Approach -	Two left turn lanes
	One through lane
	Two right turn lanes (channelized)
	One right turn bus lane (channelized)

Driveways in close proximity to the site is the Canada Post main entrance which is located 85 m south of the Sandford Fleming/Steamline intersection, with loading docks located along the east side of the Canada Post building across from Steamline Street. Along Terminal Avenue the access to 405 Terminal Avenue is located 90 m west of the Terminal/Steamline intersection, and the access to Walmart is located 70 m east of the proposed intersection.

Transit service in the vicinity of Steamline Street comprises of routes along both Sandford Fleming Avenue and Terminal Avenue. These routes provide service to the downtown area and to Hurdman Transit Station. Bus stops are located at the Terminal/Sandford Fleming and Sandford Fleming/Steamline intersections. Hurdman Transit Station is located at a walk of approximately 900 m.

Traffic counts obtained from the City of Ottawa at intersections in the vicinity of the site has determined the weekday peak AM hour to occur between 7:30 and 9:30, and peak PM between 3:15 and 5:15. The time period for the peak volume of traffic was applicable to vehicular, cycling and pedestrian traffic. Figure 2.3 presents the existing peak hour traffic counts.

Element 2.1.3 – Planned Conditions

The City of Ottawa *Transportation Master Plan 2013* was reviewed to identify transit and roadway projects in the vicinity of the development. The document identified the Confederation LRT Line between Tunney's Pasture and Blair stations in the "2031 Affordable RTTP Network Projects", and the widening of Tremblay Road from two to four lanes between Pickering Place and St. Laurent Boulevard in the "2031 Affordable Road Network". Both projects would have a positive impact on the volume of site related trips.

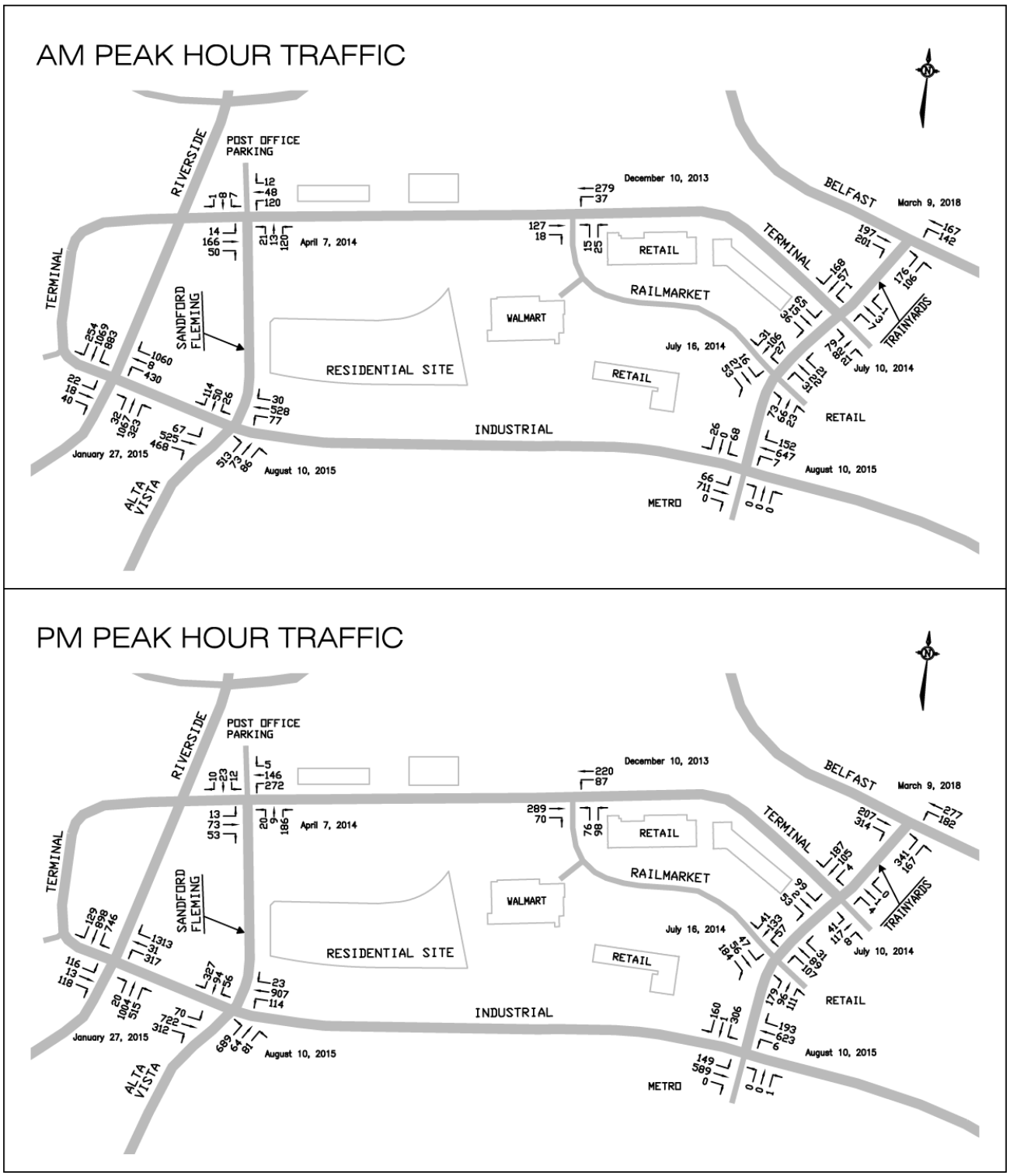
MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The study area was determined during a pre-consultation meeting with City staff which discussed the scope of the study and the impact of site trips from the proposed apartment development on the surrounding roads. It was determined that the traffic analysis should address the operation of the following intersections:

1. Sandford Fleming/Steamline intersection (proposed)
2. Terminal/Steamline intersection (proposed)
3. Terminal/Sandford Fleming intersection
4. Terminal/Railmarket intersection
5. Terminal/Trainyards intersection
6. Trainyards/Belfast intersection
7. Trainyards/Railmarket intersection
8. Industrial/Trainyards intersection
9. Industrial/Sandford Fleming (Alta Vista) intersection
10. Industrial (Terminal)/Riverside intersection

FIGURE 2.3
EXISTING PEAK AM AND PM HOUR TRAFFIC COUNTS



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Element 2.2.2 – Time Periods

The proposed apartment development would typically produce peak hour trips during the weekday AM hours as tenants leave for work and during the PM hours as tenants arrive home from work.

The adjacent land uses to the development comprise mainly of office/industrial with Canada Post west of the site, light industrial south of the site, and two office buildings located at 395 and 405 Terminal Avenue north of the site. These land uses generate peak hour trips during the weekday AM and PM hours with a very low number of trips on a Saturday.

The Ottawa Train Yards shopping centre is located east of the site with the peak hour trips occurring on a Saturday which are distributed mainly along Trainyards Drive to Industrial Avenue.

With the adjacent office/industrial uses on Sandford Fleming Avenue and Terminal Avenue generating peak hour trips on a weekday, the peak time periods for the analysis would be the weekday peak AM and PM hours which would be determined from traffic counts obtained from the City of Ottawa.

Element 2.2.3 – Horizon Years

The apartment development would be constructed in the following three phases:

Phase 1 – 2021
Phase 2 – 2027
Phase 3 – 2031

The TIA will examine the operation of the roads and intersections using the existing traffic counts, and at build out of each phase in 2021, 2027 and 2031. With the final phase planned for completion in 2031 which is beyond the immediate future and close to the horizon year of the *Transportation Master Plan* and *Official Plan*, the scope of work would not consider the "build out plus five years" time horizon as discussed in Element 2.2.3 of the TIA Guidelines.

MODULE 2.3 – Exemptions Review

The exemptions, which provide possible reductions to the scope of work of the TIA Study, were examined using Table 4: Possible Exemptions which is provided in the City's *Transportation Impact Assessment Guidelines (2017).*

There is not an equivalent volume of person-trips permitted under the established zoning for the lands. The number of parking spaces does not exceed the required parking ratio or number of parking spaces designated for a "Transit Oriented Development Zone". The development would be exempt from further examination under Module 4.8, Network Concept.

Utilizing the table, the following lists the possible exemptions proposed for the TIA Study report:

POSSIBLE EXEMPTIONS

MODULE	ELEMENT	EXEMPTION CONSIDERATIONS
Design Review Component		
4.1 Development Design	4.1.2 Circulation and Access	No - Access to the development and site circulation will be examined.
	4.1.3 New Street Networks	Yes - Only required for subdivisions.
4.2 Parking	4.2.1 Parking Supply	No - the supply of parking will be discussed.
	4.2.2 Spillover Parking	Yes - No spillover expected. Parking will be above that required by zoning.
Network Impact Component		
4.5 Transportation Demand Management	All Elements	No - TDM measures will be addressed.
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	No - Will examine the traffic along the adjacent local and collector streets and determine the function and role of the streets.
4.8 Network Concept		Yes - The site would not generate more than 200 person-trips per peak hour in excess of the volume permitted by established zoning.

MODULE 3 - FORECASTING

MODULE 3.1 – Development-generated Travel Demand

Element 3.1.1 – Trip Generation and Mode Shares

The proposed development consists of an apartment use which is located adjacent to a regional shopping centre and within walking distance to OC Transpo bus stops. The apartment development will be constructed in three phases with Table 3.1 showing the number of apartment units and expected completion date for each phase.

TABLE 3.1
PHASING OF THE DEVELOPMENT

PHASE 1		
Buildings 100 & 200	420 units	2021 completion
Total Units – Phase 1	420 units	
PHASE 2		
Buildings 300, 400 & 500	865 units	2027 completion
Total Units – Phase 1 & 2	1,285 units	
PHASE 3		
Buildings 600 & 700	605 units	2031 completion
Total Apartment Units	1,890 units	

The number of expected site generated trips utilized the trip statistical data documented in the *2009 TRANS Trip Generation Study* report. The analysis used the vehicle trip generation rates with transit bonus from Table 6.3 of the TRANS document for ITE Land Use Code 222 "High-rise apartments", and the blended directional distribution shown in Table 6.2 of the document. The trips rates are shown in Table 3.2 below.

TABLE 3.2
TRIP GENERATION RATES AND DIRECTIONAL SPLITS

Peak Hr. / Trip Rate	**Peak AM Hour**		**Peak PM Hour**	
Trip Rate	0.24 T/Unit		0.27 T/Unit	
	Inbound	**Outbound**	**Inbound**	**Outbound**
Directional Distribution	24%	77%	62%	39%

The development falls within the Transit Oriented Development area which would place a high priority on transit use. Table 3.3 presents the mode share of person-trips as discussed with staff of the City of Ottawa.

TABLE 3.3
MODE SHARE SUMMARY (Person-trips)

Future Mode Share Targets for the Development		
Travel Mode	**Mode Share Target**	**Rationale**
Transit	65%	The development is within the Transit Oriented Development area
Walking	13%	Due to the close proximity to the Train Yards shopping centre
Cycling	2%	Consistent with the City's *Official Plan*
Auto Passenger	5%	Consistent with modal share targets and proximity to employment and retail areas
Auto Driver	15%	

The site generated trips were determined by the product of the number of units for each phase during the peak hour (Table 3.1), and the trip rates shown in Table 3.2. The total number of auto trips for each phase is shown in Table 3.4. The person-trips were determined by the number of auto trips divided by the mode share for the number of vehicle-trips. The mode share used was from Table 3.13 of the 2009 TRANS Trip Generation report for an apartment use in an urban area inside the green belt. The mode share is 0.37 vehicle-trips for the peak AM hour and 0.40 vehicle-trips for the peak PM hour. Table 3.4 shows the future peak hour person-trips, and includes the Trip Reduction Factor for the existing building on site. The Trip Reduction Factor for the existence of an existing building and use is explained below:

- The existing site is currently occupied by a light industrial land use which will be replaced by the proposed apartment development. The building is currently unoccupied and is ready for demolition. The building comprises of a three storey office/commercial building and an attached single storey industrial building. The building use and zoning would be for an ITE Land Use 110 "General Light Industrial" with a gross floor area of approximately 5,400 m^2 (58,125 ft^2). The number of existing site trips which will be replaced by the proposed apartment development will be accounted for as a trip reduction in the vehicular trip generation table in the Analysis module. It was determined that during the peak AM hour there would be 47 vehicles entering the site and 6 exiting, and during the peak PM hour 7 vehicles would be entering and 49 vehicles exiting the site. The calculated vehicle-trips were converted to person-trips using a 1.28 trip rate as stated in the TIA Guidelines. The person-trips were calculated as 68 trips during the peak AM hour and 72 during the peak PM hour. The person-trips from the existing buildings on site were subtracted from the site generated future person-trips in Table 3.4.

TABLE 3.4
TOTAL PEAK HOUR SITE GENERATED TRIPS

Trips / Phase	AUTO-TRIP GENERATION		FUTURE PERSON-TRIPS	
	PEAK AM HR.	PEAK PM HR.	PEAK AM HR.	PEAK PM HR.
PHASE 1 420 Units	101 veh.	113 veh.	273 per. -68 per. 205 per.	283 per. -72 per. 211 per.
PHASE 2 1,285 Units	308 veh.	347 veh.	832 per. -68 per. 764 per.	868 per. -72 per. 796 per.
PHASE 3 1,890 Units	453 veh.	510 veh.	1,224 per. -68 per. 1,156 per.	1,275 per. -72 per. 1,203 per.

The peak hour person-trips were determined by the product of the peak hour future person-trips from Table 3.4 and the future mode share from Table 3.3. The results are shown in Table 3.5.

Element 3.1.2 – Trip Distribution

The distribution of site generated trips for the proposed apartment development was determined from the projected population and employment growth at the year 2021, and examination of the existing traffic pattern in the area. The trip distribution which will be utilized in the study for both the weekday peak AM hour and PM hour was as follows:

To/From the north	along Riverside Drive & Vanier Parkway	30%
	along Belfast Road	5%
To/From the south	along Riverside Drive	20%
	along Alta Vista Drive	10%
	along Industrial Ave. and St. Laurent Blvd.	10%
To/From the east	along Belfast Rd. and St. Laurent Blvd.	10%
	along Industrial Ave. and Innes Road	15%

Element 3.1.3 – Trip Assignment

The trip assignment has examined the site generated trips with respect to the shortest and most convenient routes to/from the development. The study has assumed that the westbound Terminal Avenue traffic to Riverside Drive will be open to automobile traffic following the completion of the LRT and modifications to the Hurdman Transit Station. Figure 3.1 shows the trip assignment for the apartment development.

TABLE 3.5
PEAK HOUR FUTURE DEVELOPMENT GENERATED PERSON-TRIPS

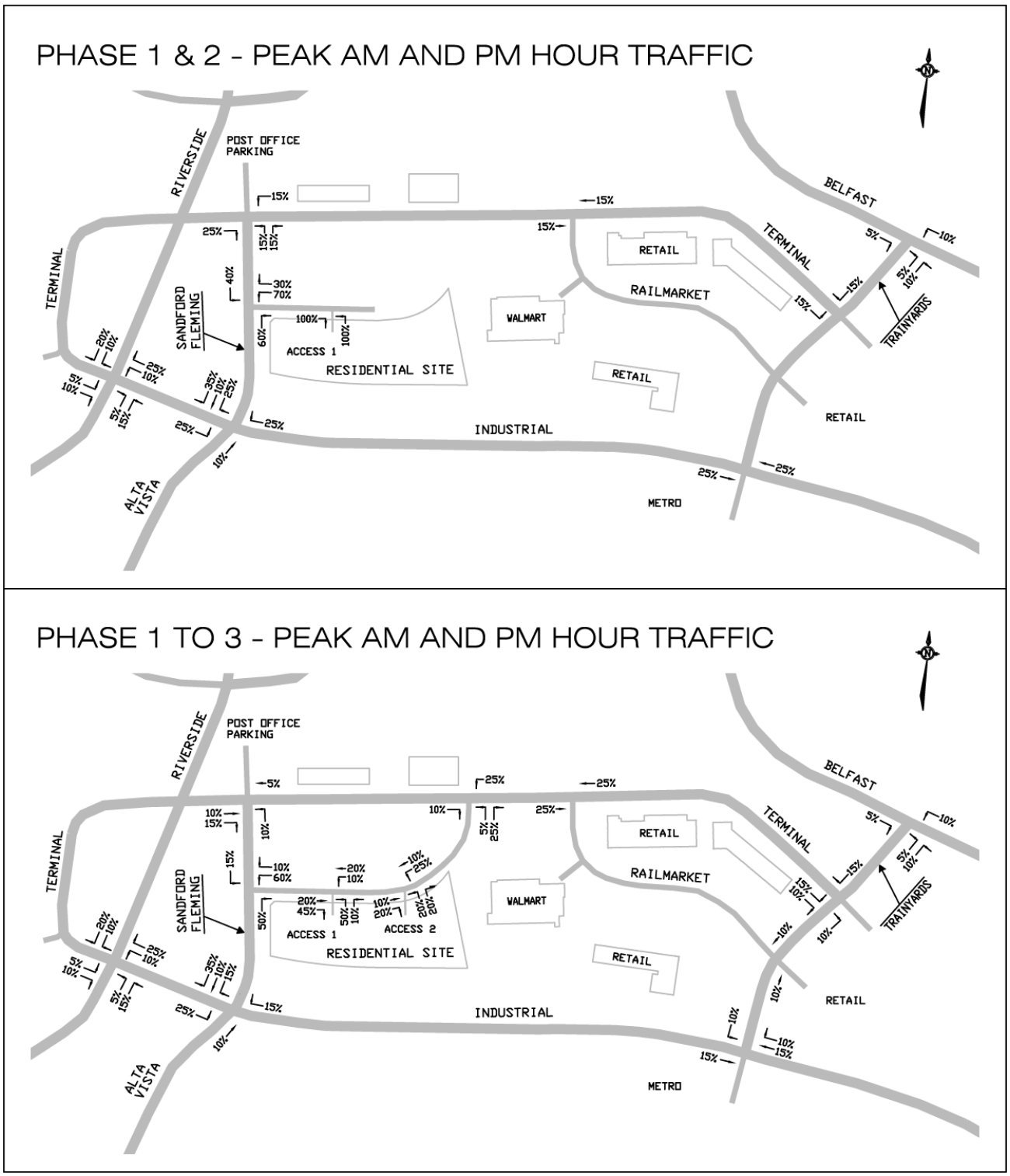
TRAVEL MODE	DEVELOPMENT GENERATED PERSON-TRIPS	
	PEAK AM HOUR	PEAK PM HOUR
PHASE 1		
Transit	133 per./trips	137 per./trips
Walking	27 per./trips	28 per./trips
Cycling	4 per./trips	4 per./trips
Auto Passenger	11 per./trips	11 per./trips
Auto Driver	30 per./trips	31 per./trips
PHASE 2		
Transit	497 per./trips	518 per./trips
Walking	100 per./trips	104 per./trips
Cycling	15 per./trips	16 per./trips
Auto Passenger	38 per./trips	40 per./trips
Auto Driver	114 per./trips	118 per./trips
PHASE 3		
Transit	752 per./trips	782 per./trips
Walking	151 per./trips	157 per./trips
Cycling	23 per./trips	24 per./trips
Auto Passenger	58 per./trips	61 per./trips
Auto Driver	172 per./trips	179 per./trips

Element 3.2.1 – Transportation Network Plans

The City of Ottawa *Transportation Master Plan 2013* was reviewed to identify transit and roadway projects in the vicinity of the development. The document identified the Confederation LRT Line between Tunney's Pasture and Blair stations in the "2031 Affordable RTTP Network Projects", and the widening of Tremblay Road from two to four lanes between Pickering Place and St. Laurent Boulevard in the "2031 Affordable Road Network". Both projects would have a positive impact on the volume of both pedestrian and vehicular site related trips.

On a smaller scale, development in close proximity to the apartment development would consist of the office building at 405 Terminal Avenue. The construction of the building is substantially complete, but the building has not been occupied to date.

FIGURE 3.1
PEAK AM AND PM HOUR TRIP ASSIGNMENT



Element 3.2.2 – Background Growth

To determine the growth in background traffic, the study has compared historical traffic counts obtained from the City of Ottawa at major intersections in the vicinity of the development. The counts taken in 2009/2010 at the Industrial/Sandford Fleming, Industrial/Riverside, Industrial/Trainyards and Terminal/Trainyards were compared to the traffic from the 2015 counts. The counts showed that over the 5 or 6 year time period, the volume of traffic was relatively the same with traffic at some approach movements decreasing over time while others increased. Increases in traffic were attributed to the 395 Terminal Avenue office building and more retail which was constructed at the Ottawa Train Yards (OTY) shopping centre. From historical traffic counts, previous studies have determined the growth in background traffic from outside the study area to be at an annual rate of 0.7 percent. The study has therefore increased all municipal road traffic volumes by an annual compounded rate of 1.0 percent to account for development outside the proposed apartment development and Ottawa Train Yards shopping centre.

Element 3.2.3 – Other Developments

Local developments which will be accounted for in the background traffic are the expected trips from the 405 Terminal Avenue office building. The building is substantially complete but currently is unoccupied. The expected trips would be estimated from the TIS report prepared for the building development.

The commercial/industrial building at 400 Terminal Avenue located between Steamline Street and Terminal Avenue will be demolished in the summer of 2018. The background traffic has accounted for the reduction in trips from the site. The trips were determined from a gross floor area of the building of 3,505 m^2 (37,720 ft^2) and the ITE Land Use 110 "General Light Industrial". Figure 3.2 presents the background traffic at the year 2021 following the completion of Phase 1, Figure 3.3 the background traffic at 2027 following the completion of Phase 1 & 2, and Figure 3.4 the 2031 background traffic at the completion of Phase 1 to 3.

MODULE 4 – ANALYSIS

MODULE 4.1 – Development Design

Element 4.1.1 – Design for Sustainable Modes

The site plan is consistent with the City of Ottawa Planning and Design Guidelines by placing the parking lots within the site with the majority of parking placed in an underground parking garage. Surface parking is placed close to the apartment building accesses but within the site at a distance from the municipal street which would provide a visual separation. The site contains two access points onto Steamline Street for vehicular traffic.

The site plan provides a 3.0 m multi-use pathway along the south side of Steamline Street adjacent to the site, and a 1.85 m sidewalk along the north side. The site has an internal sidewalk/pathway network connecting the buildings to the sidewalks along Steamline Street.

FIGURE 3.2
PHASE 1 – 2021 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

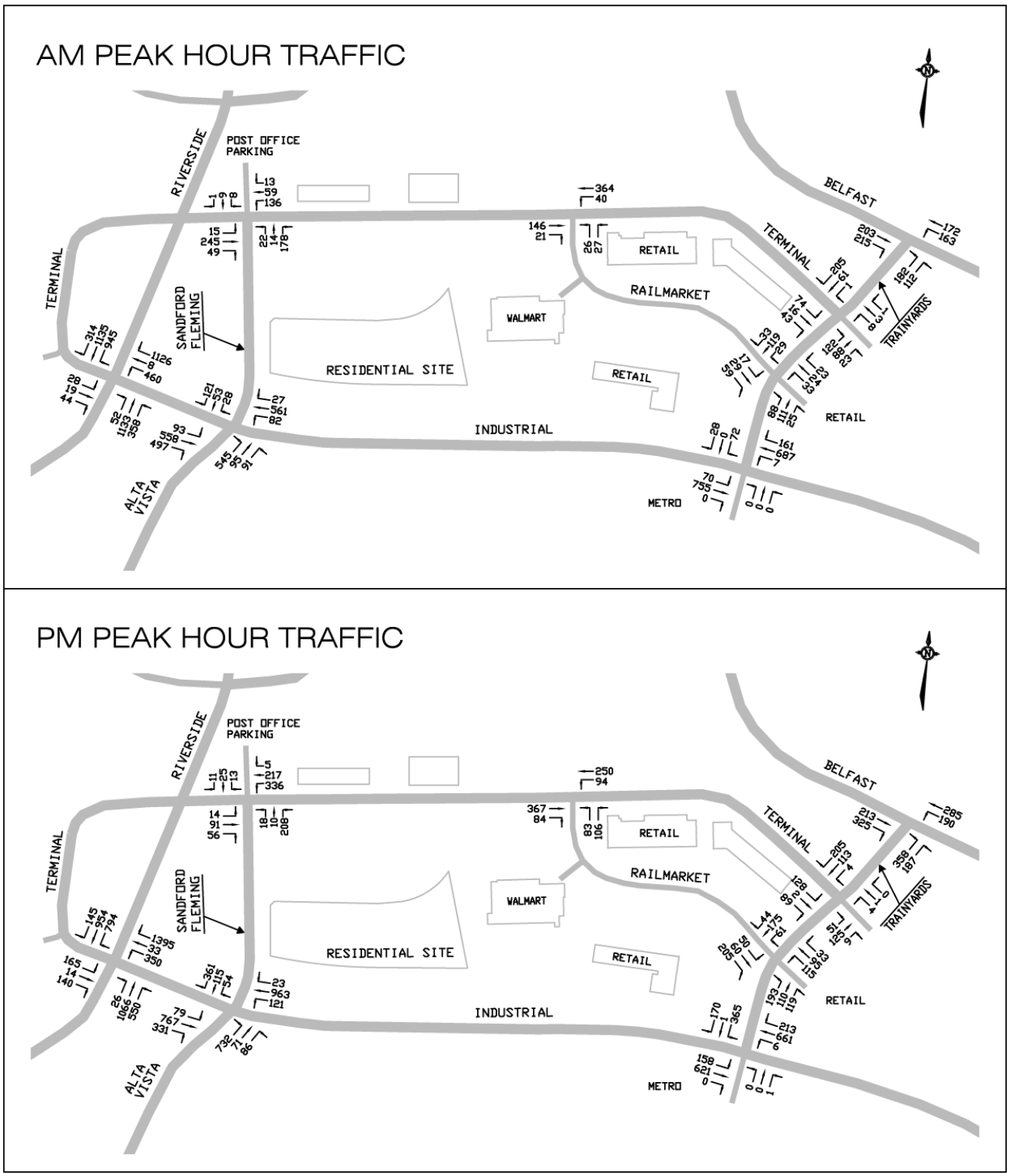


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FIGURE 3.3
PHASE 1 & 2 – 2027 PEAK AM AND PM HOUR BACKGROUND TRAFFIC

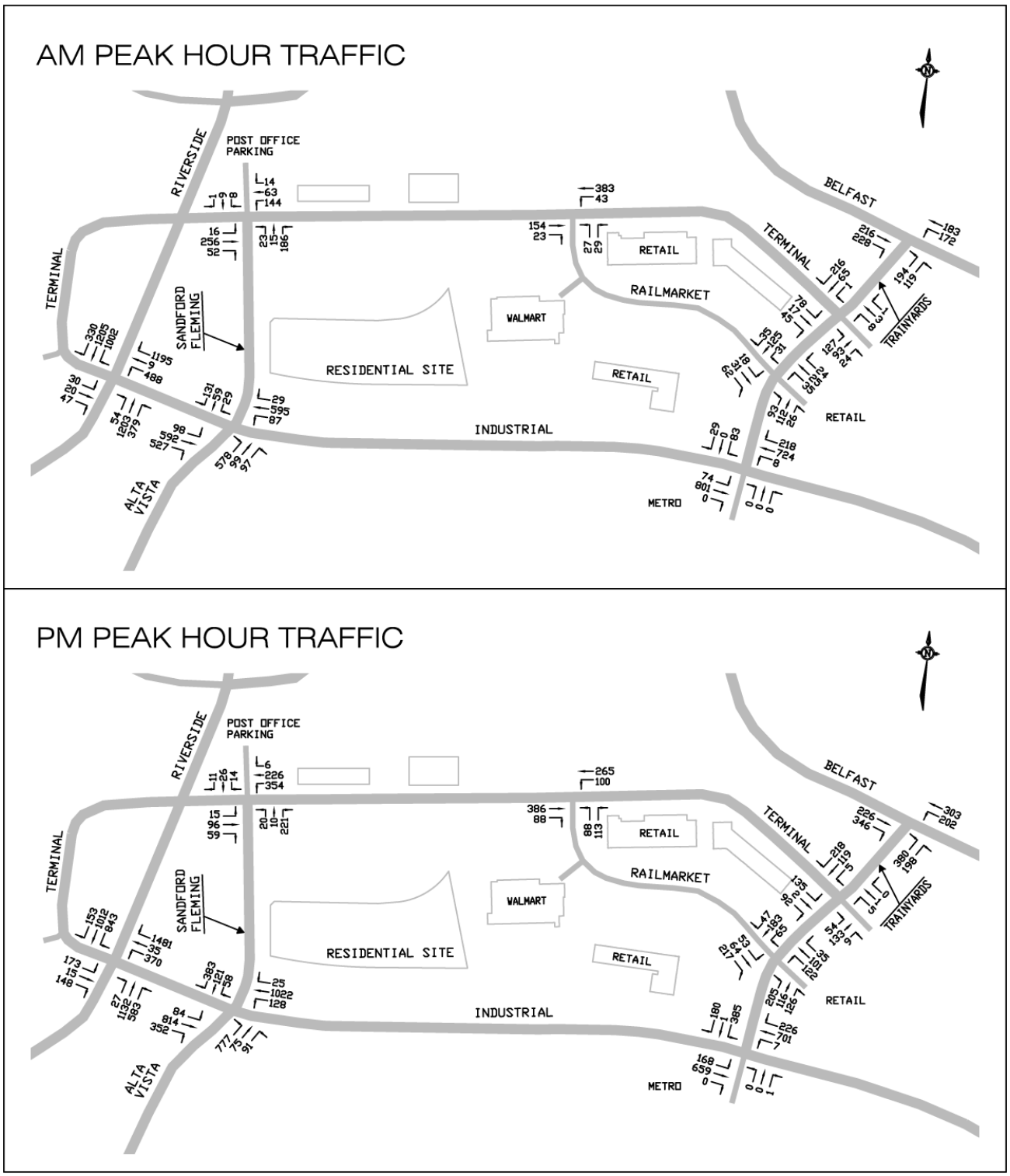
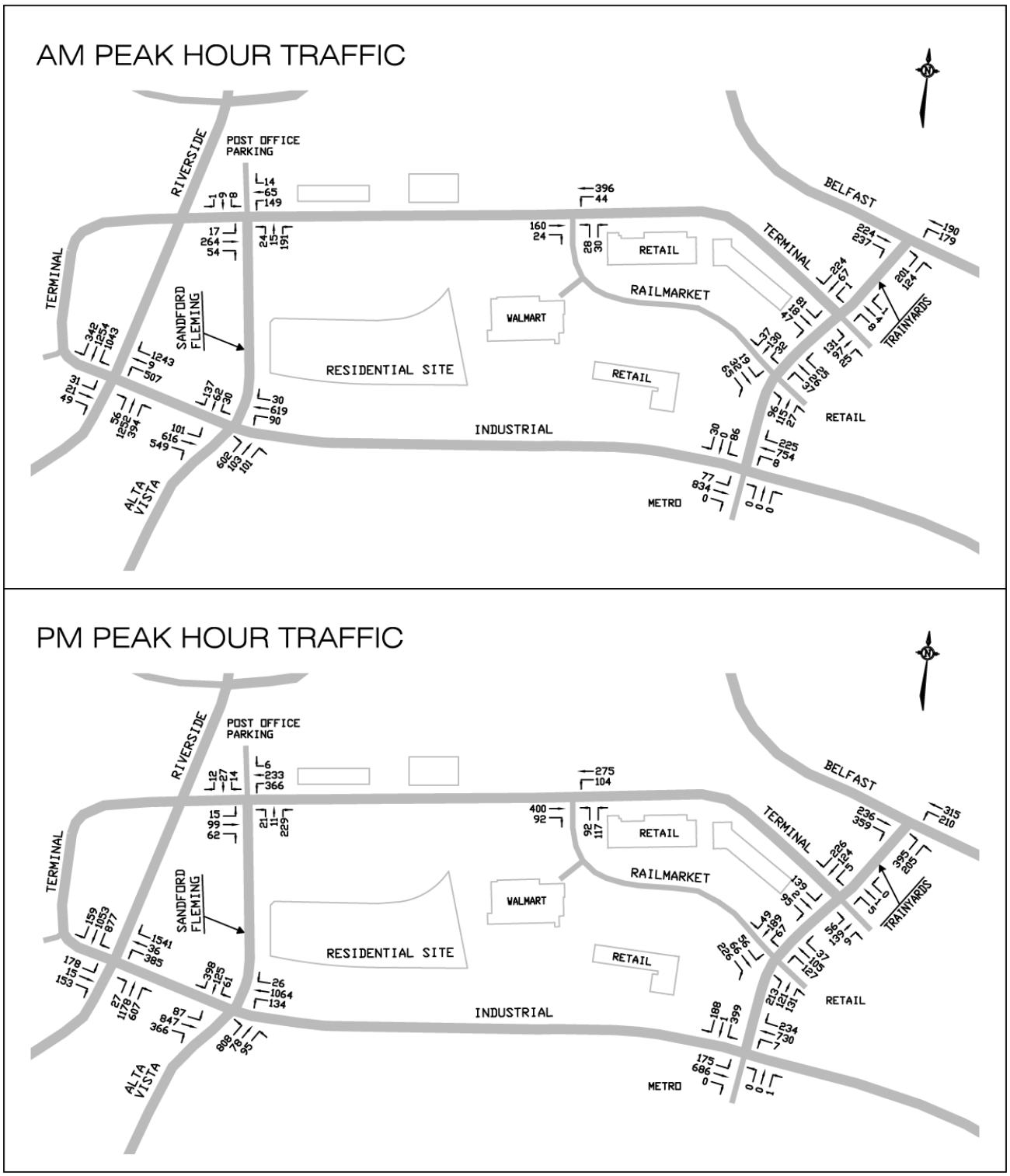


FIGURE 3.4
PHASE 1 to 3 – 2031 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



NOT TO SCALE

Bicycle storage racks for tenants are provided in the parking garage and would access the city streets from the garage to Steamline Street. Visitor bike racks are placed close to the building entrances.

OC Transpo bus stops are currently located along Sandford Fleming Avenue and at the Terminal/Sandford Fleming intersection. The site is located at an approximate walking distance of 900 m from the Hurdman Transit Station, and in close proximity to the LRT station at the Tremblay Road VIA rail station.

Element 4.1.2 – Circulation and Access

The apartment development provides two site access points onto Steamline Street. The access meets the requirements for a fire route and would allow single unit garbage trucks to access the garbage containers which are located on the garbage pad at the south limit of the site. All moving trucks will enter/exit the site from Steamline Street and load/unload within the site.

MODULE 4.2 – Parking

Element 4.2.1 – Parking Supply

The Site Plan shows parking at full development of the site (Phases 1 to 3) to have a total of 2,097 parking spaces. The number of parking spaces meets the "Transit Oriented Development Zone" for the lands. The demand for parking would be for the storage of a minimum of 1 vehicle per apartment unit, which the site would provide a parking ratio of 1.06 spaces per unit including visitor parking.

Bicycle parking will be accommodated in the underground garage. Storage racks will provide space for 946 bicycles for the total Phase 1 to 3 of the development.

Element 4.2.2 – Spillover Parking

The Site Plan provides sufficient parking for both residents and for visitors. Steamline Street will not provide any on-street parking. Spillover parking is not expected to be an issue.

MODULE 4.3 – Boundary Street Design

The City of Ottawa Complete Streets concept allows for the safe movement of everyone whether they choose to walk, bike, drive or take public transit. The boundary roads to the site would consist of the existing streets of Sandford Fleming Avenue and Terminal Avenue.

Sandford Fleming Avenue is a collector road linking Industrial Avenue to Terminal Avenue. The road has an urban cross-section with a pavement width of approximately 14 m. OC Transpo provides bus service along the road which connects to the Hurdman Transit Station. Sidewalks are provided along both sides of the road which allows pedestrian access to the Hurdman Transit Station and the Ottawa Train Yards shopping centre. Although not identified in the TMP as a cycling route, Sandford Fleming is of sufficient width to accommodate cycling.

Terminal Avenue is an urban collector road with a pavement width of 11 m. OC Transpo provides service along Terminal Avenue to the Hurdman Transit Station, and to the downtown core to the north and Billings Bridge Plaza to the south. Sidewalks currently exist along the north side of the road, east of Sandford Fleming Avenue to the approximate location of the extension of Steamline Street to Terminal Avenue. A multi-use pathway is proposed across the frontage of the site (south side of Steamline Street) which will connect to the portion of sidewalk adjacent to Walmart which will allow the safe movement of pedestrians along sidewalks to the retail at the Ottawa Train Yards shopping centre. The road is not designated as a cycling route in the TMP, but would provide a route to a major pathway along Trainyards Drive and the recreational pathway along the Rideau River.

Table 4.1 shows the collision history over a five year period between January 1, 2012 and December 31, 2016 for the intersections along the boundary roads. The collision data determined a pattern of rear end collisions being the most prominent form of collision which would be mainly attributed to a high volume of traffic. Intersections along Industrial Avenue between Riverside Drive and Trainyards Drive experienced the most collisions, with intersections along Sandford Fleming Avenue and Terminal Avenue experiencing a relatively low number of collisions for each pattern type. All intersections examined experienced more than six collisions in five years with the exception of the Sandford Fleming/Terminal and Terminal/Trainyards intersections.

The boundary streets provide the elements which would maximize the objectives of the Multi-Modal Level of Service (MMLOS).

MODULE 4.4 – Access Intersection Design

Element 4.4.1 – Location and Design of Access

The apartment development site would be located on the south side of Steamline Street. Steamline Street would be classified as a local street with a 20 m right-of-way and a pavement width of 11 m. The Site Plan proposes two access points onto Steamline Street. The first access, which will be referred to as Access 1 in the report, is located approximately 112 m east of Sandford Fleming Avenue (centreline to centreline) and would have a clear throat length of 65 m. The second access, referred to as Access 2, is located approximately 130 m east of the first access (centreline to centreline) and would provide a clear throat length of 70 m. Both Access 1 and Access 2 will have a pavement width of 6.7 m.

Steamline Street is an existing street with access to Sandford Fleming Avenue which is located 125 m south of Terminal Avenue. At Phase 3 of the development, Steamline Street will be extended to Terminal Avenue at an intersection 320 m east of Sandford Fleming Avenue.

The commercial/industrial on the north side of Steamline Street is scheduled to be demolished in the summer of 2018. Any accesses to future development for the site will align with the accesses to the apartment development. Along Sandford Fleming Avenue there is an access to the Canada Post facility which is located 85 m south of Steamline Street. Along Terminal Avenue there is an access to the office building at 405 Terminal Avenue which is located approximately 80 m west of the proposed Terminal/Steamline intersection.

TABLE 4.1
BOUNDARY ROAD COLLISION SUMMARY AT INTERSECTIONS (2012 to 2016)

YEAR	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER	TOTAL
Sandford Fleming Avenue and Terminal Avenue Intersection						
2016	0	0	0	0	0	0
2015	0	0	0	1	0	1
2014	0	0	0	0	1	1
2013	3	0	0	0	0	3
2012	0	0	0	0	0	0
Industrial Avenue and Sandford Fleming Avenue Intersection						
2016	10	2	6	3	0	21
2015	7	1	3	4	0	15
2014	9	0	4	1	0	14
2013	5	1	5	3	1	15
2012	6	5	3	3	0	17
Industrial Avenue and Riverside Drive Intersection						
2016	11	3	0	5	1	20
2015	22	2	2	13	0	39
2014	24	2	1	7	1	35
2013	17	0	3	3	0	23
2012	17	2	1	3	3	26
Terminal Avenue and Trainyards Drive Intersection						
2016	0	1	1	0	0	2
2015	0	2	0	0	1	3
2014	0	0	0	0	0	0
2013	0	0	0	0	0	0
2012	0	0	0	0	0	0
Trainyards Drive and Belfast Road Intersection						
2016	0	0	0	0	0	0
2015	0	1	1	0	1	3
2014	0	0	0	0	0	0
2013	3	1	2	2	1	9
2012	2	0	0	0	1	3
Trainyards Drive and Railmarket Private Intersection						
2016	1	2	0	1	0	4
2015	0	3	0	0	0	3
2014	1	1	0	0	0	2
2013	0	0	0	0	0	0
2012	0	0	0	0	0	0
Industrial Avenue and Trainyards Drive Intersection						
2016	3	0	0	0	0	3
2015	2	0	3	3	0	8
2014	2	0	1	3	0	6
2013	0	0	0	0	0	0
2012	0	0	0	0	0	0

Element 4.4.2 – Intersection Control

The intersection traffic controls for the Sandford Fleming/Steamline and Terminal/Steamline intersections were analyzed utilizing the traffic signal warrant analysis as documented in the Ministry of Transportation publication, *Geometric Design Standards for Ontario Highways*. The analysis determined that the Sandford Fleming/Steamline intersection met 40 percent of the warrants and the Terminal/Steamline intersection 6 percent of the warrants for the installation of traffic control signals. Exhibit 2 in the Appendix presents the warrant analysis for the Sandford Fleming/Steamline intersection and Exhibit 3 the Terminal/Steamline intersection. Both intersections should be designed as two-way stop controlled intersections.

Element 4.4.3 – Intersection Design

The intersection analysis will use the *Highway Capacity Software, Version 7.4,* which utilizes the intersection capacity analysis procedure as documented in the *Highway Capacity Manual 2010 and 6th Edition*. For unsignalized intersections the level of service of each lane movement and approach is determined as a function of the delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected delay at the approach.

LEVEL OF SERVICE	DELAY	
Level of Service A	0-10 sec./vehicle	Little or No Delay
Level of Service B	>10-15 sec./vehicle	Short Traffic Delays
Level of Service C	>15-25 sec./vehicle	Average Traffic Delays
Level of Service D	>25-35 sec./vehicle	Long Traffic Delays
Level of Service E	>35-50 sec./vehicle	Very Long Traffic Delays
Level of Service F	>50 sec./vehicle	Extreme Delays – Demand Exceeds Capacity

The expected length of queue at the critical lane movements for an unsignalized intersection was determined by the calculation of the 95th percentile queue at the lane approach. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicles.

For a signalized intersection, the operation or level of service of an intersection is determined from the volume to capacity ratio (v/c) for each lane movement as documented by the City of Ottawa in the *Transportation Impact Assessment Guidelines (2017).* The following relates the level of service with the volume to capacity ratio at each lane movement.

LEVEL OF SERVICE	VOLUME TO CAPACITY RATIO
Level of Service A	0 to 0.60
Level of Service B	0.61 to 0.70
Level of Service C	0.71 to 0.80
Level of Service D	0.81 to 0.90
Level of Service E	0.91 to 1.00
Level of Service F	> 1.00

The operational analysis of intersections has used the most current traffic counts and traffic signal timing plans which were obtained from the City of Ottawa.

The number of new site generated trips was determined utilizing the Peak Hour Future Development Generated Person-Trips (Table 3.5). One person-trip for an auto driver from the table would represent one vehicular trip. The number of new site generated trips was determined for each of the three phases of development.

PEAK HOUR SITE GENERATED TRIPS

Phase 1 would comprise of 420 apartment units, Phase 1 & 2 has a total of 1,285 apartments, and Phase 1 to 3 has a total of 1,890 apartments. The auto driver trips from Table 3.5 were proportioned to trips entering and exiting the site at the percentages shown in Table 3.2. The total number of site generated trips at each Phase is presented in Table 4.2.

TABLE 4.2
PHASES 1 to 3 - PEAK HOUR SITE TRIPS GENERATED

PHASES	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Phase 1	30	7 (24%)	23 (77%)	31	19 (62%)	12 (39%)
Phases 1 & 2	114	27 (24%)	87 (77%)	118	72 (62%)	46 (39%)
Phases 1 to 3	172	41 (24%)	131 (77%)	179	110 (62%)	69 (39%)

The number of new trips generated by the site was proportioned onto the surrounding roads using the trip assignment distribution presented in Figure 3.1. The distribution of new site generated trips for Phase 1 is shown in Figure 4.1 and for Phases 1 & 2 in Figure 4.2. Both phases would have access to Sandford Fleming Avenue from Steamline Street.

Phases 1 to 3 would be the completion of the development which would provide 1,890 apartment units. At the completion of Phase 3, access to the site would be from Steamline Street which would connect to both Sandford Fleming Avenue and Terminal Avenue. Figure 4.3 shows the distribution of site generated trips.

TOTAL PEAK AM AND PM HOUR TRAFFIC

The total traffic generated by the site was determined for each phase of the development. The total traffic is the sum of the peak hour background traffic, Figure 3.2 (2021), Figure 3.3 (2027) and Figure 3.4 (2031), and the site generated trips provided as Figure 4.1 for Phase 1, Figure 4.2 for Phases 1 & 2 and Figure 4.3 for Phases 1 to 3. Figure 4.4 presents the total peak AM and PM hour traffic at the year 2021 (Phase 1), Figure 4.5 at the year 2027 (Phases 1 & 2) and Figure 4.6 the peak hour traffic at the year 2031 (Phases 1 to 3).

FIGURE 4.1
PHASE 1 – PEAK AM AND PM HOUR SITE GENERATED TRIPS

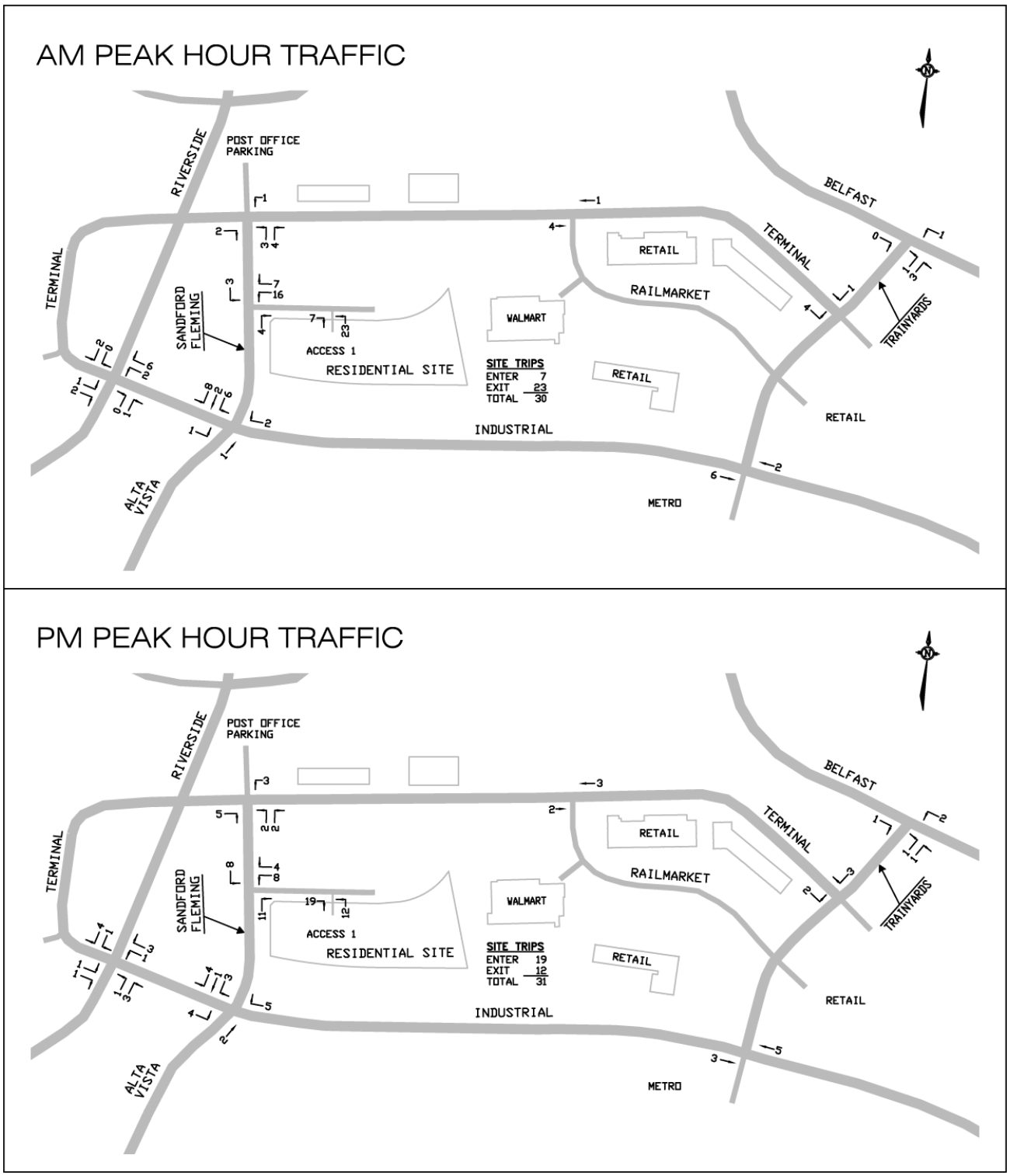


FIGURE 4.2
PHASE 1 & 2 – PEAK AM AND PM HOUR SITE GENERATED TRIPS

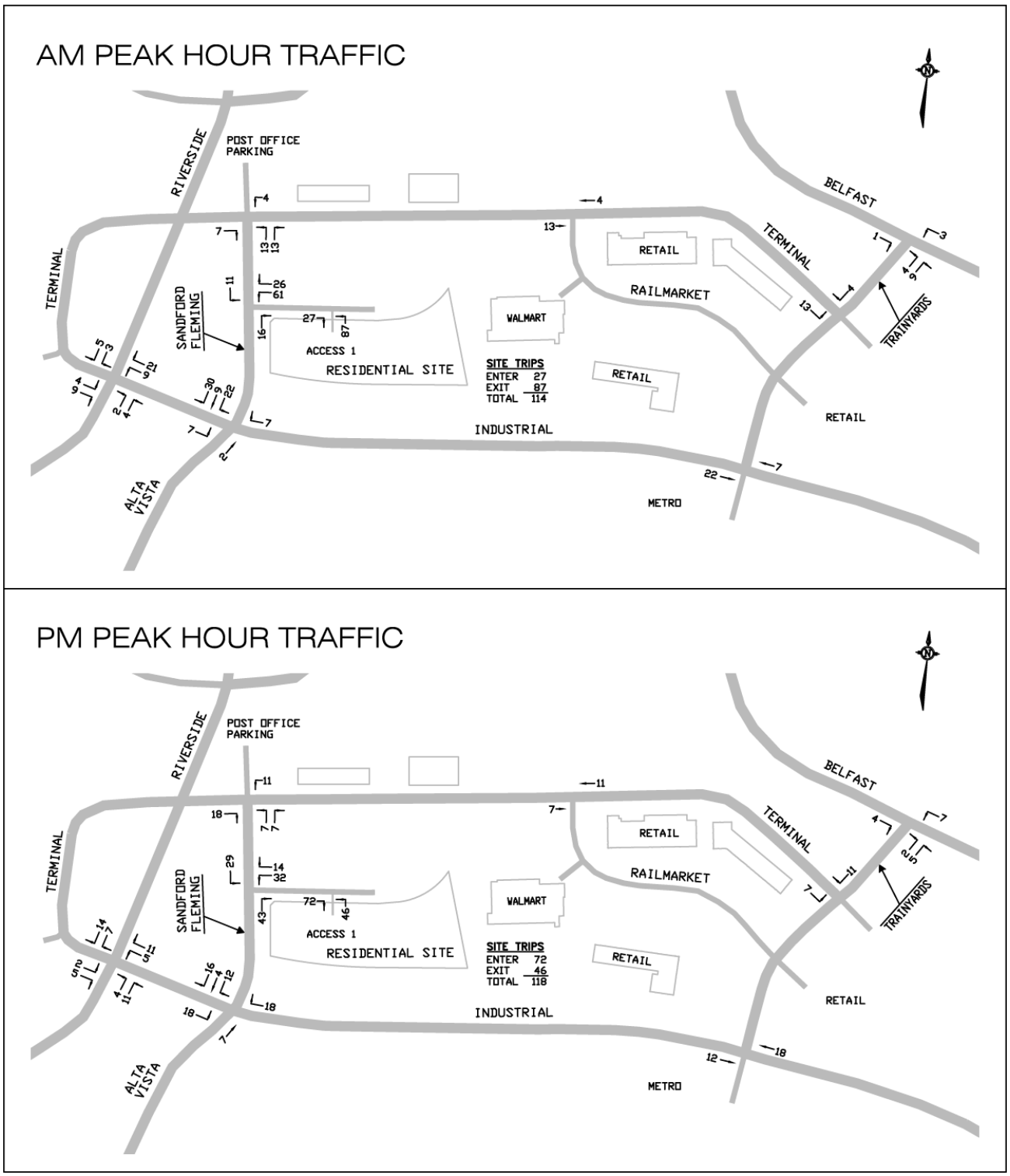


FIGURE 4.3
PHASE 1 to 3 – PEAK AM AND PM HOUR SITE GENERATED TRIPS

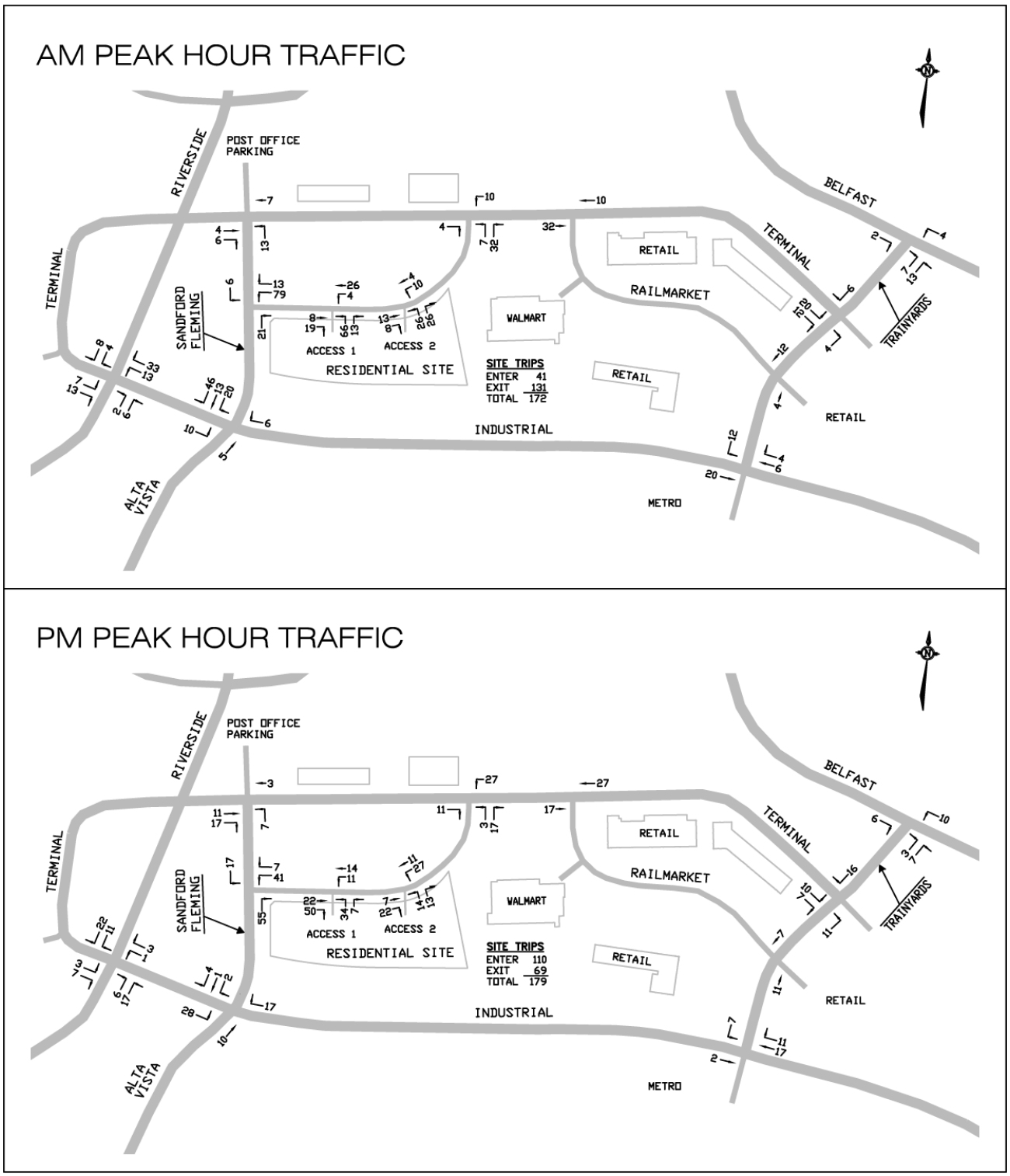


FIGURE 4.4
PHASE 1 – 2021 PEAK AM AND PM HOUR TOTAL TRAFFIC

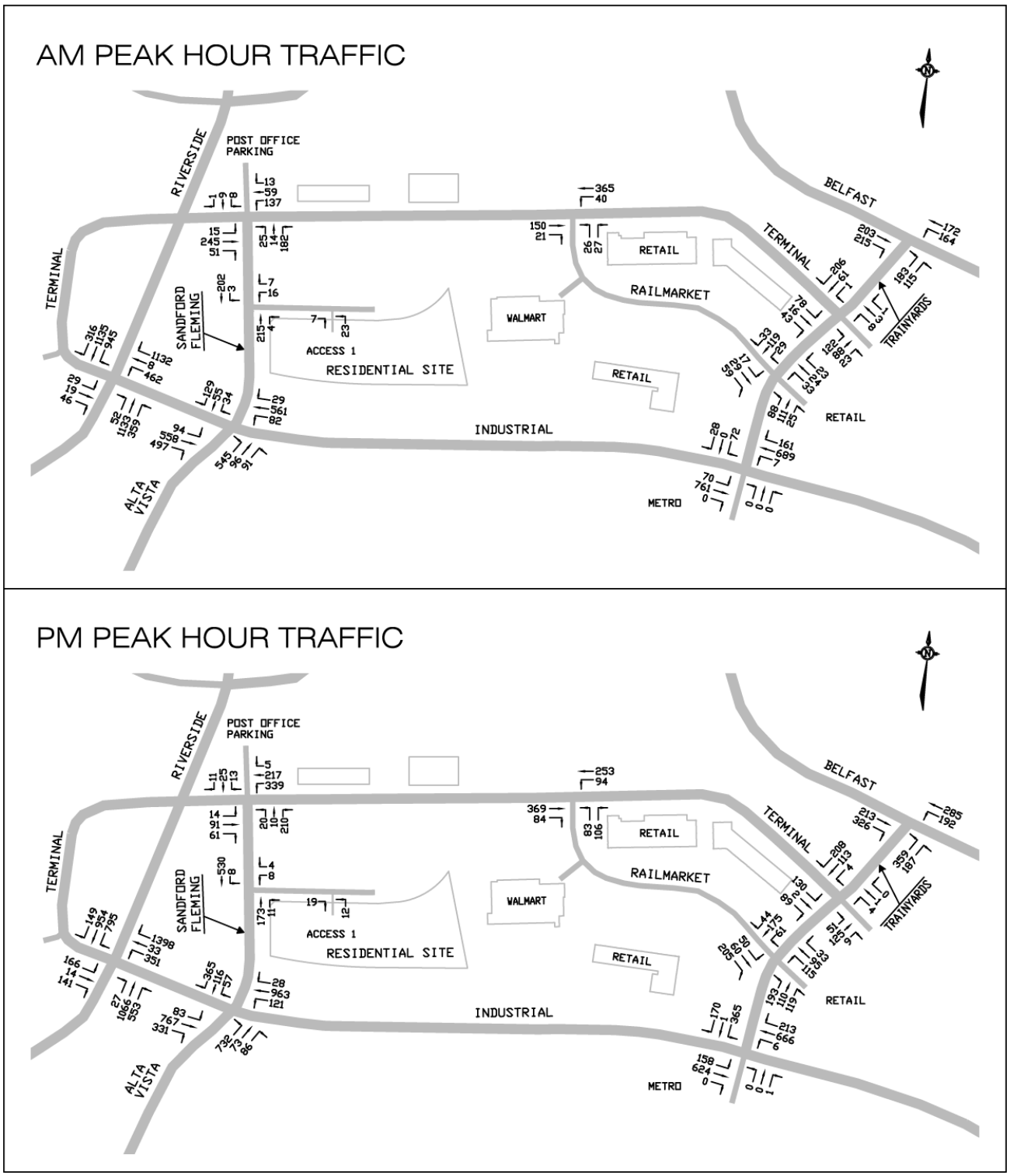
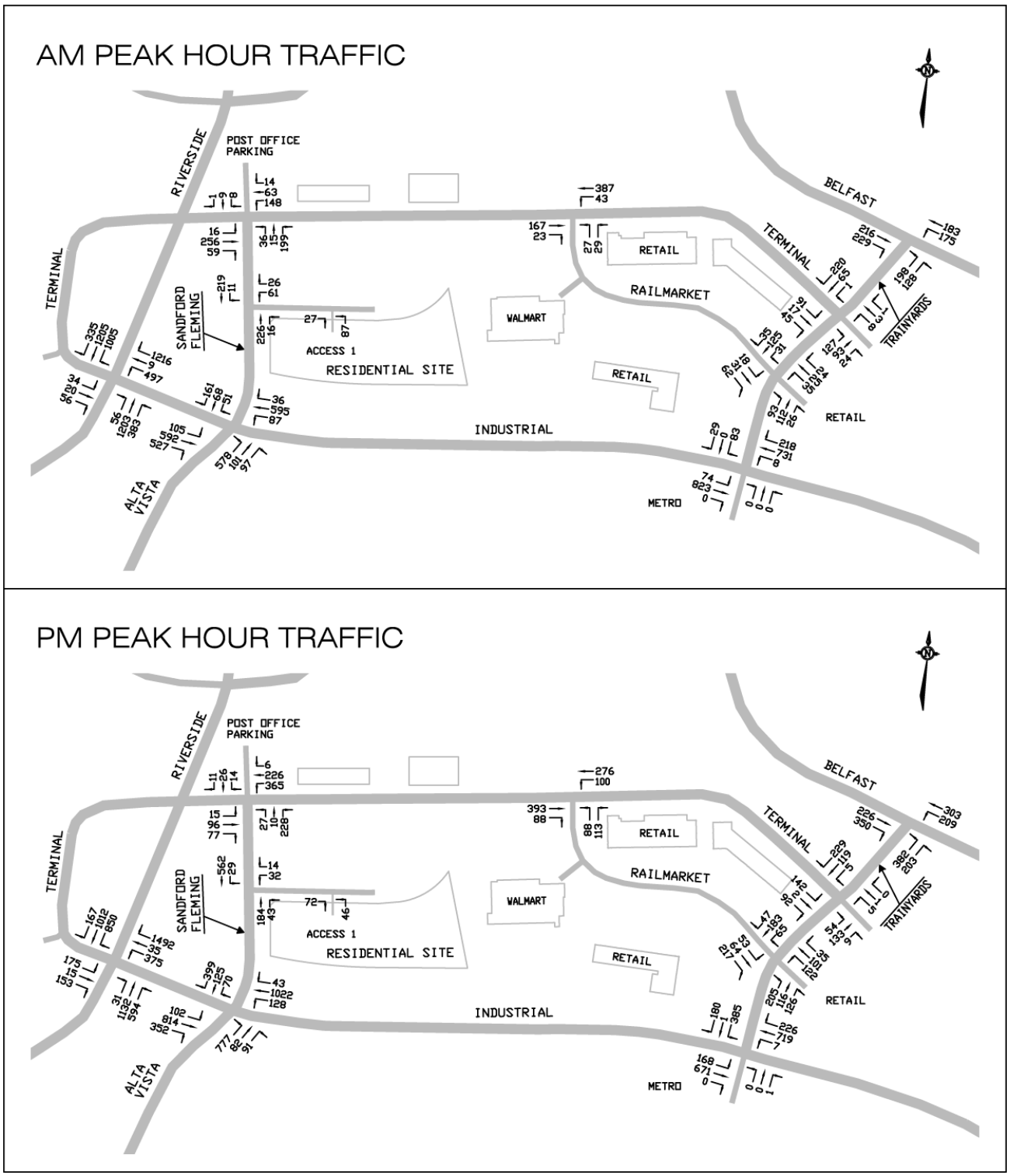
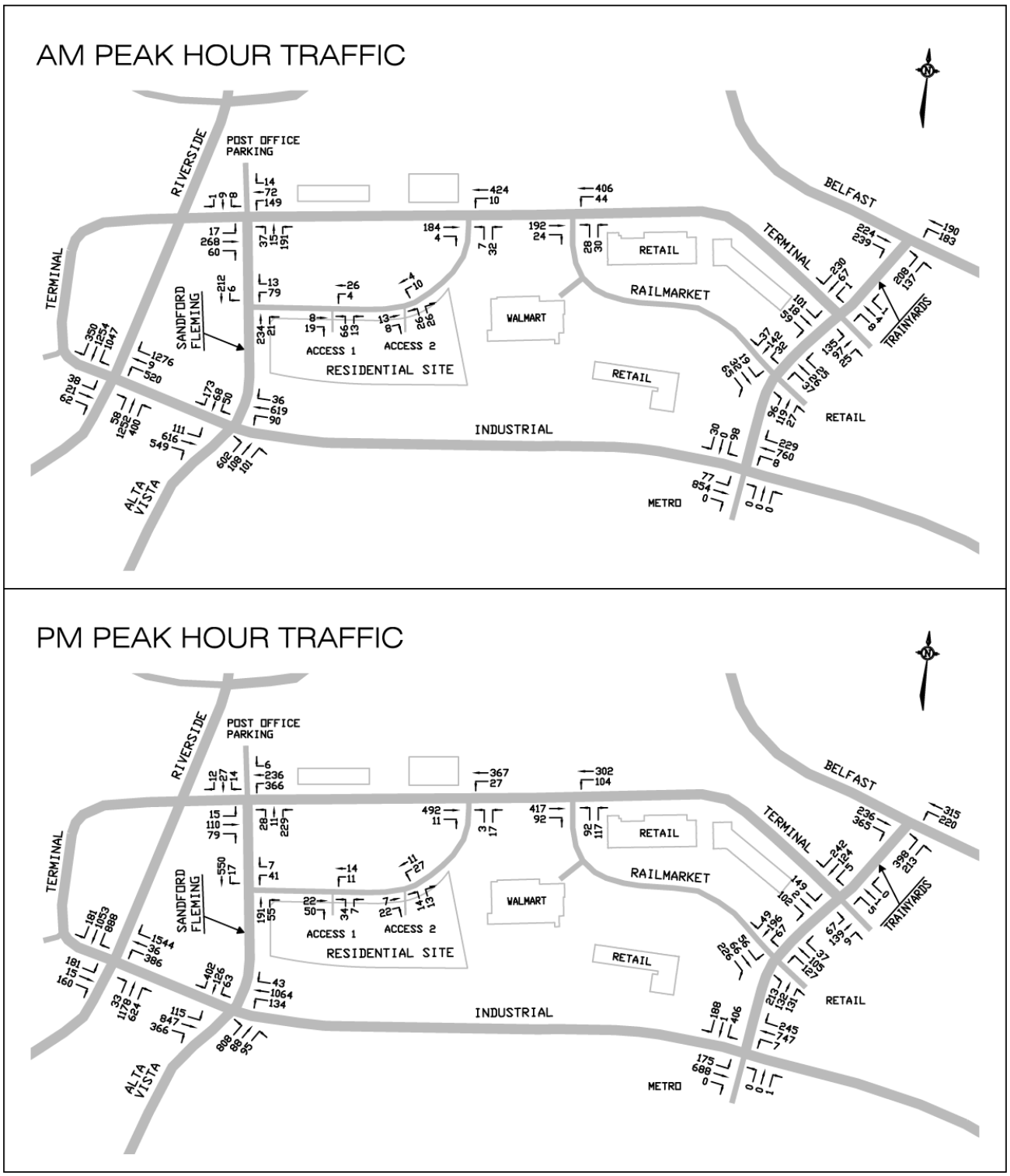


FIGURE 4.5
PHASE 1 & 2 – 2027 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

FIGURE 4.6
PHASE 1 to 3 – 2031 PEAK AM AND PM HOUR TOTAL TRAFFIC



NOT TO SCALE

VEHICULAR LEVEL OF SERVICE (LOS) - Intersection Capacity Analysis

Access 1 and Steamline Street Intersection

Access 1 will be constructed under Phase 1 of the development and will service all three phases. At the completion of Phase 3 in 2031, Steamline Street will be extended to Terminal Avenue. The access will be 6.7 m in width and will be a full movement access onto Steamline Street. The access intersection will be controlled by a stop sign at the northbound Access 1 approach with no auxiliary turn lanes at the intersection. Table 4.3 summarizes the operation of the intersection in 2031 with the summary sheets provided in the Appendix as Exhibit 4 for the peak AM hour and Exhibit 5 for the peak PM hour.

TABLE 4.3
ACCESS 1/STEAMLINE INTERSECTION – LoS & Control Delay

Intersection Approach	**WEEKDAY PEAK AM HOUR YEAR** (2031)		**WEEKDAY PEAK PM HOUR YEAR** (2031)	
	LoS	**Delay (sec/veh)**	**LoS**	**Delay (sec/veh)**
WB Left/Through – Steamline	(A)	(7.3)	(A)	(7.4)
NB Left/Right – Access 1	(A)	(9.1)	(A)	(9.1)

Access 2 and Steamline Street Intersection

Access 2 will be constructed under Phase 3 of the development at the same time that Streamline Street is extended to Terminal Avenue. The Access 2 is approximately 130 m east of Access 1. The Access 2 approach is 6.7 m in width and the intersection is controlled by a stop sign at the northbound Access 2 approach. There are no auxiliary turn lanes at the approach. Table 4.4 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 6 and Exhibit 7.

TABLE 4.4
ACCESS 2/STEAMLINE INTERSECTION – LoS & Control Delay

Intersection Approach	**WEEKDAY PEAK AM HOUR YEAR** (2031)		**WEEKDAY PEAK PM HOUR YEAR** (2031)	
	LoS	**Delay (sec/veh)**	**LoS**	**Delay (sec/veh)**
WB Left/Through – Steamline	(A)	(7.3)	(A)	(7.3)
NB Left/Right – Access 2	(A)	(8.8)	(A)	(8.8)

Sandford Fleming Avenue and Steamline Street Intersection

The Sandford Fleming/Steamline intersection is an existing intersection which provides access to the previous development on site and to 400 Terminal Avenue. A traffic signal warrant analysis (Exhibit 2) determined that the intersection would not meet the warrants for the installation of traffic signals using the expected 2031 traffic. The intersection was examined as a two-way stop controlled intersection with a stop sign at the westbound Steamline Street approach. For the 2021 and 2027 traffic, the lane configuration of Sandford Fleming Avenue would be one southbound shared left/through lane and for Steamline Street one westbound shared left/right lane. Following the completion of Phase 3 at the year 2031, the southbound approach would comprise of one excusive left turn lane and one through lane, and the westbound approach an exclusive left turn lane and right turn lane. Although the 2031 traffic did not meet the warrants for an exclusive left turn lane (Exhibit 12), the exclusive left turn lanes are recommended to improve the operation of the intersection. With a pavement width of approximately 14 m on Sandford Fleming Avenue and 11 m on Steamline Street, the exclusive turn lanes following the completion of Phase 3 at 2031 can be accommodated by the use of pavement markings.

Table 4.5 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 8 and 9 for the 2021 peak AM and PM hours, Exhibit 10 and 11 for the 2027 traffic, and Exhibit 13 and 14 for the 2031 peak AM and PM hour traffic.

TABLE 4.5
SANDFORD FLEMING/STEAMLINE INTERSECTION – LoS & Control Delay

Intersection Approach	WEEKDAY PEAK AM HOUR **YEAR** 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR **YEAR** 2021 **2027** (2031)	
	LoS	**Delay (sec/veh)**	**LoS**	**Delay (sec/veh)**
WB Left/Right – Steamline *	B **B** (B)	11.1 **12.5** (13.2)	B **C** (C)	13.3 **16.0** (18.2)
WB Left – Steamline (2031)	(A)	(9.7)	(A)	(9.5)
SB Left/Through – Sandford Flem	A **A** (A)	7.7 **7.8** (7.8)	A **A** (A)	7.6 **7.8** (7.8)

* For the 2021 and 2027 traffic scenarios, the westbound approach would comprise of a shared left/right turn lane. For the 2031 scenario the westbound left/right turn lane would become an exclusive right turn lane. The southbound left/through approach would become one exclusive left turn lane and one through lane.

Terminal Avenue and Steamline Street Intersection

Steamline Street will be extended to Terminal Avenue at Phase 3 of the development in 2031. A left turn warrant analysis shown in Exhibit 15 determined that an exclusive westbound left turn lane was not warranted, but the analysis assumed exclusive left turn lanes as the roadway has sufficient pavement width for a left turn lane which would improve the operation of the intersection. The westbound Terminal Avenue approach will comprise of an exclusive left turn and exclusive through lane, and the northbound Steamline Street approach will comprise of an

exclusive left turn and right turn lane. The intersection will be controlled by a stop sign at the northbound Steamline Street approach as the intersection does not warrant the installation of traffic control signals (Exhibit 3).

Table 4.6 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 16 and 17 for the 2031 peak AM and PM hour traffic.

TABLE 4.6
TERMINAL/STEAMLINE INTERSECTION – LoS & Control Delay

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR (2031)		WEEKDAY PEAK PM HOUR YEAR (2031)	
	LoS	Delay (sec/veh)	LoS	Delay (sec/veh)
WB Left – Terminal	(A)	(7.6)	(A)	(8.6)
NB Left – Steamline	(B)	(13.9)	(C)	(18.8)
SB Right – Steamline	(A)	(9.5)	(B)	(11.9)

Terminal Avenue and Sandford Fleming Avenue Intersection

The intersection of Terminal Avenue and Sandford Fleming Avenue is an all-way stop controlled intersection. The intersection was examined using the 2014 traffic counts which were taken during the two year period when Terminal Avenue permitted two-way vehicle travel between Sandford Fleming Avenue and Riverside Drive. Eastbound traffic along Terminal Avenue is currently restricted to buses only between Riverside Drive and Sandford Fleming Avenue until 2018 when construction of the LRT is completed.

The analysis has used the existing lane configuration for the 2014 analysis (the northbound Sandford Fleming Avenue approach was assumed to be a shared left/through lane and exclusive right turn lane as that is the way the intersection functioned). The westbound Terminal Avenue approach comprised of a shared left/through/right lane movement.

As the background traffic increases, the westbound Terminal Avenue approach should be modified to provide an exclusive left turn lane and shared through/right lane. This can be accomplished through pavement markings. The 2021, 2027 and 2031 analysis has assumed the exclusive westbound left turn lane. This would be triggered by the increasing background traffic and not by the proposed apartment development.

Table 4.7 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 18 and 19 for the existing 2014 traffic counts, Exhibit 20 and 21 for the 2021 peak AM and PM hour traffic, Exhibits 22 and 23 for the 2027 peak hour traffic, and Exhibit 24 and 25 for the 2031 peak hour traffic.

TABLE 4.7
TERMINAL/SANDFORD FLEMING INTERSECTION – LoS & Control Delay

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2014* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2014* 2021 **2027** (2031)	
	LoS	**Delay (sec/veh)**	**LoS**	**Delay (sec/veh)**
EB – Terminal	*A* B **B** (B)	*9.5* 11.7 **12.4** (12.8)	*A* B **B** (B)	*9.4* 10.1 **10.5** (12.8)
WB – Terminal *	*B* B **B** (B)	*10.7* 10.2 **10.7** (10.7)	*C* C **C** (B)	*22.5* 16.5 **19.1** (10.7)
NB – Sandford Fleming	*A* A **B** (B)	*8.8* 10.0 **10.5** (10.5)	*B* B **B** (B)	*10.7* 11.8 **12.7** (10.5)
SB – Post Office Parking Lot	*A* A **A** (A)	*9.1* 9.6 **9.8** (9.8)	*B* B **B** (A)	*10.3* 10.5 **10.8** (9.8)

* For the 2021, 2027 and 2031 traffic scenarios, the westbound approach would comprise of an exclusive left.

Industrial Avenue and Sandford Fleming Avenue Intersection

The intersection of Industrial Avenue and Sandford Fleming Avenue is controlled by traffic signals. Alta Vista Drive forms the northbound approach and Sandford Fleming Avenue the southbound approach.

Table 4.8 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 26 and 27 for the existing 2015 traffic counts, Exhibit 28 and 29 for the 2021 peak hour traffic, Exhibit 30 and 31 for the 2027 peak hour traffic, and Exhibit 32 and 33 for the 2031 peak AM and PM hour traffic.

Industrial Avenue and Riverside Drive Intersection

The intersection of Industrial Avenue and Riverside Drive is controlled by traffic signals. Riverside Drive forms the northbound and southbound approaches, Terminal Avenue the eastbound approach and Industrial Avenue the westbound approach.

Table 4.9 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 34 and 35 for the existing 2015 traffic counts, Exhibit 36 and 37 for the 2021 peak hour traffic, Exhibit 38 and 39 for the 2027 peak hour traffic, and Exhibit 40 and 41 for the 2031 peak AM and PM hour traffic.

TABLE 4.8
INDUSTRIAL/SANDFORD FLEMING INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2015* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2015* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left – Industrial	*D* F **F** (F)	*0.872* 1.224 **1.367** (1.445)	*D* E **F** (F)	*0.819* 0.971 **1.193** (1.345)
EB Through – Industrial	*A* A **A** (A)	*0.319* 0.347 **0.376** (0.398)	*A* A **B** (B)	*0.497* 0.558 **0.610** (0.636)
WB Left– Industrial	*E* E **F** (F)	*0.926* 0.986 **1.046** (1.082)	*F* F **F** (F)	*1.201* 1.275 **1.348** (1.412)
WB Through – Industrial	*A* A **A** (A)	*0.327* 0.353 **0.386** (0.407)	*A* B **C** (C)	*0.608* 0.685 **0.761** (0.792)
WB Right – Industrial	*A* A **A** (A)	*0.328* 0.354 **0.387** (0.408)	*A* B **C** (C)	*0.608* 0.685 **0.762** (0.793)
NB Left – Alta Vista	*D* D **D** (D)	*0.868* 0.874 **0.881** (0.886)	*E* E **E** (E)	*0.915* 0.929 **0.959** (0.997)
NB Through – Alta Vista	*B* C **C** (C)	*0.654* 0.721 **0.725** (0.738)	*A* A **A** (A)	*0.434* 0.453 **0.477** (0.504)
SB Left – Sandford Fleming	*A* A **A** (A)	*0.274* 0.354 **0.525** (0.514)	*A* A **A** (A)	*0.473* 0.410 **0.474** (0.424)
SB Through – Sandford Fleming	*A* A **A** (A)	*0.441* 0.479 **0.585** (0.585)	*C* C **C** (C)	*0.756* 0.794 **0.805** (0.807)

TABLE 4.9
INDUSTRIAL/RIVERSIDE INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2015* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2015* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left – Terminal	*B* C **C** (C)	*0.636* 0.744 **0.753** (0.759)	*D* D **E** (E)	*0.812* 0.869 **0.916** (0.948)
EB Through – Terminal	*A* A **A** (A)	*0.127* 0.120 **0.113** (0.110)	*A* A **A** (A)	*0.035* 0.033 **0.035** (0.035)
EB Right – Terminal	*A* A **A** (A)	*0.228* 0.234 **0.253** (0.260)	*A* A **A** (A)	*0.378* 0.392 **0.426** (0.445)
WB Left – Industrial	*F* F **F** (F)	*1.385* 1.488 **1.600** (1.674)	*D* F **F** (F)	*0.905* 1.002 **1.071** (1.102)
WB Through – Industrial	*A* A **A** (A)	*0.029* 0.028 **0.030** (0.029)	*A* A **A** (A)	*0.114* 0.120 **0.128** (0.131)
WB Right – Industrial	*A* A **A** (A)	*0.534* 0.559 **0.587** (0.608)	*B* B **C** (C)	*0.639* 0.679 **0.726** (0.752)
NB Left – Riverside	*B* C **D** (D)	*0.638* 0.779 **0.839** (0.869)	*A* B **B** (B)	*0.605* 0.639 **0.653** (0.660)
NB Through – Riverside	*B* C **D** (E)	*0.696* 0.775 **0.873** (0.948)	*C* E **F** (F)	*0.793* 0.958 **1.017** (1.058)
SB Left – Riverside	*F* F **F** (F)	*1.038* 1.111 **1.181** (1.230)	*F* F **F** (F)	*1.060* 1.130 **1.208** (1.262)
SB Through – Riverside	*A* B **C** (C)	*0.579* 0.644 **0.707** (0.754)	*A* B **C** (C)	*0.580* 0.671 **0.718** (0.750)
SB Right – Riverside	*A* A **A** (A)	*0.207* 0.305 **0.344** (0.376)	*A* A **A** (A)	*0.050* 0.092 **0.127** (0.155)

Terminal Avenue and Railmarket Private Intersection

The intersection of Terminal Avenue and Railmarket Private is controlled by two-way stop control signs. The stop sign is installed at the northbound Railmarket Private approach.

Table 4.10 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 42 and 43 for the existing 2013 traffic counts, Exhibit 44 and 45 for the 2021 peak hour traffic, Exhibit 46 and 47 for the 2027 peak hour traffic, and Exhibit 48 and 49 for the 2031 peak AM and PM hour traffic.

TABLE 4.10
TERMINAL/RAILMARKET INTERSECTION – LoS & Control Delay

Intersection Approach	**WEEKDAY PEAK AM HOUR YEAR** *2013* 2021 **2027** (2031)		**WEEKDAY PEAK PM HOUR YEAR** *2013* 2021 **2027** (2031)	
	LoS	**Delay (sec/veh)**	**LoS**	**Delay (sec/veh)**
WB Left/Through – Terminal	*A* A **A** (A)	*7.6* 7.7 **7.7** (7.8)	*A* A **A** (A)	*8.3* 8.7 **8.8** (9.0)
NB Left – Railmarket	*B* B **C** (C)	*12.5* 14.3 **15.0** (15.8)	*C* C **D** (D)	*19.2* 24.8 **28.8** (33.8)
NB Right – Railmarket	*A* A **A** (A)	*9.1* 9.3 **9.4** (9.6)	*B* B **B** (B)	*11.1* 12.2 **12.7** (13.1)

Terminal Avenue and Trainyards Drive Intersection

The intersection of Terminal Avenue and Trainyards Drive is controlled by traffic signals. Terminal Avenue forms the eastbound approach and a private driveway the westbound approach.

Table 4.11 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 50 and 51 for the existing 2014 traffic counts, Exhibit 52 and 53 for the 2021 peak hour traffic, Exhibit 54 and 55 for the 2027 peak hour traffic, and Exhibit 56 and 57 for the 2031 peak AM and PM hour traffic.

Trainyards Drive and Belfast Road Intersection

The intersection of Trainyards Drive and Belfast Road is controlled by traffic signals. The intersection is a “T” intersection with Belfast Road forming the eastbound and westbound approaches and Trainyards Drive the northbound approach.

Table 4.12 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 58 and 59 for the existing 2018 traffic counts, Exhibit 60 and 61 for the 2021 peak hour traffic, Exhibit 62 and 63 for the 2027 peak hour traffic, and Exhibit 64 and 65 for the 2031 peak AM and PM hour traffic.

TABLE 4.11
TERMINAL/TRAINYARDS INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2014* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2014* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left – Terminal	*A* A **A** (A)	*0.168* 0.197 **0.227** (0.249)	*A* A **A** (A)	*0.255* 0.329 **0.359** (0.377)
EB Through/Right – Terminal	*A* A **A** (A)	*0.245* 0.283 **0.295** (0.373)	*A* A **A** (A)	*0.255* 0.433 **0.448** (0.498)
WB Left/Through/Right – Access	*A* A **A** (A)	*0.157* 0.163 **0.163** (0.169)	*A* A **A** (A)	*0.096* 0.096 **0.107** (0.107)
NB Left – Trainyards	*A* A **A** (A)	*0.100* 0.156 **0.164** (0.176)	*A* A **A** (A)	*0.054* 0.068 **0.073** (0.091)
NB Through – Trainyards	*A* A **A** (A)	*0.087* 0.094 **0.100** (0.105)	*A* A **A** (A)	*0.121* 0.130 **0.139** (0.145)
NB Right – Trainyards	*A* A **A** (A)	*0.001* 0.004 **0.005** (0.006)	*A* A **A** (A)	*0.004* 0.005 **0.005** (0.005)
SB Left/Through – Trainyards	*A* A **A** (A)	*0.059* 0.064 **0.068** (0.070)	*A* A **A** (A)	*0.109* 0.118 **0.126** (0.131)
SB Right – Trainyards	*A* A **A** (A)	*0.016* 0.051 **0.064** (0.073)	*A* A **A** (A)	*0.037* 0.058 **0.079** (0.093)

TABLE 4.12
TRAINYARDS/BELFAST INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2018* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2018* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Through – Belfast	*A* A **A** (A)	*0.206* 0.215 **0.232** (0.243)	*A* A **A** (A)	*0.237* 0.247 **0.268** (0.284)
EB Right – Belfast	*A* A **A** (A)	*0.124* 0.143 **0.162** (0.177)	*A* A **A** (A)	*0.293* 0.314 **0.354** (0.382)
WB Left – Belfast	*A* A **A** (A)	*0.157* 0.184 **0.201** (0.213)	*A* A **A** (A)	*0.226* 0.242 **0.270** (0.289)
WB Through – Belfast	*A* A **A** (A)	*0.074* 0.077 **0.083** (0.087)	*A* A **A** (A)	*0.154* 0.160 **0.173** (0.181)
NB Left – Trainyards	*A* A **A** (A)	*0.546* 0.540 **0.544** (0.546)	*C* C **C** (C)	*0.718* 0.726 **0.737** (0.745)
NB Right – Trainyards	*A* A **A** (A)	*0.251* 0.267 **0.290** (0.306)	*A* A **A** (A)	*0.323* 0.356 **0.376** (0.387)

Trainyards Drive and Railmarket Private Intersection

The intersection of Trainyards Drive and Railmarket Private is controlled by traffic signals. Trainyards Drive forms the northbound and southbound approaches, and Railmarket Private the eastbound and westbound approaches.

Table 4.13 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 66 and 67 for the existing 2014 traffic counts, Exhibit 68 and 69 for the 2021 peak hour traffic, Exhibit 70 and 71 for the 2027 peak hour traffic, and Exhibit 72 and 73 for the 2031 peak AM and PM hour traffic.

TABLE 4.13
TRAINYARDS/RAILMARKET INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2014* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2014* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left – Railmarket	*A* A **A** (A)	*0.080* 0.086 **0.091** (0.096)	*A* A **A** (A)	*0.138* 0.138 **0.141** (0.146)
EB Through/Right – Railmarket	*A* A **A** (A)	*0.429* 0.465 **0.488** (0.506)	*A* A **A** (A)	*0.582* 0.595 **0.599** (0.601)
WB Left– Railmarket	*A* A **A** (A)	*0.185* 0.202 **0.217** (0.233)	*A* A **A** (A)	*0.479* 0.500 **0.517** (0.529)
WB Through/Right – Railmarket	*A* A **A** (A)	*0.224* 0.241 **0.249** (0.257)	*A* A **A** (A)	*0.269* 0.265 **0.267** (0.270)
NB Left – Trainyards	*A* A **A** (A)	*0.071* 0.087 **0.092** (0.097)	*A* A **A** (A)	*0.223* 0.263 **0.290** (0.312)
NB Through/Right – Trainyards	*A* A **A** (A)	*0.092* 0.141 **0.144** (0.152)	*A* A **A** (A)	*0.318* 0.370 **0.407** (0.453)
SB Left – Trainyards	*A* A **A** (A)	*0.022* 0.030 **0.032** (0.033)	*A* A **A** (A)	*0.078* 0.089 **0.100** (0.109)
SB Through – Trainyards	*A* A **A** (A)	*0.114* 0.129 **0.135** (0.154)	*A* A **A** (A)	*0.182* 0.253 **0.275** (0.303)
SB Right – Trainyards	*A* A **A** (A)	*0.001* 0.004 **0.006** (0.009)	*A* A **A** (A)	*0.018* 0.024 **0.030** (0.035)

Industrial Avenue and Trainyards Drive Intersection

The intersection of Industrial Avenue and Trainyards Drive is controlled by traffic signals. Industrial Avenue forms the eastbound and westbound approaches, Trainyards Drive the southbound approach, and a private driveway the northbound approach.

Table 4.14 shows the operational analysis of the intersection with the analysis sheets provided as Exhibit 74 and 75 for the existing 2015 traffic counts, Exhibit 76 and 77 for the 2021 peak hour traffic, Exhibit 78 and 79 for the 2027 peak hour traffic, and Exhibit 80 and 81 for the 2031 peak AM and PM hour traffic.

TABLE 4.14
INDUSTRIAL/TRAINYARDS INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR *2015* 2021 **2027** (2031)		WEEKDAY PEAK PM HOUR YEAR *2015* 2021 **2027** (2031)	
	LoS	**v/c Ratio**	**LoS**	**v/c Ratio**
EB Left – Industrial	*A* A **A** (A)	*0.111* 0.121 **0.138** (0.148)	*A* A **A** (A)	*0.312* 0.367 **0.413** (0.447)
EB Through – Industrial	*A* A **A** (A)	*0.306* 0.306 **0.316** (0.329)	*A* A **A** (A)	*0.368* 0.391 **0.400** (0.402)
EB Right– Industrial	*A* A **A** (A)	*0.000* 0.000 **0.000** (0.000)	*A* A **A** (A)	*0.000* 0.000 **0.000** (0.000)
WB Left - Industrial	*A* A **A** (A)	*0.015* 0.016 **0.019** (0.020)	*A* A **A** (A)	*0.021* 0.023 **0.029** (0.030)
WB Through – Industrial	*A* A **A** (A)	*0.442* 0.458 **0.513** (0.537)	*B* C **C** (D)	*0.624* 0.721 **0.787** (0.840)
WB Right – Industrial	*A* A **A** (A)	*0.442* 0.458 **0.514** (0.538)	*B* C **C** (D)	*0.624* 0.721 **0.787** (0.842)
NB Left/Through/Right – Access	*A* A **A** (A)	*0.000* 0.000 **0.000** (0.000)	*A* A **A** (A)	*0.000* 0.000 **0.000** (0.000)
SB Left – Trainyards	*A* A **A** (A)	*0.254* 0.265 **0.302** (0.352)	*C* C **C** (D)	*0.722* 0.765 **0.780** (0.813)
SB Through/Right – Trainyards	*A* A **A** (A)	*0.149* 0.159 **0.162** (0.165)	*A* A **A** (A)	*0.436* 0.402 **0.408** (0.421)

PEDESTRIAN LEVEL OF SERVICE (PLOS)

The pedestrian level of service was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines.* Table 4.15 presents the level of service for street segments within the study area, with the analysis for the 2031 traffic provided in the Appendix.

TABLE 4.15
PEDESTRIAN LEVEL OF SERVICE (PLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Steamline Street	Sandford Fleming to Terminal	A	Exhibit 82
Sandford Fleming Ave.	Industrial to Terminal	C	Exhibit 83
Terminal Avenue	Sandford Fleming to Railmarket	D	Exhibit 84
Industrial Avenue	Riverside to Trainyards	E	Exhibit 85
Trainyards Drive	Belfast to Industrial	D	Exhibit 86
Intersection		**Level of Service**	**Analysis**
Industrial Avenue and Sandford Fleming Avenue		F	Exhibit 87
Industrial Avenue and Riverside Drive		F	Exhibit 88
Terminal Avenue and Trainyards Drive		D	Exhibit 89

BICYCLE LEVEL OF SERVICE (BLOS)

The bicycle level of service (BLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. Industrial Avenue is classified as an arterial road which is identified as a "Spine Route" in the Cycling Network - Primary Urban plan. Industrial Avenue does not contain cycling lanes along the road. Table 4.16 presents the level of service for the road segments and intersections with the analysis for the 2031 traffic provided in the Appendix.

TABLE 4.16
BICYCLE LEVEL OF SERVICE (BLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Steamline Street	Sandford Fleming to Terminal	B	Exhibit 90
Sandford Fleming Ave.	Industrial to Terminal	D	Exhibit 91
Terminal Avenue	Sandford Fleming to Railmarket	D	Exhibit 92
Industrial Avenue	Riverside to Trainyards	F	Exhibit 93
Trainyards Drive	Belfast to Industrial	B	Exhibit 94
Intersection		**Level of Service**	**Analysis**
Industrial Avenue and Sandford Fleming Avenue		F	Exhibit 95
Industrial Avenue and Riverside Drive		F	Exhibit 96
Terminal Avenue and Trainyards Drive		F	Exhibit 97

TRANSIT LEVEL OF SERVICE (TLOS)

The apartment development is located within the Transit Oriented Development area and is in close proximity to the Hurdman transit station and the future LRT station at the VIA rail station. OC Transpo bus service provides access to the transit stations and downtown core with routes along both Terminal Avenue and Sandford Fleming Avenue. On-street parking along both roads is limited with no dedicated transit lanes.

Table 4.17 presents the level of service along Terminal Avenue and Sandford Fleming Avenue which were determined from Exhibit 15 of the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The transit level of service at the signalized intersections along the route was determined from the intersection capacity analysis for the approach delay at the intersections using the 2031 traffic.

TABLE 4.17
TRANSIT LEVEL OF SERVICE (TLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Sandford Fleming Ave.	Industrial to Terminal	D	Exhibit 98
Terminal Avenue	Sandford Fleming to Railmarket	D	Exhibit 99
Intersection		**Level of Service**	**Analysis**
Industrial Avenue and Sandford Fleming Avenue		D	Exhibit 100
Terminal Avenue and Trainyards Drive		D	Exhibit 101

TRUCK LEVEL OF SERVICE (TkLOS) - Street Segments & Intersections

The truck level of service (TkLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The truck LoS was determined for Sandford Fleming Avenue and Terminal Avenue, and the Industrial/Sandford and Terminal/Trainyards intersections. Table 4.18 presents the truck level of service for street segments and intersections within the study area and in close proximity to the site, with the analysis for the 2031 traffic provided as Exhibits 102 to 105.

TABLE 4.18
TRUCK LEVEL OF SERVICE (TkLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Sandford Fleming Ave.	Industrial to Terminal	B	Exhibit 102
Terminal Avenue	Sandford Fleming to Railmarket	B	Exhibit 103
Intersection		**Level of Service**	**Analysis**
Industrial Avenue and Sandford Fleming Avenue		C	Exhibit 104
Terminal Avenue and Trainyards Drive		C	Exhibit 105

MODULE 4.5 – Transportation Demand Management

Element 4.5.1 – Context for TDM

The apartment development is located in the Transit Oriented Development area in close proximity to transit service. The apartment units are proposed as rental apartments with tenants desiring easy access to transit and possibly within walking distance of areas of employment, shopping and other amenities. The location of the apartment development promotes transit use, walking and cycling.

Element 4.5.2 – Need and Opportunity

Future development in the area would comprise of additional office space on the north side of Steamline Street (400 Terminal Avenue) as well as future office/commercial along Terminal Avenue. These future land uses would increase employment and promote walking and cycling which would reduce the impact on the surrounding road network.

Element 4.5.3 – TDM Program

Post-occupancy TDM measures would comprise of ensuring that a sidewalk system is in place to provide the safe and efficient movement of pedestrians to adjacent employment areas and to transit stations. Additional bus routes should be examined, and the location of bus stops should be evaluated to ensure that the stops are in close proximity to the development and access to the stops is safe (road crossing).

MODULE 4.6 – Neighbourhood Traffic Management

Element 4.6.1 – Adjacent Neighbourhoods

Access routes to the apartment development are from arterial and collector roads. There would be little impact on neighbouring areas.

MODULE 4.7 - Transit

Element 4.7.1 – Transit Route Capacity

Future transit passenger demands can be accommodated at both the Hurdman Transit station and the future LRT station which is expected to be completed and operational by the end of Phase 1 of the apartment development.

MODULE 4.8 – Review of Network Concept

The travel demands of the proposed apartment development would not trigger any changes to the Transportation Master Plan (TMP) concepts for auto or transit networks.

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The intersection of Sandford Fleming Avenue and Steamline Street was examined for traffic controls using the expected 2031 traffic. A traffic signal warrant analysis determined that the intersection met 40 percent of the warrants for the installation of traffic control signals. The intersection would therefore be designed as a two-way stop controlled intersection with stop signs at the westbound Steamline Street approach.

A traffic signal warrant analysis was conducted for the intersection of Steamline Street and Terminal Avenue using the 2031 traffic. The warrant analysis determined that the intersection

met 6 percent of the traffic signal warrants. The intersection would be designed as a two-way stop controlled intersection with a stop sign installed at the northbound Steamline Street approach.

A drop-off is proposed for Building 100 which faces Sandford Fleming Avenue. Building 100 will contain 174 apartment units and would also have entrances at the rear of the building off of Access 1. The drop-off will be designed as a one-way access where vehicles would enter at the south access and exit at the north egress. The direction of traffic entering the drop-off would be controlled by painted arrows on the pavement, and a "One-Way" sign (Rb-21) located at the entrance and a "Do Not Enter" sign (Rb-19) located at the exit. The south entrance to the drop-off is located approximately 55 m north of the Industrial/Sandford Fleming intersection. The separation between the access and egress is approximately 35 m, with space for the temporary parking of two vehicles. The vehicles using the drop-off would be small parcel delivery vehicles and drivers picking up or dropping off residents of the building. The drop-off is expected to generate few trips during the peak AM and PM hours and resulting in a minor impact on the operation of the adjacent roads.

Element 4.9.2 – Intersection Design

The transportation analysis for the study area determined the following intersection design modifications.

Triggered by the Steamline Street Apartment Development

Phase 1 and Phase 2 – The site would have one access point onto Sandford Fleming Avenue from Streamline Street. Modifications to the Sandford Fleming/Steamline intersection would comprise of pavement markings which provide a Sandford Fleming shared southbound left/through lane, a shared northbound through/right lane, and a Steamline shared westbound left/right lane. Figure 4.7 shows the intersection lane configuration which would be completed at Phase 1 by the year 2021. All pavement markings can be done within the pavement width of the road.

Phase 3 – At the completion of Phase 3 by the year 2031, Steamline Street would be extended to Terminal Avenue. Modifications to the pavement markings at the Sandford Fleming/Steamline intersection would comprise of providing an exclusive Sandford Fleming southbound left turn lane and exclusive westbound Steamline left turn and right turn lanes. The Terminal/Steamline intersection would require an exclusive Terminal westbound left turn lane and exclusive northbound Steamline left turn and right turn lanes. The left turn lane warrant analysis at both the Sandford/Steamline and Terminal/Steamline intersections determined that exclusive left turn lanes were not warranted (Exhibit 12 and 15), but the exclusive left turn lanes which are shown in Figure 4.8 are recommended to improve the operation of the intersections. The existing pavement width can accommodate the turn lanes and required only pavement markings.

The 95th percentile queue in the intersection operational analysis determined that the queuing at the exclusive left turn lanes at both intersections was less than one vehicle. The pavement markings would provide all exclusive left turn lanes with 15 m of vehicular storage.

FIGURE 4.7
LANE CONFIGURATION –Phase 1 (2021) and Phase 2 (2027)

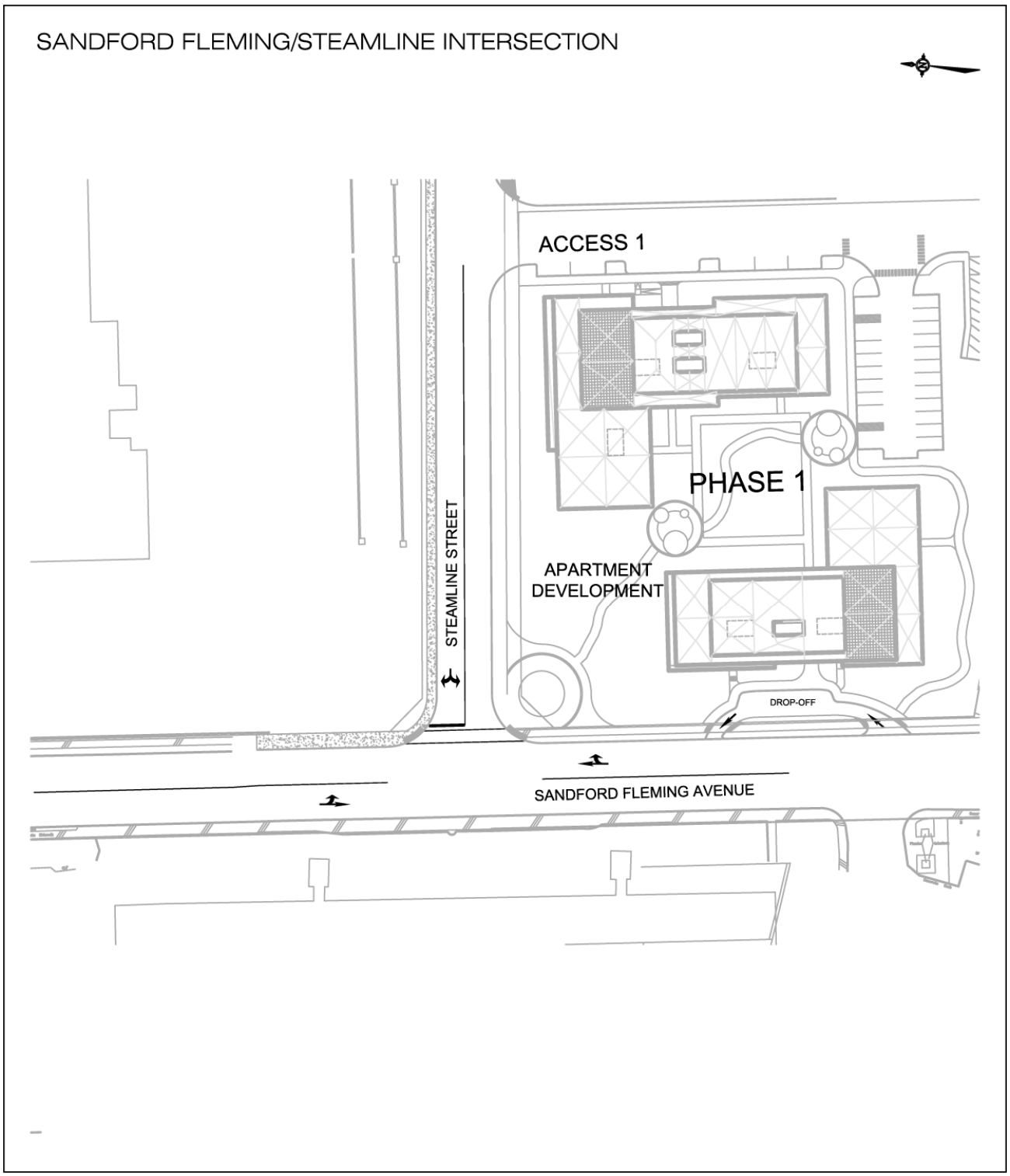
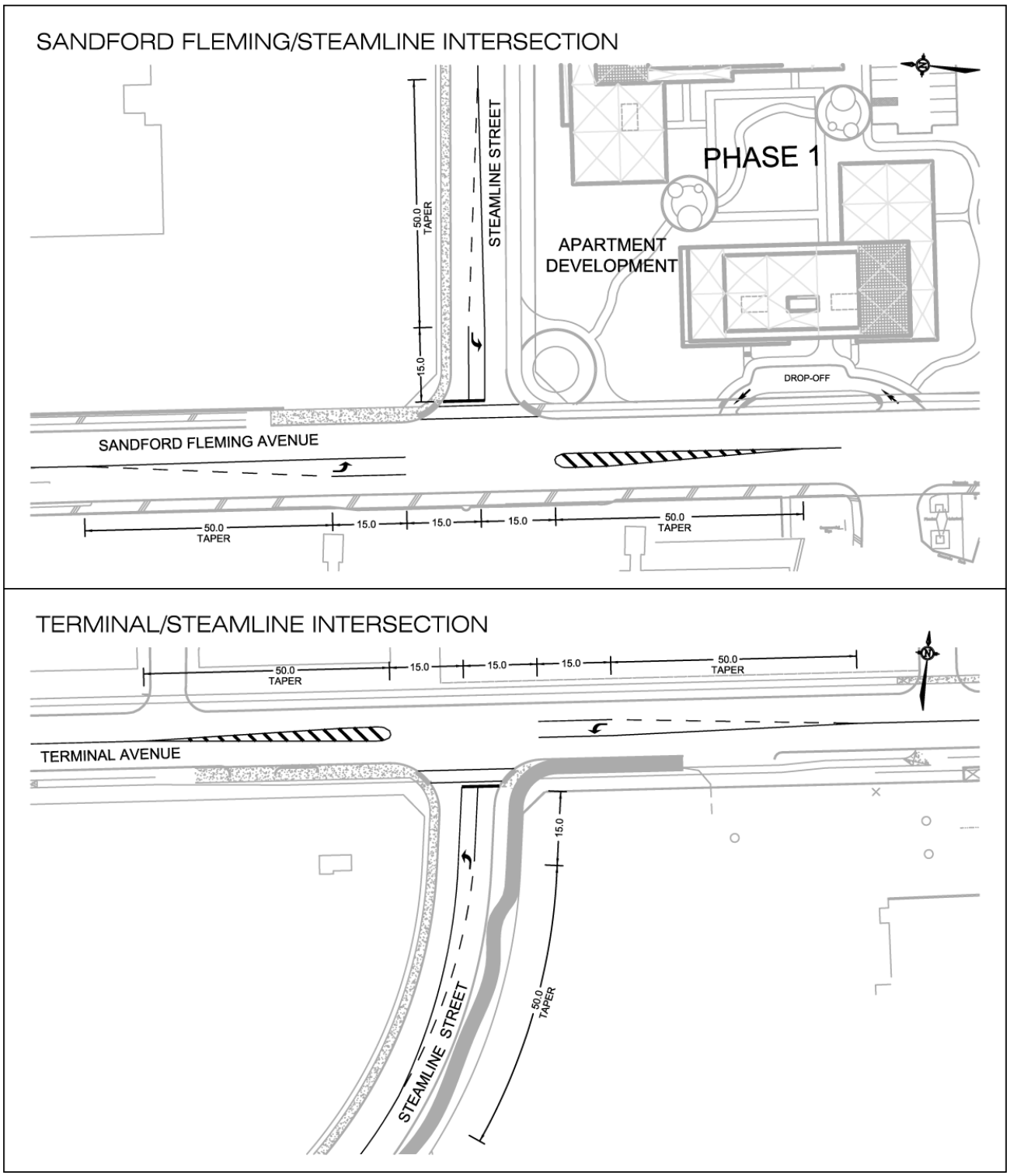


FIGURE 4.8
LANE CONFIGURATION –Phase 3 (2031)



NOT TO SCALE

The width of lanes at the intersections would be the following:

Steamline St. & Terminal Ave.			Sandford Fleming Ave.		
11 m	Left turn lane	3.25 m	14 m	Left turn lane	3.50 m
Pavement	Through/Right lane	3.50 m	Pavement	Through/Right lane	3.75 m
	Opposing lane	4.25 m		Opposing lane	6.75 m

Figure 4.8 shows the lane configuration which would be completed at Phase 3. All pavement markings can be done within the existing right-of-way of Sandford Fleming Avenue, Terminal Avenue and Steamline Street.

Triggered by the Increase in Background Traffic

The transportation analysis determined that the all-way stop controlled intersection of Terminal Avenue and Sandford Fleming Avenue was beginning to show operational problems at the westbound approach due to the increasing background traffic. The proposed apartment development on Steamline Street would have little impact on the westbound Terminal Avenue approach to the intersection. It is recommended that the westbound Terminal Avenue approach to the all-way stop controlled intersection be modified to provide an exclusive left turn lane and a shared through/right lane.

SUMMARY

A summary of the level of service for the various modes of transportation are summarized in Table 4.19, with the results detailed in the analysis sheets provided as Exhibits in the Appendix. The proposed Steamline Street would meet the minimum desirable MMLOS targets for a development in a "Transit Oriented Development Zone" within 600 m of a rapid transit station as set out in the Official Plan Policy/Designation & Road Class. The targets for pedestrian and bicycle level of service are met, along with transit level of service along Sandford Fleming Avenue and Terminal Avenue. The level of service at the Industrial/Sandford, Industrial/Riverside, and Terminal/Trainyards intersections which are signalized intersections in close proximity to the site also meet the minimum desirable MMLOS targets.

TABLE 4.19
MULTI-MODAL (MMLOS) SUMMARY TABLE

SEGMENTS	Level of Service (LoS) – 2031				
	Pedestrian	Cyclist	Transit	Auto	Truck
Steamline Street	A	B	N/A	-	N/A
Sandford Fleming Ave.	C	D	D	-	B
Terminal Avenue	D	D	D	-	B
Industrial Avenue	E	F	N/A	-	-
Trainyards Drive	D	B	N/A	-	-
INTERSECTIONS	**Level of Service (LoS) – 2031**				
	Pedestrian	**Cyclist**	**Transit**	**Auto**	**Truck**
Industrial/Sandford	F	F	D	B	C
Industrial/Riverside	F	F	-	C	-
Terminal/Trainyards	D	F	D	A	C

Prepared by:

David J. Halpenny, M. Eng., P. Eng.

APPENDIX

SCREENING FORM

TRAFFIC SIGNAL WARRANT ANALYSIS

LEFT TURN LANE WARRANT ANALYSIS

VEHICULAR TRAFFIC ANALYSIS

PLOS and BLOS SEGMENT EVALUATIONS

EXHIBIT 1
SCREENING FORM

TIA SCREENING FORM

1. Description of Proposed Development	
Municipal Address	Steamline Street, Ottawa
Description of Location	Located on the east side of Sandford Fleming Avenue, south of Steamline Street.
Land Use Classification	Transit Oriented TD2[1979]
Development Size (units)	1,845 units
Development Size (m^2)	
Number of Accesses and Locations	Two accesses onto Steamline Avenue and a layby on Sandford Fleming Avenue.
Phase of Development	3 Phases
Buildout Year	2029

2. Trip Generation Trigger	
Land Use Type	Residential Apartment Buildings
Development Size	90 units < 1,845 units
Trip Generation Trigger Satisfied?	Yes

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

4. Safety Triggers	
	Yes/No
Are posted speed limits on a boundary road 80 km/h or greater?	No

Are there any horizontal/vertical curvatures on a boundary street which limits sight lines at a proposed driveway?	No
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (300 m rural conditions or 150 m urban/suburban conditions)?	No
Is the proposed driveway within the auxiliary lanes of an intersection?	No
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	No
Does the development include a drive-thru facility?	No
Safety Trigger Satisfied?	No

5. Summary	
	Yes/No
Does the development satisfy the Trip Generation Trigger?	Yes
Does the development satisfy the Location Trigger?	No
Does the development satisfy the Safety Trigger?	No

EXHIBIT 2
TRAFFIC SIGNAL WARRANT ANALYSIS – Sandford/Steamline (2031 Traffic)

MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL USING PROJECTED VOLUME

Location Steamline Street and Sandford Fleming Avenue **of**
(Roadway) **(Intersecting Road)**

Municipality City of Ottawa **Projected Volume** Year 2031

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS		COMPLIANCE		
		2. FREE FLOW	3. RESTRICT. FLOW	SECTIONAL NUMBER	SECTIONAL %	4. ENTIRE %
1. VEHICULAR VOLUME	1. A. Vehicle volume all approaches (Average hour)	480	(720)	357	50	14%
	B. Vehicle volume, along minor roads, (Average hour)	120	(255) ~~170~~	35	14	
2. DELAY TO CROSS TRAFFIC	1. A. Vehicle volume, along artery (Average hour)	480	(720)	322	45	(40%)
	B. Combined vehicle and pedestrian volume crossing artery from minor roads, (Average hour)	50	(75)	30	40	

Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4

NOTES:

1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.

2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.

4. The lowest sectional percentage governs the entire Warrant.

5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).

6. The crossing volumes are defined as:
   (a) Left turns from both minor road approaches
   (b) The heaviest through volume from the minor road
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left turn volume > 120 vph.
      (ii) the left turn volume plus the opposing volume > 720 vph.
   (d) Pedestrians crossing the major road.

EXHIBIT 3
TRAFFIC SIGNAL WARRANT ANALYSIS – Terminal/Steamline (2031 Traffic)

MINIMUM WARRANTS FOR INSTALLATION OF TRAFFIC SIGNAL USING PROJECTED VOLUME

Location Steamline Street and Terminal Avenue **of**
(Roadway) **(Intersecting Road)**

Municipality City of Ottawa **Projected Volume** Year 2031

WARRANT	DESCRIPTION	MINIMUM REQUIREMENT FOR 2 LANE HIGHWAYS		COMPLIANCE		
		2. FREE FLOW	3. RESTRICT. FLOW	SECTIONAL NUMBER	SECTIONAL %	4. ENTIRE %
1. VEHICULAR VOLUME	1. A. Vehicle volume all approaches (Average hour)	480	(720)	395	55	(6%)
	B. Vehicle volume, along minor roads, (Average hour)	120	(255) ~~170~~	15	6	
2. DELAY TO CROSS TRAFFIC	1. A. Vehicle volume, along artery (Average hour)	480	(720)	380	53	4%
	B. Combined vehicle and pedestrian volume crossing artery from minor roads, (Average hour)	50	(75)	3	4	

Projected Average Hour - Use the sum of the AM and PM Peak volumes divided by 4

NOTES:

1. Vehicle volume warrants (1A) and (2A) for intersections of roadways having two or more moving lanes in one direction, should be 25% higher than the values given above.

2. Warrant values for free flow apply when the 85 percentile speed of artery traffic equals or exceeds 70 Km/h or when the intersection lies within the built-up area of an isolated community having a population of less than 10,000.

3. Warrant values for restricted flow apply to large urban communities when the 85 percentile speed of artery traffic does not exceed 70 Km/h.

4. The lowest sectional percentage governs the entire Warrant.

5. For "T" intersections the warrant values for minor road should be increased by 50 % (Warrant 1B only).

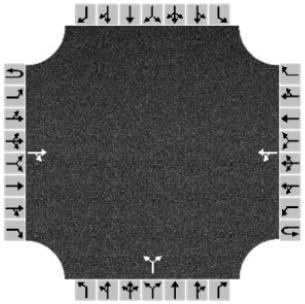
6. The crossing volumes are defined as:
   (a) Left turns from both minor road approaches
   (b) The heaviest through volume from the minor road
   (c) 50% of the heavier left turn movement from major road when both of the following are met:
      (i) the left turn volume > 120 vph.
      (ii) the left turn volume plus the opposing volume > 720 vph.
   (d) Pedestrians crossing the major road.

EXHIBIT 4
YEAR 2031 PEAK AM HOUR TRAFFIC – Access 1/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Access 1/Steamline
Agency/Co.		Jurisdiction	
Date Performed	6/13/2018	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Access 1
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			8	19		4	26			66		31				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						4					105					
Capacity, c (veh/h)						1597					987					
v/c Ratio						0.00					0.11					
95% Queue Length, Q_{95} (veh)						0.0					0.4					
Control Delay (s/veh)						7.3					9.1					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						1.0					9.1					
Approach LOS											A					

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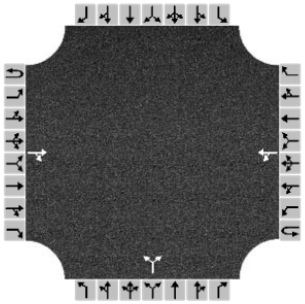
EXHIBIT 5
YEAR 2031 PEAK PM HOUR TRAFFIC – Access 1/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Access 1/Steamline
Agency/Co.		Jurisdiction	
Date Performed	6/13/2018	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Access 1
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			22	50		11	14			34		7				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No				No				No				No	
Median Type/Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12					45					
Capacity, c (veh/h)						1533					926					
v/c Ratio						0.01					0.05					
95% Queue Length, Q_{95} (veh)						0.0					0.2					
Control Delay (s/veh)						7.4					9.1					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						3.3				9.1						
Approach LOS										A						

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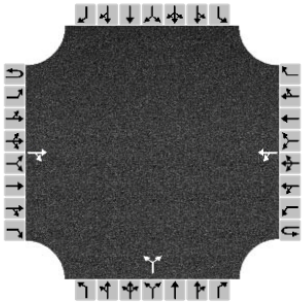
EXHIBIT 6
YEAR 2031 PEAK AM HOUR TRAFFIC – Access 2/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Access 2/Steamline
Agency/Co.		Jurisdiction	
Date Performed	6/13/2018	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Access 2
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			13	8		10	4			26		26				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No				No				No				No	
Median Type/Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11					57					
Capacity, c (veh/h)						1605					1013					
v/c Ratio						0.01					0.06					
95% Queue Length, Q_{95} (veh)						0.0					0.2					
Control Delay (s/veh)						7.3					8.8					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						5.2				8.8						
Approach LOS										A						

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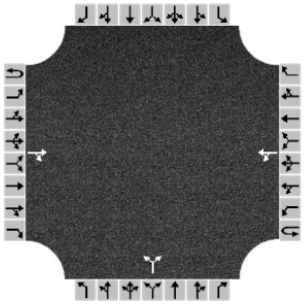
EXHIBIT 7
YEAR 2031 PEAK PM HOUR TRAFFIC – Access 2/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Access 2/Steamline
Agency/Co.		Jurisdiction	
Date Performed	6/13/2018	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Access 2
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume, V (veh/h)			7	22		27	11			14		13				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						29					29					
Capacity, c (veh/h)						1593					971					
v/c Ratio						0.02					0.03					
95% Queue Length, Q_{95} (veh)						0.1					0.1					
Control Delay (s/veh)						7.3					8.8					
Level of Service, LOS						A					A					
Approach Delay (s/veh)						5.2				8.8						
Approach LOS										A						

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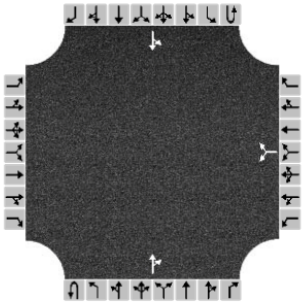
EXHIBIT 8
YEAR 2021 PEAK AM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Steamline Street
Analysis Year	2021	North/South Street	Sandford Fleming Avenue
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						16		7			215	4		3	202	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)							0									
Right Turn Channelized			No				No				No				No	
Median Type/Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							25							3		
Capacity, c (veh/h)							616							1334		
v/c Ratio							0.04							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							11.1							7.7		
Level of Service, LOS							B							A		
Approach Delay (s/veh)							11.1							0.1		
Approach LOS							B									

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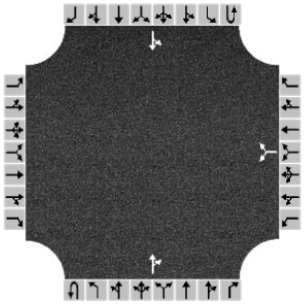
EXHIBIT 9
YEAR 2021 PEAK PM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Steamline Street
Analysis Year	2021	North/South Street	Sandford Fleming Avenue
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						8		4			173	11		8	530	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							13							9		
Capacity, c (veh/h)							445							1378		
v/c Ratio							0.03							0.01		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							13.3							7.6		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						13.3								0.2		
Approach LOS						B										

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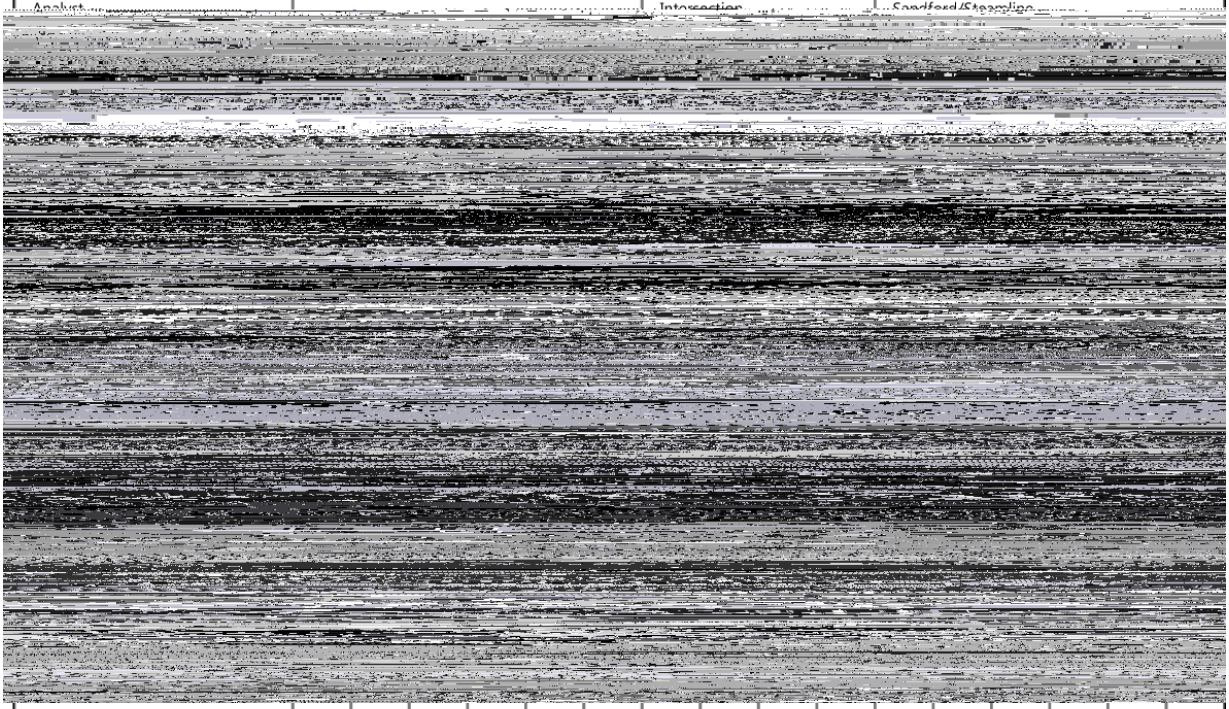
EXHIBIT 10
YEAR 2027 PEAK AM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline



Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						61		26			226	16		11	219	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No			No					No		
Median Type/Storage		Undivided														
Critical and Follow-up Headways																
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)							95							12		
Capacity, c (veh/h)							575							1307		
v/c Ratio							0.16							0.01		
95% Queue Length, Q_{95} (veh)							0.6							0.0		
Control Delay (s/veh)							12.5							7.8		
Level of Service, LOS							B							A		
Approach Delay (s/veh)						12.5								0.5		
Approach LOS						B										

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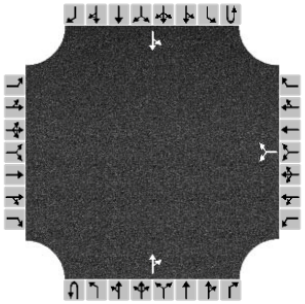
EXHIBIT 11
YEAR 2027 PEAK PM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Steamline Street
Analysis Year	2027	North/South Street	Sandford Fleming Avenue
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume, V (veh/h)						32		14			184	43		29	562	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							50							32		
Capacity, c (veh/h)							376							1324		
v/c Ratio							0.13							0.02		
95% Queue Length, Q_{95} (veh)							0.5							0.1		
Control Delay (s/veh)							16.0							7.8		
Level of Service, LOS							C							A		
Approach Delay (s/veh)						16.0								0.6		
Approach LOS						C										

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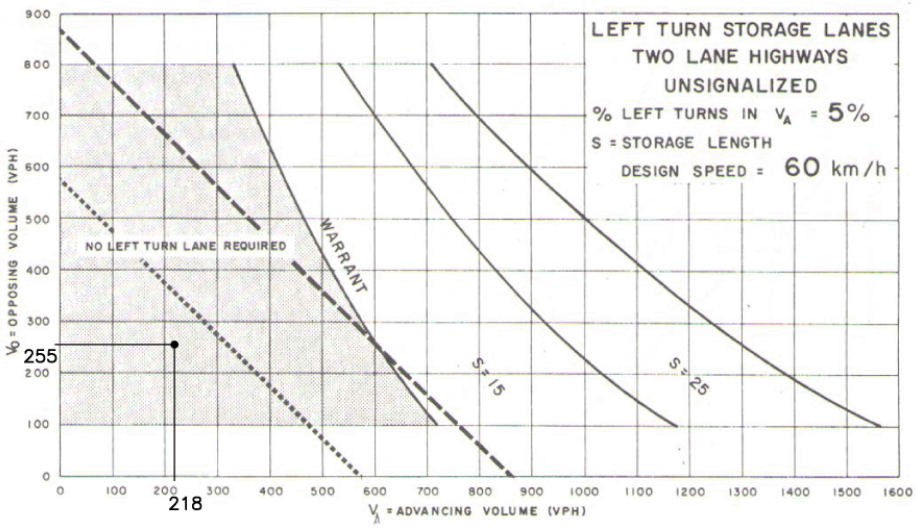
EXHIBIT 12
LEFT TURN LANE WARRANT ANALYSIS – Sandford Fleming/Steamline (2031 Traffic)

TRAFFIC

V_o = 255 vph
V_A = 218 vph
V_L = 6 vph

V_L/V_A = 2.8%

POSTED SPEED
50 km/h



WARRANT

NO LEFT TURN
LANE REQUIRED

TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

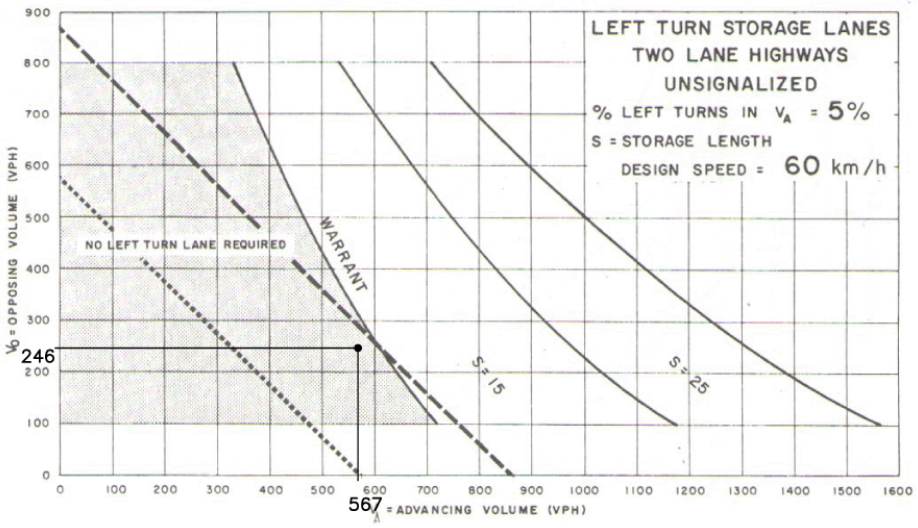
SOUTHBOUND LEFT
PEAK AM HOUR

TRAFFIC

V_o = 246 vph
V_A = 567 vph
V_L = 17 vph

V_L/V_A = 3.0%

POSTED SPEED
50 km/h



WARRANT

NO LEFT TURN
LANE REQUIRED

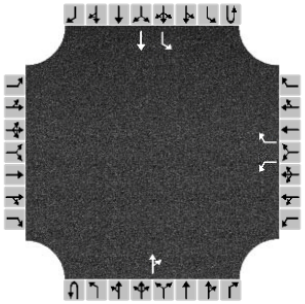
SOUTHBOUND LEFT
PEAK PM HOUR

EXHIBIT 13
YEAR 2031 PEAK AM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Sandford Fleming Avenue
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						79		13			234	21		6	212	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						86		14						7		
Capacity, c (veh/h)						523		775						1291		
v/c Ratio						0.16		0.02						0.01		
95% Queue Length, Q_{95} (veh)						0.6		0.1						0.0		
Control Delay (s/veh)						13.2		9.7						7.8		
Level of Service, LOS						B		A						A		
Approach Delay (s/veh)						12.7								0.2		
Approach LOS						B										

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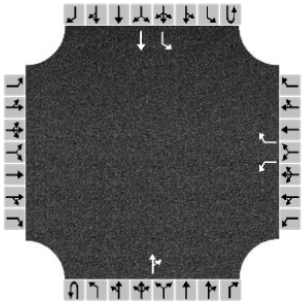
EXHIBIT 14
YEAR 2031 PEAK PM HOUR TRAFFIC – Sandford Fleming/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Sandford/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Steamline Street
Analysis Year	2031	North/South Street	Sandford Fleming Avenue
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	0	0	1	1	0
Configuration						L		R				TR		L	T	
Volume, V (veh/h)						41		7			191	55		17	550	
Percent Heavy Vehicles (%)						1		1						1		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						45		8						18		
Capacity, c (veh/h)						318		803						1302		
v/c Ratio						0.14		0.01						0.01		
95% Queue Length, Q_{95} (veh)						0.5		0.0						0.0		
Control Delay (s/veh)						18.2		9.5						7.8		
Level of Service, LOS						C		A						A		
Approach Delay (s/veh)						16.9								0.2		
Approach LOS						C										

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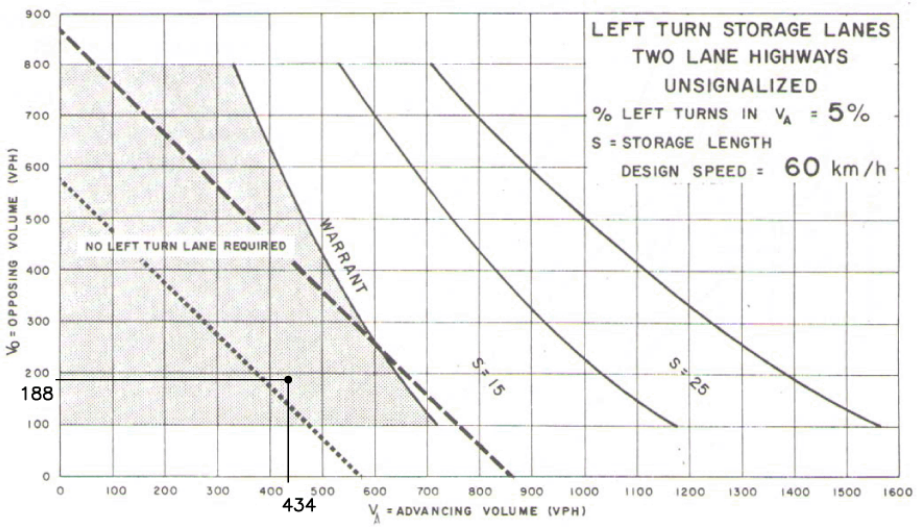
EXHIBIT 15
LEFT TURN LANE WARRANT ANALYSIS – Terminal/Steamline (2031 Traffic)

TRAFFIC

V_o = 188 vph
V_A = 434 vph
V_L = 10 vph

V_L/V_A = 2.3%

POSTED SPEED
50 km/h



WARRANT

NO LEFT TURN
LANE REQUIRED

TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL AREAS OR URBAN AREAS WITH RESTRICTED FLOW

TRAFFIC SIGNALS MAY BE WARRANTED IN "FREE FLOW" URBAN AREAS

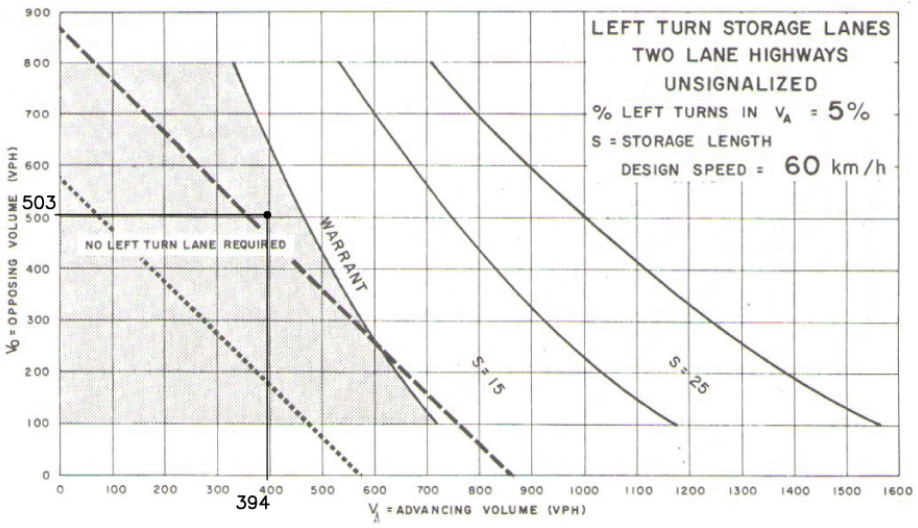
WESTBOUND LEFT
PEAK AM HOUR

TRAFFIC

V_o = 503 vph
V_A = 394 vph
V_L = 27 vph

V_L/V_A = 6.9%

POSTED SPEED
50 km/h



WARRANT

NO LEFT TURN
LANE REQUIRED

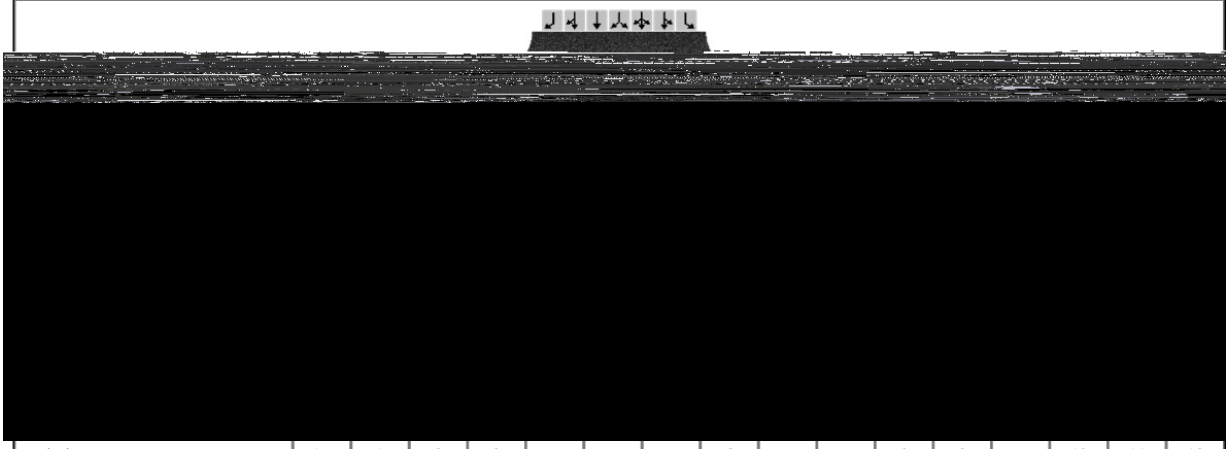
WESTBOUND LEFT
PEAK PM HOUR

EXHIBIT 16
YEAR 2031 PEAK AM HOUR TRAFFIC – Terminal/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Steamline Street
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume, V (veh/h)			184	4		10	424			7		32				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						11				8		35				
Capacity, c (veh/h)						1373				412		841				
v/c Ratio						0.01				0.02		0.04				
95% Queue Length, Q_{95} (veh)						0.0				0.1		0.1				
Control Delay (s/veh)						7.6				13.9		9.5				
Level of Service, LOS						A				B		A				
Approach Delay (s/veh)						0.2				10.3						
Approach LOS										B						

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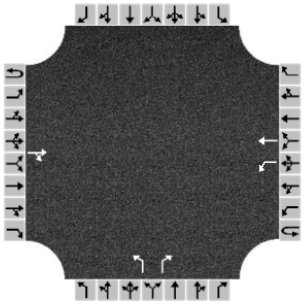
EXHIBIT 17
YEAR 2031 PEAK PM HOUR TRAFFIC – Terminal/Steamline

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Steamline
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Steamline Street
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume, V (veh/h)			492	11		27	367			3		17				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						29				3		18				
Capacity, c (veh/h)						1027				264		543				
v/c Ratio						0.03				0.01		0.03				
95% Queue Length, Q_{95} (veh)						0.1				0.0		0.1				
Control Delay (s/veh)						8.6				18.8		11.9				
Level of Service, LOS						A				C		B				
Approach Delay (s/veh)						0.6				12.9						
Approach LOS										B						

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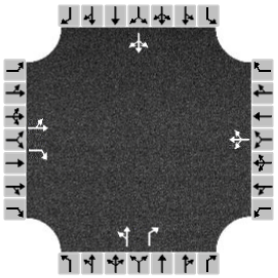
EXHIBIT 18
EXISTING 2014 PEAK AM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2014	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	14	166	50	120	48	12	21	13	120	7	8	1
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		LTR			LT	R		LTR		
Flow Rate, v (veh/h)	196	54		196			37	130		17		
Percent Heavy Vehicles	0	5		2			5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20			3.20	3.20		3.20		
Initial Degree of Utilization, x	0.174	0.048		0.174			0.033	0.116		0.015		
Final Departure Headway, hd (s)	5.24	4.58		5.42			6.05	4.95		5.94		
Final Degree of Utilization, x	0.285	0.069		0.294			0.062	0.179		0.029		
Move-Up Time, m (s)	2.3	2.3		2.0			2.3	2.3		2.0		
Service Time, ts (s)	2.94	2.28		3.42			3.75	2.65		3.94		

Capacity, Delay and Level of Service

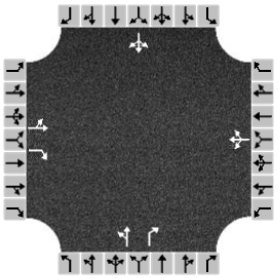
Flow Rate, v (veh/h)	196	54		196			37	130		17		
Capacity	687	786		665			595	727		606		
95% Queue Length, Q_{95} (veh)	1.2	0.2		1.2			0.2	0.7		0.1		
Control Delay (s/veh)	10.0	7.6		10.7			9.2	8.7		9.1		
Level of Service, LOS	B	A		B			A	A		A		
Approach Delay (s/veh)	9.5			10.7			8.8			9.1		
Approach LOS	A			B			A			A		
Intersection Delay, s/veh | LOS	9.7						A					

EXHIBIT 19
EXISTING 2014 PEAK PM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2014	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	13	73	53	272	146	5	20	9	186	12	23	10
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		LTR			LT	R		LTR		
Flow Rate, v (veh/h)	93	58		460			32	202		49		
Percent Heavy Vehicles	0	5		2			5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20			3.20	3.20		3.20		
Initial Degree of Utilization, x	0.083	0.051		0.409			0.028	0.180		0.043		
Final Departure Headway, hd (s)	6.04	5.34		5.71			6.75	5.61		6.61		
Final Degree of Utilization, x	0.157	0.085		0.730			0.059	0.315		0.090		
Move-Up Time, m (s)	2.3	2.3		2.0			2.3	2.3		2.0		
Service Time, ts (s)	3.74	3.04		3.71			4.45	3.31		4.61		

Capacity, Delay and Level of Service

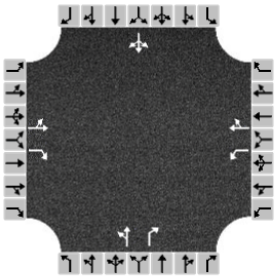
Flow Rate, v (veh/h)	93	58		460			32	202		49		
Capacity	596	675		630			533	642		544		
95% Queue Length, Q_{95} (veh)	0.6	0.3		6.3			0.2	1.3		0.3		
Control Delay (s/veh)	9.9	8.5		22.5			9.9	10.9		10.3		
Level of Service, LOS	A	A		C			A	B		B		
Approach Delay (s/veh)	9.4			22.5			10.7			10.3		
Approach LOS	A			C			B			B		
Intersection Delay, s/veh | LOS	16.6						C					

EXHIBIT 20
YEAR 2021 PEAK AM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2021	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	245	51	137	59	13	25	14	182	8	9	1
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	283	55		149	78		42	198		20		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.251	0.049		0.132	0.070		0.038	0.176		0.017		
Final Departure Headway, hd (s)	5.53	4.88		6.13	5.50		6.35	5.25		6.33		
Final Degree of Utilization, x	0.434	0.075		0.254	0.120		0.075	0.288		0.034		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	3.23	2.58		3.83	3.20		4.05	2.95		4.33		

Capacity, Delay and Level of Service

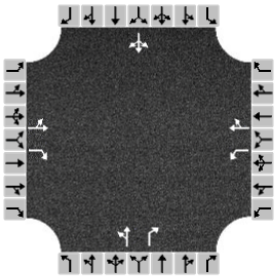
Flow Rate, v (veh/h)	283	55		149	78		42	198		20		
Capacity	652	738		587	654		567	686		569		
95% Queue Length, Q_{95} (veh)	2.2	0.2		1.0	0.4		0.2	1.2		0.1		
Control Delay (s/veh)	12.4	8.0		10.9	9.0		9.6	10.1		9.6		
Level of Service, LOS	B	A		B	A		A	B		A		
Approach Delay (s/veh)	11.7			10.2			10.0			9.6		
Approach LOS	B			B			A			A		
Intersection Delay, s/veh | LOS	10.7						B					

EXHIBIT 21
YEAR 2021 PEAK PM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2021	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	14	91	61	339	217	5	20	10	210	13	25	11
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	114	66		368	241		33	228		53		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.101	0.059		0.328	0.214		0.029	0.203		0.047		
Final Departure Headway, hd (s)	6.38	5.69		6.26	5.74		7.00	5.88		6.75		
Final Degree of Utilization, x	0.202	0.105		0.641	0.385		0.063	0.373		0.100		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	4.08	3.39		3.96	3.44		4.70	3.58		4.75		

Capacity, Delay and Level of Service

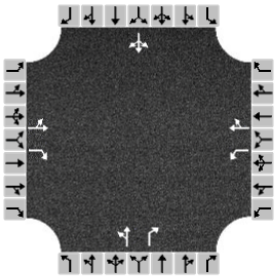
Flow Rate, v (veh/h)	114	66		368	241		33	228		53		
Capacity	564	633		575	627		514	612		533		
95% Queue Length, Q_{95} (veh)	0.8	0.3		4.5	1.8		0.2	1.7		0.3		
Control Delay (s/veh)	10.7	9.1		19.4	12.0		10.2	12.0		10.5		
Level of Service, LOS	B	A		C	B		B	B		B		
Approach Delay (s/veh)	10.1			16.5			11.8			10.5		
Approach LOS	B			C			B			B		
Intersection Delay, s/veh | LOS	14.0						B					

EXHIBIT 22
YEAR 2027 PEAK AM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2027	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	16	256	59	148	63	14	36	15	199	8	9	1
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	296	64		161	84		55	216		20		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.263	0.057		0.143	0.074		0.049	0.192		0.017		
Final Departure Headway, hd (s)	5.68	5.04		6.30	5.67		6.52	5.39		6.54		
Final Degree of Utilization, x	0.467	0.090		0.282	0.132		0.100	0.324		0.036		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	3.38	2.74		4.00	3.37		4.22	3.09		4.54		

Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	296	64		161	84		55	216		20		
Capacity	633	715		571	635		552	668		551		
95% Queue Length, Q_{95} (veh)	2.5	0.3		1.2	0.5		0.3	1.4		0.1		
Control Delay (s/veh)	13.3	8.2		11.5	9.2		10.0	10.6		9.8		
Level of Service, LOS	B	A		B	A		A	B		A		
Approach Delay (s/veh)	12.4			10.7			10.5			9.8		
Approach LOS	B			B			B			A		
Intersection Delay, s/veh | LOS	11.3						B					

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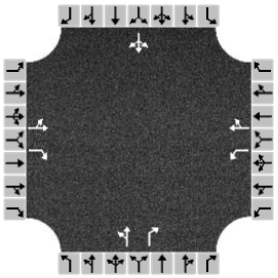
EXHIBIT 23
YEAR 2027 PEAK PM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2027	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	96	77	365	226	6	27	10	228	14	26	11
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	121	84		397	252		40	248		55		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.107	0.074		0.353	0.224		0.036	0.220		0.049		
Final Departure Headway, hd (s)	6.59	5.90		6.43	5.90		7.21	6.06		6.99		
Final Degree of Utilization, x	0.221	0.137		0.708	0.413		0.081	0.417		0.108		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	4.29	3.60		4.13	3.60		4.91	3.76		4.99		

Capacity, Delay and Level of Service

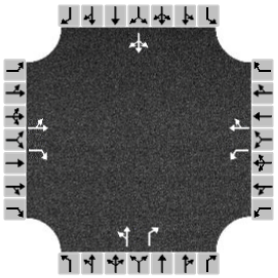
Flow Rate, v (veh/h)	121	84		397	252		40	248		55		
Capacity	547	611		560	610		499	594		515		
95% Queue Length, Q_{95} (veh)	0.8	0.5		5.7	2.0		0.3	2.1		0.4		
Control Delay (s/veh)	11.1	9.5		23.2	12.7		10.5	13.0		10.8		
Level of Service, LOS	B	A		C	B		B	B		B		
Approach Delay (s/veh)	10.5			19.1			12.7			10.8		
Approach LOS	B			C			B			B		
Intersection Delay, s/veh | LOS	15.7						C					

EXHIBIT 24
YEAR 2031 PEAK AM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak AM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	17	268	60	149	72	14	37	15	191	8	9	1
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	310	65		162	93		57	208		20		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.275	0.058		0.144	0.083		0.050	0.185		0.017		
Final Departure Headway, hd (s)	5.68	5.04		6.31	5.69		6.59	5.45		6.59		
Final Degree of Utilization, x	0.489	0.091		0.284	0.148		0.103	0.314		0.036		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	3.38	2.74		4.01	3.39		4.29	3.15		4.59		

Capacity, Delay and Level of Service

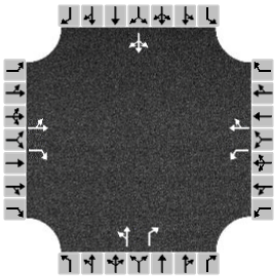
Flow Rate, v (veh/h)	310	65		162	93		57	208		20		
Capacity	633	715		571	633		547	661		546		
95% Queue Length, Q_{95} (veh)	2.7	0.3		1.2	0.5		0.3	1.3		0.1		
Control Delay (s/veh)	13.7	8.2		11.5	9.4		10.0	10.6		9.8		
Level of Service, LOS	B	A		B	A		B	B		A		
Approach Delay (s/veh)	12.8			10.7			10.5			9.8		
Approach LOS	B			B			B			A		
Intersection Delay, s/veh | LOS	11.5						B					

EXHIBIT 25
YEAR 2031 PEAK PM HOUR TRAFFIC – Terminal/Sandford Fleming

HCS7 All-Way Stop Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Sandford Fleming
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Sandford Fleming Avenue
Analysis Time Period (hrs)	0.25	Peak Hour Factor	0.92
Time Analyzed	Peak PM Hour		
Project Description	OTY Residential Development		

Lanes



Vehicle Volume and Adjustments

Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Volume	15	110	79	366	236	6	28	11	229	14	27	12
% Thrus in Shared Lane												
Lane	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
Configuration	LT	R		L	TR		LT	R		LTR		
Flow Rate, v (veh/h)	136	86		398	263		42	249		58		
Percent Heavy Vehicles	0	5		2	2		5	0		0		

Departure Headway and Service Time

Initial Departure Headway, hd (s)	3.20	3.20		3.20	3.20		3.20	3.20		3.20		
Initial Degree of Utilization, x	0.121	0.076		0.354	0.234		0.038	0.221		0.051		
Final Departure Headway, hd (s)	6.63	5.95		6.49	5.96		7.28	6.14		7.06		
Final Degree of Utilization, x	0.250	0.142		0.717	0.436		0.086	0.424		0.113		
Move-Up Time, m (s)	2.3	2.3		2.3	2.3		2.3	2.3		2.0		
Service Time, ts (s)	4.33	3.65		4.19	3.66		4.98	3.84		5.06		

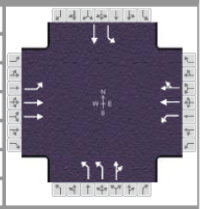
Capacity, Delay and Level of Service

Flow Rate, v (veh/h)	136	86		398	263		42	249		58		
Capacity	543	605		555	604		494	587		510		
95% Queue Length, Q_{95} (veh)	1.0	0.5		5.8	2.2		0.3	2.1		0.4		
Control Delay (s/veh)	11.5	9.6		23.9	13.2		10.7	13.3		11.0		
Level of Service, LOS	B	A		C	B		B	B		B		
Approach Delay (s/veh)	10.8			19.6			12.9			11.0		
Approach LOS	B			C			B			B		
Intersection Delay, s/veh | LOS	16.0						C					

EXHIBIT 26
EXISTING 2015 PEAK AM HOUR TRAFFIC – Industrial/Sandford Fleming

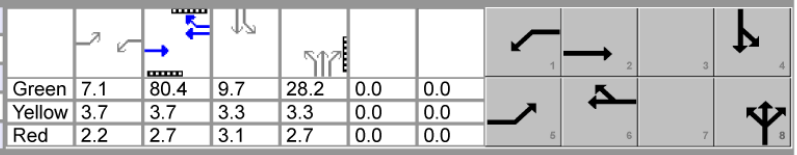
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2015_ex_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	67	525		77	528	30	513	73	86	26	50	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	7.1	80.4	9.7	28.2	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	13.0	86.8	13.0	86.8		34.2		16.1
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	8.6		9.5			26.5		6.5
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		1.6		0.1
Phase Call Probability	0.95		0.97			1.00		0.97
Max Out Probability	1.00		1.00			0.00		0.00

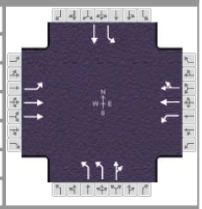
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	73	571		84	306	300	558	173		28	54	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1647		1674	1730	1689	1652	1359		1447	1730	
Queue Service Time (*g s*), s	6.6	9.4		7.5	9.6	9.7	24.5	17.6		2.8	4.5	
Cycle Queue Clearance Time (*g c*), s	6.6	9.4		7.5	9.6	9.7	24.5	17.6		2.8	4.5	
Green Ratio (*g/C*)	0.05	0.54		0.05	0.54	0.54	0.19	0.19		0.07	0.07	
Capacity (*c*), veh/h	83	1786		90	938	916	642	264		103	123	
Volume-to-Capacity Ratio (*X*)	0.872	0.319		0.926	0.327	0.328	0.868	0.654		0.274	0.441	
Back of Queue (*Q*), ft/ln (50 th percentile)	105.1	83.1		125	92.3	101.2	267.8	177		30.2	52.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	4.0	3.2		4.9	3.6	3.5	10.6	6.1		1.0	2.0	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.5	10.9		69.3	11.0	10.8	58.6	55.8		66.0	66.8	
Incremental Delay (*d 2*), s/veh	56.8	0.5		69.6	0.9	1.0	4.6	1.0		0.5	0.9	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	126.2	11.4		138.9	11.9	11.8	63.2	56.8		66.5	67.7	
Level of Service (LOS)	F	B		F	B	B	E	E		E	E	
Approach Delay, s/veh / LOS	24.4	C		27.3	C		61.7	E		67.3	E	
Intersection Delay, s/veh / LOS	39.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.60	C	2.22	B	2.76	C	3.52	D
Bicycle LOS Score / LOS	2.09	B	2.13	B	2.76	C	1.70	B

EXHIBIT 27
EXISTING 2015 PEAK PM HOUR TRAFFIC – Industrial/Sandford Fleming

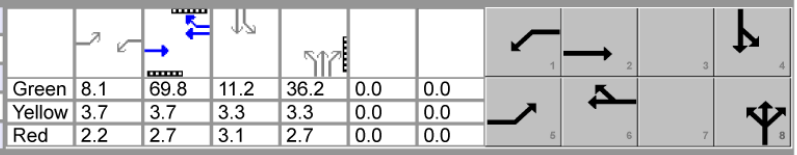
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2015_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	722		114	907	23	689	64	81	56	94	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	8.1	69.8	11.2	36.2	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	14.0	76.2	14.0	76.2		42.2		17.6
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	8.9		11.1			35.1		11.0
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		1.1		0.2
Phase Call Probability	0.96		0.99			1.00		1.00
Max Out Probability	1.00		1.00			0.74		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	76	785		124	508	503	749	158		61	102	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1621	1674		1701	1772	1752	1652	1466		1581	1660	
Queue Service Time (*g s*), s	6.9	19.0		9.1	25.8	25.8	33.1	13.6		5.5	9.0	
Cycle Queue Clearance Time (*g c*), s	6.9	19.0		9.1	25.8	25.8	33.1	13.6		5.5	9.0	
Green Ratio (*g/C*)	0.06	0.47		0.06	0.47	0.47	0.25	0.25		0.08	0.08	
Capacity (*c*), veh/h	93	1580		103	836	827	819	363		129	135	
Volume-to-Capacity Ratio (*X*)	0.819	0.497		1.201	0.608	0.608	0.915	0.434		0.473	0.756	
Back of Queue (*Q*), ft/ln (50 th percentile)	101.4	171.1		207.5	255	288.2	381.4	135.5		61	106.6	
Back of Queue (*Q*), veh/ln (50 th percentile)	3.8	6.7		8.2	10.0	9.9	15.1	5.0		2.3	3.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	68.5	18.4		68.9	19.7	19.5	54.9	47.5		65.8	67.4	
Incremental Delay (*d 2*), s/veh	39.4	1.1		152.3	3.3	3.3	12.8	0.3		1.0	3.2	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	107.9	19.5		221.2	23.0	22.8	67.7	47.8		66.8	70.6	
Level of Service (LOS)	F	B		F	C	C	E	D		E	E	
Approach Delay, s/veh / LOS	27.3	C		44.5	D		64.2	E		69.2	E	
Intersection Delay, s/veh / LOS	46.8						D					

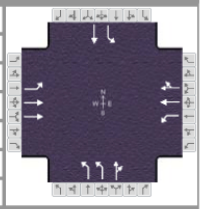
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.64	C	2.24	B	2.94	C	3.62	D
Bicycle LOS Score / LOS	2.27	B	2.50	B	3.06	C	1.83	B

HCS7™ Streets Version 7.4
Generated: 6/15/2018 10:10:03 AM

EXHIBIT 28
YEAR 2021 PEAK AM HOUR TRAFFIC – Industrial/Sandford Fleming

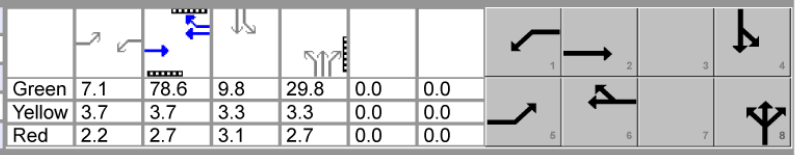
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	94	558		82	561	29	545	96	91	34	55	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	7.1	78.6	9.8	29.8	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	13.0	85.0	13.0	85.0		35.8		16.2
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	9.6		10.0			28.1		7.0
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		1.7		0.1
Phase Call Probability	0.99		0.98			1.00		0.98
Max Out Probability	1.00		1.00			0.01		0.00

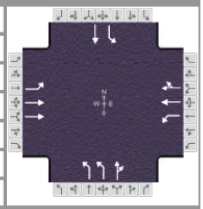
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	102	607		89	324	318	592	203		37	60	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1647		1674	1730	1693	1652	1374		1447	1730	
Queue Service Time (*g s*), s	7.6	10.7		8.0	10.9	11.0	26.1	20.7		3.6	5.0	
Cycle Queue Clearance Time (*g c*), s	7.6	10.7		8.0	10.9	11.0	26.1	20.7		3.6	5.0	
Green Ratio (*g/C*)	0.05	0.53		0.05	0.53	0.53	0.21	0.21		0.07	0.07	
Capacity (*c*), veh/h	83	1748		90	918	898	678	282		104	125	
Volume-to-Capacity Ratio (*X*)	1.224	0.347		0.986	0.353	0.354	0.874	0.721		0.354	0.479	
Back of Queue (*Q*), ft/ln (50 th percentile)	184.6	94.6		143.4	104.7	114.7	286.5	212.5		39.7	58.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	7.1	3.6		5.6	4.0	4.0	11.4	7.3		1.4	2.2	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.9	12.0		69.5	12.0	11.9	57.7	55.6		66.3	66.9	
Incremental Delay (*d 2*), s/veh	170.5	0.5		89.6	1.1	1.1	5.7	2.1		0.8	1.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	240.4	12.6		159.2	13.1	13.0	63.4	57.8		67.0	67.9	
Level of Service (LOS)	F	B		F	B	B	E	E		E	E	
Approach Delay, s/veh / LOS	45.4	D		30.9	C		62.0	E		67.6	E	
Intersection Delay, s/veh / LOS	47.4						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.61	C	2.24	B	2.79	C	3.54	D
Bicycle LOS Score / LOS	2.14	B	2.16	B	2.87	C	1.72	B

EXHIBIT 29
YEAR 2021 PEAK PM HOUR TRAFFIC – Industrial/Sandford Fleming

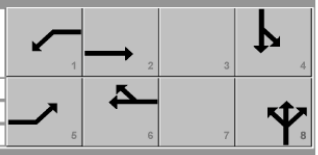
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	83	767		121	963	28	732	73	86	57	116	

Signal Information					EB			WB			NB			SB		
Cycle, s	150.0	Reference Phase	2													
Offset, s	0	Reference Point	Begin	Green	8.1	66.0		13.4	37.9	0.0	0.0					
Uncoordinated	No	Simult. Gap E/W	Off	Yellow	3.7	3.7		3.3	3.3	0.0	0.0					
Force Mode	Float	Simult. Gap N/S	Off	Red	2.2	2.7		3.1	2.7	0.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	14.0	72.4	14.0	72.4		43.9		19.8
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	10.3		11.1			37.3		13.2
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		0.6		0.2
Phase Call Probability	0.98		1.00			1.00		1.00
Max Out Probability	1.00		1.00			1.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	90	834		132	542	535	796	173		62	126	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1621	1674		1701	1772	1749	1652	1473		1581	1660	
Queue Service Time (*g s*), s	8.3	22.6		9.1	31.4	31.4	35.3	14.8		5.5	11.2	
Cycle Queue Clearance Time (*g c*), s	8.3	22.6		9.1	31.4	31.4	35.3	14.8		5.5	11.2	
Green Ratio (*g/C*)	0.06	0.45		0.06	0.45	0.45	0.26	0.26		0.10	0.10	
Capacity (*c*), veh/h	93	1494		103	791	781	856	382		151	159	
Volume-to-Capacity Ratio (*X*)	0.971	0.558		1.275	0.685	0.685	0.929	0.453		0.410	0.794	
Back of Queue (*Q*), ft/ln (50 th percentile)	146	211		227	322.3	363.7	412.7	147.6		60.9	131.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	5.5	8.2		9.0	12.7	12.5	16.4	5.5		2.3	4.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.1	21.6		68.9	23.4	23.2	54.2	46.6		63.8	66.4	
Incremental Delay (*d 2*), s/veh	83.2	1.5		179.3	4.8	4.9	15.3	0.3		0.7	3.4	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	152.3	23.1		248.3	28.2	28.0	69.6	46.9		64.5	69.7	
Level of Service (LOS)	F	C		F	C	C	E	D		E	E	
Approach Delay, s/veh / LOS	35.7	D		52.1	D		65.5	E		68.0	E	
Intersection Delay, s/veh / LOS	52.4						D					

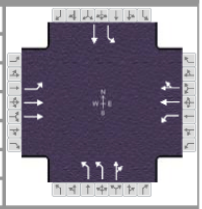
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.66	C	2.27	B	2.97	C	3.64	D
Bicycle LOS Score / LOS	2.32	B	2.56	C	3.16	C	1.87	B

HCS7™ Streets Version 7.4
Generated: 6/15/2018 10:11:55 AM

EXHIBIT 30
YEAR 2027 PEAK AM HOUR TRAFFIC – Industrial/Sandford Fleming

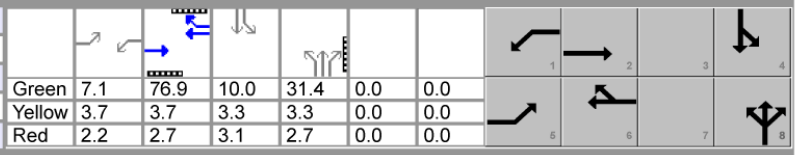
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	105	592		87	595	36	578	101	97	51	68	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	7.1	76.9	10.0	31.4	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	13.0	83.3	13.0	83.3		37.4		16.4
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	9.6		10.1			29.6		8.2
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		1.8		0.1
Phase Call Probability	0.99		0.98			1.00		1.00
Max Out Probability	1.00		1.00			0.03		0.00

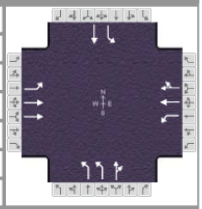
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	114	643		95	347	339	628	215		55	74	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1647		1674	1730	1687	1652	1374		1447	1730	
Queue Service Time (*g s*), s	7.6	12.2		8.1	12.6	12.7	27.6	21.8		5.5	6.2	
Cycle Queue Clearance Time (*g c*), s	7.6	12.2		8.1	12.6	12.7	27.6	21.8		5.5	6.2	
Green Ratio (*g/C*)	0.05	0.52		0.05	0.52	0.52	0.22	0.22		0.07	0.07	
Capacity (*c*), veh/h	83	1709		90	898	875	713	297		106	126	
Volume-to-Capacity Ratio (*X*)	1.367	0.376		1.046	0.386	0.387	0.881	0.725		0.525	0.585	
Back of Queue (*Q*), ft/ln (50 th percentile)	217.1	107.6		156.3	120.3	131.5	306.1	225.9		60.6	72.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	8.3	4.1		6.1	4.6	4.5	12.1	7.8		2.1	2.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.9	13.2		69.6	13.2	13.1	56.9	54.7		67.0	67.3	
Incremental Delay (*d 2*), s/veh	224.4	0.6		107.7	1.3	1.3	6.8	3.0		1.5	1.6	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	294.4	13.8		177.3	14.5	14.4	63.7	57.6		68.5	68.9	
Level of Service (LOS)	F	B		F	B	B	E	E		E	E	
Approach Delay, s/veh / LOS	56.1	E		34.2	C		62.2	E		68.7	E	
Intersection Delay, s/veh / LOS	52.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.62	C	2.27	B	2.82	C	3.55	D
Bicycle LOS Score / LOS	2.18	B	2.20	B	2.95	C	1.77	B

EXHIBIT 31
YEAR 2027 PEAK PM HOUR TRAFFIC – Industrial/Sandford Fleming

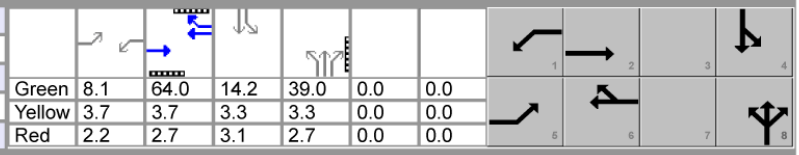
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2027_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	102	814		128	1022	43	777	82	91	70	125	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	8.1	64.0	14.2	39.0	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	14.0	70.4	14.0	70.4		45.0		20.6
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	10.6		11.1			39.8		14.0
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		0.0		0.2
Phase Call Probability	0.99		1.00			1.00		1.00
Max Out Probability	1.00		1.00			1.00		0.00

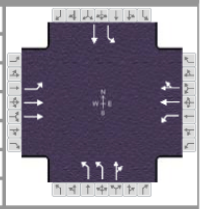
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	111	885		139	584	574	845	188		76	136	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1621	1674		1701	1772	1739	1652	1478		1581	1660	
Queue Service Time (*g s*), s	8.6	25.9		9.1	37.3	37.3	37.8	16.0		6.8	12.0	
Cycle Queue Clearance Time (*g c*), s	8.6	25.9		9.1	37.3	37.3	37.8	16.0		6.8	12.0	
Green Ratio (*g/C*)	0.06	0.43		0.06	0.43	0.43	0.27	0.27		0.10	0.10	
Capacity (*c*), veh/h	93	1449		103	767	753	881	394		161	169	
Volume-to-Capacity Ratio (*X*)	1.193	0.610		1.348	0.761	0.762	0.959	0.477		0.474	0.805	
Back of Queue (*Q*), ft/ln (50 th percentile)	197.3	245.6		247.5	394.4	443.1	456.2	160.6		75	143.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	7.5	9.6		9.8	15.5	15.3	18.1	5.9		2.8	5.3	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.3	23.7		68.9	26.2	25.9	54.2	46.2		63.6	65.9	
Incremental Delay (*d 2*), s/veh	154.3	1.9		207.7	7.0	7.2	20.7	0.3		0.8	4.9	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	223.6	25.6		276.6	33.2	33.0	74.9	46.5		64.4	70.8	
Level of Service (LOS)	F	C		F	C	C	E	D		E	E	
Approach Delay, s/veh / LOS	47.7	D		59.2	E		69.8	E		68.5	E	
Intersection Delay, s/veh / LOS	59.6						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.67	C	2.30	B	3.02	C	3.66	D
Bicycle LOS Score / LOS	2.38	B	2.63	C	3.26	C	1.91	B

EXHIBIT 32
YEAR 2031 PEAK AM HOUR TRAFFIC – Industrial/Sandford Fleming

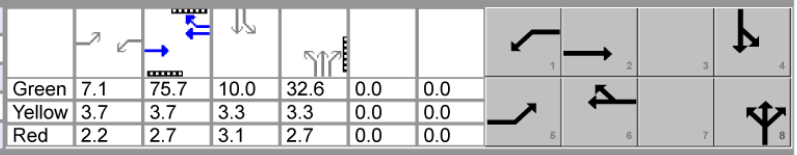
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	111	616		90	619	36	602	108	101	50	68	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	7.1	75.7	10.0	32.6	0.0	0.0
Yellow	3.7	3.7	3.3	3.3	0.0	0.0
Red	2.2	2.7	3.1	2.7	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	13.0	82.1	13.0	82.1		38.6		16.4
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	9.6		10.1			30.8		8.2
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		1.8		0.1
Phase Call Probability	0.99		0.98			1.00		1.00
Max Out Probability	1.00		1.00			0.05		0.00

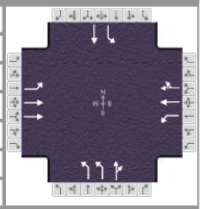
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	121	670		98	360	352	654	227		54	74	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1647	1647		1674	1730	1688	1652	1376		1447	1730	
Queue Service Time (*g s*), s	7.6	13.3		8.1	13.8	13.8	28.8	23.0		5.4	6.2	
Cycle Queue Clearance Time (*g c*), s	7.6	13.3		8.1	13.8	13.8	28.8	23.0		5.4	6.2	
Green Ratio (*g/C*)	0.05	0.51		0.05	0.51	0.51	0.22	0.22		0.07	0.07	
Capacity (*c*), veh/h	83	1684		90	884	863	739	308		106	126	
Volume-to-Capacity Ratio (*X*)	1.445	0.398		1.082	0.407	0.408	0.886	0.738		0.514	0.585	
Back of Queue (*Q*), ft/ln (50 th percentile)	235.7	117		163.4	130.6	142.7	320.3	240.4		59.4	72.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	9.1	4.5		6.4	5.0	4.9	12.7	8.3		2.0	2.8	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.9	14.0		69.6	14.0	13.9	56.4	54.1		67.0	67.3	
Incremental Delay (*d 2*), s/veh	255.4	0.7		118.6	1.4	1.4	7.6	3.9		1.4	1.6	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	325.3	14.7		188.2	15.4	15.3	64.0	58.0		68.4	68.9	
Level of Service (LOS)	F	B		F	B	B	E	E		E	E	
Approach Delay, s/veh / LOS	62.1		E	36.2		D	62.4		E	68.7		E
Intersection Delay, s/veh / LOS	54.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.63	C	2.28	B	2.83	C	3.56	D
Bicycle LOS Score / LOS	2.21	B	2.23	B	3.01	C	1.77	B

EXHIBIT 33
YEAR 2031 PEAK PM HOUR TRAFFIC – Industrial/Sandford Fleming

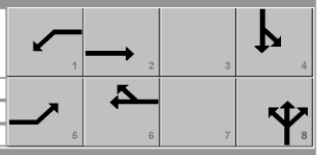
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 14, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Sandford/Industrial	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	115	847		134	1064	43	808	88	95	63	126	

Signal Information					EB		WB			NB		SB				
Cycle, s	150.0	Reference Phase	2													
Offset, s	0	Reference Point	Begin													
Uncoordinated	No	Simult. Gap E/W	Off	Green	8.1	63.9	14.3	39.0	0.0	0.0						
Force Mode	Float	Simult. Gap N/S	Off	Yellow	3.7	3.7	3.3	3.3	0.0	0.0						
				Red	2.2	2.7	3.1	2.7	0.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	2.0	4.0	2.0	4.0		10.0		10.0
Phase Duration, s	14.0	70.3	14.0	70.3		45.0		20.7
Change Period, (*Y+R c*), s	6.4	6.4	5.9	6.4		6.0		6.4
Max Allow Headway (*MAH*), s	3.1	0.0	3.1	0.0		3.2		3.1
Queue Clearance Time (*g s*), s	10.6		11.1			41.8		14.1
Green Extension Time (*g e*), s	0.0	0.0	0.0	0.0		0.0		0.2
Phase Call Probability	0.99		1.00			1.00		1.00
Max Out Probability	1.00		1.00			1.00		0.00

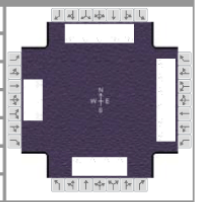
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16	3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h	125	921		146	607	597	878	199		68	137	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1621	1674		1701	1772	1740	1652	1480		1581	1660	
Queue Service Time (*g s*), s	8.6	27.6		9.1	40.0	40.1	39.8	17.1		6.1	12.1	
Cycle Queue Clearance Time (*g c*), s	8.6	27.6		9.1	40.0	40.1	39.8	17.1		6.1	12.1	
Green Ratio (*g/C*)	0.06	0.43		0.06	0.43	0.43	0.27	0.27		0.10	0.10	
Capacity (*c*), veh/h	93	1447		103	766	753	881	395		162	170	
Volume-to-Capacity Ratio (*X*)	1.345	0.636		1.412	0.792	0.793	0.997	0.504		0.424	0.807	
Back of Queue (*Q*), ft/ln (50 th percentile)	235.9	262.3		265.6	427.2	480.6	504.5	171.4		67	144.9	
Back of Queue (*Q*), veh/ln (50 th percentile)	8.9	10.2		10.5	16.8	16.6	20.0	6.3		2.5	5.4	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	69.3	24.1		68.9	26.8	26.5	54.9	46.6		63.2	65.9	
Incremental Delay (*d 2*), s/veh	211.0	2.1		232.8	8.2	8.4	29.5	0.4		0.7	5.3	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh	280.2	26.3		301.7	35.0	34.9	84.5	47.0		63.8	71.1	
Level of Service (LOS)	F	C		F	D	C	F	D		E	E	
Approach Delay, s/veh / LOS	56.6	E		63.8	E		77.6	E		68.7	E	
Intersection Delay, s/veh / LOS	66.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.68	C	2.30	B	3.04	C	3.68	D
Bicycle LOS Score / LOS	2.42	B	2.67	C	3.34	C	1.90	B

EXHIBIT 34
EXISTING 2015 PEAK AM HOUR TRAFFIC – Industrial/Riverside

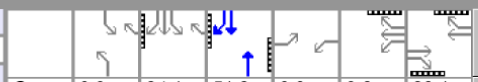
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2015_ex_am.xus		
Project Description	OTY Residential Development				

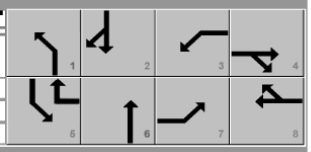


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	22	18	40	430	8	1060	32	1067		883	1069	254

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	3.9	24.1	51.2	3.8	3.6	20.1
Yellow	3.7	3.7	3.7	3.3	3.3	3.3
Red	2.8	2.8	2.7	4.0	6.0	4.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	11.1	27.4	24.0	40.3	10.4	57.6	41.0	88.2
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.3	3.1	3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	5.0	6.3	17.7	30.2	5.1		44.0	
Green Extension Time (*g e*), s	0.0	0.1	0.0	2.8	0.0	0.0	0.0	0.0
Phase Call Probability	0.63	0.93	1.00	1.00	0.77		1.00	
Max Out Probability	0.00	0.00	1.00	0.17	1.00		1.00	

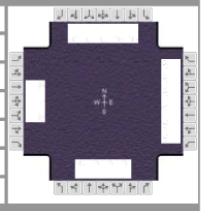
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	24	20	43	467	9	1125	35	1160		960	1162	167
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1179	1098	1357	1613	1309	1263	1674	1596		1652	1687	1466
Queue Service Time (*g s*), s	3.0	2.3	4.3	15.7	0.8	28.2	3.1	31.2		42.0	31.9	8.7
Cycle Queue Clearance Time (*g c*), s	3.0	2.3	4.3	15.7	0.8	28.2	3.1	31.2		42.0	31.9	8.7
Green Ratio (*g/C*)	0.03	0.14	0.14	0.10	0.23	0.51	0.03	0.35		0.28	0.59	0.59
Capacity (*c*), veh/h	38	154	191	338	296	2106	55	1668		925	2007	810
Volume-to-Capacity Ratio (*X*)	0.636	0.127	0.228	1.385	0.029	0.534	0.638	0.696		1.038	0.579	0.207
Back of Queue (*Q*), ft/ln (50 th percentile)	32	22.8	38.8	395.4	8.1	215.8	35.4	320.5		560	313.6	78.6
Back of Queue (*Q*), veh/ln (50 th percentile)	1.0	0.7	1.5	15.3	0.3	8.1	1.4	12.5		22.2	12.3	3.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	71.7	56.9	57.2	67.2	45.6	21.1	71.7	42.4		54.0	20.6	17.0
Incremental Delay (*d 2*), s/veh	6.4	0.1	0.2	190.5	0.0	0.1	4.5	2.4		39.8	1.2	0.6
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	78.2	57.0	57.5	257.6	45.6	21.2	76.2	44.9		93.8	21.8	17.5
Level of Service (LOS)	E	E	E	F	D	C	E	D		F	C	B
Approach Delay, s/veh / LOS	63.1	E		90.3	F		45.8	D		51.7	D	
Intersection Delay, s/veh / LOS	62.5						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.88	C	2.76	C	2.10	B
Bicycle LOS Score / LOS	0.63	A	3.13	C	1.14	A	2.38	B

EXHIBIT 35
EXISTING 2015 PEAK PM HOUR TRAFFIC – Industrial/Riverside

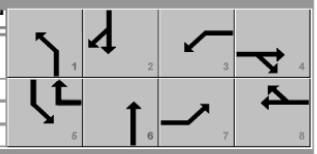
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2015_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	116	13	118	317	31	1313	20	1004		746	898	129

Signal Information					EB			WB			NB			SB		
Cycle, s	150.0	Reference Phase	2													
Offset, s	0	Reference Point	End	Green	2.4	18.6		41.8	13.7	5.0	34.5					
Uncoordinated	No	Simult. Gap E/W	Off	Yellow	3.7	3.7		3.7	3.3	0.0	3.3					
Force Mode	Float	Simult. Gap N/S	Off	Red	2.8	2.8		2.7	4.0	0.0	4.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	21.0	41.8	26.0	46.8	8.9	48.2	34.0	73.3
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	13.7	13.2	17.8	39.1	4.0		37.0	
Green Extension Time (*g e*), s	0.1	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Phase Call Probability	0.99	1.00	1.00	1.00	0.60		1.00	
Max Out Probability	0.09	0.00	1.00	1.00	1.00		1.00	

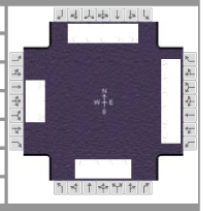
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	126	14	128	345	34	1400	22	1091		811	976	32
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1581	1702	1434	1613	1098	1311	1581	1609		1639	1700	1402
Queue Service Time (*g s*), s	11.7	1.0	11.2	15.8	3.5	37.1	2.0	31.3		35.0	30.5	1.9
Cycle Queue Clearance Time (*g c*), s	11.7	1.0	11.2	15.8	3.5	37.1	2.0	31.3		35.0	30.5	1.9
Green Ratio (*g/C*)	0.10	0.24	0.24	0.12	0.27	0.51	0.02	0.29		0.23	0.50	0.50
Capacity (*c*), veh/h	155	403	339	381	296	2191	36	1377		765	1684	634
Volume-to-Capacity Ratio (*X*)	0.812	0.035	0.378	0.905	0.114	0.639	0.605	0.793		1.060	0.580	0.050
Back of Queue (*Q*), ft/ln (50 th percentile)	140.8	10.7	102.4	198.8	33.1	282.5	23.8	331.1		496.2	313.7	17.7
Back of Queue (*Q*), veh/ln (50 th percentile)	5.2	0.4	4.0	7.7	0.9	11.2	0.9	13.0		19.5	12.4	0.7
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	66.3	44.4	48.0	65.3	41.6	23.4	72.6	50.0		57.5	29.0	23.0
Incremental Delay (*d 2*), s/veh	12.2	0.0	0.3	23.9	0.1	0.5	6.0	4.8		49.8	1.5	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	78.5	44.4	48.2	89.2	41.7	23.9	78.6	54.7		107.3	30.5	23.2
Level of Service (LOS)	E	D	D	F	D	C	E	D		F	C	C
Approach Delay, s/veh / LOS	62.2	E		36.9	D		55.2	E		64.6	E	
Intersection Delay, s/veh / LOS	52.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.87	C	2.77	C	2.11	B
Bicycle LOS Score / LOS	0.93	A	3.42	C	1.10	A	1.99	B

EXHIBIT 36
YEAR 2021 PEAK AM HOUR TRAFFIC – Industrial/Riverside

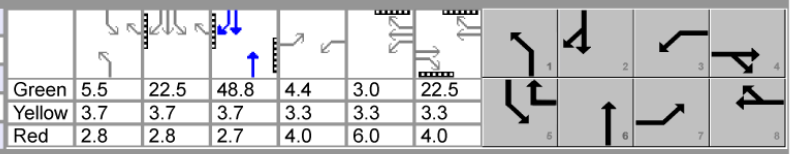
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	29	19	46	462	8	1132	52	1133		945	1135	316

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	5.5	22.5	48.8	4.4	3.0	22.5	
Yellow	3.7	3.7	3.7	3.3	3.3	3.3	
Red	2.8	2.8	2.7	4.0	6.0	4.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	11.7	29.8	24.0	42.1	12.0	55.2	41.0	84.2
Change Period, ($Y+R_c$), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.3	3.1	3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s	6.0	6.8	17.7	32.2	7.0		44.0	
Green Extension Time (g_e), s	0.0	0.1	0.0	2.7	0.0	0.0	0.0	0.0
Phase Call Probability	0.73	0.95	1.00	1.00	0.91		1.00	
Max Out Probability	0.00	0.00	1.00	0.33	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	32	21	50	502	9	1203	57	1232		1027	1234	235
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1179	1098	1364	1613	1309	1264	1674	1596		1652	1687	1466
Queue Service Time (g_s), s	4.0	2.4	4.8	15.7	0.8	30.2	5.0	34.7		42.0	37.4	13.6
Cycle Queue Clearance Time (g_c), s	4.0	2.4	4.8	15.7	0.8	30.2	5.0	34.7		42.0	37.4	13.6
Green Ratio (*g/C*)	0.04	0.16	0.16	0.10	0.24	0.52	0.04	0.33		0.28	0.57	0.57
Capacity (*c*), veh/h	42	172	214	338	313	2153	73	1589		925	1916	770
Volume-to-Capacity Ratio (*X*)	0.744	0.120	0.234	1.488	0.028	0.559	0.779	0.775		1.111	0.644	0.305
Back of Queue (*Q*), ft/ln (50 th percentile)	42.9	23.6	43.8	448.8	8	230	74.1	361		640.9	373.5	125.1
Back of Queue (*Q*), veh/ln (50 th percentile)	1.3	0.7	1.7	17.4	0.2	8.6	2.9	14.1		25.4	14.7	4.8
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	71.6	54.8	55.4	67.2	44.1	20.5	71.0	45.5		54.0	24.1	20.1
Incremental Delay (d_2), s/veh	9.2	0.1	0.2	234.6	0.0	0.1	37.7	3.8		64.8	1.7	1.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	80.8	54.9	55.6	301.8	44.1	20.7	108.7	49.2		118.8	25.8	21.2
Level of Service (LOS)	F	D	E	F	D	C	F	D		F	C	C
Approach Delay, s/veh / LOS	63.2	E		103.2	F		51.9	D		63.6	E	
Intersection Delay, s/veh / LOS	73.0						E					

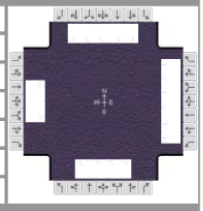
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.88	C	2.76	C	2.10	B
Bicycle LOS Score / LOS	0.66	A	3.32	C	1.20	A	2.55	C

HCS7™ Streets Version 7.4
Generated: 6/15/2018 11:38:09 AM

EXHIBIT 37
YEAR 2021 PEAK PM HOUR TRAFFIC – Industrial/Riverside

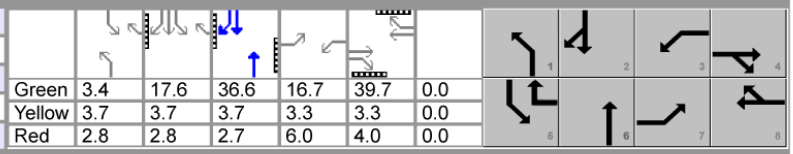
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	166	14	141	351	33	1398	27	1066		795	954	149

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	3.4	17.6	36.6	16.7	39.7	0.0
Yellow	3.7	3.7	3.7	3.3	3.3	0.0
Red	2.8	2.8	2.7	6.0	4.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	26.0	47.0	26.0	47.0	9.9	43.0	34.0	67.1
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	18.8	15.0	19.7	43.0	4.8		37.0	
Green Extension Time (*g e*), s	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.71		1.00	
Max Out Probability	1.00	0.00	1.00	1.00	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	180	15	153	382	36	1492	29	1159		864	1037	53
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1581	1702	1440	1613	1098	1311	1581	1609		1639	1700	1401
Queue Service Time (*g s*), s	16.8	1.0	13.0	17.7	3.7	41.0	2.8	35.5		35.0	35.9	3.5
Cycle Queue Clearance Time (*g c*), s	16.8	1.0	13.0	17.7	3.7	41.0	2.8	35.5		35.0	35.9	3.5
Green Ratio (*g/C*)	0.13	0.27	0.27	0.12	0.27	0.51	0.03	0.25		0.23	0.45	0.45
Capacity (*c*), veh/h	208	462	391	381	298	2197	46	1210		765	1545	577
Volume-to-Capacity Ratio (*X*)	0.869	0.033	0.392	1.002	0.120	0.679	0.639	0.958		1.130	0.671	0.092
Back of Queue (*Q*), ft/ln (50 th percentile)	226.2	11	118.3	249.6	35.2	312.2	31.8	409.6		563.2	377	33
Back of Queue (*Q*), veh/ln (50 th percentile)	8.4	0.4	4.7	9.7	1.0	12.4	1.2	16.1		22.2	15.0	1.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	63.9	40.5	44.6	66.2	41.5	24.1	72.0	55.9		57.5	34.7	27.0
Incremental Delay (*d 2*), s/veh	29.2	0.0	0.2	46.7	0.1	0.7	5.4	17.5		74.6	2.3	0.3
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	93.1	40.6	44.8	112.9	41.6	24.8	77.4	73.4		132.1	37.0	27.3
Level of Service (LOS)	F	D	D	F	D	C	E	E		F	D	C
Approach Delay, s/veh / LOS	69.6	E		42.7	D		73.5	E		78.8	E	
Intersection Delay, s/veh / LOS	64.3						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.87	C	2.77	C	2.12	B
Bicycle LOS Score / LOS	1.06	A	3.64	D	1.14	A	2.10	B

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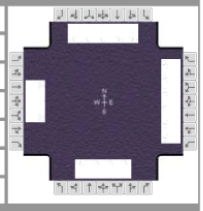
EXHIBIT 38
YEAR 2027 PEAK AM HOUR TRAFFIC – Industrial/Riverside

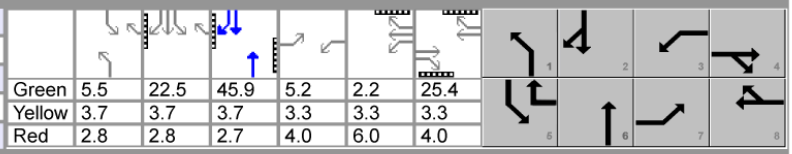
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	34	20	56	497	9	1216	56	1203		1005	1205	335

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	5.5	22.5	45.9	5.2	2.2	25.4	
Yellow	3.7	3.7	3.7	3.3	3.3	3.3	
Red	2.8	2.8	2.7	4.0	6.0	4.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	12.5	32.7	24.0	44.1	12.0	52.3	41.0	81.3
Change Period, ($Y+R_c$), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.3	3.1	3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s	6.7	7.7	17.7	34.6	7.4		44.0	
Green Extension Time (g_e), s	0.0	0.2	0.0	2.2	0.0	0.0	0.0	0.0
Phase Call Probability	0.79	0.97	1.00	1.00	0.92		1.00	
Max Out Probability	0.00	0.00	1.00	0.66	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	37	22	61	540	10	1295	61	1308		1092	1310	255
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1179	1098	1371	1613	1309	1264	1674	1596		1652	1687	1466
Queue Service Time (g_s), s	4.7	2.5	5.7	15.7	0.8	32.6	5.4	38.7		42.0	42.9	15.6
Cycle Queue Clearance Time (g_c), s	4.7	2.5	5.7	15.7	0.8	32.6	5.4	38.7		42.0	42.9	15.6
Green Ratio (*g/C*)	0.04	0.18	0.18	0.10	0.25	0.53	0.04	0.31		0.28	0.55	0.55
Capacity (*c*), veh/h	49	193	241	338	330	2204	73	1498		925	1852	742
Volume-to-Capacity Ratio (*X*)	0.753	0.113	0.253	1.600	0.030	0.587	0.839	0.873		1.181	0.707	0.344
Back of Queue (*Q*), ft/ln (50 th percentile)	49.8	24.3	52.4	508.1	8.8	247.4	86.2	414		731.1	435.1	145.3
Back of Queue (*Q*), veh/ln (50 th percentile)	1.5	0.7	2.0	19.7	0.3	9.3	3.4	16.2		29.0	17.1	5.6
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	71.1	52.4	53.3	67.2	42.6	20.0	71.2	49.2		54.0	27.3	22.1
Incremental Delay (d_2), s/veh	8.4	0.1	0.2	283.7	0.0	0.2	52.7	7.3		92.7	2.3	1.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	79.5	52.5	53.5	350.8	42.6	20.2	123.9	56.5		146.7	29.6	23.4
Level of Service (LOS)	E	D	D	F	D	C	F	E		F	C	C
Approach Delay, s/veh / LOS	61.4	E		117.2	F		59.5	E		77.1	E	
Intersection Delay, s/veh / LOS	85.1						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.88	C	2.76	C	2.11	B
Bicycle LOS Score / LOS	0.68	A	3.53	D	1.24	A	2.68	C

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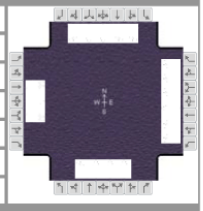
EXHIBIT 39
YEAR 2027 PEAK PM HOUR TRAFFIC – Industrial/Riverside

HCS7 Signalized Intersection Results Summary

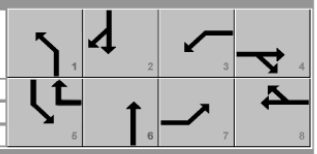
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2027_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	175	15	153	375	35	1492	31	1132		850	1012	167

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off

Green	3.9	17.1	36.6	16.7	39.7	0.0	
Yellow	3.7	3.7	3.7	3.3	3.3	0.0	
Red	2.8	2.8	2.7	6.0	4.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	26.0	47.0	26.0	47.0	10.4	43.0	34.0	66.6
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	19.8	16.3	19.7	47.7	5.2		37.0	
Green Extension Time (*g e*), s	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.75		1.00	
Max Out Probability	1.00	0.00	1.00	1.00	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	190	16	166	408	38	1595	34	1230		924	1100	73
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1581	1702	1440	1613	1098	1311	1581	1609		1639	1700	1401
Queue Service Time (*g s*), s	17.8	1.1	14.3	17.7	3.9	45.7	3.2	37.6		35.0	39.4	4.9
Cycle Queue Clearance Time (*g c*), s	17.8	1.1	14.3	17.7	3.9	45.7	3.2	37.6		35.0	39.4	4.9
Green Ratio (*g/C*)	0.13	0.27	0.27	0.12	0.27	0.51	0.03	0.25		0.23	0.45	0.45
Capacity (*c*), veh/h	208	462	391	381	298	2197	52	1210		765	1533	572
Volume-to-Capacity Ratio (*X*)	0.916	0.035	0.426	1.071	0.128	0.726	0.653	1.017		1.208	0.718	0.127
Back of Queue (*Q*), ft/ln (50 th percentile)	252.8	11.8	129.8	276.3	37.5	349.3	36.4	466.6		647.4	416.1	46.2
Back of Queue (*Q*), veh/ln (50 th percentile)	9.4	0.4	5.1	10.7	1.1	13.9	1.3	18.4		25.5	16.5	1.7
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	64.3	40.6	45.0	66.2	41.6	25.2	71.7	56.2		57.5	36.2	27.7
Incremental Delay (*d 2*), s/veh	39.3	0.0	0.3	66.3	0.1	1.1	5.1	30.2		105.8	2.9	0.5
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	103.7	40.6	45.3	132.5	41.7	26.2	76.8	86.4		163.3	39.1	28.2
Level of Service (LOS)	F	D	D	F	D	C	E	F		F	D	C
Approach Delay, s/veh / LOS	74.9	E		47.7	D		86.1	F		93.4	F	
Intersection Delay, s/veh / LOS	74.5						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.87	C	2.77	C	2.12	B
Bicycle LOS Score / LOS	1.10	A	3.85	D	1.18	A	2.22	B

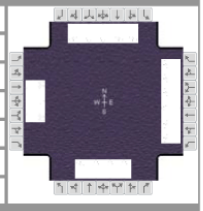
HCS7™ Streets Version 7.4

Generated: 6/15/2018 12:40:54 PM

EXHIBIT 40
YEAR 2031 PEAK AM HOUR TRAFFIC – Industrial/Riverside

HCS7 Signalized Intersection Results Summary

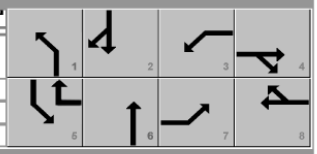
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	38	21	62	520	9	1276	58	1252		1047	1254	350

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off

Green	5.5	22.5	44.0	5.9	1.5	27.3
Yellow	3.7	3.7	3.7	3.3	3.3	3.3
Red	2.8	2.8	2.7	4.0	6.0	4.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	13.2	34.6	24.0	45.4	12.0	50.4	41.0	79.4
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.3	3.1	3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	7.2	8.3	17.7	36.5	7.6		44.0	
Green Extension Time (*g e*), s	0.0	0.2	0.0	1.7	0.0	0.0	0.0	0.0
Phase Call Probability	0.82	0.98	1.00	1.00	0.93		1.00	
Max Out Probability	0.00	0.00	1.00	1.00	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	41	23	67	565	10	1360	63	1361		1138	1363	272
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1179	1098	1374	1613	1309	1264	1674	1596		1652	1687	1466
Queue Service Time (*g s*), s	5.2	2.6	6.3	15.7	0.8	34.5	5.6	41.7		42.0	47.2	17.3
Cycle Queue Clearance Time (*g c*), s	5.2	2.6	6.3	15.7	0.8	34.5	5.6	41.7		42.0	47.2	17.3
Green Ratio (*g/C*)	0.05	0.19	0.19	0.10	0.26	0.54	0.04	0.30		0.28	0.54	0.54
Capacity (*c*), veh/h	54	207	260	338	341	2236	73	1436		925	1808	723
Volume-to-Capacity Ratio (*X*)	0.759	0.110	0.260	1.674	0.029	0.608	0.869	0.948		1.230	0.754	0.376
Back of Queue (*Q*), ft/ln (50 th percentile)	55.3	25	57.3	547.4	8.7	260.7	92.8	467.4		797.7	484.4	161.9
Back of Queue (*Q*), veh/ln (50 th percentile)	1.7	0.7	2.2	21.2	0.3	9.8	3.6	18.3		31.7	19.1	6.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	70.7	50.8	51.9	67.2	41.7	19.7	71.3	51.9		54.0	29.6	23.7
Incremental Delay (*d 2*), s/veh	7.8	0.1	0.2	316.2	0.0	0.3	61.3	14.2		113.2	3.0	1.5
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	78.5	50.9	52.1	383.3	41.7	20.0	132.6	66.1		167.2	32.6	25.1
Level of Service (LOS)	E	D	D	F	D	C	F	E		F	C	C
Approach Delay, s/veh / LOS	60.2	E		126.3	F		69.0	E		87.1	F	
Intersection Delay, s/veh / LOS	94.5						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.47	B	2.87	C	2.76	C	2.11	B
Bicycle LOS Score / LOS	0.70	A	3.68	D	1.27	A	2.78	C

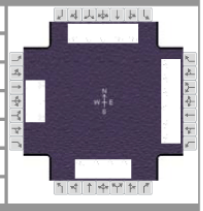
HCS7™ Streets Version 7.4

Generated: 6/15/2018 11:42:45 AM

EXHIBIT 41
YEAR 2031 PEAK PM HOUR TRAFFIC – Industrial/Riverside

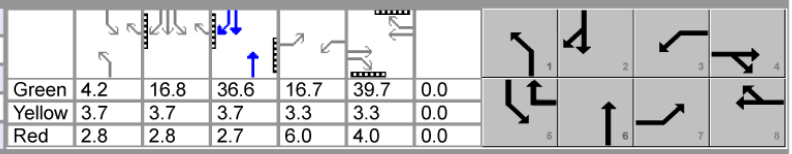
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.92
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Industrial/Riverside	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	181	15	160	386	36	1544	33	1178		888	1053	181

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.2	16.8	36.6	16.7	39.7	0.0
Yellow	3.7	3.7	3.7	3.3	3.3	0.0
Red	2.8	2.8	2.7	6.0	4.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	1	6	5	2
Case Number	2.0	3.0	2.0	3.0	2.0	4.0	2.0	3.0
Phase Duration, s	26.0	47.0	26.0	47.0	10.7	43.0	34.0	66.3
Change Period, (*Y+R c*), s	7.3	7.3	9.3	7.3	6.5	6.4	6.5	6.4
Max Allow Headway (*MAH*), s	3.1	3.4	3.1	3.4	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s	20.5	17.0	19.7	49.6	5.4		37.0	
Green Extension Time (*g e*), s	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.78		1.00	
Max Out Probability	1.00	0.00	1.00	1.00	1.00		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6		5	2	12
Adjusted Flow Rate (*v*), veh/h	197	16	174	420	39	1651	36	1280		965	1145	88
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1581	1702	1440	1613	1098	1311	1581	1609		1639	1700	1401
Queue Service Time (*g s*), s	18.5	1.1	15.0	17.7	4.0	47.6	3.4	37.6		35.0	41.9	6.0
Cycle Queue Clearance Time (*g c*), s	18.5	1.1	15.0	17.7	4.0	47.6	3.4	37.6		35.0	41.9	6.0
Green Ratio (*g/C*)	0.13	0.27	0.27	0.12	0.27	0.51	0.03	0.25		0.23	0.45	0.45
Capacity (*c*), veh/h	208	462	391	381	298	2197	54	1210		765	1527	569
Volume-to-Capacity Ratio (*X*)	0.948	0.035	0.445	1.102	0.131	0.752	0.660	1.058		1.262	0.750	0.155
Back of Queue (*Q*), ft/ln (50 th percentile)	272.9	11.8	136.5	290.5	38.5	371.7	39.6	502.5		708.5	445	56.7
Back of Queue (*Q*), veh/ln (50 th percentile)	10.1	0.4	5.4	11.3	1.1	14.7	1.5	19.8		27.9	17.7	2.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	64.6	40.6	45.3	66.2	41.7	25.8	71.6	56.2		57.5	37.1	28.2
Incremental Delay (*d 2*), s/veh	47.2	0.0	0.3	76.7	0.1	1.3	7.6	42.8		128.4	3.4	0.6
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	111.9	40.6	45.6	142.8	41.7	27.1	79.1	99.0		185.9	40.6	28.8
Level of Service (LOS)	F	D	D	F	D	C	E	F		F	D	C
Approach Delay, s/veh / LOS	79.1	E		50.4	D		98.5	F		103.9	F	
Intersection Delay, s/veh / LOS	82.3						F					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.87	C	2.77	C	2.12	B
Bicycle LOS Score / LOS	1.13	A	3.97	D	1.21	A	2.30	B

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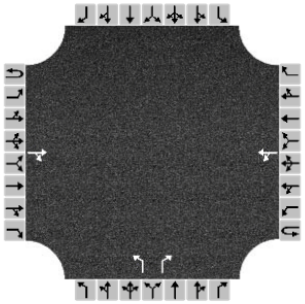
EXHIBIT 42
EXISTING 2013 PEAK AM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2013	North/South Street	Railmarket Private
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			127	18		37	279			15		25				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

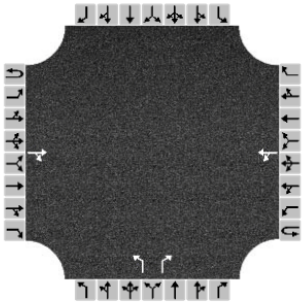
Flow Rate, v (veh/h)						40				16		27				
Capacity, c (veh/h)						1427				496		901				
v/c Ratio						0.03				0.03		0.03				
95% Queue Length, Q_{95} (veh)						0.1				0.1		0.1				
Control Delay (s/veh)						7.6				12.5		9.1				
Level of Service, LOS						A				B		A				
Approach Delay (s/veh)						1.1				10.4						
Approach LOS										B						

EXHIBIT 43
EXISTING 2013 PEAK PM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2013	North/South Street	Railmarket Private
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			289	70		87	220			76		98				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						95				83		107				
Capacity, c (veh/h)						1174				336		694				
v/c Ratio						0.08				0.25		0.15				
95% Queue Length, Q_{95} (veh)						0.3				1.0		0.5				
Control Delay (s/veh)						8.3				19.2		11.1				
Level of Service, LOS						A				C		B				
Approach Delay (s/veh)						2.9				14.6						
Approach LOS										B						

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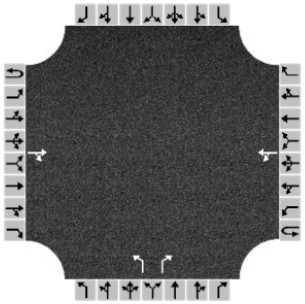
EXHIBIT 44
YEAR 2021 PEAK AM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2021	North/South Street	Railmarket Private
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			150	21		40	365			26		27				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No				No				No				No	
Median Type/Storage				Undivided												

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						43				28		29				
Capacity, c (veh/h)						1394				417		872				
v/c Ratio						0.03				0.07		0.03				
95% Queue Length, Q_{95} (veh)						0.1				0.2		0.1				
Control Delay (s/veh)						7.7				14.3		9.3				
Level of Service, LOS						A				B		A				
Approach Delay (s/veh)						1.0				11.7						
Approach LOS										B						

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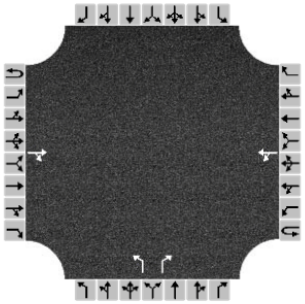
EXHIBIT 45
YEAR 2021 PEAK PM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2021	North/South Street	Railmarket Private
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			369	84		94	253			83		106				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						102				90		115				
Capacity, c (veh/h)						1076				271		614				
v/c Ratio						0.09				0.33		0.19				
95% Queue Length, Q_{95} (veh)						0.3				1.4		0.7				
Control Delay (s/veh)						8.7				24.8		12.2				
Level of Service, LOS						A				C		B				
Approach Delay (s/veh)						3.1				17.7						
Approach LOS										C						

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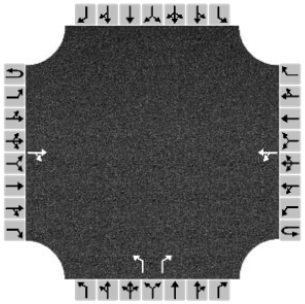
EXHIBIT 46
YEAR 2027 PEAK AM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2027	North/South Street	Railmarket Private
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			167	23		43	387			27		29				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						47				29		32				
Capacity, c (veh/h)						1370				389		850				
v/c Ratio						0.03				0.08		0.04				
95% Queue Length, Q_{95} (veh)						0.1				0.2		0.1				
Control Delay (s/veh)						7.7				15.0		9.4				
Level of Service, LOS						A				C		A				
Approach Delay (s/veh)						1.1				12.1						
Approach LOS										B						

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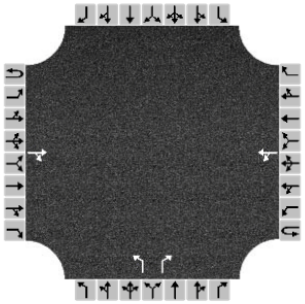
EXHIBIT 47
YEAR 2027 PEAK PM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2027	North/South Street	Railmarket Private
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			393	88		100	276			88		113				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						109				96		123				
Capacity, c (veh/h)						1048				245		592				
v/c Ratio						0.10				0.39		0.21				
95% Queue Length, Q_{95} (veh)						0.3				1.8		0.8				
Control Delay (s/veh)						8.8				28.8		12.7				
Level of Service, LOS						A				D		B				
Approach Delay (s/veh)						3.2				19.7						
Approach LOS										C						

HCS7™ TWSC Version 7.4
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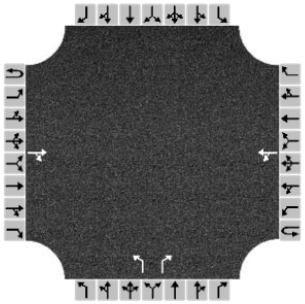
EXHIBIT 48
YEAR 2031 PEAK AM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Railmarket Private
Time Analyzed	Peak AM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			192	24		44	406			28		30				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.41		6.21				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.51		3.31				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						48				30		33				
Capacity, c (veh/h)						1338				362		820				
v/c Ratio						0.04				0.08		0.04				
95% Queue Length, Q_{95} (veh)						0.1				0.3		0.1				
Control Delay (s/veh)						7.8				15.8		9.6				
Level of Service, LOS						A				C		A				
Approach Delay (s/veh)						1.1				12.6						
Approach LOS										B						

HCS7™ TWSC Version 7.4
2031_tot_am.xtw
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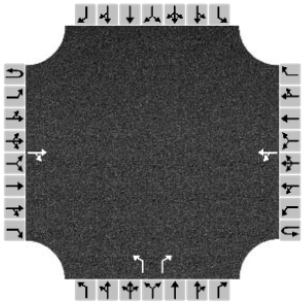
EXHIBIT 49
YEAR 2031 PEAK PM HOUR TRAFFIC – Terminal/Railmarket

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst		Intersection	Terminal/Railmarket
Agency/Co.		Jurisdiction	City of Ottawa
Date Performed	11/22/2017	East/West Street	Terminal Avenue
Analysis Year	2031	North/South Street	Railmarket Private
Time Analyzed	Peak PM Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	OTY Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume, V (veh/h)			417	92		104	302			92		117				
Percent Heavy Vehicles (%)						1				1		1				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized		No				No				No				No		
Median Type/Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						113				100		127				
Capacity, c (veh/h)						1022				222		571				
v/c Ratio						0.11				0.45		0.22				
95% Queue Length, Q_{95} (veh)						0.4				2.2		0.8				
Control Delay (s/veh)						9.0				33.8		13.1				
Level of Service, LOS						A				D		B				
Approach Delay (s/veh)						3.2				22.2						
Approach LOS										C						

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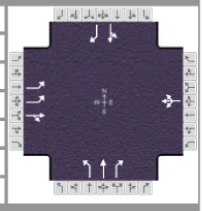
EXHIBIT 50
EXISTING 2014 PEAK AM HOUR TRAFFIC – Terminal/Trainyards

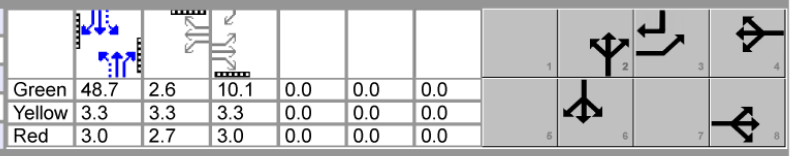
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2014	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2014_ex_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	65	15	36	7	3	1	79	82	21	1	57	168

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	48.7	2.6	10.1	0.0	0.0	0.0						
Yellow	3.3	3.3	3.3	0.0	0.0	0.0						
Red	3.0	2.7	3.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		16.4		8.6		55.0		55.0
Change Period, (*Y+R c*), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.2		3.1		0.0		0.0
Queue Clearance Time (*g s*), s		4.4		2.5				
Green Extension Time (*g e*), s		0.2		0.0		0.0		0.0
Phase Call Probability		0.94		0.24				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	72	51			12		88	91	1		64	20
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1600	1548			1717		1301	1688	1478		1686	1340
Queue Service Time (*g s*), s	1.6	2.4			0.5		2.3	1.7	0.0		0.0	0.1
Cycle Queue Clearance Time (*g c*), s	1.6	2.4			0.5		3.5	1.7	0.0		1.2	0.1
Green Ratio (*g/C*)	0.13	0.13			0.05		0.62	0.62	0.62		0.62	0.83
Capacity (*c*), veh/h	430	208			78		879	1049	918		1093	1216
Volume-to-Capacity Ratio (*X*)	0.168	0.245			0.157		0.100	0.087	0.001		0.059	0.016
Back of Queue (*Q*), ft/ln (50 th percentile)	15.6	21.8			5.8		15.2	14.8	0.2		10.3	0.2
Back of Queue (*Q*), veh/ln (50 th percentile)	0.6	0.9			0.2		0.6	0.6	0.0		0.4	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	30.7	31.0			36.7		6.6	6.1	5.7		6.0	0.4
Incremental Delay (*d 2*), s/veh	0.1	0.2			0.3		0.2	0.2	0.0		0.1	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.7	31.2			37.1		6.9	6.2	5.7		6.1	0.4
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	30.9	C		37.1	D		6.5	A		4.7	A	
Intersection Delay, s/veh / LOS	14.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.69	A	0.51	A	0.78	A	0.63	A

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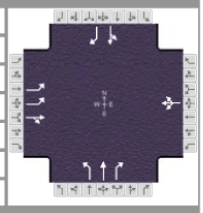
EXHIBIT 51
EXISTING 2014 PEAK PM HOUR TRAFFIC – Terminal/Trainyards

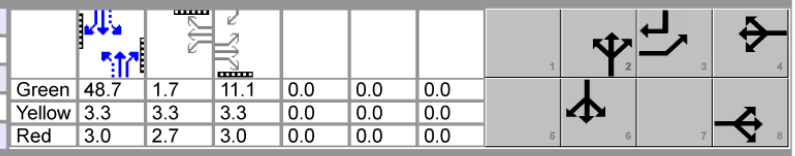
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2014	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2014_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	99	2	53	4	1	0	41	117	8	4	105	187

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	48.7	1.7	11.1	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	3.0	2.7	3.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		17.4		7.7		55.0		55.0
Change Period, (*Y+R c*), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.2		3.1		0.0		0.0
Queue Clearance Time (*g s*), s		4.7		2.2				
Green Extension Time (*g e*), s		0.4		0.0		0.0		0.0
Phase Call Probability		0.97		0.12				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	110	56			6		46	130	3		121	41
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1470	1483			1731		1284	1730	1486		1707	1200
Queue Service Time (*g s*), s	2.7	2.7			0.2		1.2	2.5	0.1		0.0	0.2
Cycle Queue Clearance Time (*g c*), s	2.7	2.7			0.2		3.5	2.5	0.1		2.3	0.2
Green Ratio (*g/C*)	0.15	0.15			0.03		0.62	0.62	0.62		0.62	0.84
Capacity (*c*), veh/h	432	218			58		850	1074	923		1106	1107
Volume-to-Capacity Ratio (*X*)	0.255	0.255			0.096		0.054	0.121	0.004		0.109	0.037
Back of Queue (*Q*), ft/ln (50 th percentile)	25.6	23.4			2.7		7.8	21.2	0.5		19.8	0.6
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	0.9			0.1		0.3	0.8	0.0		0.8	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	30.2	30.2			37.5		6.9	6.2	5.8		6.2	0.3
Incremental Delay (*d 2*), s/veh	0.1	0.2			0.3		0.1	0.2	0.0		0.2	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.4	30.5			37.8		7.0	6.4	5.8		6.4	0.3
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	30.4	C		37.8	D		6.6	A		4.9	A	
Intersection Delay, s/veh / LOS	14.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.76	A	0.50	A	0.78	A	0.76	A

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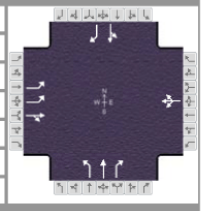
FIGURE 52
YEAR 2021 PEAK AM HOUR TRAFFIC – Terminal/Trainyards

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	78	16	43	8	3	1	122	88	23	1	61	206

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	48.3	2.8	10.3	0.0	0.0	0.0						
Yellow	3.3	3.3	3.3	0.0	0.0	0.0						
Red	3.0	2.7	3.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		16.6		8.8		54.6		54.6
Change Period, (*Y+R c*), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.2		3.1		0.0		0.0
Queue Clearance Time (*g s*), s		4.8		2.6				
Green Extension Time (*g e*), s		0.3		0.0		0.0		0.0
Phase Call Probability		0.96		0.26				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	87	60			13		136	98	3		69	62
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1600	1540			1717		1295	1688	1478		1686	1340
Queue Service Time (*g s*), s	1.9	2.8			0.6		3.7	1.9	0.1		0.0	0.4
Cycle Queue Clearance Time (*g c*), s	1.9	2.8			0.6		5.1	1.9	0.1		1.3	0.4
Green Ratio (*g/C*)	0.14	0.14			0.05		0.62	0.62	0.62		0.62	0.83
Capacity (*c*), veh/h	440	212			82		867	1040	910		1084	1213
Volume-to-Capacity Ratio (*X*)	0.197	0.283			0.163		0.156	0.094	0.004		0.064	0.051
Back of Queue (*Q*), ft/ln (50 th percentile)	18.7	25.6			6.3		25.2	16.4	0.5		11.3	0.8
Back of Queue (*Q*), veh/ln (50 th percentile)	0.7	1.0			0.3		1.0	0.6	0.0		0.4	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	30.6	30.9			36.6		7.2	6.3	5.9		6.1	0.4
Incremental Delay (*d 2*), s/veh	0.1	0.3			0.3		0.4	0.2	0.0		0.1	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.7	31.2			36.9		7.5	6.4	5.9		6.3	0.5
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	30.9	C		36.9	D		7.1	A		3.5	A	
Intersection Delay, s/veh / LOS	13.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.73	A	0.51	A	0.88	A	0.70	A

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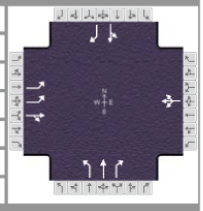
FIGURE 53
YEAR 2021 PEAK PM HOUR TRAFFIC – Terminal/Trainyards

HCS7 Signalized Intersection Results Summary

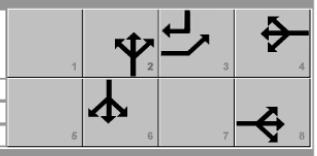
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	130	2	89	4	1	0	51	125	9	4	113	208

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	48.5	1.7	11.2	0.0	0.0	0.0						
Yellow	3.3	3.3	3.3	0.0	0.0	0.0						
Red	3.0	2.7	3.0	0.0	0.0	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		17.5		7.7		54.8		54.8
Change Period, ($Y+R_c$), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.3		3.1		0.0		0.0
Queue Clearance Time (g_s), s		6.7		2.2				
Green Extension Time (g_e), s		0.5		0.0		0.0		0.0
Phase Call Probability		1.00		0.12				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	144	96			6		57	139	4		130	64
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1470	1479			1731		1274	1730	1486		1707	1200
Queue Service Time (g_s), s	3.5	4.7			0.2		1.5	2.7	0.1		0.0	0.4
Cycle Queue Clearance Time (g_c), s	3.5	4.7			0.2		4.0	2.7	0.1		2.5	0.4
Green Ratio (*g/C*)	0.15	0.15			0.03		0.62	0.62	0.62		0.62	0.84
Capacity (*c*), veh/h	439	221			58		838	1070	919		1103	1108
Volume-to-Capacity Ratio (*X*)	0.329	0.433			0.096		0.068	0.130	0.005		0.118	0.058
Back of Queue (*Q*), ft/ln (50 th percentile)	33.9	41.4			2.7		10	23	0.7		21.5	0.9
Back of Queue (*Q*), veh/ln (50 th percentile)	1.2	1.6			0.1		0.4	0.9	0.0		0.8	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (d_1), s/veh	30.4	31.0			37.5		7.1	6.3	5.8		6.3	0.3
Incremental Delay (d_2), s/veh	0.2	0.5			0.3		0.2	0.3	0.0		0.2	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.6	31.4			37.8		7.3	6.6	5.8		6.5	0.4
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	30.9	C		37.8	D		6.8	A		4.5	A	
Intersection Delay, s/veh / LOS	15.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.88	A	0.50	A	0.82	A	0.81	A

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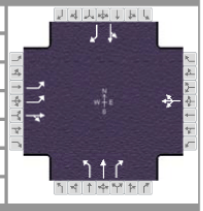
FIGURE 54
YEAR 2027 PEAK AM HOUR TRAFFIC – Terminal/Trainyards

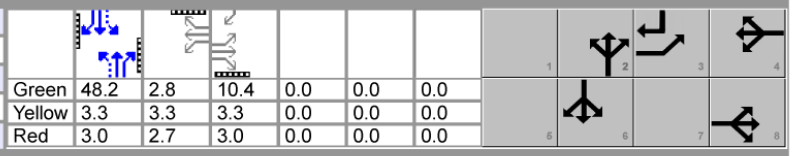
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	91	17	45	8	3	1	127	93	24	1	65	220

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	48.2	2.8	10.4	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	3.0	2.7	3.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		16.7		8.8		54.5		54.5
Change Period, (*Y+R c*), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.2		3.1		0.0		0.0
Queue Clearance Time (*g s*), s		5.0		2.6				
Green Extension Time (*g e*), s		0.3		0.0		0.0		0.0
Phase Call Probability		0.97		0.26				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	101	63			13		141	103	4		73	78
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1600	1540			1717		1290	1688	1477		1686	1340
Queue Service Time (*g s*), s	2.2	3.0			0.6		4.0	2.0	0.1		0.0	0.5
Cycle Queue Clearance Time (*g c*), s	2.2	3.0			0.6		5.4	2.0	0.1		1.4	0.5
Green Ratio (*g/C*)	0.14	0.14			0.05		0.61	0.61	0.61		0.61	0.83
Capacity (*c*), veh/h	445	214			82		860	1037	908		1082	1213
Volume-to-Capacity Ratio (*X*)	0.227	0.295			0.163		0.164	0.100	0.005		0.068	0.064
Back of Queue (*Q*), ft/ln (50 th percentile)	21.9	27.1			6.3		26.6	17.4	0.7		12.1	1
Back of Queue (*Q*), veh/ln (50 th percentile)	0.8	1.1			0.3		1.0	0.7	0.0		0.5	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	30.6	30.9			36.6		7.3	6.3	6.0		6.2	0.4
Incremental Delay (*d 2*), s/veh	0.1	0.3			0.3		0.4	0.2	0.0		0.1	0.1
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.7	31.2			36.9		7.7	6.5	6.0		6.3	0.5
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	30.9	C		36.9	D		7.2	A		3.3	A	
Intersection Delay, s/veh / LOS	13.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.76	A	0.51	A	0.90	A	0.74	A

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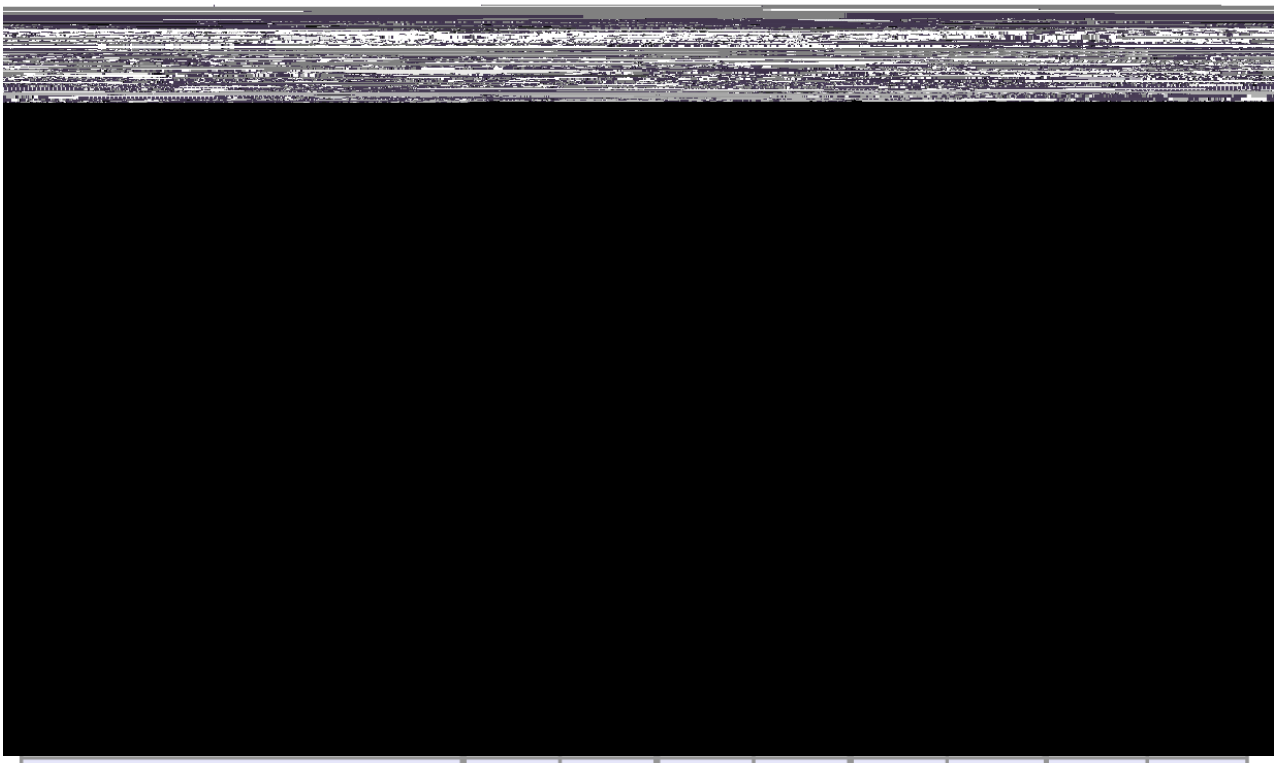
FIGURE 55
YEAR 2027 PEAK PM HOUR TRAFFIC – Terminal/Trainyards

HCS7 Signalized Intersection Results Summary



Phase Call Probability		1.00			0.14							
Max Out Probability		0.00			0.00							

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	158	99			7		60	148	4		138	88
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1470	1479			1728		1266	1730	1486		1704	1200
Queue Service Time (g_s), s	3.9	4.9			0.3		1.7	2.9	0.1		0.0	0.5
Cycle Queue Clearance Time (g_c), s	3.9	4.9			0.3		4.4	2.9	0.1		2.7	0.5
Green Ratio (*g/C*)	0.15	0.15			0.04		0.62	0.62	0.62		0.62	0.84
Capacity (*c*), veh/h	439	221			62		827	1065	915		1096	1104
Volume-to-Capacity Ratio (*X*)	0.359	0.448			0.107		0.073	0.139	0.005		0.126	0.079
Back of Queue (*Q*), ft/ln (50 th percentile)	37.2	43			3.2		10.8	24.9	0.7		23.2	1.3
Back of Queue (*Q*), veh/ln (50 th percentile)	1.3	1.7			0.1		0.4	1.0	0.0		0.9	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (d_1), s/veh	30.6	31.0			37.3		7.3	6.5	5.9		6.4	0.3
Incremental Delay (d_2), s/veh	0.2	0.5			0.3		0.2	0.3	0.0		0.2	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.8	31.5			37.6		7.5	6.7	5.9		6.7	0.5
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	31.1	C		37.6	D		6.9	A		4.2	A	
Intersection Delay, s/veh / LOS	15.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.91	A	0.50	A	0.84	A	0.86	A

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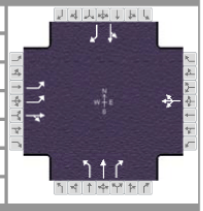
FIGURE 56
YEAR 2031 PEAK AM HOUR TRAFFIC – Terminal/Trainyards

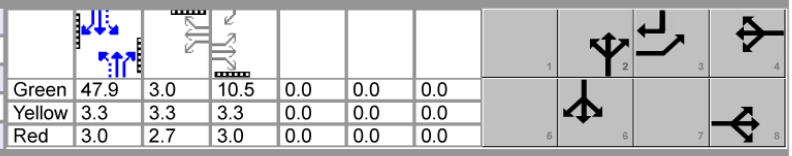
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	101	18	59	8	4	1	135	97	25	1	67	230

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	47.9	3.0	10.5	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	3.0	2.7	3.0	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		16.8		9.0		54.2		54.2
Change Period, ($Y+R_c$), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.2		3.1		0.0		0.0
Queue Clearance Time (g_s), s		5.8		2.6				
Green Extension Time (g_e), s		0.4		0.0		0.0		0.0
Phase Call Probability		0.99		0.27				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	112	80			14		150	108	6		76	89
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1600	1526			1723		1288	1688	1477		1686	1340
Queue Service Time (g_s), s	2.5	3.8			0.6		4.3	2.1	0.1		0.0	0.6
Cycle Queue Clearance Time (g_c), s	2.5	3.8			0.6		5.8	2.1	0.1		1.5	0.6
Green Ratio (*g/C*)	0.14	0.14			0.05		0.61	0.61	0.61		0.61	0.83
Capacity (*c*), veh/h	450	215			86		853	1031	903		1076	1210
Volume-to-Capacity Ratio (*X*)	0.249	0.373			0.169		0.176	0.105	0.006		0.070	0.073
Back of Queue (*Q*), ft/ln (50 th percentile)	24.3	34.6			6.8		29	18.5	0.9		12.7	1.1
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	1.4			0.3		1.1	0.7	0.0		0.5	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (d_1), s/veh	30.6	31.2			36.4		7.5	6.5	6.1		6.3	0.4
Incremental Delay (d_2), s/veh	0.1	0.4			0.3		0.4	0.2	0.0		0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.7	31.6			36.8		8.0	6.7	6.1		6.5	0.5
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	31.1	C		36.8	D		7.4	A		3.3	A	
Intersection Delay, s/veh / LOS	14.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.14	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.80	A	0.51	A	0.92	A	0.76	A

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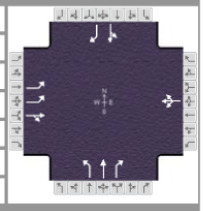
FIGURE 57
YEAR 2031 PEAK PM HOUR TRAFFIC – Terminal/Trainyards

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	12/18/2017	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Traintards/Terminal	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	149	2	102	5	1	0	67	139	9	5	124	242

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	48.3	1.9	11.3	0.0	0.0	0.0						
Yellow	3.3	3.3	3.3	0.0	0.0	0.0						
Red	3.0	2.7	3.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		8		4		2		6
Case Number		10.0		12.0		5.0		7.0
Phase Duration, s		17.6		7.9		54.6		54.6
Change Period, (*Y+R c*), s		6.6		6.0		6.3		6.3
Max Allow Headway (*MAH*), s		3.3		3.1		0.0		0.0
Queue Clearance Time (*g s*), s		7.5		2.3				
Green Extension Time (*g e*), s		0.6		0.0		0.0		0.0
Phase Call Probability		1.00		0.14				
Max Out Probability		0.00		0.00				

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	3	8	18	7	4	14	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	166	110			7		74	154	4		143	102
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1470	1478			1728		1260	1730	1486		1705	1200
Queue Service Time (*g s*), s	4.1	5.5			0.3		2.1	3.0	0.1		0.0	0.6
Cycle Queue Clearance Time (*g c*), s	4.1	5.5			0.3		4.9	3.0	0.1		2.8	0.6
Green Ratio (*g/C*)	0.15	0.15			0.04		0.62	0.62	0.62		0.62	0.84
Capacity (*c*), veh/h	440	221			62		821	1065	915		1097	1104
Volume-to-Capacity Ratio (*X*)	0.377	0.498			0.107		0.091	0.145	0.005		0.131	0.093
Back of Queue (*Q*), ft/ln (50 th percentile)	39.1	48.3			3.2		13.7	26.2	0.7		24.2	1.5
Back of Queue (*Q*), veh/ln (50 th percentile)	1.4	1.9			0.1		0.5	1.0	0.0		0.9	0.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00			0.00		0.00	0.00	0.00		0.00	0.00
Uniform Delay (*d 1*), s/veh	30.7	31.3			37.3		7.5	6.5	5.9		6.4	0.3
Incremental Delay (*d 2*), s/veh	0.2	0.6			0.3		0.2	0.3	0.0		0.2	0.2
Initial Queue Delay (*d 3*), s/veh	0.0	0.0			0.0		0.0	0.0	0.0		0.0	0.0
Control Delay (*d*), s/veh	30.9	31.9			37.6		7.7	6.8	5.9		6.7	0.5
Level of Service (LOS)	C	C			D		A	A	A		A	A
Approach Delay, s/veh / LOS	31.3	C		37.6	D		7.1	A		4.1	A	
Intersection Delay, s/veh / LOS	15.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.12	B	2.32	B	1.69	B	2.11	B
Bicycle LOS Score / LOS	0.94	A	0.50	A	0.87	A	0.89	A

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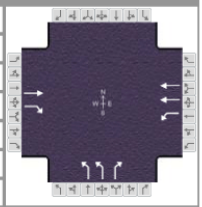
FIGURE 58
EXISTING 2018 PEAK AM HOUR TRAFFIC – Trainyards/Belfast

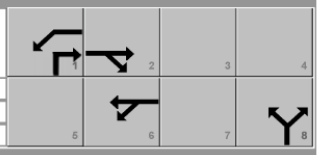
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2018_ex_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		197	201	142	167		176		106			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.9	47.3	7.7	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		54.4	11.0	65.4		14.6		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.3		
Queue Clearance Time (*g s*), s			3.3			7.1		
Green Extension Time (*g e*), s		0.0	0.1	0.0		0.6		
Phase Call Probability			0.97			1.00		
Max Out Probability			0.19			0.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		219	112	158	186		196		118			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1500	1581	1687		1639		1305			
Queue Service Time (*g s*), s		4.5	2.6	1.3	1.2		4.5		5.1			
Cycle Queue Clearance Time (*g c*), s		4.5	2.6	1.3	1.2		4.5		5.1			
Green Ratio (*g/C*)		0.60	0.60	0.85	0.74		0.11		0.27			
Capacity (*c*), veh/h		1062	906	1005	2499		358		470			
Volume-to-Capacity Ratio (*X*)		0.206	0.124	0.157	0.074		0.546		0.251			
Back of Queue (*Q*), ft/ln (50 th percentile)		39.7	19.3	0.6	7.1		44.7		41			
Back of Queue (*Q*), veh/ln (50 th percentile)		1.6	0.8	0.0	0.3		1.8		1.5			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		7.2	6.8	1.2	3.0		33.8		18.3			
Incremental Delay (*d 2*), s/veh		0.4	0.3	0.0	0.1		0.5		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		7.6	7.1	1.3	3.0		34.2		18.4			
Level of Service (LOS)		A	A	A	A		C		B			
Approach Delay, s/veh / LOS	7.4	A		2.2	A		28.3	C		0.0		
Intersection Delay, s/veh / LOS	12.2						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.34	B	0.84	A	2.46	B	2.54	C
Bicycle LOS Score / LOS	2.11	B	1.84	B		F		

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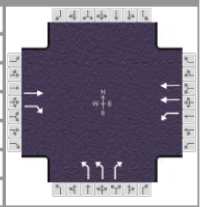
FIGURE 59
EXISTING 2018 PEAK PM HOUR TRAFFIC – Trainyards/Belfast

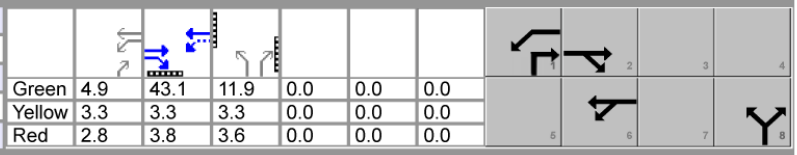
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2018_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		207	314	182	277		341		167			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.9	43.1	11.9	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		50.2	11.0	61.2		18.8		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.2		
Queue Clearance Time (*g s*), s			4.4			10.8		
Green Extension Time (*g e*), s		0.0	0.1	0.0		1.1		
Phase Call Probability			0.99			1.00		
Max Out Probability			0.71			0.02		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		230	238	202	308		379		186			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1472	1514	1446		1639		1395			
Queue Service Time (*g s*), s		5.4	6.9	2.4	3.0		8.8		7.3			
Cycle Queue Clearance Time (*g c*), s		5.4	6.9	2.4	3.0		8.8		7.3			
Green Ratio (*g/C*)		0.55	0.55	0.80	0.69		0.16		0.32			
Capacity (*c*), veh/h		969	811	895	1993		528		575			
Volume-to-Capacity Ratio (*X*)		0.237	0.293	0.226	0.154		0.718		0.323			
Back of Queue (*Q*), ft/ln (50 th percentile)		50.6	54.3	8.3	20.3		85.9		57.5			
Back of Queue (*Q*), veh/ln (50 th percentile)		2.0	2.2	0.3	0.7		3.4		2.2			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		9.3	9.6	2.2	4.5		31.8		16.2			
Incremental Delay (*d 2*), s/veh		0.6	0.9	0.0	0.2		0.7		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		9.9	10.5	2.3	4.7		32.5		16.3			
Level of Service (LOS)		A	B	A	A		C		B			
Approach Delay, s/veh / LOS	10.2		B	3.7		A	27.2		C	0.0		
Intersection Delay, s/veh / LOS	14.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.48	B	0.84	A	2.54	C	2.69	C
Bicycle LOS Score / LOS	2.33	B	1.98	B		F		

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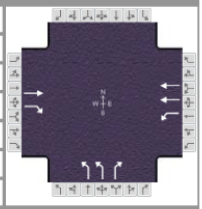
FIGURE 60
YEAR 2021 PEAK AM HOUR TRAFFIC – Trainyards/Belfast

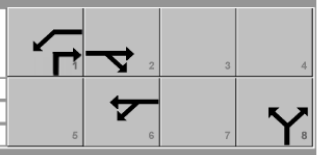
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		203	215	164	172		183		115			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.9	46.8	8.2	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		53.9	11.0	64.9		15.1		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.3		
Queue Clearance Time (*g s*), s			3.6			7.5		
Green Extension Time (*g e*), s		0.0	0.1	0.0		0.7		
Phase Call Probability			0.98			1.00		
Max Out Probability			0.29			0.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		226	128	182	191		203		128			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1500	1581	1687		1639		1305			
Queue Service Time (*g s*), s		4.7	3.0	1.6	1.3		4.7		5.5			
Cycle Queue Clearance Time (*g c*), s		4.7	3.0	1.6	1.3		4.7		5.5			
Green Ratio (*g/C*)		0.60	0.60	0.85	0.74		0.11		0.28			
Capacity (*c*), veh/h		1050	896	992	2480		377		478			
Volume-to-Capacity Ratio (*X*)		0.215	0.143	0.184	0.077		0.540		0.267			
Back of Queue (*Q*), ft/ln (50 th percentile)		42.3	22.8	1.5	7.7		46.2		44.2			
Back of Queue (*Q*), veh/ln (50 th percentile)		1.7	0.9	0.1	0.3		1.8		1.6			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		7.4	7.1	1.4	3.1		33.4		18.1			
Incremental Delay (*d 2*), s/veh		0.5	0.3	0.0	0.1		0.4		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		7.9	7.4	1.4	3.2		33.9		18.2			
Level of Service (LOS)		A	A	A	A		C		B			
Approach Delay, s/veh / LOS	7.7	A		2.3	A		27.8	C		0.0		
Intersection Delay, s/veh / LOS	12.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.36	B	0.84	A	2.47	B	2.56	C
Bicycle LOS Score / LOS	2.14	B	1.87	B		F		

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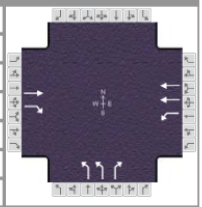
FIGURE 61
YEAR 2021 PEAK PM HOUR TRAFFIC – Trainyards/Belfast

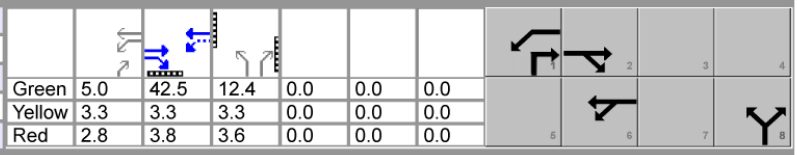
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		213	326	192	285		359		187			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	5.0	42.5	12.4	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		49.6	11.1	60.7		19.3		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.2		
Queue Clearance Time (*g s*), s			4.7			11.2		
Green Extension Time (*g e*), s		0.0	0.1	0.0		1.2		
Phase Call Probability			0.99			1.00		
Max Out Probability			0.91			0.03		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		237	251	213	317		399		208			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1472	1514	1446		1639		1395			
Queue Service Time (*g s*), s		5.7	7.5	2.7	3.1		9.2		8.2			
Cycle Queue Clearance Time (*g c*), s		5.7	7.5	2.7	3.1		9.2		8.2			
Green Ratio (*g/C*)		0.54	0.54	0.80	0.68		0.17		0.33			
Capacity (*c*), veh/h		957	801	882	1974		549		584			
Volume-to-Capacity Ratio (*X*)		0.247	0.314	0.242	0.160		0.726		0.356			
Back of Queue (*Q*), ft/ln (50 th percentile)		53.3	59.3	10	21.8		90		64.8			
Back of Queue (*Q*), veh/ln (50 th percentile)		2.1	2.4	0.4	0.8		3.5		2.4			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		9.6	10.0	2.4	4.7		31.6		16.1			
Incremental Delay (*d 2*), s/veh		0.6	1.0	0.1	0.2		0.7		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		10.2	11.0	2.5	4.9		32.3		16.2			
Level of Service (LOS)		B	B	A	A		C		B			
Approach Delay, s/veh / LOS	10.6		B	3.9		A	26.8		C	0.0		
Intersection Delay, s/veh / LOS	14.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.50	B	0.84	A	2.55	C	2.70	C
Bicycle LOS Score / LOS	2.36	B	2.00	B		F		

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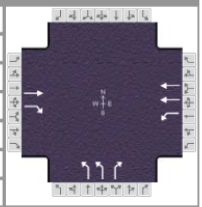
FIGURE 62
YEAR 2027 PEAK AM HOUR TRAFFIC – Trainyards/Belfast

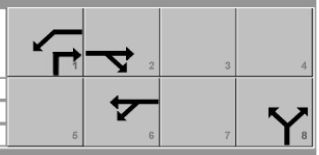
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		216	229	175	183		198		128			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.9	46.1	8.9	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		53.2	11.0	64.2		15.8		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.3		
Queue Clearance Time (*g s*), s			3.8			8.2		
Green Extension Time (*g e*), s		0.0	0.1	0.0		0.7		
Phase Call Probability			0.99			1.00		
Max Out Probability			0.37			0.00		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		240	143	194	203		220		142			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1500	1581	1687		1639		1306			
Queue Service Time (*g s*), s		5.2	3.5	1.8	1.4		5.0		6.2			
Cycle Queue Clearance Time (*g c*), s		5.2	3.5	1.8	1.4		5.0		6.2			
Green Ratio (*g/C*)		0.59	0.59	0.84	0.73		0.12		0.28			
Capacity (*c*), veh/h		1035	883	968	2451		404		490			
Volume-to-Capacity Ratio (*X*)		0.232	0.162	0.201	0.083		0.544		0.290			
Back of Queue (*Q*), ft/ln (50 th percentile)		46.9	26.8	2.8	8.7		49.7		48.9			
Back of Queue (*Q*), veh/ln (50 th percentile)		1.8	1.1	0.1	0.3		2.0		1.7			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		7.8	7.5	1.6	3.3		32.9		17.8			
Incremental Delay (*d 2*), s/veh		0.5	0.4	0.0	0.1		0.4		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		8.4	7.9	1.6	3.4		33.4		17.9			
Level of Service (LOS)		A	A	A	A		C		B			
Approach Delay, s/veh / LOS	8.2	A		2.5	A		27.3	C		0.0		
Intersection Delay, s/veh / LOS	12.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.38	B	0.84	A	2.49	B	2.57	C
Bicycle LOS Score / LOS	2.19	B	1.89	B		F		

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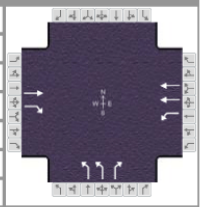
FIGURE 63
YEAR 2027 PEAK PM HOUR TRAFFIC – Trainyards/Belfast

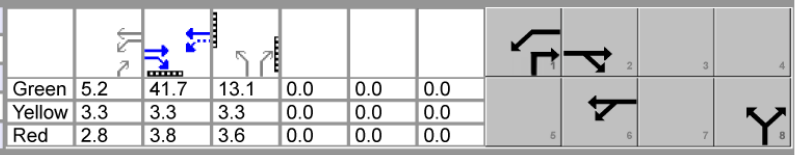
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2027_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		226	350	209	303		382		203			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	5.2	41.7	13.1	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		48.8	11.3	60.0		20.0		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.2		
Queue Clearance Time (*g s*), s			5.1			11.8		
Green Extension Time (*g e*), s		0.0	0.1	0.0		1.2		
Phase Call Probability			0.99			1.00		
Max Out Probability			1.00			0.05		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		251	278	232	337		424		226			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1471	1514	1446		1639		1396			
Queue Service Time (*g s*), s		6.2	8.7	3.1	3.4		9.8		8.9			
Cycle Queue Clearance Time (*g c*), s		6.2	8.7	3.1	3.4		9.8		8.9			
Green Ratio (*g/C*)		0.53	0.53	0.79	0.67		0.18		0.34			
Capacity (*c*), veh/h		938	785	861	1950		576		599			
Volume-to-Capacity Ratio (*X*)		0.268	0.354	0.270	0.173		0.737		0.376			
Back of Queue (*Q*), ft/ln (50 th percentile)		59.1	69.5	12.5	24.3		95.6		69.8			
Back of Queue (*Q*), veh/ln (50 th percentile)		2.3	2.8	0.4	0.8		3.8		2.6			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		10.2	10.7	2.7	5.0		31.2		15.8			
Incremental Delay (*d 2*), s/veh		0.7	1.3	0.1	0.2		0.7		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		10.9	12.0	2.7	5.2		31.9		15.9			
Level of Service (LOS)		B	B	A	A		C		B			
Approach Delay, s/veh / LOS	11.4	B		4.2	A		26.4	C		0.0		
Intersection Delay, s/veh / LOS	14.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.53	C	0.84	A	2.58	C	2.73	C
Bicycle LOS Score / LOS	2.43	B	2.03	B		F		

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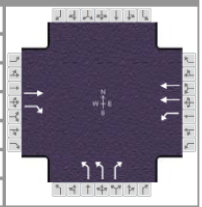
FIGURE 64
YEAR 2031 PEAK AM HOUR TRAFFIC – Trainyards/Belfast

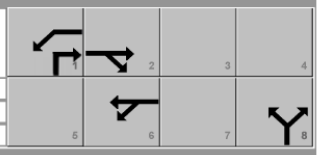
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		224	239	183	190		208		137			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	4.9	45.6	9.3	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		52.7	11.0	63.8		16.2		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.3		
Queue Clearance Time (*g s*), s			4.0			8.6		
Green Extension Time (*g e*), s		0.0	0.1	0.0		0.8		
Phase Call Probability			0.99			1.00		
Max Out Probability			0.44			0.00		

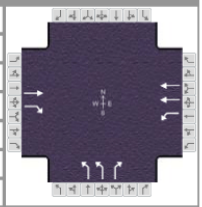
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		249	154	203	211		231		152			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1500	1581	1687		1639		1306			
Queue Service Time (*g s*), s		5.5	3.8	2.0	1.5		5.3		6.6			
Cycle Queue Clearance Time (*g c*), s		5.5	3.8	2.0	1.5		5.3		6.6			
Green Ratio (*g/C*)		0.58	0.58	0.83	0.72		0.13		0.29			
Capacity (*c*), veh/h		1024	874	953	2432		424		498			
Volume-to-Capacity Ratio (*X*)		0.243	0.177	0.213	0.087		0.546		0.306			
Back of Queue (*Q*), ft/ln (50 th percentile)		49.8	29.6	3.5	9.5		51.9		52.4			
Back of Queue (*Q*), veh/ln (50 th percentile)		1.9	1.2	0.1	0.4		2.0		1.9			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		8.1	7.8	1.7	3.5		32.6		17.6			
Incremental Delay (*d 2*), s/veh		0.6	0.4	0.0	0.1		0.4		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		8.7	8.2	1.7	3.5		33.0		17.8			
Level of Service (LOS)		A	A	A	A		C		B			
Approach Delay, s/veh / LOS	8.5	A		2.7	A		27.0	C		0.0		
Intersection Delay, s/veh / LOS	12.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.39	B	0.84	A	2.50	C	2.59	C
Bicycle LOS Score / LOS	2.23	B	1.90	B		F		

FIGURE 65
YEAR 2031 PEAK PM HOUR TRAFFIC – Trainyards/Belfast

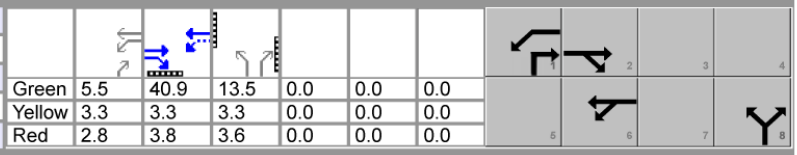
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Trainyards/Belfast	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		236	365	220	315		398		213			

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Float	Simult. Gap N/S	Off



Green	5.5	40.9	13.5	0.0	0.0	0.0
Yellow	3.3	3.3	3.3	0.0	0.0	0.0
Red	2.8	3.8	3.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		7.3	1.0	4.0		9.0		
Phase Duration, s		48.0	11.6	59.6		20.4		
Change Period, (*Y+R c*), s		7.1	6.1	7.1		6.9		
Max Allow Headway (*MAH*), s		0.0	3.1	0.0		3.2		
Queue Clearance Time (*g s*), s			5.4			12.2		
Green Extension Time (*g e*), s		0.0	0.1	0.0		1.3		
Phase Call Probability			1.00			1.00		
Max Out Probability			1.00			0.06		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12	1	6		3		18			
Adjusted Flow Rate (*v*), veh/h		262	294	244	350		442		237			
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1758	1471	1514	1446		1639		1396			
Queue Service Time (*g s*), s		6.7	9.5	3.4	3.6		10.2		9.2			
Cycle Queue Clearance Time (*g c*), s		6.7	9.5	3.4	3.6		10.2		9.2			
Green Ratio (*g/C*)		0.52	0.52	0.78	0.67		0.18		0.35			
Capacity (*c*), veh/h		922	771	846	1934		594		612			
Volume-to-Capacity Ratio (*X*)		0.284	0.382	0.289	0.181		0.745		0.387			
Back of Queue (*Q*), ft/ln (50 th percentile)		64	77	14.1	26.1		99.4		72.3			
Back of Queue (*Q*), veh/ln (50 th percentile)		2.5	3.1	0.5	0.9		3.9		2.7			
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00	0.00	0.00		0.00		0.00			
Uniform Delay (*d 1*), s/veh		10.6	11.3	2.9	5.2		31.0		15.4			
Incremental Delay (*d 2*), s/veh		0.8	1.4	0.1	0.2		0.7		0.1			
Initial Queue Delay (*d 3*), s/veh		0.0	0.0	0.0	0.0		0.0		0.0			
Control Delay (*d*), s/veh		11.4	12.7	2.9	5.4		31.7		15.6			
Level of Service (LOS)		B	B	A	A		C		B			
Approach Delay, s/veh / LOS	12.1		B	4.4		A	26.1		C	0.0		
Intersection Delay, s/veh / LOS	14.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.55	C	0.84	A	2.59	C	2.75	C
Bicycle LOS Score / LOS	2.48	B	2.05	B		F		

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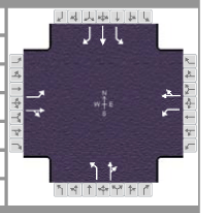
FIGURE 66
EXISTING 2014 PEAK AM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2014	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2014_ex_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	27	53	31	22	21	73	66	23	23	106	31

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	48.8	4.9	8.9	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		14.6		14.6	10.7	54.6	10.8	54.6
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		5.9		8.0	2.0		2.0	
Green Extension Time (*g e*), s		0.2		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		0.89		0.83	0.99		0.99	
Max Out Probability		0.00		0.00	0.90		0.83	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	18	83		34	46		81	97		26	118	1
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1319	1564		1283	1635		1701	1684		1647	1660	1478
Queue Service Time (*g s*), s	1.0	3.9		2.0	2.0		0.0	1.8		0.0	2.3	0.0
Cycle Queue Clearance Time (*g c*), s	3.0	3.9		6.0	2.0		0.0	1.8		0.0	2.3	0.0
Green Ratio (*g/C*)	0.12	0.12		0.12	0.12		0.80	0.62		0.80	0.62	0.62
Capacity (*c*), veh/h	221	194		186	203		1147	1048		1136	1033	920
Volume-to-Capacity Ratio (*X*)	0.080	0.429		0.185	0.224		0.071	0.092		0.022	0.114	0.001
Back of Queue (*Q*), ft/ln (50 th percentile)	8	37.9		16.3	19.4		4.2	15.2		1.2	19.8	0.2
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	1.5		0.6	0.8		0.2	0.6		0.0	0.7	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	32.9	32.4		35.2	31.6		2.2	6.1		2.0	6.3	5.7
Incremental Delay (*d 2*), s/veh	0.1	0.6		0.2	0.2		0.0	0.2		0.0	0.2	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	33.0	33.0		35.3	31.8		2.2	6.2		2.0	6.5	5.7
Level of Service (LOS)	C	C		D	C		A	A		A	A	A
Approach Delay, s/veh / LOS	33.0	C		33.3	C		4.4	A		5.7	A	
Intersection Delay, s/veh / LOS	15.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	0.65	A	0.62	A	0.78	A	0.73	A

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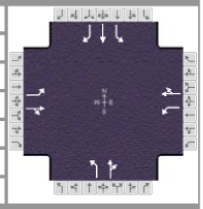
FIGURE 67
EXISTING 2014 PEAK PM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

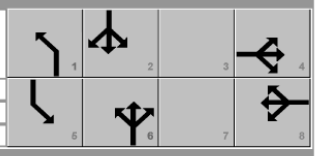
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2014	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2014_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	47	56	184	107	89	31	179	96	111	57	133	41

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	35.8	5.0	21.9	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		27.6		27.6	10.8	41.6	10.8	41.6
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.4	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		13.4		21.7	2.0		2.0	
Green Extension Time (*g e*), s		0.6		0.3	0.2	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.07	0.02		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	52	261		119	131		199	228		63	148	12
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1270	1570		1103	1707		1688	1557		1714	1758	1483
Queue Service Time (*g s*), s	2.7	11.4		8.3	4.8		0.0	7.4		0.0	4.0	0.4
Cycle Queue Clearance Time (*g c*), s	7.4	11.4		19.7	4.8		0.0	7.4		0.0	4.0	0.4
Green Ratio (*g/C*)	0.29	0.29		0.29	0.29		0.64	0.46		0.64	0.46	0.46
Capacity (*c*), veh/h	378	448		248	487		892	717		815	810	683
Volume-to-Capacity Ratio (*X*)	0.138	0.582		0.479	0.269		0.223	0.318		0.078	0.182	0.018
Back of Queue (*Q*), ft/ln (50 th percentile)	19.3	101.3		55.3	45.7		35.9	67.6		11.6	39.5	3
Back of Queue (*Q*), veh/ln (50 th percentile)	0.8	4.1		2.2	1.8		1.4	2.6		0.5	1.5	0.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	25.0	24.5		32.9	22.1		7.9	13.6		8.5	13.0	11.7
Incremental Delay (*d 2*), s/veh	0.1	0.4		0.5	0.1		0.0	1.2		0.0	0.5	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	25.0	24.9		33.4	22.2		7.9	14.8		8.6	13.5	11.8
Level of Service (LOS)	C	C		C	C		A	B		A	B	B
Approach Delay, s/veh / LOS	25.0	C		27.6	C		11.6	B		12.0	B	
Intersection Delay, s/veh / LOS	18.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	1.00	A	0.90	A	1.19	A	0.86	A

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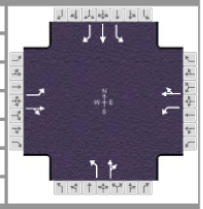
FIGURE 68
YEAR 2021 PEAK AM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

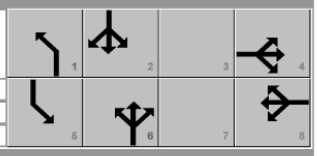
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	17	29	59	33	24	23	88	111	25	29	119	33

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	48.6	5.0	9.2	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		14.9		14.9	10.8	54.4	10.8	54.4
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		6.4		8.6	2.0		2.0	
Green Extension Time (*g e*), s		0.2		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		0.92		0.85	1.00		1.00	
Max Out Probability		0.00		0.00	0.91		0.88	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	19	92		37	50		98	149		32	132	3
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1314	1561		1273	1634		1701	1705		1647	1660	1478
Queue Service Time (*g s*), s	1.1	4.4		2.2	2.2		0.0	2.9		0.0	2.6	0.1
Cycle Queue Clearance Time (*g c*), s	3.2	4.4		6.6	2.2		0.0	2.9		0.0	2.6	0.1
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13		0.80	0.62		0.80	0.62	0.62
Capacity (*c*), veh/h	221	198		182	207		1128	1056		1080	1028	915
Volume-to-Capacity Ratio (*X*)	0.086	0.465		0.202	0.241		0.087	0.141		0.030	0.129	0.004
Back of Queue (*Q*), ft/ln (50 th percentile)	8.5	42.1		17.4	21.3		5.6	24.4		1.8	22.7	0.5
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	1.6		0.7	0.9		0.2	1.0		0.1	0.8	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	32.9	32.4		35.5	31.5		2.3	6.3		2.3	6.5	5.8
Incremental Delay (*d 2*), s/veh	0.1	0.6		0.2	0.2		0.0	0.3		0.0	0.3	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	33.0	33.0		35.7	31.7		2.3	6.6		2.3	6.7	5.8
Level of Service (LOS)	C	C		D	C		A	A		A	A	A
Approach Delay, s/veh / LOS	33.0	C		33.4	C		4.9	A		5.9	A	
Intersection Delay, s/veh / LOS	14.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	0.67	A	0.63	A	0.89	A	0.76	A

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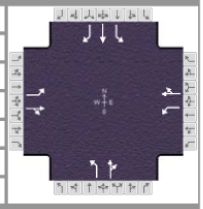
FIGURE 69
YEAR 2021 PEAK PM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	50	60	205	115	95	33	193	110	119	61	175	44

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	33.9	5.0	23.8	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		29.5		29.5	10.8	39.7	10.8	39.7
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.5	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		14.5		23.6	2.0		2.0	
Green Extension Time (g_e), s		0.7		0.3	0.2	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.34	0.02		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	56	289		128	140		214	252		68	194	16
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1261	1569		1076	1707		1688	1561		1714	1758	1482
Queue Service Time (g_s), s	2.8	12.5		9.1	4.9		0.0	8.7		0.0	5.6	0.5
Cycle Queue Clearance Time (g_c), s	7.7	12.5		21.6	4.9		0.0	8.7		0.0	5.6	0.5
Green Ratio (*g/C*)	0.31	0.31		0.31	0.31		0.62	0.44		0.62	0.44	0.44
Capacity (*c*), veh/h	403	486		256	529		816	682		759	768	647
Volume-to-Capacity Ratio (*X*)	0.138	0.595		0.500	0.265		0.263	0.370		0.089	0.253	0.024
Back of Queue (*Q*), ft/ln (50 th percentile)	19.9	109.8		59.3	47		46.2	81.2		14.1	57	4
Back of Queue (*Q*), veh/ln (50 th percentile)	0.8	4.4		2.3	1.9		1.8	3.1		0.6	2.2	0.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	23.7	23.4		32.5	20.8		9.9	15.1		10.2	14.6	12.8
Incremental Delay (d_2), s/veh	0.1	0.4		0.6	0.1		0.1	1.5		0.0	0.8	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	23.7	23.8		33.1	20.9		10.0	16.7		10.2	15.4	12.9
Level of Service (LOS)	C	C		C	C		A	B		B	B	B
Approach Delay, s/veh / LOS	23.8	C		26.7	C		13.6	B		14.0	B	
Intersection Delay, s/veh / LOS	18.8						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	1.06	A	0.93	A	1.26	A	0.95	A

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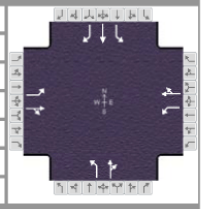
FIGURE 70
YEAR 2027 PEAK AM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

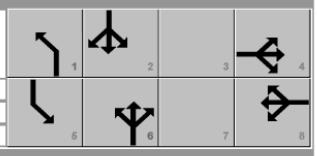
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	18	31	62	35	25	24	93	112	26	31	125	35

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	48.4	5.0	9.3	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		15.0		15.0	10.8	54.2	10.8	54.2
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		6.7		9.0	2.0		2.0	
Green Extension Time (*g e*), s		0.2		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		0.93		0.87	1.00		1.00	
Max Out Probability		0.00		0.00	0.91		0.88	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	20	98		39	52		103	151		34	139	6
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1312	1562		1267	1634		1701	1703		1647	1660	1478
Queue Service Time (*g s*), s	1.1	4.7		2.4	2.3		0.0	3.0		0.0	2.8	0.1
Cycle Queue Clearance Time (*g c*), s	3.4	4.7		7.0	2.3		0.0	3.0		0.0	2.8	0.1
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13		0.80	0.62		0.80	0.62	0.62
Capacity (*c*), veh/h	221	201		179	210		1119	1053		1076	1026	913
Volume-to-Capacity Ratio (*X*)	0.091	0.488		0.217	0.249		0.092	0.144		0.032	0.135	0.006
Back of Queue (*Q*), ft/ln (50 th percentile)	9	44.8		18.6	22.3		6	24.9		2	24.1	0.8
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	1.7		0.7	0.9		0.2	1.0		0.1	0.9	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	32.9	32.4		35.7	31.4		2.4	6.4		2.3	6.6	5.9
Incremental Delay (*d 2*), s/veh	0.1	0.7		0.2	0.2		0.0	0.3		0.0	0.3	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	33.0	33.1		35.9	31.6		2.4	6.7		2.3	6.8	5.9
Level of Service (LOS)	C	C		D	C		A	A		A	A	A
Approach Delay, s/veh / LOS	33.1	C		33.4	C		5.0	A		5.9	A	
Intersection Delay, s/veh / LOS	14.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	0.68	A	0.64	A	0.91	A	0.78	A

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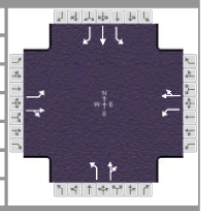
FIGURE 71
YEAR 2027 PEAK PM HOUR TRAFFIC – Trainyards/Railmarket

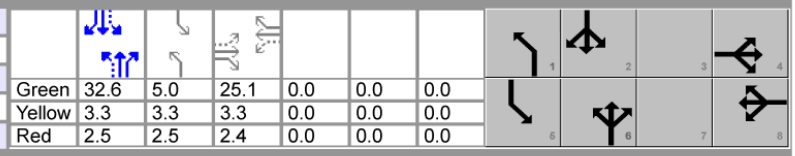
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2027_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	53	64	217	122	101	35	205	116	126	65	183	47

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off



Green	32.6	5.0	25.1	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		30.8		30.8	10.8	38.4	10.8	38.4
Change Period, ($Y+R_c$), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.5	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		15.1		24.9	2.0		2.0	
Green Extension Time (g_e), s		0.7		0.2	0.2	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		0.96	0.02		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	59	307		136	149		228	267		72	203	19
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1251	1570		1059	1707		1688	1561		1714	1758	1482
Queue Service Time (g_s), s	2.9	13.1		9.8	5.1		0.0	9.6		0.0	6.1	0.6
Cycle Queue Clearance Time (g_c), s	8.1	13.1		22.9	5.1		0.0	9.6		0.0	6.1	0.6
Green Ratio (*g/C*)	0.33	0.33		0.33	0.33		0.60	0.42		0.60	0.42	0.42
Capacity (*c*), veh/h	418	512		262	557		786	655		722	738	622
Volume-to-Capacity Ratio (*X*)	0.141	0.599		0.517	0.267		0.290	0.407		0.100	0.275	0.030
Back of Queue (*Q*), ft/ln (50 th percentile)	20.7	115.4		62.7	48.7		53.5	90.7		16.3	62.5	5.1
Back of Queue (*Q*), veh/ln (50 th percentile)	0.8	4.6		2.4	1.9		2.1	3.5		0.7	2.4	0.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	22.9	22.6		32.2	19.9		11.1	16.2		11.4	15.5	13.6
Incremental Delay (d_2), s/veh	0.1	0.7		0.6	0.1		0.1	1.9		0.0	0.9	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	22.9	23.3		32.8	20.0		11.2	18.1		11.4	16.4	13.7
Level of Service (LOS)	C	C		C	B		B	B		B	B	B
Approach Delay, s/veh / LOS	23.2	C		26.1	C		14.9	B		15.0	B	
Intersection Delay, s/veh / LOS	19.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	1.09	A	0.96	A	1.30	A	0.97	A

HCS7™ Streets Version 7.4

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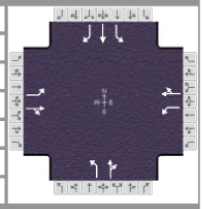
FIGURE 72
YEAR 2031 PEAK AM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

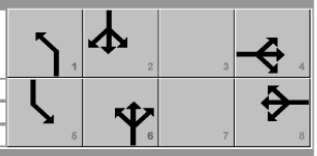
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	19	32	65	37	26	25	96	119	27	32	142	37

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	48.4	5.0	9.4	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		15.1		15.1	10.8	54.2	10.8	54.2
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		6.9		9.4	2.0		2.0	
Green Extension Time (*g e*), s		0.2		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		0.94		0.88	1.00		1.00	
Max Out Probability		0.00		0.00	0.91		0.87	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	21	102		41	54		107	160		36	158	8
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1309	1561		1262	1634		1701	1704		1647	1660	1478
Queue Service Time (*g s*), s	1.2	4.9		2.5	2.4		0.0	3.2		0.0	3.2	0.2
Cycle Queue Clearance Time (*g c*), s	3.6	4.9		7.4	2.4		0.0	3.2		0.0	3.2	0.2
Green Ratio (*g/C*)	0.13	0.13		0.13	0.13		0.80	0.62		0.80	0.62	0.62
Capacity (*c*), veh/h	220	202		176	211		1098	1051		1066	1024	911
Volume-to-Capacity Ratio (*X*)	0.096	0.506		0.233	0.257		0.097	0.152		0.033	0.154	0.009
Back of Queue (*Q*), ft/ln (50 th percentile)	9.5	46.9		19.8	23.2		6.7	26.8		2.2	27.9	1.2
Back of Queue (*Q*), veh/ln (50 th percentile)	0.4	1.8		0.8	0.9		0.3	1.0		0.1	1.0	0.0
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	33.0	32.4		35.9	31.4		2.5	6.5		2.4	6.7	5.9
Incremental Delay (*d 2*), s/veh	0.1	0.7		0.2	0.2		0.0	0.3		0.0	0.3	0.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	33.0	33.2		36.1	31.6		2.6	6.8		2.4	7.0	5.9
Level of Service (LOS)	C	C		D	C		A	A		A	A	A
Approach Delay, s/veh / LOS	33.1	C		33.5	C		5.1	A		6.1	A	
Intersection Delay, s/veh / LOS	14.4						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	0.69	A	0.65	A	0.93	A	0.82	A

HCS7™ Streets Version 7.4
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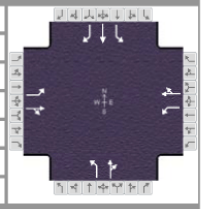
FIGURE 73
YEAR 2031 PEAK PM HOUR TRAFFIC – Trainyards/Railmarket

HCS7 Signalized Intersection Results Summary

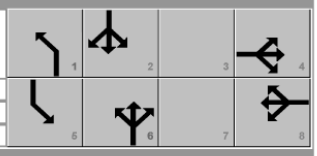
General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Steamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Traintards/Railmarket	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	56	66	226	127	105	37	213	132	131	67	196	49

Signal Information			
Cycle, s	80.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	Off
Force Mode	Fixed	Simult. Gap N/S	Off

Green	31.7	5.0	26.0	0.0	0.0	0.0	
Yellow	3.3	3.3	3.3	0.0	0.0	0.0	
Red	2.5	2.5	2.4	0.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	1	6	5	2
Case Number		6.0		6.0	1.4	4.0	1.4	3.0
Phase Duration, s		31.7		31.7	10.8	37.5	10.8	37.5
Change Period, (*Y+R c*), s		5.7		5.7	5.8	5.8	5.8	5.8
Max Allow Headway (*MAH*), s		3.3		3.5	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		15.5		25.9	2.0		2.0	
Green Extension Time (g_e), s		0.7		0.2	0.3	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		1.00	
Max Out Probability		0.00		1.00	0.02		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	1	6	16	5	2	12
Adjusted Flow Rate (*v*), veh/h	62	319		141	156		237	290		74	218	21
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1244	1570		1048	1706		1688	1567		1714	1758	1482
Queue Service Time (g_s), s	3.1	13.5		10.3	5.3		0.0	10.7		0.0	6.7	0.7
Cycle Queue Clearance Time (g_c), s	8.4	13.5		23.9	5.3		0.0	10.7		0.0	6.7	0.7
Green Ratio (*g/C*)	0.34	0.34		0.34	0.34		0.59	0.41		0.59	0.41	0.41
Capacity (*c*), veh/h	427	531		267	577		758	640		685	718	605
Volume-to-Capacity Ratio (*X*)	0.146	0.601		0.529	0.270		0.312	0.453		0.109	0.303	0.035
Back of Queue (*Q*), ft/ln (50 th percentile)	21.6	119.3		65.3	50		59.7	103.7		18	69.5	5.8
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	4.8		2.5	2.0		2.4	4.0		0.7	2.7	0.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	22.4	22.0		31.9	19.3		12.2	17.2		12.7	16.3	14.2
Incremental Delay (d_2), s/veh	0.1	0.9		0.6	0.1		0.1	2.3		0.0	1.1	0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Control Delay (*d*), s/veh	22.4	22.9		32.5	19.4		12.3	19.5		12.7	17.4	14.3
Level of Service (LOS)	C	C		C	B		B	B		B	B	B
Approach Delay, s/veh / LOS	22.8	C		25.6	C		16.2	B		16.1	B	
Intersection Delay, s/veh / LOS	19.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.17	B	1.94	B	1.95	B
Bicycle LOS Score / LOS	1.12	A	0.98	A	1.36	A	1.00	A

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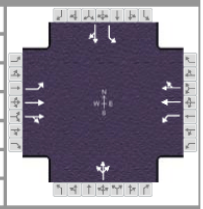
FIGURE 74
EXISTING 2015 PEAK AM HOUR TRAFFIC – Industrial/Trainyards

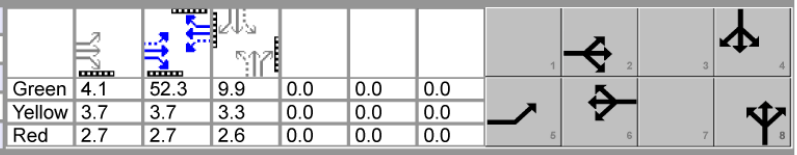
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2015_ex_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	66	711	0	7	647	152	0	0	0	68	0	26

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	4.1	52.3	9.9	0.0	0.0	0.0
Yellow	3.7	3.7	3.3	0.0	0.0	0.0
Red	2.7	2.7	2.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	10.5	69.2		58.7		15.8		15.8
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		0.0		3.1
Queue Clearance Time (*g s*), s	2.5							5.5
Green Extension Time (*g e*), s	0.1	0.0		0.0		0.0		0.1
Phase Call Probability	0.82							0.92
Max Out Probability	0.00							0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	73	790	0	8	443	445		0		76	29	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1562	0	686	1599	1604		0		1684	1515	
Queue Service Time (*g s*), s	0.5	5.0	0.0	0.4	12.1	12.2		0.0		3.5	1.4	
Cycle Queue Clearance Time (*g c*), s	0.5	5.0	0.0	0.4	12.1	12.2		0.0		3.5	1.4	
Green Ratio (*g/C*)	0.86	0.83		0.63	0.63	0.63				0.13	0.13	
Capacity (*c*), veh/h	664	2582		515	1003	1006				300	193	
Volume-to-Capacity Ratio (*X*)	0.111	0.306	0.000	0.015	0.442	0.442		0.000		0.252	0.149	
Back of Queue (*Q*), ft/ln (50 th percentile)	1.8	16.3	0	1.3	100.8	112.8		0		35.5	13.1	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.1	0.6	0.0	0.1	3.9	3.9		0.0		1.4	0.5	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	2.2	2.4		6.0	8.2	8.2				33.9	33.0	
Incremental Delay (*d 2*), s/veh	0.0	0.3	0.0	0.1	1.4	1.4		0.0		0.2	0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	2.2	2.7		6.0	9.6	9.6				34.0	33.1	
Level of Service (LOS)	A	A		A	A	A				C	C	
Approach Delay, s/veh / LOS	2.6	A		9.5	A		0.0			33.8	C	
Intersection Delay, s/veh / LOS	7.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.17	B	2.85	C	2.71	C
Bicycle LOS Score / LOS	2.27	B	2.30	B	1.56	B	1.73	B

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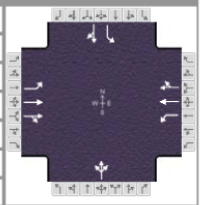
FIGURE 75
EXISTING 2015 PEAK PM HOUR TRAFFIC – Industrial/Trainyards

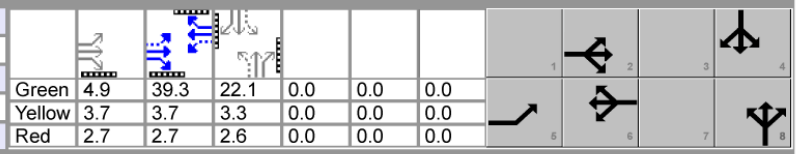
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2015	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2015_ex_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	149	589	0	6	623	193	0	0	1	306	1	160

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	4.9	39.3	22.1	0.0	0.0	0.0						
Yellow	3.7	3.7	3.3	0.0	0.0	0.0						
Red	2.7	2.7	2.6	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	11.3	57.0		45.7		28.0		28.0
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		3.2		3.2
Queue Clearance Time (*g s*), s	4.6					2.0		21.5
Green Extension Time (*g e*), s	0.2	0.0		0.0		1.0		0.6
Phase Call Probability	0.98					1.00		1.00
Max Out Probability	0.01					0.00		0.25

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	166	654	0	7	448	459		0		340	179	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1305	0	482	1515	1551		0		1423	1507	
Queue Service Time (*g s*), s	2.6	9.0	0.0	0.6	18.8	18.8		0.0		19.4	8.3	
Cycle Queue Clearance Time (*g c*), s	2.6	9.0	0.0	0.6	18.8	18.8		0.0		19.5	8.3	
Green Ratio (*g/C*)	0.72	0.68		0.47	0.47	0.47				0.27	0.27	
Capacity (*c*), veh/h	531	1779		313	718	735				471	410	
Volume-to-Capacity Ratio (*X*)	0.312	0.368	0.000	0.021	0.624	0.624		0.000		0.722	0.436	
Back of Queue (*Q*), ft/ln (50 th percentile)	16.9	52.6	0	2.6	178	199.9		0		168	72.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.7	2.1	0.0	0.1	6.7	6.9		0.0		6.7	2.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	7.2	7.0		11.9	16.7	16.7				29.6	25.6	
Incremental Delay (*d 2*), s/veh	0.1	0.6	0.0	0.1	4.1	4.0		0.0		2.8	0.3	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	7.4	7.6		12.1	20.8	20.7				32.4	25.8	
Level of Service (LOS)	A	A		B	C	C				C	C	
Approach Delay, s/veh / LOS	7.5	A		20.7	C		22.5	C		30.2	C	
Intersection Delay, s/veh / LOS	18.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.41	B	2.87	C	2.72	C
Bicycle LOS Score / LOS	2.24	B	2.31	B	1.56	B	2.42	B

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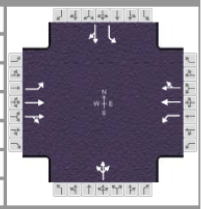
FIGURE 76
YEAR 2021 PEAK AM HOUR TRAFFIC – Industrial/Trainyards

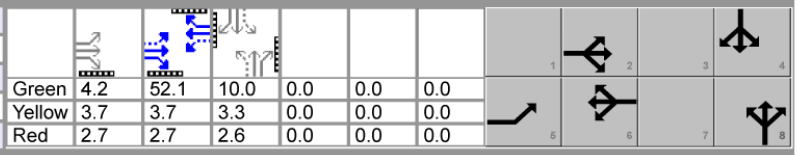
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2021_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	70	761	0	7	689	161	0	0	0	72	0	28

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	4.2	52.1	10.0	0.0	0.0	0.0
Yellow	3.7	3.7	3.3	0.0	0.0	0.0
Red	2.7	2.7	2.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	10.6	69.1		58.5		15.9		15.9
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		0.0		3.1
Queue Clearance Time (*g s*), s	2.6							5.7
Green Extension Time (*g e*), s	0.1	0.0		0.0		0.0		0.2
Phase Call Probability	0.84							0.93
Max Out Probability	0.00							0.00

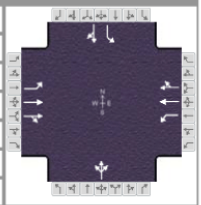
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	78	846	0	8	487	458		0		80	31	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1672	0	651	1703	1600		0		1684	1515	
Queue Service Time (*g s*), s	0.6	5.0	0.0	0.4	12.8	12.8		0.0		3.7	1.6	
Cycle Queue Clearance Time (*g c*), s	0.6	5.0	0.0	0.4	12.8	12.8		0.0		3.7	1.6	
Green Ratio (*g/C*)	0.86	0.83		0.62	0.62	0.62				0.13	0.13	
Capacity (*c*), veh/h	642	2759		492	1064	1000				302	196	
Volume-to-Capacity Ratio (*X*)	0.121	0.306	0.000	0.016	0.458	0.458		0.000		0.265	0.159	
Back of Queue (*Q*), ft/ln (50 th percentile)	2.4	17.6	0	1.4	112.5	118.7		0		37.6	14.1	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.1	0.7	0.0	0.1	4.3	4.1		0.0		1.5	0.6	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	2.3	2.4		6.1	8.4	8.4				33.8	32.9	
Incremental Delay (*d 2*), s/veh	0.0	0.3	0.0	0.1	1.4	1.5		0.0		0.2	0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	2.4	2.7		6.1	9.8	9.9				34.0	33.1	
Level of Service (LOS)	A	A		A	A	A				C	C	
Approach Delay, s/veh / LOS	2.7	A		9.8	A		0.0			33.7	C	
Intersection Delay, s/veh / LOS	7.8						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.18	B	2.88	C	2.74	C
Bicycle LOS Score / LOS	2.32	B	2.35	B	1.56	B	1.74	B

FIGURE 77
YEAR 2021 PEAK PM HOUR TRAFFIC – Industrial/Trainyards

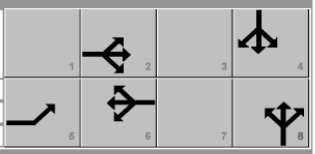
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2021	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2021_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	158	624	0	6	666	213	0	0	1	365	1	170

Signal Information					EB			WB			NB			SB		
Cycle, s	85.0	Reference Phase	2		L	T	R	L	T	R	L	T	R	L	T	R
Offset, s	0	Reference Point	Begin	Green	5.2	35.4		25.6	0.0	0.0	0.0					
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.7	3.7		3.3	0.0	0.0	0.0					
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.7	2.7		2.6	0.0	0.0	0.0					



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	11.6	53.5		41.8		31.5		31.5
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		3.2		3.2
Queue Clearance Time (*g s*), s	5.2					2.0		25.3
Green Extension Time (*g e*), s	0.1	0.0		0.0		1.2		0.3
Phase Call Probability	0.98					1.00		1.00
Max Out Probability	0.46					0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	176	693	0	7	500	477		0		406	190	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1382	0	465	1619	1543		0		1423	1509	
Queue Service Time (*g s*), s	3.2	10.2	0.0	0.7	21.7	21.7		0.0		23.3	8.4	
Cycle Queue Clearance Time (*g c*), s	3.2	10.2	0.0	0.7	21.7	21.7		0.0		23.3	8.4	
Green Ratio (*g/C*)	0.68	0.64		0.43	0.43	0.43				0.31	0.31	
Capacity (*c*), veh/h	478	1771		284	694	661				530	473	
Volume-to-Capacity Ratio (*X*)	0.367	0.391	0.000	0.023	0.721	0.721		0.000		0.765	0.402	
Back of Queue (*Q*), ft/ln (50 th percentile)	23	67.2	0	2.9	230.8	243.2		0		207.4	71.8	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.9	2.6	0.0	0.1	8.7	8.4		0.0		8.2	2.9	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	9.7	8.8		14.1	20.1	20.1				28.1	22.9	
Incremental Delay (*d 2*), s/veh	0.2	0.7	0.0	0.2	6.4	6.7		0.0		5.3	0.2	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	9.9	9.4		14.2	26.4	26.7				33.4	23.1	
Level of Service (LOS)	A	A		B	C	C				C	C	
Approach Delay, s/veh / LOS	9.5	A		26.5	C		20.1	C		30.1	C	
Intersection Delay, s/veh / LOS	21.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.45	B	2.91	C	2.74	C
Bicycle LOS Score / LOS	2.28	B	2.37	B	1.56	B	2.54	C

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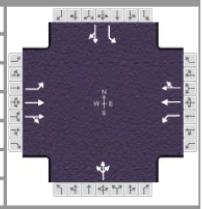
FIGURE 78
YEAR 2027 PEAK AM HOUR TRAFFIC – Industrial/Trainyards

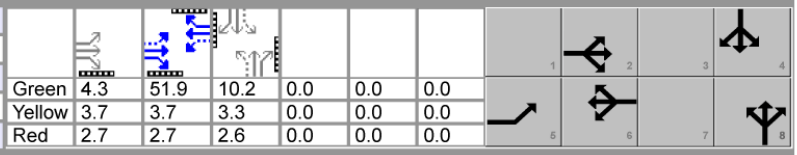
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2027_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	74	823	0	8	731	218	0	0	0	83	0	29

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	4.3	51.9	10.2	0.0	0.0	0.0
Yellow	3.7	3.7	3.3	0.0	0.0	0.0
Red	2.7	2.7	2.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	10.7	68.9		58.3		16.1		16.1
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		0.0		3.1
Queue Clearance Time (*g s*), s	2.6							6.3
Green Extension Time (*g e*), s	0.1	0.0		0.0		0.0		0.2
Phase Call Probability	0.86							0.95
Max Out Probability	0.00							0.00

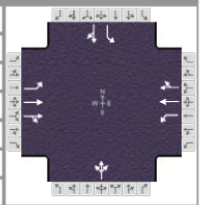
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	82	914	0	9	552	502		0		92	32	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1758	0	610	1730	1573		0		1684	1515	
Queue Service Time (*g s*), s	0.6	5.3	0.0	0.5	15.1	15.1		0.0		4.3	1.6	
Cycle Queue Clearance Time (*g c*), s	0.6	5.3	0.0	0.5	15.1	15.1		0.0		4.3	1.6	
Green Ratio (*g/C*)	0.86	0.82		0.62	0.62	0.62				0.13	0.13	
Capacity (*c*), veh/h	595	2893		464	1076	978				306	199	
Volume-to-Capacity Ratio (*X*)	0.138	0.316	0.000	0.019	0.513	0.514		0.000		0.302	0.162	
Back of Queue (*Q*), ft/ln (50 th percentile)	4.2	19.9	0	1.6	136.4	139.8		0		43.6	14.5	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.2	0.8	0.0	0.1	5.2	4.8		0.0		1.7	0.6	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	2.9	2.5		6.2	8.9	8.9				33.9	32.8	
Incremental Delay (*d 2*), s/veh	0.0	0.3	0.0	0.1	1.8	1.9		0.0		0.2	0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	3.0	2.8		6.2	10.7	10.9				34.1	32.9	
Level of Service (LOS)	A	A		A	B	B				C	C	
Approach Delay, s/veh / LOS	2.8	A		10.7	B		0.0			33.8	C	
Intersection Delay, s/veh / LOS	8.4						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.21	B	2.93	C	2.77	C
Bicycle LOS Score / LOS	2.38	B	2.44	B	1.56	B	1.76	B

FIGURE 79
YEAR 2027 PEAK PM HOUR TRAFFIC – Industrial/Trainyards

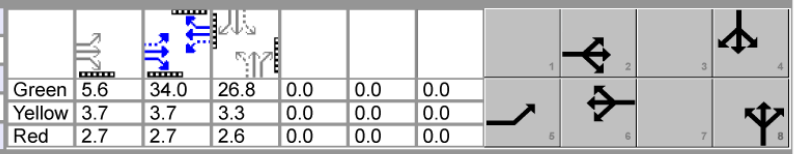
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2027	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2027_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	168	671	0	7	719	226	0	0	1	385	1	180

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.6	34.0	26.8	0.0	0.0	0.0						
Yellow	3.7	3.7	3.3	0.0	0.0	0.0						
Red	2.7	2.7	2.6	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	12.0	52.3		40.4		32.7		32.7
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		3.2		3.2
Queue Clearance Time (*g s*), s	5.6					2.0		26.7
Green Extension Time (*g e*), s	0.1	0.0		0.0		1.3		0.1
Phase Call Probability	0.99					1.00		1.00
Max Out Probability	1.00					0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	187	746	0	8	551	499		0		428	201	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1486	0	443	1702	1541		0		1423	1510	
Queue Service Time (*g s*), s	3.6	10.6	0.0	0.9	23.9	24.0		0.0		24.6	8.8	
Cycle Queue Clearance Time (*g c*), s	3.6	10.6	0.0	0.9	23.9	24.0		0.0		24.7	8.8	
Green Ratio (*g/C*)	0.66	0.63		0.41	0.41	0.41				0.33	0.33	
Capacity (*c*), veh/h	452	1865		267	700	634				549	493	
Volume-to-Capacity Ratio (*X*)	0.413	0.400	0.000	0.029	0.787	0.787		0.000		0.780	0.408	
Back of Queue (*Q*), ft/ln (50 th percentile)	30.5	76	0	3.5	277	280		0		221.6	74.9	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.2	3.0	0.0	0.1	10.5	9.7		0.0		8.8	3.0	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	11.5	9.4		15.0	21.8	21.8				27.6	22.2	
Incremental Delay (*d 2*), s/veh	0.2	0.6	0.0	0.2	8.7	9.6		0.0		6.3	0.2	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	11.7	10.0		15.2	30.5	31.3				33.9	22.4	
Level of Service (LOS)	B	A		B	C	C				C	C	
Approach Delay, s/veh / LOS	10.3	B		30.8	C		19.3	B		30.2	C	
Intersection Delay, s/veh / LOS	23.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.48	B	2.95	C	2.77	C
Bicycle LOS Score / LOS	2.33	B	2.43	B	1.56	B	2.60	C

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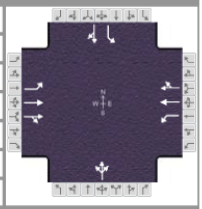
FIGURE 80
YEAR 2031 PEAK AM HOUR TRAFFIC – Industrial/Trainyards

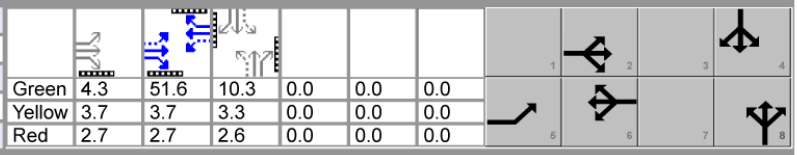
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak AM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2031_tot_am.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	77	854	0	8	760	229	0	0	0	98	0	30

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	4.3	51.6	10.3	0.0	0.0	0.0
Yellow	3.7	3.7	3.3	0.0	0.0	0.0
Red	2.7	2.7	2.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	10.7	68.8		58.0		16.2		16.2
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		0.0		3.1
Queue Clearance Time (*g s*), s	2.7							7.1
Green Extension Time (*g e*), s	0.1	0.0		0.0		0.0		0.2
Phase Call Probability	0.87							0.97
Max Out Probability	0.00							0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	86	949	0	9	575	524		0		109	33	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1758	0	591	1730	1571		0		1684	1515	
Queue Service Time (*g s*), s	0.7	5.6	0.0	0.5	16.1	16.2		0.0		5.1	1.7	
Cycle Queue Clearance Time (*g c*), s	0.7	5.6	0.0	0.5	16.1	16.2		0.0		5.1	1.7	
Green Ratio (*g/C*)	0.86	0.82		0.62	0.62	0.62				0.13	0.13	
Capacity (*c*), veh/h	576	2886		451	1071	973				309	202	
Volume-to-Capacity Ratio (*X*)	0.148	0.329	0.000	0.020	0.537	0.538		0.000		0.352	0.165	
Back of Queue (*Q*), ft/ln (50 th percentile)	5.2	22	0	1.6	146.7	150.4		0		51.9	15	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.2	0.9	0.0	0.1	5.6	5.2		0.0		2.0	0.6	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	3.3	2.6		6.3	9.2	9.2				34.1	32.6	
Incremental Delay (*d 2*), s/veh	0.0	0.3	0.0	0.1	1.9	2.1		0.0		0.3	0.1	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	3.3	2.9		6.3	11.2	11.4				34.4	32.8	
Level of Service (LOS)	A	A		A	B	B				C	C	
Approach Delay, s/veh / LOS	2.9	A		11.2	B		0.0			34.0	C	
Intersection Delay, s/veh / LOS	8.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.23	B	2.95	C	2.79	C
Bicycle LOS Score / LOS	2.41	B	2.47	B	1.56	B	1.79	B

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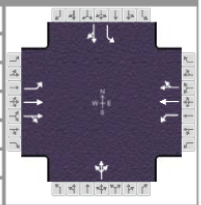
FIGURE 81
YEAR 2031 PEAK PM HOUR TRAFFIC – Industrial/Trainyards

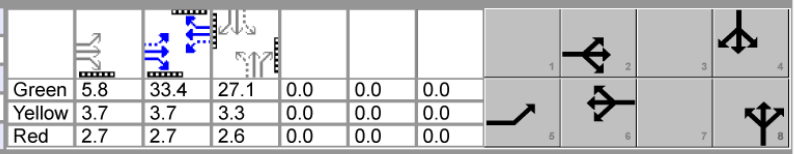
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency				Duration, h	0.25
Analyst		Analysis Date	Jun 15, 2018	Area Type	Other
Jurisdiction		Time Period	Peak PM Hour	PHF	0.90
Urban Street	200, 230 & 260 Streamli…	Analysis Year	2031	Analysis Period	1> 7:00
Intersection	Industrial/Trainyards	File Name	2031_tot_pm.xus		
Project Description	OTY Residential Development				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	175	688	0	7	747	245	0	0	1	406	1	188

Signal Information			
Cycle, s	85.0	Reference Phase	2
Offset, s	0	Reference Point	Begin
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.8	33.4	27.1	0.0	0.0	0.0
Yellow	3.7	3.7	3.3	0.0	0.0	0.0
Red	2.7	2.7	2.6	0.0	0.0	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		8.0		6.0
Phase Duration, s	12.2	52.0		39.8		33.0		33.0
Change Period, (*Y+R c*), s	6.4	6.4		6.4		5.9		5.9
Max Allow Headway (*MAH*), s	3.1	0.0		0.0		3.2		3.2
Queue Clearance Time (*g s*), s	5.8					2.0		28.5
Green Extension Time (*g e*), s	0.1	0.0		0.0		1.3		0.0
Phase Call Probability	0.99					1.00		1.00
Max Out Probability	1.00					0.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	194	764	0	8	579	523		0		451	210	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1688	1524	0	435	1702	1536		0		1423	1510	
Queue Service Time (*g s*), s	3.8	10.7	0.0	0.9	26.1	26.1		0.0		26.4	9.2	
Cycle Queue Clearance Time (*g c*), s	3.8	10.7	0.0	0.9	26.1	26.1		0.0		26.5	9.2	
Green Ratio (*g/C*)	0.66	0.62		0.40	0.40	0.40				0.33	0.33	
Capacity (*c*), veh/h	435	1900		261	689	622				555	499	
Volume-to-Capacity Ratio (*X*)	0.447	0.402	0.000	0.030	0.840	0.842		0.000		0.813	0.421	
Back of Queue (*Q*), ft/ln (50 th percentile)	38.4	79	0	3.6	313.1	316.8		0		244.4	78	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.5	3.1	0.0	0.1	11.9	10.9		0.0		9.7	3.1	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00		0.00	0.00	
Uniform Delay (*d 1*), s/veh	13.0	9.5		15.3	22.8	22.8				27.9	22.1	
Incremental Delay (*d 2*), s/veh	0.3	0.6	0.0	0.2	11.8	13.0		0.0		8.4	0.2	
Initial Queue Delay (*d 3*), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Control Delay (*d*), s/veh	13.3	10.2		15.5	34.6	35.8				36.4	22.3	
Level of Service (LOS)	B	B		B	C	D				D	C	
Approach Delay, s/veh / LOS	10.8	B		35.1	D		19.1	B		31.9	C	
Intersection Delay, s/veh / LOS	25.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.71	B	2.51	C	2.97	C	2.79	C
Bicycle LOS Score / LOS	2.35	B	2.48	B	1.56	B	2.65	C

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EXHIBIT 82
STEAMLINE STREET – PLOS Segment Evaluation

STREET	Steamline Street
FROM	Sandford Fleming Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	PLOS

SEGMENT SCORE **A**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 83
SANDFORD FLEMING AVENUE – PLOS Segment Evaluation

STREET	Sandford Fleming Avenue
FROM	Industrial Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	PLOS

SEGMENT SCORE **C**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 84
TERMINAL AVENUE – PLOS Segment Evaluation

STREET	Terminal Avenue
FROM	Sandford Fleming Avenue
TO	Railmarket Private
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	PLOS

SEGMENT SCORE **D**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 85
INDUSTRIAL AVENUE – PLOS Segment Evaluation

STREET	Industrial Avenue
FROM	Riverside Drive
TO	Trainyards Drive
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	PLOS

SEGMENT SCORE **E**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 86
TRAINYARDS DRIVE – PLOS Segment Evaluation

STREET	Trainyards Drive
FROM	Belfast Road
TO	Industrial Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	PLOS

SEGMENT SCORE **D**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On-street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 [1]
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F [2]	F [2]
<1.5	N/A			F [3]	F [3]	F [3]	F [3]
No sidewalk	N/A			C [4]	F [3]	F [3]	F [3]

EXHIBIT 87
INDUSTRIAL/SANDFORD FLEMING – PLOS Signalized Intersection Evaluation

MAIN STREET	Industrial Avenue
MINOR STREET	Sandford Fleming Avenue
APPROACHES	All
YEAR	2031
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		East Approach	
	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions						
Median?	No		No		Yes	
Total Travel Lanes Crossed	3	105	3	105	5	75
Island Refuge	No	−4	No	−4	No	−4
5.2 Signal Phasing & Timing Features						
Left Turn Conflict	Protected	0	Protected	0	Protected	0
Right Turn Conflict	Permissive/ or Yield Control	−5	Permissive/ or Yield Control	−5	Permissive/ or Yield Control	−5
Right Turns on Red	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3
Leading Ped Interval	No	−2	No	−2	No	−2
5.3 Corner Radius						
Radius	> 10m to 15m	−8	> 15m to 25m	−8	> 15m to 25m	−8
Right Turn	Right Turn Channel	−3	Right Turn Channel	−3	No Channelization	0
5.4 Crosswalk Treatment	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		73		73		46
DELAY SCORE From Signal Timing Plan		65		65		68
PETSI SCORE		**C**		**C**		**D**
DELAY SCORE		**F**		**F**		**F**
OVERALL APPROACH SCORE		**F**		**F**		**F**

OVERALL INTERSECTION SCORE **F**

EXHIBIT 88
INDUSTRIAL/RIVERSIDE – PLOS Signalized Intersection Evaluation

MAIN STREET	Riverside Drive
MINOR STREET	Industrial Avenue
APPROACHES	All
YEAR	2031
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		East Approach		West Approach	
	Comment	Points	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions								
Median?	No		No		No		No	
Total Travel Lanes Crossed	8	23	7	39	6	55	5	72
Island Refuge	No	−4	Yes	0	No	−4	No	−4
5.2 Signal Phasing & Timing Features								
Left Turn Conflict	Protected	0	Protected	0	Protected	0	Protected	0
Right Turn Conflict	Permissive/ or Yield Control	−5	No Right Turn	0	Permissive/ or Yield Control	−5	Permissive/ or Yield Control	−5
Right Turns on Red	RTOR Allowed	−3	RTOR Prohibited	0	RTOR Allowed	−3	RTOR Allowed	−3
Leading Ped Interval	No	−2	No	−2	No	−2	No	−2
5.3 Corner Radius								
Radius	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8	> 10m to 15m	−6
Right Turn	No Channelization	0	Channel With Receiving	−3	No Channelization	0	No Right Turn	0
5.4 Crosswalk Treatment	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		0		19		26		45
DELAY SCORE		68		68		68		68
From Signal Timing Plan								
PETSI SCORE		**F**		**F**		**F**		**D**
DELAY SCORE		**F**		**F**		**F**		**F**
OVERALL APPROACH SCORE		**F**		**F**		**F**		**F**

OVERALL INTERSECTION SCORE **F**

EXHIBIT 89
TERMINAL/TRAINYARDS – PLOS Signalized Intersection Evaluation

MAIN STREET	Trainyards Drive
MINOR STREET	Terminal Avenue
APPROACHES	All
YEAR	2031
DIRECTION	All
MMLOS MODE	PLOS

	North Approach		South Approach		West Approach	
	Comment	Points	Comment	Points	Comment	Points
5.1 Crossing Distance & Conditions						
Median?	No		No		No	
Total Travel Lanes Crossed	5	88	4	88	4	88
Island Refuge	No	−4	No	−4	No	−4
5.2 Signal Phasing & Timing Features						
Left Turn Conflict	Permissive	−8	Permissive	−8	Permissive	−8
Right Turn Conflict	Protected	0	Permissive/ or Yield Control	−5	Permissive/ or Yield Control	−5
Right Turns on Red	RTOR Allowed	−3	RTOR Allowed	−3	RTOR Allowed	−3
Leading Ped Interval	No	−2	No	−2	No	−2
5.3 Corner Radius						
Radius	> 15m to 25m	−8	> 15m to 25m	−8	> 15m to 25m	−8
Right Turn	No Channelization	0	No Channelization	0	No Channelization	0
5.4 Crosswalk Treatment	Standard Transverse Markings	−7	Standard Transverse Markings	−7	Standard Transverse Markings	−7
TOTAL PETSI SCORE		0		51		51
DELAY SCORE		33		33		33
From Signal Timing Plan						
PETSI SCORE		**D**		**C**		**C**
DELAY SCORE		**D**		**D**		**D**
OVERALL APPROACH SCORE		**D**		**D**		**D**

OVERALL INTERSECTION SCORE **D**

EXHIBIT 90
SANDFORD FLEMING AVENUE – BLOS Segment Evaluation

STREET	Steamline Street
FROM	Sandford Fleming Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Eastbound–Weastbound
MMLOS MODE	BLOS

SEGMENT SCORE **B**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	> 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	< 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	> 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (> 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE

NOT APPLICABLE

NOT APPLICABLE

EXHIBIT 91
SANDFORD FLEMING AVENUE – BLOS Segment Evaluation

STREET	Sandford Fleming Avenue
FROM	Industrial Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	BLOS

SEGMENT SCORE **D**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	≥ 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	≥ 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	< 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	≥ 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE

NOT APPLICABLE

NOT APPLICABLE

EXHIBIT 92
TERMINAL AVENUE – BLOS Segment Evaluation

STREET	Terminal Avenue
FROM	Sandford Fleming Avenue
TO	Trainyards Drive
YEAR	2031
DIRECTION	Eastbound–Weastbound
MMLOS MODE	BLOS

SEGMENT SCORE **D**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	≥ 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	≥ 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	< 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	≥ 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE
NOT APPLICABLE
NOT APPLICABLE

EXHIBIT 93
INDUSTRIAL AVENUE – BLOS Segment Evaluation

STREET	Industrial Avenue Avenue
FROM	Riverside Drive
TO	Trainyards Drive
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	BLOS

SEGMENT SCORE **F**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	≥ 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	< 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	> 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE
NOT APPLICABLE
NOT APPLICABLE

EXHIBIT 94
TRAINYARDS DRIVE – BLOS Segment Evaluation

STREET	Trainyards Drive
FROM	Belfast Road
TO	Industrial Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	BLOS

SEGMENT SCORE **B**

Type of Bikeway		LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).		A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	B
	2 travel lanes in each direction without a separating median	C
	More than 2 travel lanes in each direction	D
Bike Lane Width	≥ 1.8 m wide bike lane (includes marked buffer and paved gutter width)	A
	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	B
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 50 km/h operating speed	A
	60 km/h operating speed	C
	≥ 70 km/h operating speed	E
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria		
No. of Travel Lanes	1 travel lane in each direction	A
	2 or more travel lanes in each direction	C
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
	≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	C
Operating Speed	≤ 40 km/h operating speed	A
	50 km/h operating speed	B
	60 km/h operating speed	D
	≥ 70 km/h operating speed	F
Bike lane blockage (commercial areas)	Rare	A
	Frequent	C
Mixed Traffic		
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	B
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	B
	2 to 3 travel lanes; 50 km/h	D
	4 to 5 travel lanes; ≤ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route: no median refuge		
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	B
	3 or less lanes being crossed; 50 km/h	B
	4 to 5 lanes being crossed; 50 km/h	C
	3 or less lanes being crossed; 60 km/h	C
	4 to 5 lanes being crossed; 60 km/h	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route: with median refuge (≥ 1.8 m wide)		
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	6 or more lanes being crossed; ≤ 40 km/h	B
	4 to 5 lanes being crossed; 50 km/h	B
	3 or less lanes being crossed; 60 km/h	B
	6 or more lanes being crossed; 50 km/h	C
	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 65 km/h	F

NOT APPLICABLE
NOT APPLICABLE
NOT APPLICABLE
NOT APPLICABLE

EXHIBIT 95
INDUSTRIAL/SANDFORD FLEMING – BLOS Signalized Intersection Evaluation

MAIN STREET	Industrial Avenue
MINOR STREET	Sandford Fleming Avenue
APPROACHES	Eastbound–Westbound
YEAR	2031
DIRECTION	East/West
MMLOS MODE	BLOS

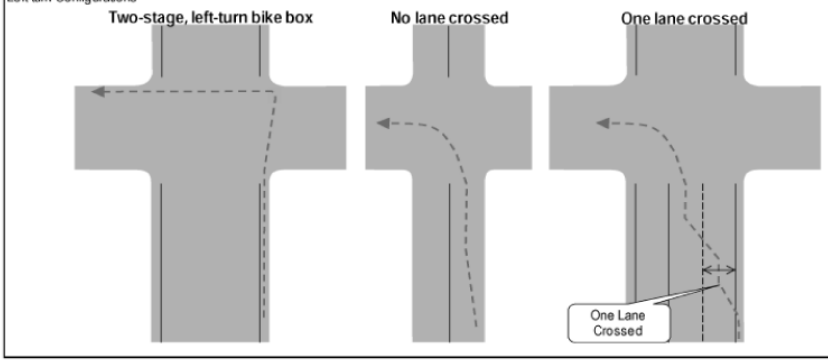
INTERSECTION SCORE **F**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

NOT APPLICABLE

NOT APPLICABLE

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 96
INDUSTRIAL/RIVERSIDE – BLOS Signalized Intersection Evaluation

MAIN STREET Riverside Drive
MINOR STREET Industrial Avenue
APPROACHES Northbound–Southbound
YEAR 2031
DIRECTION North/South
MMLOS MODE BLOS

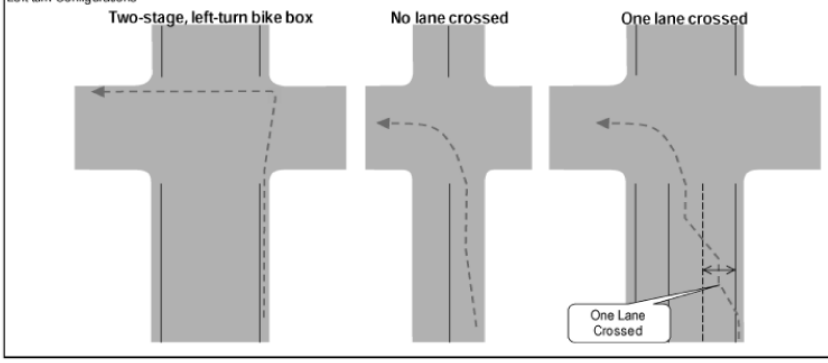
INTERSECTION SCORE **F**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	F
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

NOT APPLICABLE

NOT APPLICABLE

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 97
TERMINAL/TRAINYARDS – BLOS Signalized Intersection Evaluation

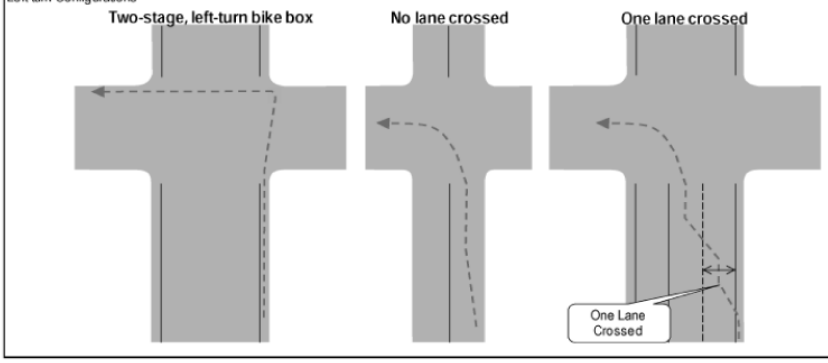
MAIN STREET Trainyards Drive
MINOR STREET Terminal Avenue
APPROACHES Northbound–Southbound
YEAR 2031
DIRECTION North/South
MMLOS MODE BLOS

INTERSECTION SCORE **F**

NOT APPLICABLE

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	F
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F

Left-turn Configurations



Notes:
1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 98
SANDFORD FLEMING AVENUE – TLOS Segment Evaluation

STREET	Sandford Fleming Avenue
FROM	Industrial Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	TLOS

SEGMENT SCORE **D**

Facility Type		Level/exposure to congestion delay, friction and incidents			Quantitative Measurement	LOS
		Congestion	Friction	Incident Potential		
Segregated ROW		No	No	No	N/A	A
Bus lane	No/limited parking/driveway friction	No	Low	Low	$C_f \leq 60$	B
	Frequent parking/driveway friction	No	Medium	Medium	$C_f > 60$	C
Mixed Traffic	Limited parking/driveway friction	Yes	Low	Medium	$Vt/Vp \geq 0.8$	D
	Moderate parking/driveway friction	Yes	Medium	Medium	$Vt/Vp \leq 0.6$	E
	Frequent parking/driveway friction	Yes	High	High	$Vt/Vp < 0.4$	F

Notes:

Cf, Conflict Factor = = (Number of driveways x crossing volume) / 1 km

Vt/Vp is the ratio of average transit travel speed to posted speed limit

EXHIBIT 99
TERMINAL AVENUE – TLOS Segment Evaluation

STREET	Terminal Avenue
FROM	Sandford Fleming Avenue
TO	Trainyards Drive
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	TLOS

SEGMENT SCORE **D**

Facility Type		Level/exposure to congestion delay, friction and incidents			Quantitative Measurement	LOS
		Congestion	Friction	Incident Potential		
Segregated ROW		No	No	No	N/A	A
Bus lane	No/limited parking/driveway friction	No	Low	Low	$C_f \leq 60$	B
	Frequent parking/driveway friction	No	Medium	Medium	$C_f > 60$	C
Mixed Traffic	Limited parking/driveway friction	Yes	Low	Medium	Vt/Vp ≥ 0.8	D
	Moderate parking/driveway friction	Yes	Medium	Medium	Vt/Vp ≤ 0.6	E
	Frequent parking/driveway friction	Yes	High	High	Vt/Vp < 0.4	F

Notes:

Cf, Conflict Factor = = (Number of driveways x crossing volume) / 1 km

Vt/Vp is the ratio of average transit travel speed to posted speed limit

EXHIBIT 100
INDUSTRIAL/SANDFORD FLEMING – TLOS Signalized Intersection Evaluation

MAIN STREET	Industrial Avenue
MINOR STREET	Sandford Fleming Avenue
APPROACHES	Eastbound–Westbound
YEAR	2031
DIRECTION	East/West
MMLOS MODE	TLOS

INTERSECTION SCORE **D**

Exhibit 16 – TLOS Signalized Intersection Evaluation Table

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec		C
≤30 sec		D
≤40 sec	TSP & long cycle length	E
>40 sec	No TSP & long cycle length	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 101
TERMINAL/TRAINYARDS – TLOS Signalized Intersection Evaluation

MAIN STREET	Terminal Avenue
MINOR STREET	Trainyards Drive
APPROACHES	Eastbound–Westbound
YEAR	2031
DIRECTION	East/West
MMLOS MODE	TLOS

INTERSECTION SCORE **D**

Exhibit 16 – TLOS Signalized Intersection Evaluation Table

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec		C
≤30 sec		D
≤40 sec	TSP & long cycle length	E
>40 sec	No TSP & long cycle length	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 102
SANDFORD FLEMING AVENUE – TkLOS Segment Evaluation

STREET	Sandford Fleming Avenue
FROM	Industrial Avenue
TO	Terminal Avenue
YEAR	2031
DIRECTION	Northbound–Southbound
MMLOS MODE	TkLOS

SEGMENT SCORE **B**

Exhibit 20 – TkLOS Segment Evaluation Table

Curb Lane Width (m)	Only two travel lanes (one in each direction)	More than two travel lanes
>3.7	**B**	A
≤3.5	C	A
≤3.3	D	C
≤3.2	E	D
≤3	F	E

EXHIBIT 103
TERMINAL AVENUE – TkLOS Segment Evaluation

STREET	Terminal Avenue
FROM	Sandford Fleming Avenue
TO	Trainyards Drive
YEAR	2031
DIRECTION	Eastbound–Westbound
MMLOS MODE	TkLOS

SEGMENT SCORE **B**

Exhibit 20 – TkLOS Segment Evaluation Table

Curb Lane Width (m)	Only two travel lanes (one in each direction)	More than two travel lanes
>3.7	B	A
≤3.5	C	A
≤3.3	D	C
≤3.2	E	D
≤3	F	E

EXHIBIT 104
INDUSTRIAL/SANDFORD FLEMING – TkLOS Signalized Intersection Evaluation

MAIN STREET	Industrial Avenue
MINOR STREET	Sandford Fleming Avenue
APPROACHES	Eastbound–Westbound
YEAR	2031
MMLOS MODE	TkLOS

INTERSECTION SCORE **C**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	A

EXHIBIT 105
TERMINAL/TRAINYARDS – TkLOS Signalized Intersection Evaluation

MAIN STREET	Trainyards Drive
MINOR STREET	Terminal Avenue
APPROACHES	Northbound–Southbound
YEAR	2031
MMLOS MODE	TkLOS

INTERSECTION SCORE **C**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	A