# Appendix C Traffic Impact Analysis

# Traffic Impact Analysis

# BOW LAKE TRANSFER/RECYCLING STATION

Prepared for:

King County Solid Waste Division

### December 2006

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# **Executive Summary**

This report summarizes the traffic impact analysis results for the Bow Lake Transfer/ Recycling Station. The transfer station is located in unincorporated King County and the City of Tukwila. The station is located north of the S 188<sup>th</sup> Street/Orillia Road S intersection. The eight-acre site is bound on the west by I-5 and overlooks the Duwamish Valley to the east. The site is accessed from the S 188<sup>th</sup> Street/Orillia Road S intersection. The Bow Lake Transfer/Recycling Station is being upgraded primarily to meet current building and environmental standards, improve safety and efficiency, and accommodate projected regional growth trends. Construction is expected to be complete by the year 2011.

The traffic analysis was for the weekday AM and PM peak hours, which represent peak commuter traffic volumes on the roadway network. A Saturday peak hour was also analyzed since Saturday is the peak period of traffic flow attracted to the site. The primary State Environmental Policy Act (SEPA) analysis reviews existing conditions, year 2011 baseline conditions, and 2011 with-project conditions which reflect a horizon year consistent with project buildout. A future year 2030 planning level analysis is also included to support the long-range Master Plan. Five intersections were studied, which were:

- S 188<sup>th</sup> Street/Military Road S;
- S 188<sup>th</sup> Street/I-5 Southbound (SB) Ramps;
- S 188<sup>th</sup> Street/I-5 Northbound (NB) Ramps;
- S 188<sup>th</sup> Street/Orillia Road S (Bow Lake Transfer/Recycling Station Access); and
- Orillia Road S/S 200<sup>th</sup> Street.

Additional analysis was also conducted to measure the potential impacts of Bow Lake traffic when the proposed Tukwila South Project is included in the baseline conditions. Information contained in the Bow Lake Traffic Impact Analysis related to the proposed Tukwila South Project was derived from the Draft Environmental Impact Statement (DEIS) developed by La Pianta, LLC for that proposal. All technical and other information concerning that site was presumed to be accurate, and no additional independent analysis for that proposed site's development and traffic conditions was prepared by The Transpo Group, Inc.. Tukwila South is proposing mixed-use development of up to 14 million square feet under near-term (2015) and long-term (2030) build-out years. The Tukwila South Year 2015 Alternative 1 build-out is forecast to generate about 3,727 net new PM peak hour trips, and the Year 2030 Alternative 1 build-out is forecast to generate about 13,975 net new PM peak hour trips. This traffic would access the street system at S 180<sup>th</sup> Street and S 200<sup>th</sup> Street.

The existing conditions analysis shows that the five study intersections all operate at level of service (LOS) D or better during both the weekday AM and PM peak hours. During the Saturday peak hour, all intersections operate at LOS B, with the exception of S 188<sup>th</sup> Street/Military Road S which operates at LOS C. All intersection operations remain similar under 2011 baseline conditions.

The Bow Lake Transfer/Recycling Station is a currently operating site with existing and measurable traffic volumes. The methodology for estimating future traffic volumes is based on a linear increase of existing traffic volumes based on solid waste forecasts provided by the King County Solid Waste Division. As stated in econometric model forecasting prepared by the Solid Waste Division, it is estimated that the tonnage of solid waste disposal will increase by about 16 percent from year 2006 to 2011. Existing peak hour traffic volumes accessing the site were increased by 16 percent to estimate the net new trips accessing the site by year 2011. By year 2011 there is expected to be 12 net new trips during the AM peak hour, 7 net new trips during the PM peak hour, and 29 net new trips during the Saturday peak hour. When compared to baseline intersection total entering volume (TEV), the project trips account for less that 1 percent of the volume at the study intersections during the weekday AM and PM peak hours. On Saturday, the project trips account for about 2 percent of the TEV at S 188th Street/Orillia Road S (site access) and 1 percent or less at all remaining study intersections. Since traffic volumes vary by 5 to 10 percent from day-to-day, it is unlikely the average driver will notice these projected related forecast volume increases.

As can be expected due to the low volume impact on the study intersections, the withproject LOS does not change from baseline conditions. Since the project related traffic volumes are so light, the LOS is unchanged at most study intersections when comparing baseline to with-project conditions.

These results are echoed with the year 2030 long-range analysis, as well as the additional analysis that includes the Tukwila South Project traffic volumes in the baseline conditions. Under the long-range 2030 analysis, as well as the 2011 and 2030 analyses that include Tukwila South traffic volumes, when compared to with-Bow Lake project conditions, the LOS is similar between baseline and with-project conditions. The insignificant impacts of the Bow Lake project are a result of the project's future traffic volumes as comprising a small percentage of the overall traffic volumes on the roadway network.

# Introduction

This report summarizes the transportation impact analysis (TIA) conducted for the Bow Lake Transfer/Recycling Station located in unincorporated King County and Tukwila, Washington. The analysis is consistent with TIA guidelines for a SEPA checklist.

# **Project Location and Description**

The Bow Lake Transfer/Recycling Station is located north of the S 188<sup>th</sup> Street/Orillia Road S intersection in unincorporated King County and the City of Tukwila. The transfer station was constructed in 1977. The eight-acre site is located along the east edge of I-5 overlooking the Duwamish Valley. The site vicinity is shown in Figure 1. The transfer station operates 24 hours per day, Monday through Friday, and from 8:30 am to 5:30 pm on weekends. The site is open to commercial haulers, residential selfhaulers, and business self-haul customers. The site is accessed from the S 188<sup>th</sup> Street/Orillia Road S intersection.

The Bow Lake Transfer/Recycling Station is being upgraded to meet current building and environmental standards, improve safety and operational efficiency, and accommodate projected future regional growth trends. It will incorporate solid waste management efficiencies that will help keep disposal rates as low as possible when the County's remaining landfill reaches capacity and solid waste is exported to an out-ofcounty disposal site.

Specific proposed improvements include:

- An expanded recycling area, including a yard waste area;
- A larger transfer building that will have easier-to-use waste unloading areas, which should reduce customer wait times;
- An enclosed transfer building;
- An enhanced site layout to improve on-site circulation and increased on-site vehicle queuing storage;
- Two preload compactors to improve operational efficiency and decrease the number of transfer trailer truck trips required to/from the transfer station;
- Improved building design; and
- Environmental enhancements to the storm and waste water system to protect public health.

It should be noted that the proposed improvements don't necessarily equate to increased site traffic generation. The site is being improved to accommodate the growing demands from local and regional population increases. At the same time, operational enhancements are being provided to provide enhanced compaction of solid waste to reduce the number of trailer truck trips to/from the site.

One of the site improvements will be new compaction technology know as a "preload compactor". This relates to the loading and compacting of waste containers which are used to transport waste from Bow Lake final disposal sites. The current practice is to top-load a waste transfer trailer and lightly compact the material with a knuckleboom crane. This practice allows transfer trailers to carry about 18 tons of waste. The new preload compactor will allow transfer trailers to carry about 27 to 30 tons of waste. In the short term, this could equate to 50 to 67 percent fewer truck trips from this site. The project will be completed by 2011.

# Study Approach

The analysis of traffic operations of five off-site intersections focuses on the weekday AM and PM peak hour, as well as a Saturday peak hour. The AM and PM peak hours are typically the time periods with the highest roadway traffic volumes representative of commuter traffic. The Saturday peak hour represents the time period when the site generates their highest volume of trips. The following intersections were selected for study:

- S 188<sup>th</sup> Street/Military Road S;
- S 188<sup>th</sup> Street/I-5 Southbound (SB) Ramps;
- S 188<sup>th</sup> Street/I-5 Northbound (NB) Ramps;
- S 188<sup>th</sup> Street/Orillia Road S (Bow Lake Transfer/Recycling Station Access); and
- Orillia Road S/S 200<sup>th</sup> Street.

The following sections document existing, future baseline (without-project), and future with-project conditions within the study area. Project impacts are identified by comparing forecast with-project conditions against forecast baseline conditions. Potential mitigation measures are identified where necessary to offset these impacts. The report is divided into the following primary sections:

- Existing Conditions documents the current (year 2006) conditions within the study area. Existing levels of service at study intersections are calculated based on existing intersection geometry and traffic volumes. This section also includes descriptions of transportation facilities within the study area and on roadways adjacent to the site. This study documents AM, PM, and Saturday peak hour traffic operations at the study intersections.
- Future Baseline Conditions (Without-Project) documents the conditions expected to prevail in the study area in year 2011 without the proposed project. The operations analyses include all roadway improvements and increases in traffic volume resulting from other planned developments in the vicinity of the project site by year 2011.
- **Future With-Project Conditions** documents the impact of a "typical day" of the proposed project relative to year 2011 baseline conditions. A "typical day" is the

estimate of traffic that is expected to be generated by the normal use of the facility. The impacts are measured by comparing with-project conditions to the year 2011 baseline, which is the proposed year of opening. All SEPA-based mitigation will be based on year of opening (year 2011) conditions.

- **Cumulative Analysis with Tukwila South** documents the conditions expected to prevail in the study area when the Tukwila South Project traffic volumes are included in the background (baseline) conditions.
- **Proposed Mitigation** documents the results of the analysis and identifies measures to offset potential transportation impacts, if necessary.







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# **Existing Conditions**

This section of the report provides an inventory of existing transportation conditions throughout the study area. This inventory serves as the foundation from which future traffic conditions are forecast and evaluated. The following paragraphs describe the vicinity roadway network, existing traffic volumes and operations, and safety.

### **Roadway Network**

The following roadways comprise the primary roadway system in the project site vicinity. Furthermore, these roadways are anticipated to accommodate a majority of the projectgenerated traffic and, in doing so, would experience the greatest project impacts. The following paragraphs describe the general characteristics of these roadways.

**I-5** is a north-south interstate freeway facility providing regional access to the area. In the project vicinity, I-405 is five lanes (four general purpose lanes and one High Occupancy Vehicle [HOV} lane in both directions).

**S 188<sup>th</sup> Street** is classified as a principal arterial, providing access to I-5. It connects with Orillia Road, just east of the site and continues west to Normandy Park, near Puget Sound. It is a five-lane facility near the project site, providing left-turn lanes at each of the study intersections. There are paved shoulders within the project vicinity. Sidewalks are on the north side of the roadway starting just west of Military Road.

**Orillia Road S** is a principal arterial located southwest of the site. It connects S 188<sup>th</sup> Street and I-5 with the valley floor to the east via S 200<sup>th</sup> Street and S 212<sup>th</sup> Street. Orillia Road is a four-lane roadway with a posted speed limit of 40 mph. It has 11- and 12-foot lanes with 4- to 5-foot paved bicycle lanes. There is curb and gutter, as well as intermittent sidewalks.

## Traffic Volumes

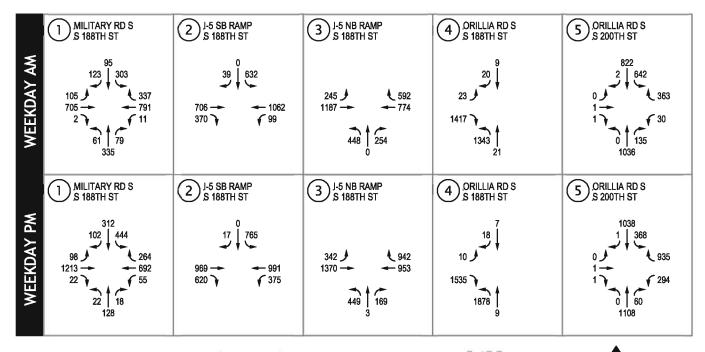
The weekday AM and PM peak hour was selected for the analysis since it is the time period that typically accounts for the highest background traffic volumes, and thus results in the most congested periods for a traffic analysis. A Saturday peak hour was also selected for analysis since this represents a time period when traffic volumes at the transfer station are typically the highest. Existing weekday AM, PM, and Saturday peak hour turning movement counts were performed in the field by All Traffic Data Services, Inc.

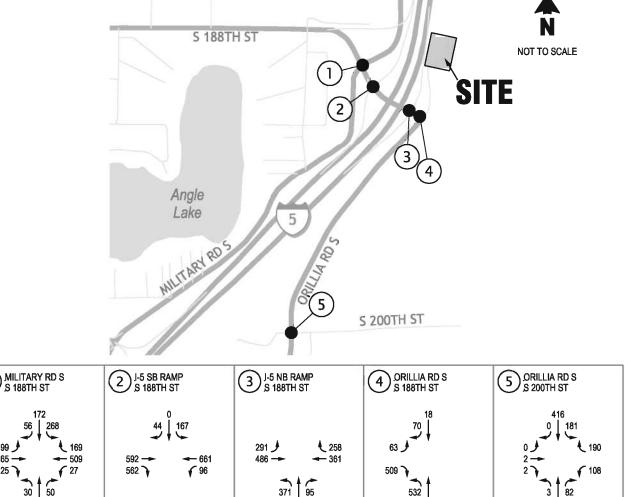
Transfer station traffic volume is primarily comprised of two types of trips: self-hauled and commercially collected. Self-hauled trips are comprised of residents or small businesses delivering their solid waste. Commercially collected trips are from the large waste hauling companies. Table 1 summarized the vehicle volumes accessing the transfer station during the three peak hours.

Table 1.Existing Traffic Volumes: S 188th St/Orillia Rd S/Transfer Station									
	Accessing Station	TEV <sup>2</sup>	<u>% Vol. Related to Station<sup>3</sup></u>						
AM Peak Hour	73	2,833	2.6%						
PM Peak Hour	44	3,457	1.3%						
Sat. Peak Hour	181	1,222	14.8%						
<ol> <li>Total trips in/out from</li> <li>TEV = total entering vo</li> </ol>	transfer station during peak hour co	ounted.							

The percentage of intersection volume accessing the transfer station.

As Table 1 shows, the total volume accessing the transfer station is the lowest during the PM peak hour, which is when traffic volumes are the highest. The transfer station experiences higher volumes on a Saturday peak hour due to increased self-haul residential trips. Figure 2 shows the peak hour turning movement counts at all of the study intersections.









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### **Traffic Operations**

This section of the report summarizes existing traffic operations at the study intersections. The operations analysis section summarizes LOS calculations as well as off-site vehicle queuing.

#### Level of Service

A LOS analysis was conducted for the study intersections under existing conditions. Level of service is a qualitative measure of the performance of an intersection. Levels of service values range from LOS A, indicating good operation and low vehicle delays, to LOS F, which indicates congestion and longer vehicle delays. Appendix A contains a detailed explanation of LOS criteria and definitions.

Synchro v.6.0 (Build 612) was used to evaluate intersection levels of service based on the 2000 Highway Capacity Manual (HCM) (Transportation Research Board, 2000) methodologies. As part of HCM methodologies, intersection operations are analyzed during the peak 15-minute period of the peak hour represented. Existing traffic volumes, lane geometries, and traffic controls were used to estimate existing traffic operations for the study intersections. The existing signal timing plans were obtained from the City of SeaTac, King County, and the Washington State Department of Transportation (WSDOT). Table 1 shows the LOS results for the study intersections. The detailed LOS worksheets are included in Appendix B of this report.

Table 2. Existing (2	006) L(	OS Sumn	nary: We	ekday	AM, PM,	and Sat	. Peak	Hours			
	AM	AM Peak Hour P			I Peak Ho	our	Sa	Sat. Peak Hour			
Intersection	LOS	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM	LOS	Delay	V/C or WM		
S 188 <sup>th</sup> St/Military Rd S	D	51.8	0.92	D	38.4	0.76	С	28.3	0.59		
S 188th St/I-5 SB Ramps	В	16.8	0.64	D	40.3	0.88	В	10.9	0.39		
S 188th St/I-5 NB Ramps	С	23.3	0.79	С	30.8	0.86	В	15.7	0.51		
Orillia Rd S/S 200 <sup>th</sup> St	С	32.2	0.77	С	26.1	0.77	В	16.8	0.36		
<u>Unsignalized</u>											
S 188 <sup>th</sup> St/Orillia Rd S	А	4.0	NA	А	4.2	NA	А	1.4	NA		
Worst Movement	F	>120	SB⁵	F	>120	SB	В	13.2	SB		

1. Level of service, based on 2000 Highway Capacity Manual methodology.

2. Average delay in seconds per vehicle.

3. Volume-to-capacity ratio reported for signalized intersections.

4. Worst movement reported for unsignalized intersections.

SB = Southbound approach.
 NB = Northbound approach.

King County LOS standards for an urban area is LOS E. Both WSDOT and the City of SeaTac LOS standards are LOS D. As Table 2 shows, all of the signalized study area intersections operate at LOS D or better during the weekday peak hours. All intersections operate well during the Saturday peak hour. The unsignalized intersection of S 188<sup>th</sup> Street/Orillia Road S (site access) operates at LOS A as a whole. Only the southbound movement of the unsignalized intersection operates at LOS F during the weekday peak hours analyzed. The S 188<sup>th</sup> Street/Orillia Road southbound exit does not impact operations along the S 188<sup>th</sup> Street – Orillia Road corridor, only the ability for vehicles to exit the transfer station.

### **Off-Site Traffic Queuing**

This section of the report summarizes the calculated queuing between the study area intersections. Due to the close spacing of these intersections, queues can occur that may inhibit an adjacent intersection from functioning properly. Queue calculations are summarized on S 188<sup>th</sup> Street for both the westbound and eastbound directions. On S 188<sup>th</sup> Street, westbound queues are estimated to measure potential blocking between: Military Road S and I-5 Northbound (NB) Ramps, I-5 NB Ramps and I-5 Southbound (SB) Ramps, and I-5 SB Ramps and Orillia Road S (site access). In the eastbound direction, queues are estimated to measure potential blocking between Orillia Road S and I-5 NB Ramps, I-5 NB Ramps and I-5 SB Ramps

Synchro v.6.0 (Build 612) was used to evaluate intersection queuing. The 95<sup>th</sup> percentile (maximum) queuing data is reported from Synchro. The 95<sup>th</sup> percentile would be the worst case queue during the time period with the highest traffic volumes. Thus, the 95<sup>th</sup> percentile queues are likely to occur for 1 to 2 cycles during the peak 15-minutes of the weekday PM peak hour. However, queues could be longer if there are multiple intersection blockages that are impacting corridor operations, as Synchro and HCM calculations cannot account for these situations.

Table 3 provides an estimate of capacity between the intersections compared with 95<sup>th</sup> percentile queue (maximum). The purpose of this data is to provide an estimate of queues to use as a bench mark to measure queue impacts with increased future traffic volumes.

	AM	1 Peak Hour			
Direction/Intersection	Capacity <sup>1</sup> (ft)	95 <sup>th</sup> Percentile <sup>2</sup> Queue (ft)	<u>Available Capacity?</u> <u>(ft)</u>		
Westbound					
S 188 <sup>th</sup> St /Military Rd S	205	260	No		
S 188th St /I-5 SB Ramps	490	200	Yes		
S 188th St /I-5 NB Ramps	65	365	No		
Eastbound					
S 188th St/Orillia Rd S	65	20	Yes		
S 188th St /I-5 NB Ramps	490	330	Yes		
S 188 <sup>th</sup> St /I-5 SB Ramps	205	160	Yes		
	PM	l Peak Hour			
Westbound					
S 188 <sup>th</sup> St /Military Rd S	205	245	No		
S 188 <sup>th</sup> St /I-5 SB Ramps	490	230	Yes		
S 188 <sup>th</sup> St /I-5 NB Ramps	65	600	No		
Eastbound					
S 188 <sup>th</sup> St/Orillia Rd S	65	20	Yes		
S 188th St /I-5 NB Ramps	490	335	Yes		
S 188th St /I-5 SB Ramps	205	255	No		

During the AM and PM peak hour in the westbound direction the I-5 SB Ramps/S 188<sup>th</sup> Street and S 188<sup>th</sup> Street/Orillia Road S intersections will experience blockages from adjacent intersections. During the PM peak hour in the eastbound direction the S 188<sup>th</sup> Street/Military Road S intersection will experience blockages resulting from the S 188<sup>th</sup> Street/I-5 SB Ramps intersection.

During the AM and PM peak hour the east-to-north left-turn into the project site (S 188<sup>th</sup> Street/Orillia Road S) does not queue into the adjacent intersection based on model calculations. However, the left-turns would be blocked due to queues on the westbound approach at the S 188<sup>th</sup> Street /I-5 NB Ramps intersection. Eastbound left-turns into the site will depend on westbound traffic not blocking the site access during the weekday AM and PM peak hours.

# **Traffic Safety**

Records of reported accidents at study intersections were reviewed to help identify if any existing traffic safety issues exist. The most recent summary of accidents is for the period between January 1, 2002/2003 through July, 2005. The data was provided by the City of SeaTac, King County, and WSDOT. A historical review of the frequency of accidents was conducted at all study intersections. Typically, intersections with collision rates greater than 1.0 collisions per million entering vehicles (MEV) are earmarked for continued evaluation and potential safety improvements. A summary of the total average annual and MEV of reported accidents at each study intersection is provided in Table 4.

	N	umber of	Acciden	ts		
Intersection	2002/ 2003	2004	2005	Total	Annual Average	ΜΕν
S 188 <sup>th</sup> St/Military Rd S	15	16	14	45	15.0	1.22
S 188 <sup>th</sup> St/I-5 SB Ramps	9	10	8	27	9.0	0.66
S 188 <sup>th</sup> St/I-5 NB Ramps	9	17	11	37	12.3	0.80
S 188th St/Orillia Rd S	6	11	8	25	8.3	0.66
Orillia Rd S/S 200 <sup>th</sup> St	7	10	6	23	7.7	0.55

As Table 4 shows, the MEV is less than 1.0 at all of the study intersections with the exception of S 188<sup>th</sup> Street/Military Road S. This intersection has an average of 15 accidents per year over the last three years. The accidents were 12 rear-end, 5 angle, 4 turning, 5 head-on, 6 sideswipe, 4 fixed object, and 9 other. The City of SeaTac currently does not have accident safety analysis standards.

### **Transit Service**

King County Metro Transit (MT) and Sound Transit (ST) provide service to an eastbound stop at the near side of S 188<sup>th</sup> Street/Military Road S. Transit service is provided by three routes:

- MT 180 provides service on 30-minute headways between Burien and Auburn.
- MT 194 provides service on 45-minute headways between Seattle and Federal Way.
- ST 574 provides service on 30-minute headways between SeaTac and Lakewood.

# Future Baseline Conditions (Without-Project)

A future 2011 baseline (representing a without-project scenario) analysis was developed to identify forecast traffic conditions. Although traffic volumes at the existing driveway will increase with or without the proposed transfer station improvements, traffic volumes accessing the site were assumed to remain consistent with existing conditions in order to isolate growth in site-related traffic volumes for the with-project analysis.

The evaluations in this section establish a baseline for identifying project impacts, which will be based upon a comparison of baseline traffic conditions to with-project conditions. The future roadway network, traffic volumes, and traffic operations are defined in this section.

# **Traffic Volumes**

Year 2011 baseline traffic volumes were established based on a forecast from a regional traffic forecasting model (TMODEL2). This model was derived from the Puget Sound Regional Council model (PSRC) and used for the SR 509 extension studies. The model has recently been updated to support the Port of Seattle (POS) Comprehensive Development Plan (CDP). Model roadway link data was plotted for a short-term year of 2010 and a long-term year of 2024. The short-term model plot shows traffic volumes are expected to remain about the same over the next four years. This is due to traffic shifts created by the City of Kent's South 228<sup>th</sup> Street Extension. Some traffic volumes are expected to shift from S 212<sup>th</sup> Street and Orillia Road S to the new S 228<sup>th</sup> Street extension. The long-term plots show expected traffic volume increases at an annual rate of 1 percent.

Although traffic volumes in the short-term are not expected to increase near the study area due to the S 228<sup>th</sup> Street extension project, to be conservative, existing (year 2006) traffic volumes were increased at an annual rate of 1 percent to estimate year 2011 forecast traffic volumes. The volumes were rounded to the nearest 5 vehicles, and the site access volumes were assumed to remain unchanged. Site access traffic volumes will be addressed under the with-project conditions section. Figure 3 shows the future 2011 baseline traffic volumes for the weekday AM and PM, and Saturday peak hours. These volumes will be used to estimate year 2011 baseline conditions.

### **Planned Transportation Improvements**

No short-term (year 2011) transportation improvement projects that would enhance capacity were identified for the study intersections.

## **Traffic Operations**

This section of the report summarizes baseline traffic operations at the study intersections. The operations analysis section summarizes baseline LOS calculations as well as off-site vehicle queuing.

#### **Level of Service**

Future traffic operations in the study area were evaluated based on the year 2011 forecast traffic volumes. Since no short-term planned improvements were identified, intersection channelization is consistent with existing conditions. The traffic operations analysis uses the same methodologies discussed in the evaluation of existing levels of service. Table 5 summarizes the weekday AM and PM baseline LOS results; existing conditions results are provided for comparison purposes. The detailed LOS worksheets are provided in Appendix B.

	AM	Existing (2	2006)	AM Baseline (2011)			
Intersection	LOS <sup>1</sup>	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM	
S 188th St/Military Rd S	D	51.8	0.92	D	46.7	1.03	
S 188th St/I-5 SB Ramps	В	16.8	0.64	В	15.4	0.67	
S 188th St/I-5 NB Ramps	С	23.3	0.79	С	24.0	0.78	
Orillia Rd S/S 200 <sup>th</sup> St	С	32.2	0.77	С	21.6	0.78	
<u>Unsignalized</u>							
S 188th St/Orillia Rd S	А	4.0	NA	А	5.7	NA	
Worst Movement	F	>120	SB	F	>120	SB	
	PM	Existing (2	2006)	PM	Baseline (2	2011 <u>)</u>	
Intersection	LOS	Delay	V/C or WM	LOS	Delay	V/C or WM	
S 188 <sup>th</sup> St/Military Rd S	D	38.4	0.76	С	33.5	0.82	
S 188th St/I-5 SB Ramps	D	40.3	0.88	D	35.2	0.94	
S 188th St/I-5 NB Ramps	С	30.8	0.86	С	30.3	0.90	
Orillia Rd S/S 200 <sup>th</sup> St	С	26.1	0.77	С	29.3	0.82	
<u>Unsignalized</u>							
S 188th St/Orillia Rd S	А	4.2	NA	А	6.4	NA	
Worst Movement	F	>120	SB	F	>120	SB	

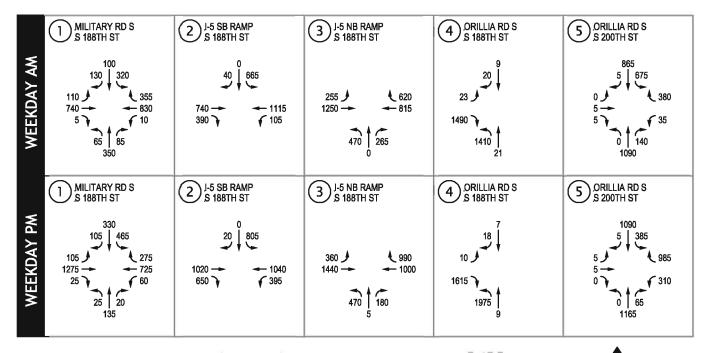
Level of service, based on 2000 Highway (
 Average delay in seconds per vehicle.

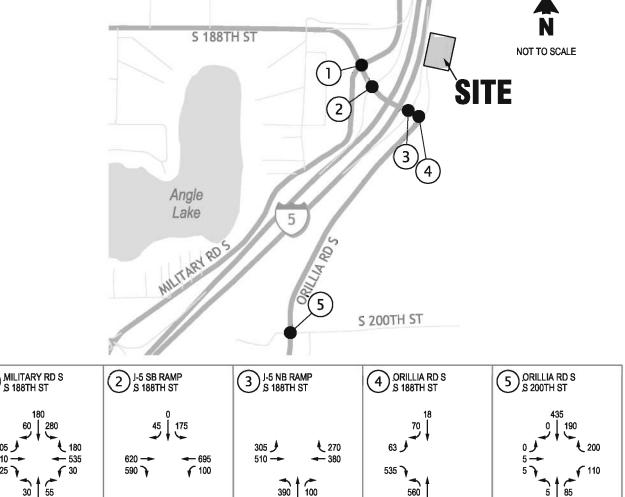
Average delay in seconds per venicle.
 Volume-to-capacity ratio reported for signalized intersections.

Volume-to-capacity ratio reported for signalized intersections
 Worst movement reported for unsignalized intersections.

As Table 5 shows, under future baseline conditions all signalized intersections are calculated to operate at LOS D or better. The unsignalized S 188<sup>th</sup> Street/Orillia Rd S (site access) intersection continues to operate at LOS A as a whole, with the southbound movement expected to continue to operate at LOS F during the weekday peak hours.

Table 6 provides a summary of the Saturday peak hour LOS results. Both existing and baseline conditions are provided for comparison purposes.





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Figure 3 2011 Baseline AM and PM Weekday, and Sat. Peak Hour Volumes Bow Lake Transfer/Recycling Station



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	Exi	sting (Sat. 20	<u>)06)</u>	Bas	Baseline (Sat. 2011)			
Intersection	LOS <sup>1</sup>	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM		
S 188th St/Military Rd S	С	28.3	0.59	С	27.8	0.61		
S 188th St/I-5 SB Ramps	В	10.9	0.39	А	9.3	0.41		
S 188th St/I-5 NB Ramps	В	15.7	0.51	В	16.4	0.54		
Orillia Rd S/S 200 <sup>th</sup> St	В	16.8	0.36	В	17.3	0.38		
<u>Unsignalized</u>								
S 188th St/Orillia Rd S	А	1.4	NA	А	1.4	NA		
Worst Movement	В	13.2	SB	В	13.6	В		

1. Level of service, based on 2000 Highway Capacity Manual methodology.

2. Average delay in seconds per vehicle.

Volume-to-capacity ratio reported for signalized intersections. 3.

Worst movement reported for unsignalized intersections 4.

As Table 6 shows, all intersections operate well during the Saturday peak hour.

### **Off-Site Traffic Queuing**

This section of the report summarizes the calculated queuing between the study area intersections for the forecast baseline conditions. Queue calculations are summarized on S 188<sup>th</sup> Street for both the westbound and eastbound directions. On S 188<sup>th</sup> Street in the westbound direction queues are estimated to measure potential blocking between: Military Road S and I-5 NB Ramps, I-5 NB Ramps and I-5 SB Ramps, and I-5 SB Ramps and Orillia Road S (site access). In the eastbound direction queues are estimated to measure potential blocking between Orillia Road S and I-5 NB Ramps, I-5 NB Ramps and I-5 SB Ramps, as well as I-5 SB Ramps and Military Road S.

Table 7 compares the existing with future baseline calculated queues. Capacity between intersections is shown to help identify if there is blocking between intersections during baseline conditions.

		AM Peak Hour					
		95th Percentile <sup>2</sup> Queue					
Direction/Intersection	Capacity' (ft)	Existing (ft)	<u>Baseline (ft)</u>	<u>Available</u> Capacity?			
Westbound							
S 188 <sup>th</sup> St /Military Rd S	205	260	365	No			
S 188 <sup>th</sup> St /I-5 SB Ramps	490	200	225	Yes			
S 188 <sup>th</sup> St /I-5 NB Ramps	65	365	290	No			
Eastbound							
S 188 <sup>th</sup> St/Orillia Rd S	65	20	20	Yes			
S 188th St /I-5 NB Ramps	490	330	275	Yes			
S 188th St /I-5 SB Ramps	205	160	150	Yes			
		PM Peak Hour					
Westbound							
S 188 <sup>th</sup> St /Military Rd S	205	245	230	No			
S 188th St /I-5 SB Ramps	490	230	365	Yes			
S 188th St /I-5 NB Ramps	65	600	620	No			
Eastbound							
S 188 <sup>th</sup> St/Orillia Rd S	65	20	20	Yes			
S 188 <sup>th</sup> St /I-5 NB Ramps	490	335	265	Yes			
S 188 <sup>th</sup> St /I-5 SB Ramps	205	255	450	No			
<ul> <li>Distance between intersec</li> <li>95<sup>th</sup> percentile queue leng</li> </ul>		by Synchro 6.0.					

# Table 7.2011 Baseline Intersection Queue Summary: Weekday AM and PM Peak Hours

As Table 7 shows, during AM and PM peak hour conditions, the queuing results are similar between existing and baseline conditions.

# **Future With-Project Conditions**

This section highlights forecast traffic conditions with the proposed project. The results were compared to baseline traffic conditions to identify project impacts. A description of project trip generation, trip distribution, and future traffic operations with the proposed project is provided in this section.

### **Trip Generation**

The Bow Lake Transfer/Recycling Station is an existing site with exiting traffic volumes. The methodology for estimating future traffic volumes is based on a linear increase of existing traffic volumes based on solid waste forecasts provided by the King County Solid Waste Division. The Solid Waste Division forecasts the total annual waste tonnage based on historic data and the expected development in economic activities and population growth. Factors influencing the waste tonnage being disposed are income, tip fees, number of jobs, service area population, household size, and the structure of the job market.

Based on econometric model forecasting done by the Solid Waste Division, it is estimated that the tonnage of solid waste disposal will increase by about 16 percent from year 2006 to 2011. It is assumed that traffic volumes accessing the site will increase at a linear rate. Thus, existing peak hour traffic volumes accessing the site will be increased by 16 percent to estimate the net new trips accessing the site by year 2011. Table 8 summarizes the estimated weekday AM and PM, and Saturday peak hour net new project traffic volumes.

	AM Peak Hour		PM Peak Hour			Sat. Peak Hour			
Land Use	Total	In	Out	Total	In	Out	Total	In	Out
Existing Traffic Volumes <sup>1</sup>	73	44	29	44	19	25	181	93	88
Increased by 16.0% <sup>2</sup>	<u>85</u>	<u>51</u>	<u>34</u>	<u>51</u>	<u>22</u>	<u>29</u>	<u>210</u>	<u>108</u>	<u>102</u>
Total Net New Project Trips	12	7	5	7	3	4	29	15	14

Table 8.	2011 Trip Generation Estimate Summary
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1. Based on existing year 2006 peak hour turning movement counts.

2. Growth rate based on County econometric model forecasts.

As Table 8 shows, by year 2011 there is expected to be 12 net new trips during the AM peak hour, 7 net new trips during the PM peak hour, and 29 net new trips during the Saturday peak hour. As this data shows, net new trips attracted to the site during the commuter peak hours is relatively low. Trips attracted to the site typically increase on weekends since this is the time period when residents (self-haul) have the opportunity to dispose of household waste.

These estimates are likely conservative, since no reduction to site truck volumes was applied due to the new preload compactor technology that will be used to load waste containers. In the short-term, this preload compactor application should reduce truck trips by 50 to 67 percent. In addition, the analysis is constructed to consider all growth

traffic as, in effect, Net New Project Trips. Since there are no plans to close the transfer station site if the improvements are not made, this results in a systematic overestimate of the actual effect of the proposal on off-site traffic. However, the analysis is constructed this way to assure that potential impacts are not underestimated.

# **Project Trip Distribution/Assignment**

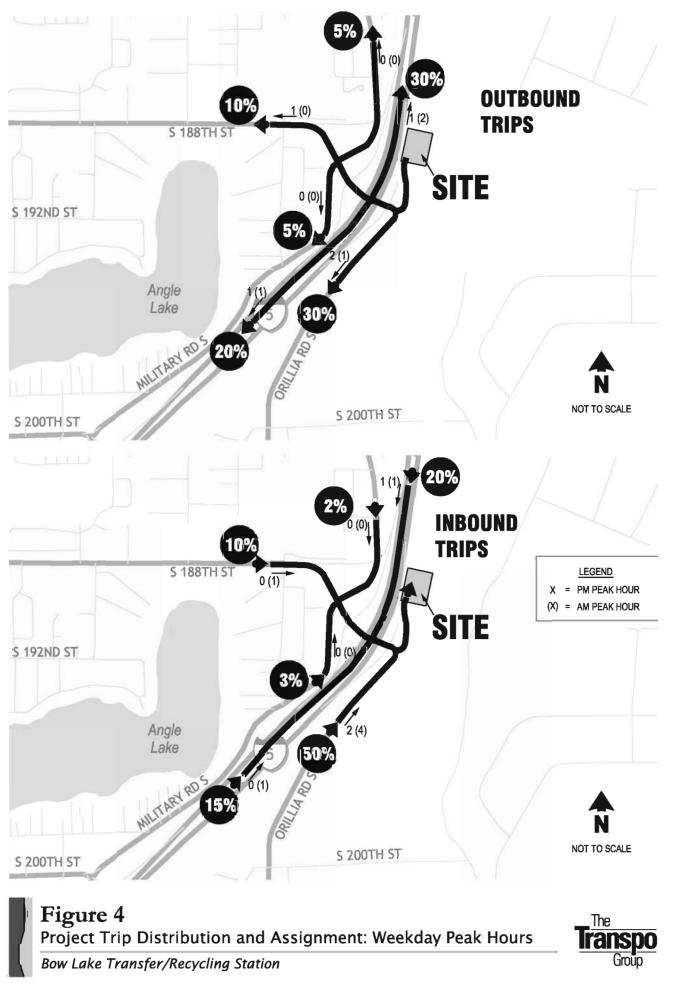
Project trip distribution is based on existing site access traffic volumes and an origin/destination study summarized in an April 2004 report called "Waste Monitoring Program." Existing turning movement counts were used to identify existing distribution patterns at the site access (S 188<sup>th</sup> Street/Orillia Road S). Beyond the site access, trip distributions were assigned to roadways based on the origin/destination study. Project trip distribution is illustrated in Figures 4 and 5. As Figure 4 shows, distribution was distinctly different for inbound and outbound trips during the weekday AM and PM peak hours and trips were assigned accordingly. As Figure 5 illustrates, during the Saturday peak hour outbound trips tend to mirror inbound trips.

These differences between weekday and weekend traffic patterns are likely due to the difference in trip types. Weekday peak hour site traffic is going to tend to attract more commercial-haulers then self-haulers; and when commercial-haulers finish dumping solid waste many trucks likely continue community service routes other than where they originated. Whereas a weekend will have a higher concentration of self-haul trips (residents), and likely return home after they unload.

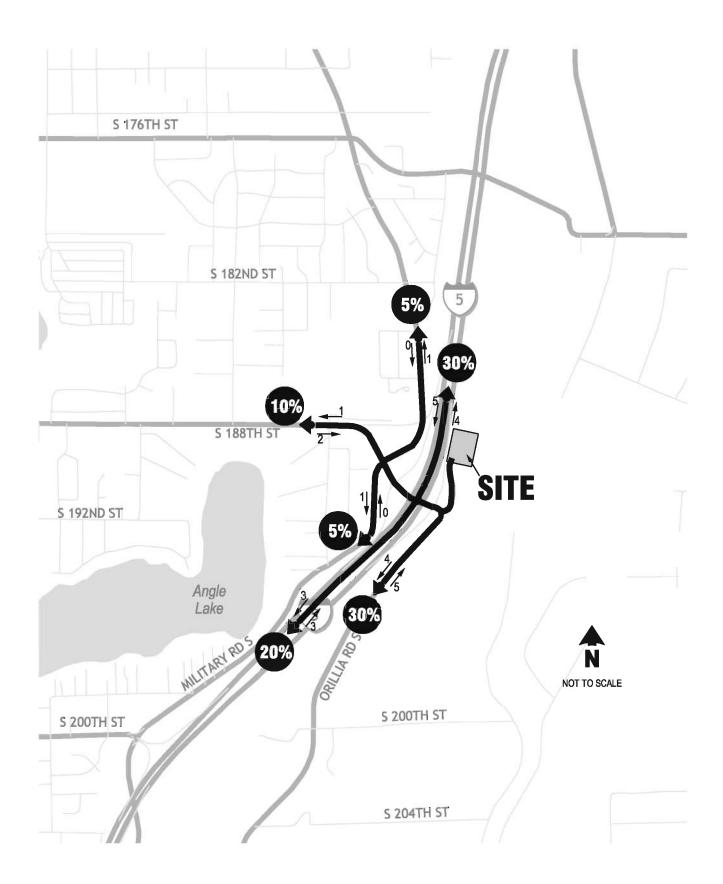
## 2011 Traffic Volume

The project-generated traffic was added to the baseline traffic volumes to obtain the with-project volumes for the study intersections illustrated in Figure 6. These are the volumes used to estimate project impacts in the operations analysis.

To characterize potential traffic volume impacts, with-project traffic volumes were compared to 2011 baseline volumes to determine the percent impact of project traffic on study intersections. Table 9 summarizes the project's peak hour contribution to total entering traffic volumes at the study intersections.



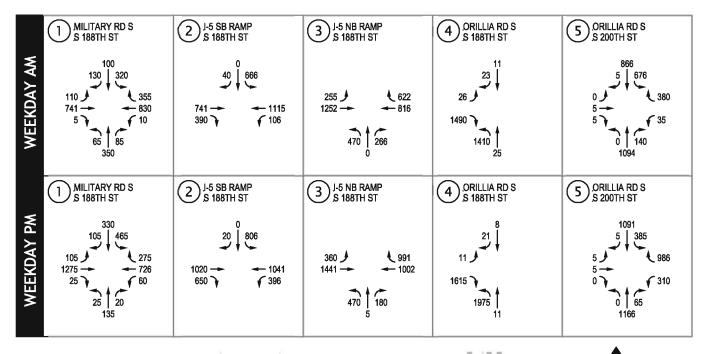
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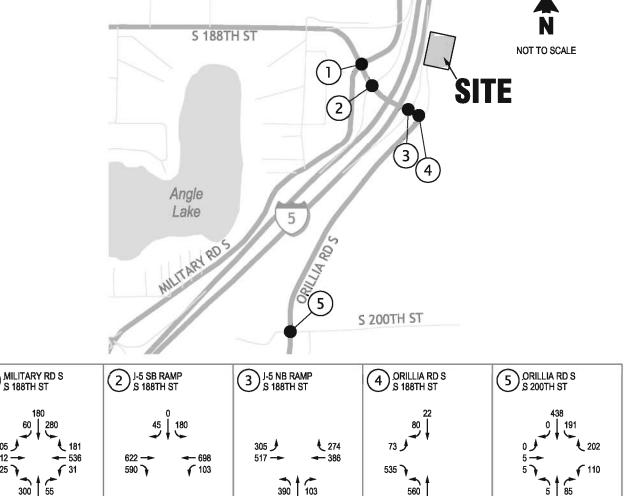




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Intersection				
AM Peak Hour	2011 Baseline	Project Traffic	2011 With-Project	% Impact
S 188 <sup>th</sup> St/Military Rd S	3,100	1	3,101	>0.1
S 188 <sup>th</sup> St/I-5 SB Ramps	3,055	3	3,058	0.1
S 188 <sup>th</sup> St/I-5 NB Ramps	3,675	6	3,681	0.2
S 188 <sup>th</sup> St/Orillia Rd S	2,973	12	2,985	0.4
Orillia Rd S/S 200 <sup>th</sup> St	3,200	6	3,206	0.2
PM Peak Hour	2011 Baseline	Project Traffic	2011 With-Project	% Impact
S 188 <sup>th</sup> St/Military Rd S	3,545	1	3,546	>0.1
S 188 <sup>th</sup> St/I-5 SB Ramps	3,930	3	3,933	0.1
S 188 <sup>th</sup> St/I-5 NB Ramps	4,445	4	4,449	0.1
S 188 <sup>th</sup> St/Orillia Rd S	3,634	7	3,641	0.2
Orillia Rd S/S 200 <sup>th</sup> St	4,015	3	4,018	0.1
Sat. Peak Hour	2011 Baseline	Project Traffic	2011 With-Project	% Impact
S 188 <sup>th</sup> St/Military Rd S	2,540	5	2,545	0.2
S 188 <sup>th</sup> St/I-5 SB Ramps	2,225	13	2,238	0.6
S 188 <sup>th</sup> St/I-5 NB Ramps	1,960	20	1,980	1.0
S 188th St/Orillia Rd S	1,276	29	1,305	2.3
Orillia Rd S/S 200 <sup>th</sup> St	1,500	9	1,509	0.6

Table 9.	2011 Project Traffic Volume Impacts
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As Table 9 shows, during the AM and PM peak hours the expected increase in projectrelated traffic volumes will impact all study intersections by less than 1 percent. On Saturday project trips impact the site access driveway (188<sup>th</sup> Street/Orillia Road S) by about 2 percent. Project-related traffic volumes impact all remaining study intersections by less than 1 percent. Traffic volumes typically fluctuate about plus or minus 5 percent from day-to-day depending on factors such as the day of the week, weather, and traffic conditions elsewhere in the roadway network. Based on these results, it is unlikely that the average motorist would notice the forecast impact of increased site traffic volume. As noted above, even these impacts overstate the probable traffic impacts, since the waste stream forecasts are not dependent on the proposed action, and there are no plans to close the transfer station if the improvements are not made.

## **Traffic Operation Impacts**

This section of the report summarizes with-project traffic operations at the study area intersections. The operations analysis section summarizes LOS calculations as well as off-site vehicle queuing. Baseline analysis results are provided to measure the degree of impact of project related traffic.

### Level of Service

A LOS analysis was conducted for with-project conditions in order to quantify traffic operations in the study. The same HCM 2000 methodologies were applied and all intersection parameters such as channelization, intersection control, and signal timings were held consistent with those used in the evaluation of baseline conditions to measure the degree of impact of the proposed project. With-project traffic operations forecasts are based on Figure 6 with-project traffic volumes. Table 10 summarizes the with-project LOS, baseline conditions are provided for comparison purposes. The detailed LOS worksheets are provided in Appendix B.

	AM Baseline			AM With-Project		
Intersection	LOS	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM
S 188 <sup>th</sup> St/Military Rd S	D	46.7	1.03	D	46.6	1.03
S 188th St/I-5 SB Ramps	В	15.4	0.67	В	15.4	0.67
S 188th St/I-5 NB Ramps	С	24.0	0.78	С	24.0	0.79
Orillia Rd S/S 200th St	С	21.6	0.78	С	21.7	0.79
<u>Unsignalized</u>						
S 188th St/Orillia Rd S	А	5.7	NA	А	8.1	NA
Worst Movement	F	>120	SB	F	>120	SB
		PM Baselir	<u>1e</u>	P	M With Pro	<u>ject</u>
Intersection	LOS	Delay	V/C or WM	LOS	Delay	V/C or WM
S 188 <sup>th</sup> St/Military Rd S	С	33.5	0.82	С	33.5	0.82
S 188th St/I-5 SB Ramps	D	35.2	0.94	D	35.3	0.94
S 188th St/I-5 NB Ramps	С	30.3	0.90	С	30.4	0.90
Orillia Rd S/S 200 <sup>th</sup> St	С	29.3	0.82	С	29.3	0.82
<u>Unsignalized</u>						
	А	6.4	NA	С	22.2	NA
S 188 <sup>th</sup> St/Orillia Rd S	<i>,</i> ,					

1. Level of service, based on 2000 Highway Capacity Manual methodology.

2. Average delay in seconds per vehicle.

Volume-to-capacity ratio reported for signalized intersections.
 Worst movement reported for unsignalized intersections.

As Table 10 shows, all of the study intersections are expected to remain at the same LOS as reported for baseline conditions during the weekday AM peak hour. During the PM peak hour, the overall operation of S 188<sup>th</sup> Street/Orillia Road S (site access) is expected to degrade from LOS A to LOS C. This change in LOS does not impact commuter traffic on S 188<sup>th</sup> Street. The change in LOS is due to the increased southbound delay at the site access, which results in increased delays for vehicles exiting the transfer station during the PM peak hour.

Table 11 provides a summary of the Saturday peak hour LOS results. Both baseline and with-project conditions are provided for comparison purposes.

	<u>Baseline (Sat.)</u>			With-Project (Sat.)		
Intersection	LOS	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM
S 188th St/Military Rd S	С	27.8	0.61	С	27.8	0.61
S 188th St/I-5 SB Ramps	А	9.3	0.41	А	9.4	0.41
S 188th St/I-5 NB Ramps	В	16.4	0.54	В	16.5	0.54
Orillia Rd S/S 200 <sup>th</sup> St	В	17.3	0.38	В	17.3	0.38
Unsignalized						
S 188th St/Orillia Rd S	А	1.4	NA	А	1.6	NA
Worst Movement	В	13.6	В	В	14.2	SB

1. Level of service, based on 2000 Highway Capacity Manual methodology.

2. Average delay in seconds per vehicle.

Volume-to-capacity ratio reported for signalized intersections.
 Worst movement reported for unsignalized intersections.

4. Worst movement reported for unsignalized intersections.

As Table 11 shows, all study intersections are expected to continue to operate well on a Saturday peak hour when project related traffic volumes are added.

As previously described, while impacts are calculated to be negligible, they are likely an overstatement of probable traffic impacts, since no change in the waste stream would occur as a result of the project, nor are there plans to close the transfer station in the event the improvements are not constructed.

### **Off-Site Traffic Queuing**

This section of the report summarizes the calculated queuing between the study area intersections for the with-project conditions. Similarly to baseline conditions, queue calculations are summarized on S 188<sup>th</sup> Street for both the westbound and eastbound directions. On S 188<sup>th</sup> Street in the westbound direction queues are estimated to measure potential blocking between: Military Road S and I-5 NB Ramps, I-5 NB Ramps and I-5 SB Ramps, and I-5 SB Ramps and Orillia Road S (site access). In the eastbound direction, queues are estimated to measure potential blocking between Orillia Road S and I-5 NB Ramps, I-5 NB Ramps and I-5 SB Ramps, I-5 NB Ramps and I-5 SB Ramps.

Table 12 provides a summary of the with-project queue calculations. The baseline queue calculations are provided for comparison purposes to measure the project impacts on queues.

		AM Peak Hour		
		<u>95<sup>th</sup> Perce</u>	entile <sup>2</sup> Queue	<u>With-Project</u>
Direction/Intersection	Capacity <sup>1</sup> (ft)	<u>Baseline (ft)</u>	<u>With-Project (ft)</u>	<u>Available</u> Capacity?
Westbound				
S 188 <sup>th</sup> St /Military Rd S	205	365	365	No
S 188th St /I-5 SB Ramps	490	225	225	Yes
S 188 <sup>th</sup> St /I-5 NB Ramps	65	290	290	No
Eastbound				
S 188 <sup>th</sup> St/Orillia Rd S	65	20	20	Yes
S 188 <sup>th</sup> St /I-5 NB Ramps	490	275	275	Yes
S 188th St /I-5 SB Ramps	205	150	155	Yes
		PM Peak Hour		
Westbound				
S 188 <sup>th</sup> St /Military Rd S	205	230	230	No
S 188 <sup>th</sup> St /I-5 SB Ramps	490	365	365	Yes
S 188 <sup>th</sup> St /I-5 NB Ramps	65	620	625	No
Eastbound				
S 188 <sup>th</sup> St/Orillia Rd S	65	20	20	Yes
S 188 <sup>th</sup> St /I-5 NB Ramps	490	265	265	Yes
S 188th St /I-5 SB Ramps	205	450	450	No
Distance between intersec 95 <sup>th</sup> percentile queue leng		by Synchro 6.0.		

# Table 12. 2011 With-Project Intersection Queue Summary: Weekday AM and PM Pk Hours

As Table 12 shows, during the AM and PM peak hour the queuing results are similar for future baseline and with-project conditions. Since the forecast project related traffic volumes are relatively low, the impacts of the proposed transfer station improvements to local queuing issues is expected to be negligible.

Concerns have been expressed with regard to added queuing from the transfer station further backing-up and inhibiting traffic on the southbound approach to S 188<sup>th</sup> Street at Orillia Road (transfer station exit). As noted in the analysis, this is an unsignalized approach to an arterial that operates at LOS F with average weekday peak hour delays in excess of 2 minutes, and will do so in the future with or without the growth increment added by the continued operation of the transfer facility. The minimal impact of this growth is reflected throughout the LOS and queuing analysis herein. The proposed action itself will result in <u>no impact</u> to these conditions, especially for outbound traffic, since the waste stream expected at the site is forecast to grow at approximately 2 percent annually with or without the project, and there are no plans to close the transfer station. Even with no transfer station and potential development to the north, delays would be very significant for any new development traffic.

## Safety Impacts

As was illustrated in Table 9 (2011 Project Traffic Volume Impacts), this project is expected to increase the volumes by less than 1 percent during the weekday AM and PM

peak hours. As such, it is unlikely this project will impact safety conditions at the study intersections.

# Year 2030 Planning Analysis

To support longer-range planning, a traffic analysis is also provided for the 2030 horizon year. This is consistent with the Master Plan for the Transfer Station. This section summarizes the traffic volumes for both baseline (without) and with-project conditions. Also, a future 2030 LOS analysis is provided of future baseline and with-project conditions.

## **Baseline Traffic Volumes**

Forecast traffic volumes were established for year 2030 by increasing existing (2006) traffic volumes at an annual rate of 1 percent. This is based on information from the regional forecasting model. The 2030 baseline traffic volumes are provided in Figure 7.

## **Trip Generation**

Based on waste tonnage forecasts provided by King County Solid Waste, year 2030 new project trips were estimated. Waste tonnage is forecast to increase from year 2006 to year 2030 at an annual rate of approximately 2 percent. It is assumed that traffic volumes accessing the site will increase at a linear rate. Thus, existing (2006) PM peak hour traffic volumes accessing the site were increased by 2 percent annually to estimate year 2030 net new project trips. Table 13 summarizes the estimated weekday PM peak hour net new project traffic volumes.

		PM Peak Hour	
Land Use	Total	In	Out
Existing Traffic Volumes <sup>1</sup>	44	19	25
Increased by 2.0% Annually <sup>2</sup>	<u>71</u>	<u>31</u>	<u>40</u>
Total Net New Project Trips	27	12	15

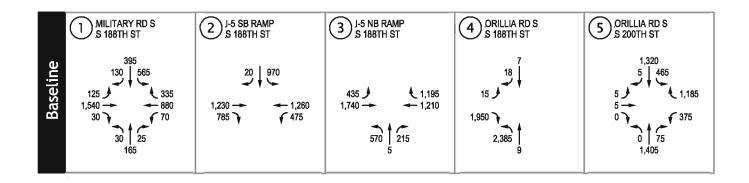
1. Based on existing year 2006 peak hour turning movement counts.

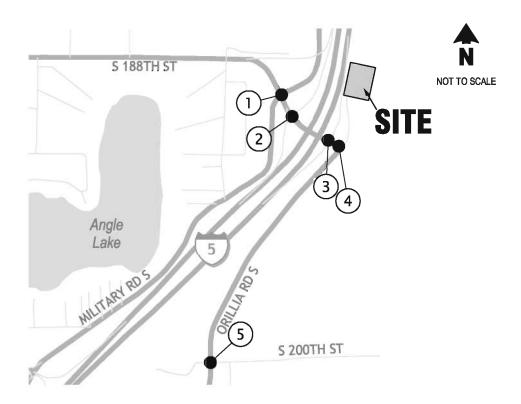
2. Growth rate based on County waste tonnage forecasts.

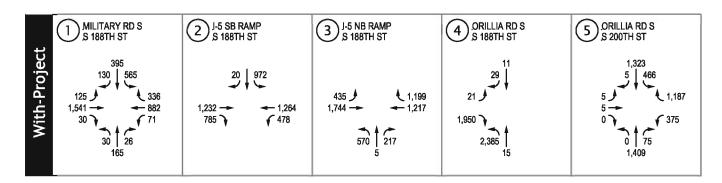
As Table 13 shows, by year 2030 the project is forecast to generate 27 net new weekday PM peak hour trips. As described in the analysis of 2011 conditions, these net new totals actually overstate the effect of project traffic, since there is no anticipated change in the waste stream arriving at Bow Lake Transfer/Recycling Station due to the proposal.

## With-Project Traffic Volumes

The project-generated weekday PM peak hour traffic (Table 13) was added to the baseline traffic volumes to obtain the with-project volumes for the study intersections illustrated in Figure 7. These are the volumes used to estimate project impacts in the operations analysis under 2030 forecast conditions.









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# **Traffic Operations**

A LOS analysis was conducted for year 2030 to quantify forecast traffic operations for both baseline and with-project conditions. The LOS is based on the same HCM methodologies used in the previous analysis. Signal timing was optimized to account for the expected growth in traffic volumes. The optimized signal timing data used to estimate baseline conditions was held constant for the evaluation of with-project conditions to measure the degree of impact of project volumes on study intersections. Table 14 summarizes the baseline and with-project LOS for 2030. The detailed LOS worksheets are provided in Appendix B.

Table 14.         2030 With-Project and Baseline LOS Summary: Weekday PM Peak Hour										
	<u>PM</u>	Baseline (20	<u>30)</u>	<u>PM W</u>	/ith-Project	(2030)				
Intersection	LOS	Delay <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM				
S 188 <sup>th</sup> St/Military Rd S	D	48.7	0.97	D	49.1	0.97				
S 188 <sup>th</sup> St/I-5 SB Ramps	E	56.5	1.12	Е	58.5	1.13				
S 188 <sup>th</sup> St/I-5 NB Ramps	Е	67.0	1.14	Е	67.9	1.14				
Orillia Rd S/S 200 <sup>th</sup> St	D	49.2	0.97	D	49.5	D				
<u>Unsignalized</u>										
S 188 <sup>th</sup> St/Orillia Rd S	С	16.2	NA	D	25.4	NA				
Worst Movement	F	>120	SB	F	>120	SB				

1. Level of service, based on 2000 Highway Capacity Manual methodology

2. Average delay in seconds per vehicle.

Volume-to-capacity ratio reported for signalized intersections.
 Worst movement reported for unsignalized intersections.

As Table 14 shows, during the PM peak hour the overall operation of S 188<sup>th</sup> Street/Orillia Road S (site access) is expected to degrade from LOS C to LOS D. This change in LOS does not impact commuter traffic on S 188<sup>th</sup> Street. The change in LOS is due to the increased southbound delay at the site access, which results in increased delays for vehicles exiting the transfer station during the PM peak hour. Project traffic volumes have a negligible impact on all remaining study intersections under 2030 conditions. As noted above, even these negligible impacts are an overestimate of actual impacts. The approach taken was intentionally conservative and assures impacts are not underestimated.

## **Off-Site Traffic Queuing**

Similar to previous queue calculation summaries, this section of the report summarizes the calculated queues between the study area intersections. Table 15 provides a summary of the forecast queuing under baseline conditions compared to the with-project conditions.

PM Peak Hour									
		95 <sup>th</sup> Percentile <sup>2</sup> Queue							
Direction/Intersection	Capacity' (ft)	2030 Baseline (ft) <sup>3</sup>	2030 With-Project (ft)						
Westbound									
S 188 <sup>th</sup> St /Military Rd S	205	315	315						
S 188 <sup>th</sup> St /I-5 SB Ramps	490	520	525						
S 188 <sup>th</sup> St /I-5 NB Ramps	65	1,105	1,115						
Eastbound									
S 188 <sup>th</sup> St/Orillia Rd S	65	325	330						
S 188th St /I-5 NB Ramps	490	605	605						
S 188th St /I-5 SB Ramps	205	800	805						

Table 15.	Intersection Queue Summary: 2030 Baseline and With-Project

95<sup>th</sup> percentile queue length in feet as reported by Synchro 6.0. Baseline conditions include the volumes from the proposed Tukwila South Project. 2.

3.

As Table 15 shows, by year 2030 capacity between all intersections is expected to be exceeded assuming no capacity improvement projects occur. The addition of the Bow Lake with-project future traffic volume has a negligible impact on queuing along the S 188th Street corridor. Most of the forecast queuing is the result of background traffic volume unrelated to the project site. As previously described, these impacts are an overstatement of actual impacts.

# Cumulative Analysis With Tukwila South Project

The purpose of this section is to analyze a future conditions scenario that includes the forecast traffic volumes from the proposed Tukwila South Project (La Pianta, LLC). Tukwila South is proposing development of up to approximately 14 million square feet in a large-scale, campus setting on approximately 498 contiguous acres. Proposed uses are office, research, commercial, retail, residential, hotel, and recreational. Tukwila South proposes three access points with the regional roadway system. The proposed access points are at S 180<sup>th</sup> Street/South Center Parkway, S 180<sup>th</sup> Street/Andover Park W, and S 200<sup>th</sup> Street/Frager Road S. Sixty percent of the Tukwila South traffic is forecast to access the site through the S 200<sup>th</sup> Street/Frager Road S intersection. From this location, 20 percent of the Tukwila South traffic is forecast to travel on Orillia Road S between S 200<sup>th</sup> Street and S 188<sup>th</sup> Street. Tukwila South evaluates the interim year of 2015 and the full-build out year of 2030.

This section of the report summarizes a baseline forecast condition that includes the Tukwila South traffic volumes. The project-generated traffic volumes are added to the baseline (with Tukwila South) volumes to estimate with-project impacts when Tukwila South volumes are included in the background traffic. The Tukwila South Project traffic volumes and data used in this analysis are derived from the Tukwila South Project DEIS (April 2005).

# Baseline 2011 Volumes with Tukwila South

Baseline traffic volumes (without Bow Lake new trips) were developed that included the Tukwila South Alternative 1 year 2015 weekday PM peak hour volumes. During this time period, Tukwila South is forecast to generate a total of 3,727 (1,192 in/2,535 out) weekday PM peak hour trips. Of these PM peak hour trips, 745 (20%) are forecast to travel on Orillia Road S between S 188<sup>th</sup> Street and S 200<sup>th</sup> Street. These trips were assigned to the roadway network based on the distributions provided in the Tukwila South DEIS.

Only weekday PM peak hour is evaluated since this is typically the time period with highest adjacent street traffic volumes and it is the only time period that was analyzed by Tukwila South in its DEIS. Year 2011 future volumes were estimated by increasing the existing (2006) traffic volume by 1 percent annually and adding the Tukwila South weekday PM peak hour traffic volumes. The 2011 with baseline (with Tukwila South) weekday PM peak hour traffic volumes are summarized in Figure 8.

# **Tukwila South Planned Improvement Projects**

The Tukwila South Project DEIS year 2015 analysis has no planned improvements for the Bow Lake Study intersections. Thus, there are roadway improvements assumed for the traffic operations analysis.

# 2011 With-Project Traffic Volumes

The project-generated weekday PM peak hour traffic (Table 8) was added to the baseline (with Tukwila South) traffic volumes to obtain the with-project volumes for the study intersections illustrated in Figure 8. These are the volumes used to estimate project impacts in the operations analysis when the Tukwila South project traffic volumes are assumed on the roadway system.

# 2011 Traffic Operation Impacts

This section of the report summarizes the baseline (with Tukwila South) and withproject (Bow Lake) traffic operations at the study intersections. The operations analysis section summarizes LOS calculations as well as off-site vehicle queuing.

### **Level of Service**

A LOS analysis was conducted for baseline (with Tukwila South) and with-project conditions in order to quantify traffic operations in the study area. For future baseline conditions, cycle lengths remained consistent with existing conditions; the splits were optimized within the max/min parameters on the existing timing plans. Signal timings were held consistent with those used in the evaluation of baseline conditions to measure the degree of impact of the proposed Bow Lake Project. Table 16 summarizes the baseline (with Tukwila South) and with-project (Bow Lake) conditions. The detailed LOS worksheets are provided in Appendix B.

Table 16.         2011 With-Project and Baseline (Tukwila South) LOS Summary: PM Peak Hour										
	<u>20</u>	11 PM Basel	ine	<u>201</u>	PM With-	Project				
Intersection	LOS <sup>1</sup>	<b>Delay</b> <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM				
S 188 <sup>th</sup> St/Military Rd S	С	34.8	0.83	С	34.8	0.83				
S 188 <sup>th</sup> St/I-5 SB Ramps	Е	61.8	1.13	Е	62.0	1.13				
S 188 <sup>th</sup> St/I-5 NB Ramps	Е	55.4	1.11	Е	55.6	1.11				
Orillia Rd S/S 200 <sup>th</sup> St	F	90.1	1.06	F	90.3	1.06				
<u>Unsignalized</u>										
S 188 <sup>th</sup> St/Orillia Rd S	С	16.3	NA	С	18.6	NA				
Worst Movement	F	>120	SB	F	>120	SB				

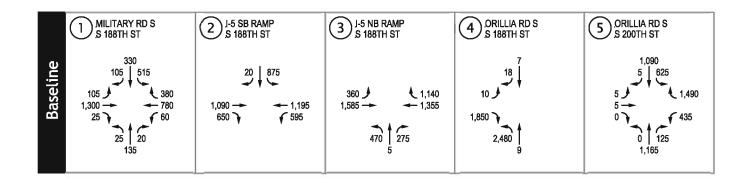
1. Level of service, based on 2000 Highway Capacity Manual methodology.

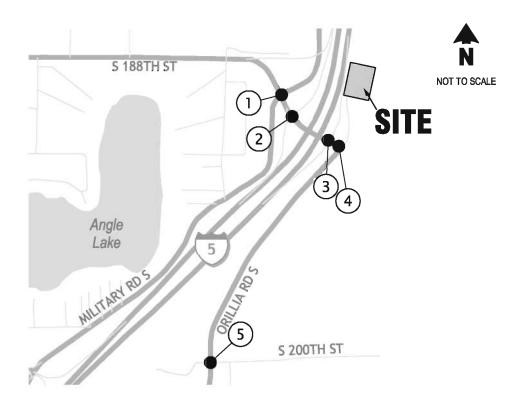
2. Average delay in seconds per vehicle.

3. Volume-to-capacity ratio reported for signalized intersections.

4. Worst movement reported for unsignalized intersections.

As Table 16 shows, with the inclusion of the Tukwila South Project in the baseline traffic volumes, the Bow Lake project traffic volumes are expected to have an insignificant impact on calculated level of service. The roadways are expected to operate essentially the same with or without Bow Lake traffic volumes.





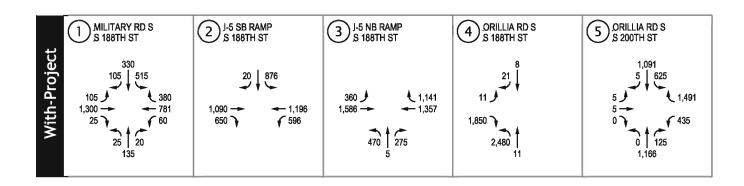


Figure 8 The 2011 With-Project and Baseline (with Tukwila south) PM Peak Hour Traffic Volumes Group

Bow Lake Transfer/Recycling Station

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### **Off-Site Traffic Queuing**

Similar to previous queue calculation summaries, this section of the report summarizes the calculated queuing between the study area intersections. Table 17 provides a summary of the forecast queuing under baseline conditions that include the Tukwila South traffic volumes, compared with the with-project (Bow Lake) conditions.

### Table 17. 2011 Intersection Queue Summary: Weekday PM Peak Hours

PM Peak Hour									
		95 <sup>th</sup> Perce	ntile <sup>2</sup> Queue						
Direction/Intersection	Capacity' (ft)	Baseline (ft) <sup>3</sup>	With-Project (ft)						
Westbound									
S 188 <sup>th</sup> St /Military Rd S	205	260	260						
S 188th St /I-5 SB Ramps	490	510	515						
S 188th St /I-5 NB Ramps	65	865	865						
Eastbound									
S 188 <sup>th</sup> St/Orillia Rd S	65	255	255						
S 188th St /I-5 NB Ramps	490	540	540						
S 188 <sup>th</sup> St /I-5 SB Ramps	205	550	550						

2. 95<sup>th</sup> percentile queue length in feet as reported by Synchro 6.0.

3. Baseline conditions include the volumes from the proposed Tukwila South Project

As Table 17 shows, the addition of the Bow Lake with-project future traffic volume has a negligible impact on queuing along the S 188<sup>th</sup> Street corridor.

# Baseline 2030 Volumes with Tukwila South

Baseline traffic volumes (without Bow Lake new trips) were developed that included the Tukwila South Alternative 1 year 2030 weekday PM peak hour volumes. During this time period Tukwila South is forecast to generate a total of 13,975 (4,304 in/9,671 out) weekday PM peak hour trips. Of these PM peak hour trips 2,795 (20%) are forecast to travel on Orillia Road S between S 188<sup>th</sup> Street and S 200<sup>th</sup> Street. These trips were assigned to the roadway network based on the distributions provided in the Tukwila South DEIS.

Only weekday PM peak hour is evaluated since this is typically the time period with highest adjacent street traffic volumes and it is the only time period analyzed by Tukwila South. Year 2030 future volumes were estimated by increasing the existing (2006) traffic volume by 1 percent annually and adding the Tukwila South weekday PM peak hour traffic volumes. The 2030 with baseline (with Tukwila South) weekday PM peak hour traffic volumes are summarized in Figure 9.

# Tukwila South Planned Improvement Projects

The Tukwila South Project DEIS year 2030 analysis proposes improvement projects at three study intersections. The proposed improvements are as follows:

- **S 188th Street/I-5 SB Ramps:** Provide an additional westbound left-turn lane for dual lefts and an additional eastbound right-turn lane for dual rights. Rechannelize the southbound leg for dual left-turn lanes and a thru-right lane.
- **S 188<sup>th</sup> Street/I-5 NB Ramps:** Provide dual westbound right-turn lanes. Rechannelize the northbound leg for dual left-turn lanes, a thru-right lane and a right-turn lane.
- **Orillia Road S/S 200<sup>th</sup> Street:** Provide double westbound (WB) left-turn lanes, an additional northbound thru lane for three thru lanes, and a northbound right-turn only lane.

These projects were assumed as a baseline condition for the 2030 analysis.

# 2030 With-Project Traffic Volumes

The project-generated weekday PM peak hour traffic (Table 13) was added to the baseline (with Tukwila South) traffic volumes to obtain the with-project volumes for the study intersections illustrated in Figure 9. These are the volumes used to estimate project impacts in the operations analysis when the Tukwila South project traffic volumes are assumed on the roadway system.

# 2030 Traffic Operation Impacts

This section of the report summarizes the baseline (with Tukwila South) and withproject (Bow Lake) traffic operations at the study intersections. The operations analysis section summarizes LOS calculations as well as off-site vehicle queuing.

## Level of Service

A LOS analysis was conducted for year 2030 to quantify forecast traffic operations for both baseline (with Tukwila South) and with-project (Bow Lake) conditions. The LOS is based on the same HCM methodologies used in the previous analysis. Signal timing was optimized to account for the expected growth in traffic volumes. Cycle lengths were limited to between 60 and 130 seconds for this planning analysis as a reasonable limit for optimization of the 2030 baseline conditions. The proposed intersections projects at the three study intersections were also coded into the model for both baseline and withproject conditions.

The optimized signal timing data used to estimate baseline conditions was held constant for the evaluation of with-project conditions to measure the degree of impact of project volumes on study intersections. Table 18 summarizes the baseline and with-project level of service for 2030, assuming the Tukwila South Project traffic volumes. The detailed LOS worksheets are provided in Appendix B.

	<u>PM</u>	Baseline (2	<u>030)</u>	PM W	/ith-Project	: (2030 <u>)</u>
Intersection	LOS <sup>1</sup>	Delay <sup>2</sup>	V/C³ or WM⁴	LOS	Delay	V/C or WM
S 188 <sup>th</sup> St/Military Rd S	D	53.2	0.98	D	53.3	0.98
S 188 <sup>th</sup> St/I-5 SB Ramps	F	>120	1.40	F	>120	1.41
S 188 <sup>th</sup> St/I-5 NB Ramps	F	104.4	1.32	F	105.3	1.32
Orillia Rd S/S 200 <sup>th</sup> St	F	>120	1.59	F	>120	1.59
<u>Unsignalized</u>						
S 188 <sup>th</sup> St/Orillia Rd S	В	11.7	NA	С	20.1	NA
Worst Movement	F	>120	SB	F	>120	SB

able 18.	2030 With-Project and Baseline (Tukwila South) LOS Summary: PM Peak Ho

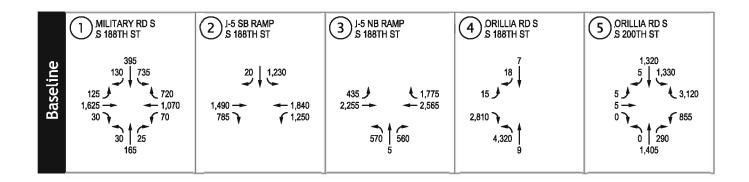
1. Level of service, based on 2000 Highway Capacity Manual methodology.

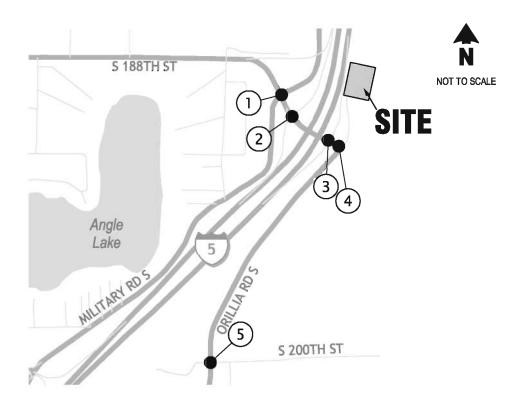
2. Average delay in seconds per vehicle.

Volume-to-capacity ratio reported for signalized intersections. Worst movement reported for unsignalized intersections. 3.

4.

As Table 18 shows, with the inclusion of the Tukwila South in the baseline traffic volumes, the Bow Lake project traffic volumes are expected to have an insignificant impact on calculated LOS. The roadways are expected to operate essentially the same with or without Bow Lake traffic volumes.





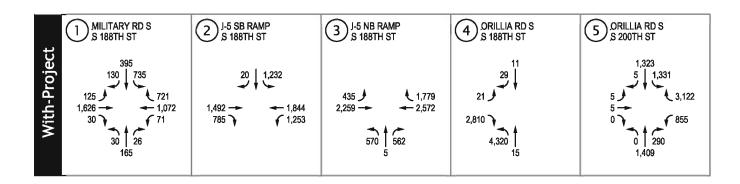


Figure 9 2030 With-Project and Baseline (with Tukwila south) PM Peak Hour Traffic Volumes Bow Lake Transfer/Recycling Station

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### **Off-Site Traffic Queuing**

Similar to previous queue calculation summaries, this section of the report summarizes the calculated queues between the study area intersections. Table 19 provides a summary of the forecast queuing under baseline conditions that include the Tukwila South traffic volumes, compared with the with-project (Bow Lake) conditions.

### Table 19. 2030 Intersection Queue Summary: Weekday PM Peak Hours

PM Peak Hour									
		95th Perce	ntile <sup>2</sup> Queue						
Direction/Intersection	Capacity <sup>1</sup> (ft)	Baseline <sup>3</sup> (ft)	<u>With-Project (ft)</u>						
Westbound									
S 188 <sup>th</sup> St /Military Rd S	205	260	260						
S 188 <sup>th</sup> St /I-5 SB Ramps	490	450	450						
S 188 <sup>th</sup> St /I-5 NB Ramps	65	1680	1685						
Eastbound									
S 188 <sup>th</sup> St/Orillia Rd S	65	350	350						
S 188 <sup>th</sup> St /I-5 NB Ramps	490	865	870						
S 188 <sup>th</sup> St /I-5 SB Ramps	205	900	905						
. Distance between intersections.									

95<sup>th</sup> percentile queue length in feet as reported by Synchro 6.0.

3. Baseline conditions include the volumes from the proposed Tukwila South Project.

As Table 19 shows, the addition of the Bow Lake with-project future traffic volume has a negligible impact on queuing along the S 188<sup>th</sup> Street corridor. When compared to Table 17, the intersection of S 188<sup>th</sup> Street/I-5 SB Ramps shows shorter queue lengths under 2030 conditions when compared to the 2011 results. This is due to the proposed improvements at S 188<sup>th</sup> Street/I-5 SB Ramps under the 2030 analysis.

# **Mitigation Measures**

Based on the identified negligible impacts, no mitigation measures were identified. The negligible impacts are a result of the low volume of new site-generated traffic volume when compared to the TEV of traffic at the study intersections. During the weekday AM peak hour, site-generated future new traffic volume impacts the study intersections total traffic volume with a range of 0.1 to 0.4 percent. During the weekday PM peak hour, site-generated future new traffic volume impacts the study intersections total traffic volume with a range of 0.1 to 0.2 percent. As these results show, during peak commuter travel times the future new site-generated trips comprise a very small part of the traffic stream. The transfer station generates the highest traffic volumes on a Saturday, which coincides with the lowest volume of traffic volumes on the adjacent streets. During the Saturday peak hour, site-generated future new traffic volume impacts the study intersections total traffic volume with a range of 0.2 to 2.3 percent; the 2.3 percent is at the site access. Traffic volumes typically fluctuate about plus or minus 5 percent from day-to-day depending on factors such as the day of the week, weather, and traffic conditions elsewhere in the roadway network. Based on these results, it is unlikely that the average motorist would notice the forecast impact of increased site-generated traffic volume. These conclusions are also verified through the LOS analysis. In addition, even the negligible increases due to the site are an overstatement of actual impacts, since there is no probable difference in site traffic demand anticipated between the proposal and "no action."

Under year 2011, four of the study intersections experienced no LOS change when comparing baseline to with-project conditions. Level of service calculations show that the calculated delay is expected to change by less than 0.1 seconds at the four intersections. Only the intersection of S 188<sup>th</sup> Street/Orillia Road S (site access) experienced changes in LOS during the PM peak hour. During the weekday AM peak hour, S 188th Street/Orillia Road S operates at LOS A under both baseline and withproject conditions. During the weekday PM peak hour, S 188th Street/Orillia Road S changes from LOS A under baseline conditions to LOS C under with-project conditions. The southbound approach operates at LOS F under both weekday AM and PM conditions. As noted in the foregoing analysis, S 188th Street/Orillia Road S is an unsignalized approach to an arterial that operates at LOS F with average weekday peak hour delays in excess of 2 minutes, and will do so in the future with or without the growth increment added by the continued operation of the transfer facility. The proposed action itself will result in <u>no impact</u> to these conditions, especially for outbound traffic, since the waste stream expected at the site is forecast to grow at approximately 2 percent annually with or without the project, and there are no plans to close the transfer station. Even without a transfer station and potential development to the north, delays would be very significant for any new development traffic.

# Appendix A: Level Of Service Criteria

### Highway Capacity Manual, 2000

**Signalized intersection** level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 1.         Level of Service Criteria for Signalized Intersections									
Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)							
А	≤10	Free Flow							
В	>10 - 20	Stable Flow (slight delays)							
С	>20 - 35	Stable flow (acceptable delays)							
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)							
E	>55 - 80	Unstable flow (intolerable delay)							
F	>80	Forced flow (jammed)							

**Unsignalized intersection** LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 2.	Level of Service Criteria for Unsignalized Intersections							
L	evel of Service	Average Control Delay (sec/veh)						
	А	0 - 10						
	В	>10 - 15						
	С	>15 - 25						
	D	>25 - 35						
	E	>35 - 50						
	F	>50						

Appendix B: Level of Service Worksheets

1: S 188th St & Millitary Rd

Queues 2006 Existing Weekday AM

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	117	783	2	12	879	374	68	460	337	243	
v/c Ratio	0.69	0.52	0.00	0.08	0.80	0.57	0.41	1.43	0.65	0.80	
Control Delay	57.3	18.5	12.0	46.5	25.4	9.5	41.8	237.7	37.6	44.3	
Queue Delay	0.0	0.3	0.0	0.0	14.7	2.4	0.0	2.0	0.0	0,0	
Total Delay	57.3	18.8	12.0	46.5	40.1	11.9	41.8	239.7	37.6	44.3	
Queue Length 50th (ft)	58	133	0	5	170	52	33	~319	86	91	
Queue Length 95th (ft)	#134	242	5	m12	261	64	72	#500	132	#219	
Internal Link Dist (ft)	1.11	436			107		431	ć .	· ··	246	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	170	1516	679	169	1097	658	169	322	537	302	
Starvation Cap Reductn	0	0	0	0	218	169	0	0	0	0	
Spillback Cap Reductn	0	249	. 0	0	0	0	0	1	0	0	
Storage Cap Reductn	Ó	0	0	0	0	0	0	0	0	0	
	0.69	0.62	0.00	0.07	1.00	0.76	0.40	1.43	0.63	0.80	

Intersection Summary

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

m Volume for 95th percentile queue is metered by upstream signal.

1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday AM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ሻ	<b>††</b>	*	×,	<b>^†</b>	۴	ሻ	r.		ሻሻ	ā	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	101 2	0.91	0.91	W. C. M.
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.92	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	la de	0.95	0.98	
Satd. Flow (prot)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1448	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	141 Jr.	0.95	1.00	8 - <u>2</u> - 1
Satd. Flow (perm)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1479	
Volume (vph)	105	705	2	11	791	337	61	335	79	303	95	123
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	117	783	2	12	879	374	68	372	88	337	106	137
RTOR Reduction (vph)	0	0	1	0	0	171	0	10	0	0	39	0
Lane Group Flow (vph)	117	783	1	12	879	203	68	450	. 0	337	204	0
Heavy Vehicles (%)	6%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot		Perm	Prot	200 - AR	Perm	Prot	e	·	Prot		2022
Protected Phases	1	6		5	2		7	4		3	8	ć
Permitted Phases			6	A		2		14 1				
Actuated Green, G (s)	6.3	28.9	28.9	1.5	24.2	24.2	5.0	15.7		11.9	33.5	
Effective Green, g (s)	8.0	30.7	30.7	2.2	24.9	24.9	6.7	17.6		13.5	35.1	38 <sup>1</sup> .2
Actuated g/C Ratio	0.10	0.38	0.38	0.03	0.31	0.31	0.08	0.22		0.17	0.44	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	나는 네.
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	170	1307	585	46	1050	470	141	332	이슈는	518	645	
v/s Ratio Prot	c0.07	0.23		0.01	c0.26	1000,000,000	0.04	c0.30		c0.11	0.05	1. M. 1. M.
v/s Ratio Perm	280 C 3		0.00	e ja o	5 A 1	0.13	e î șe e			122	0.09	de la c
v/c Ratio	0.69	0.60	0.00	0.26	0.84	0.43	0.48	1.36		0.65	0.32	
Uniform Delay, d1	34.8	19.7	15.2	38.1	25.7	21.9		31.2		31.0	14.6	8 G
Progression Factor	1.00	1.00	1.00	1.36	0.79	0.82	1.00	1.00		1.00	1.00	
Incremental Delay, d2	20.4	2.0	0.0	2.6	6.8	2.5		178.3		2.9	0.3	2 .
Delay (s)	55.2	21.8	15.2	54.4	27.1	20.4	37.6	209.5		34.0	14.9	
Level of Service	E	C	B	D	C	С	D	F		С	В	
Approach Delay (s)		26.1	-,	÷	25.4		187.4	-			26.0	
Approach LOS		C			C	. ·	E				C	tu ki
Intersection Summary												
HCM Average Control I	Delay		51.8	- F	ICM Le	vel of Se	ervice		D	,	1	
HCM Volume to Capaci	ty ratio		0.92									
Actuated Cycle Length	(s)		80.0	5	Sum of I	ost time	(s)		16.0			
Intersection Capacity U			63.3%	1	CU Lev	el of Ser	vice		В			
Analysis Period (min)			15									
c Critical Lane Group												
			10			,						· .

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The Transpo Group

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The Transpo Group

2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday AM

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	٦	+	7	4	+	•	•	1	1	1	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		**	*	ሻ	**					٦	÷.	
Ideal Flow (vphpl)	1900		1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	,		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		4.0	4.0	
Lane Util. Factor	· · ·	0.95	1.00	1.00	0.95	5.281		5.7		0.95	0,95	ار اسې ک
Frt		1.00	0.85	1.00	1.00			4. A.A.A.		1.00	0.98	21 I V
Fit Protected	1.a	1.00	1.00	0.95	1.00	1.14.54		1.344.4		0.95	0.96	45 12
Satd. Flow (prot)	21.1	3374	1509	1656	3312	675		1.1.1.1.1		1715	1698	
Flt Permitted		1.00	1.00		1.00					0.95	0.96	n dar fel
Satd. Flow (perm)		3374	1509	439	3312		· · · ·			1715	1698	te here the
Volume (vph)	0	706	370	99	1062	0	0	<	0	632	0	39
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0.52	767			1154	0.02	0.52	0.02	0.02	687	0.02	
RTOR Reduction (vph)	ő	0	216	0	0	0	0	0	0	007	7	0
Lane Group Flow (vph)	ő	767		-	1154	ŏ	. ŏ	ŏ	0	383	339	
	7%	7%	7%	9%	9%	9%	9%	9%	9%	0%	0%	0%
Heavy Vehicles (%)	1 70	1 70				970	970	970	970		0.76	0.76
Turn Type			Perm	pm+pt		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		e non non e		Perm		and the second second
Protected Phases		2		1	6		,	~			8	14.11
Permitted Phases	e a constante da servición de la constante da servición de la constante da servición de la constante da servic	·	2	<ul> <li>1. Solution</li> </ul>		na hata		1992년 19		8	st Ma	
Actuated Green, G (s)		36.1	36.1	47.8	47.8					22.2	22.2	
Effective Green, g (s)		37.1	37.1	48.8	, <i>19</i> , 19, 19, 19, 19, 19, 19, 19, 19, 19, 19	e quip		li seda ed	14.5	23.2	23.2	y Berner
Actuated g/C Ratio		0.46	0.46	0.61	0.61					0.29	0.29	
Clearance Time (s)		5.0	5.0	5.0	5.0	staine ,				5.0	5.0	1990) 
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1565	700	385	2020		Sel Sej Se	C. Balance, F.	g zer	497	492	
v/s Ratio Prot		0.23		0.03	c0.35							
v/s Ratio Perm	6 - L		0.12	0.14		11. J.A.		and and a		c0.22	0.20	ta ang ang ang ang ang ang ang ang ang an
v/c Ratio		0.49	0.27	0.28	0.57					0.77	0.69	
Uniform Delay, d1	i di	14.9	13.1	7.7	9.3	en" - 24		14 40 3		26.0	25.2	Maria di Pro- Prista di
Progression Factor		0.91	1.18	1.63	0.97					1.00	1.00	
Incremental Delay, d2		0.9	0.7	0.2	0.7	1			· .	7.3	4.0	terite d
Delay (s)	, ,	14.4	16.3	12.7	9.7	· · ·				33.2	29.2	
Level of Service		B	В	∼"B	A	المحار وخر			<	C	C	14 M.
Approach Delay (s)		15.1	, , .		10.0			0.0			31.3	1. 1. 1
Approach LOS		В			A A	ji ka s		Α			С	14 M 2.
Intersection Summary												
HCM Average Control D	elav	· · · ·	16.8	-	ICM Le	vel of Se	rvice	1913 - L	В		1.1.1.5	gert, P
HCM Volume to Capacit			0.64			1410-001 - 141				· ·	·	1.0
Actuated Cycle Length (			80.0		Sum of I	ost time (	s)	1.1.1	8.0			1.2.4
Intersection Capacity Ut			96.4%			el of Serv			F			2-2
Analysis Period (min)			15						•			
c Critical Lane Group			.5									
o ontioar cano oroup												

Queues 2006 Existing Weekday AM

	+	*	4	Ļ	*	ţ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	767	402	108	1154	383	346	
v/c Ratio	0.48	0.43	0.32	0.57	0.77	0.69	
Control Delay	16.4	4.0	14.9	11.1	36.1	31.3	
Queue Delay	0.5	0.8	0.0	1.9	0.1	0.6	
Total Delay	16.9	4.8	14.9	13.0	36.3	31.9	
Queue Length 50th (ft)	154	16	22	133	184	156	
Queue Length 95th (ft)	m160	m39	m38	198	247	215	
Internal Link Dist (ft)	107			326		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1610	930	371	2021	665	664	
Starvation Cap Reductn	432	268	0	176	0	0	
Spillback Cap Reductn	0	0	0	668	23	97	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.65	0.61	0.29	0.85	0.60	0,61	
intersection Summary			des es de				

m Volume for 95th percentile queue is metered by upstream signal.

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The Transpo Group

The Transpo Group

2: S 188th St & I-5 SB

3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday AM

	٦	-	7	*	-	×	1	لر	3	*	/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	٦	<u>^</u>			<b>††</b>	*			٦	M	
Ideal Flow (vphpl)			1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util, Factor	1.00	0.95	. 86. 5	e 15 11	0.95	1.00	1.5	alto: 5	0.95	0.95	
Frt	1.00	1.00			1.00	0.85			1.00	0.89	
Fit Protected	0.95	,		100	1.00	1.00			0.95	0.99	and the state
Satd. Flow (prot)	1703	3406			3059	1369			1618	1492	
Fit Permitted	0.15	1.00			1.00	1.00			0.95	0.99	te de la contraction
Satd. Flow (perm)	270	3406	A 11 - 12-		3059	1369			1618	1492	
Volume (vph)	245	1187	0	0	774	592	0	0	448	0	254
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	278	1349	0	0	880	· - 10#	0	0	509	0	289
RTOR Reduction (vph)	0	0	0	0	0	428	0	0	0	26	0
Lane Group Flow (vph)		, ÷		0		245	0	0	1 . C . T . T	359	0
Heavy Vehicles (%)	6%	6%	6%	18%	18%	18%	0%	0%	6%	6%	6%
Turn Type	pm+pt		1.54	1.1	2 C	Perm	1. 19 M.		Split		an a
Protected Phases	5	2			6	~			4	4	
Permitted Phases	2				·	6			ha a	· · · ·	이 생활가 운영되는
Actuated Green, G (s)	46.3	46.3			28.1	28.1			23.7	23.7	19.5 A. 1. 1.
Effective Green, g (s)	47.3		91217	1463.1	29.1	29.1	144	ef l'es	24.7	24.7	사람이 공기되었다.
Actuated g/C Ratio Clearance Time (s)	0.59	0.59 <b>5.0</b>			0.36	0.36			0.31	0.31	the state
Vehicle Extension (s)	5.0 2.5	4.0	1000	, the main	5.0 5.0	5.0			5.0	5.0	Martin Carta
			. Re. Car	1.114968		5.0	) outration	action .	3.5	3.5	
Lane Grp Cap (vph)	414 0.12	2014 c0.40		- Maria	1113 c0.29	498	1. maga		500	461	
v/s Ratio Perm	0.12	CU.40	.t. sh	1.00	CU.29	0.18	1 1 10	an e se a de se	c0.26	0.24	
v/c Ratio	0.28	0.67	S 585.	estat. "	0.79	0.18	, 19 M	a the start of	0.83	0.78	i tille af se a tille
Uniform Delay, d1	12.2	11.1	and and the	39.50	22.7	19.7			25.7	25.2	- Martin - Art
Progression Factor	1.55	1.05	21 I A 11 V	Stratter"	1.00	1.00	1. S.	統二 ブロト	1.00	1.00	
Incremental Delay, d2	3.3				5.8				11.0	8.4	. Shugara nga
Delay (s)	22.2	13.1		ಗಳ ಕಗೆರೆ ರ	28.5	23.2	1	a de con	36.6	33.6	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Level of Service	<sup>2</sup> C			· 5.	<sup>2</sup> C	<sup>20</sup> C			D.0		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Approach Delay (s)	- 13 <b>36</b> 8	14.7	1. 1 h	A.	26.2	dage :	0.0	26 - 7 - 2	the second	35.1	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Approach LOS	1 340 1	B	de la	dia d	Č.	ere Stark	A	Sec. 1		D	
Intersection Summary	<sup>ر</sup> د						nitiki ana medaana	and a second	e het hoer Staat de staat de s		
	100 C	<u> </u>			<u></u>		in frequeble		1. here 199	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	
HCM Average Control D HCM Volume to Capaci		3 ÷	23.3	い合教機	CM Le	vel of Se	rvice		С	4.0X_1	e state in the
Actuated Cycle Length (			0.79 80.0		m of I	a at the is a	(a) (c)		10.0		5.0 × 21
Intersection Capacity Ut			96.4%			ost time i al of Serv			12.0	8 S	とうし ちんどうが
Analysis Period (min)	anzation		15		O Leve	SI UL Sell			, · <b>F</b>		11. 1. 1. 1. M. M.
c Critical Lane Group			10-	N 47	5.25	2000 A		2010		19 F	1 - A

Queues

3: S 188th St & I-5 NB

2006 Existing Weekday AM

	۶	-	-	×.	3	•	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	278	1349	880	673	413	385	
v/c Ratio	0.66	0.67	0.79	0.73	0.83	0.79	
Control Delay	25.0	14.4	33.2	8.0	39.7	34.8	
Queue Delay	0.0	0.2	0.0	0:0	0.0	0.0	
Total Delay	25.0	14.6	33.2	8.0	39.7	34.8	
Queue Length 50th (ft)	102	207	210	0	196	164	
	m186	332	#367	92	283	249	
Internal Link Dist (ft)		326	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	488	2013	1111	926	587	564	
Starvation Cap Reductn	0	154	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	õ	0	0	0	
Reduced v/c Ratio	0.57	0.73	0.79	0.73	0.70	0.68	

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

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#### 4: Orillia Rd & Site Access

HCM Unsignalized Intersection Capacity Analysis 2006 Existing Weekday AM

	1	۲	4	Ŧ	¥	t				
Vovement	NBT	NBR	SBL	SBT	SWL	SWR				
ane Configurations	<b>≜</b> t≽		۲	<b>††</b>	٦	۴				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
/olume (veh/h)	1343	21	23	1417	9	20				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph)	1444	23	25	1524	10	22				
Pedestrians										
ane Width (ft)										
Valking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type					None					
Median storage veh)										
Jpstream signal (ft)				74						
X, platoon unblocked					0.73					
C, conflicting volume			1467		2267	733				
C1, stage 1 conf vol										
C2, stage 2 conf vol	Sec.									
Cu, unblocked vol			1467		2364	733				
C, single (s)	2.1		4.3		8.4	8.5				
C, 2 stage (s)										
F (s)		1. S. S. S.	2.3		4,3	4.1				
0 queue free %			94		0	91				
M capacity (veh/h)			418		. 7	231				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2		Laker (	
/olume Total	963	504	25	762	762	10	22		11	
/olume Left	0	0	25	0	0	10	0			
/olume Right	. 0	23	0.	0	0	0	22			
SH	1700	1700	418	1700	1700	7	231			
olume to Capacity	0.57	0.30	0.06	0.45	0.45	1,37	0.09			
Queue Length 95th (ft)	0	0	5	0	0	52	8			
Control Delay (s)	0.0	0.0	14.1	.0.0	0.0	1164.9	22.2			
ane LOS			В			F	С			
Approach Delay (s)	0,0		0.2			376,8				
Approach LOS						F				
ntersection Summary			- Second and the				i an			
verage Delay			4.0							
ntersection Capacity Uti	lization		49.2%	10	CU Leve	of Ser	vice	A		
analysis Period (min)			15							

#### 5: S 200th St & Orillia Rd

#### Queues 2006 Existing Weekday AM

		1	•	1	1	Ļ		
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT		
Lane Group Flow (vph)	2	31	374	1207	662	849		
v/c Ratio	0.01	0.19	0.45	0.66	0.99	0.29	5	
Control Delay	30.0	32.8	6.7	14.4	61.8	3.0		13 11 2 1 2 1 2021
Queue Delay	0,0	0.0	0.0	0.0	0.0	0.0		and the second second
Total Delay	30.0	32.8	6.7	14.4	61.8	3.0		
Queue Length 50th (ft)	0	10	13	104	112	0		
Queue Length 95th (ft)	7	40	51	#394	#333	132	,	
Internal Link Dist (ft)	36			266		3370		
Turn Bay Length (ft)								
Base Capacity (vph)	171	313	828	1827	672	2967		1
Starvation Cap Reductn	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	×0.	0	0	0	18 248	March 2017
Storage Cap Reductn	0	0	0	0	Ó	0		
Reduced v/c Ratio	0.01	0.10	0.45	0.66	0.99	0.29		Content of the second

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

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5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday AM

	۶	-	$\mathbf{F}$	*	←	*	1	1	1	5	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		<u> </u>		77	۲	<b>≜</b> ↑⊅		ኘሻ	<b>†</b> î>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		0.93		1.00		0.85		0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1772		1410		2221		3196		3273	3373	
Fit Permitted		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1772		1410		2221		3196		3273	3373	
Volume (vph)	<u> </u>	1	1	30	0	363	0	1036	135	642	822	2
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	- 0	1	, <b>1</b> .	31	0	374	0	1068	139	662	847	2
RTOR Reduction (vph)	0	1	0	0	0	222	0	9	0	0	0	0
Lane Group Flow (vph)	0	1	O:	31	0	152	· 0	1198	0	662	849	0
Heavy Vehicles (%)	0%	0%	0%	28%	28%	28%	11%	11%	11%	7%	7%	7%
	Perm			Prot	, c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3		<u> </u>			4						
Actuated Green, G (s)		0.8		3.0		14.3		34.9		11.3	52.2	
Effective Green, g (s)		2.8		4,0		17.3		36.9		13.3	54.2	
Actuated g/C Ratio		0.04		0.05		0.24		0.51		0.18	0.74	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		68		77		648		1616		596	2504	
v/s Ratio Prot		c0.00		c0.02		0.04		c0.37		c0.20	0.25	
v/s Ratio Perm	~ .<					0.03						
v/c Ratio		0.02		0.40		0.23		0.74		1.11	0.34	
Uniform Delay, d1		33,8	tal pro	33.3		22.5		14.3		29.8	3.2	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.1		3.4		0.2		3.1		71.1	0.4	
Delay (s)		33.9		36.8		22.7		17.4		100.9	3.6	
Level of Service	1.	С		D		C,		в		F	A	
Approach Delay (s)		33.9			23.8			17.4			46.2	
Approach LOS	· · ·	С			C,			B			D	
Intersection Summary												and the second
HCM Average Control De	lav	( A.,	32.2	F	ICM Lev	el of Se	rvice	1 (a	C			1.1
HCM Volume to Capacity			0.77									
Actuated Cycle Length (s			73.0	S	um of l	ost time	(s)		16.0			
Intersection Capacity Utili	zation		69.6%	10	CU Leve	of Ser	vice		С			
Analysis Period (min)	0 J		15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday PM

\*

1: S 188th St & Millitary Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	5	<u>†</u> †	1	ሻ	**	۲	ኘ	ដ		ሻሻ	¥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1. A.
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	S. J. Cale
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Volume (vph)	98	1213	22	55	692	264	22	128	18	444	312	102
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	100	1238	22	.56	706	269	.22	131	18	453	318	104
RTOR Reduction (vph)	0	0	9	0	0	126	0	5	0	0	12	0
Lane Group Flow (vph)	100	1238	13	56	706	143	22	144	.0	453	410	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	s) est co	Perm	Prot		Perm	Prot	の現在で	1.2	Prot	n serves Romans	한 영상 문
Protected Phases	1	6	1 1 100	5	2		7	4		3	8	
Permitted Phases		10 1	6			2						
Actuated Green, G (s)	16.0	35.8	35.8	7.0	26.9	26.9	2.5	17.0		18.2	32.9	
Effective Green, g (s)	17.7	37.6	37.6	7.7	27.6	27.6	4.2	18.9		19.8	34.5	ante da fil
Actuated g/C Ratio	0.18	0.38	0.38	0.08	0.28	0.28	0.04	0.19		0.20	0.34	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9	, ·.	5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	307	1305	584	132	949	424	73	294	1. N/	673	591	Sard.
v/s Ratio Prot	0.06	c0.36		c0.03	0.21		0.01	0.09		c0.13	c0.24	
v/s Ratio Perm			0.01		1. 10.	0.09	12					
v/c Ratio	0.33	0.95	0.02	0.42	0.74	0.34	0.30	0.49	14 J.	0.67	0.69	
Uniform Delay, d1	35.9	30.3	19.6	44.0	33.0	28.9	46.5	36.2	1. P	37.1	28.2	にてる。
Progression Factor	1.00	1.00	1.00	0.80	0.83	1.02	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.8	15.3	0.1	2.0	4.7	1.9	2.3	1.3		2.7	3.5	1
Delay (s)	38.7	45.6	19.7	37.4	32.0	31.5	48.8	37.5	,	39.8	31.7	
Level of Service	C D	D	В	D	C	C:	D	D		D.	С	ている。
Approach Delay (s)		44.7			32.2		39.0	· ·			35.9	
Approach LOS		D			. C	: 	, D	-			<b>D</b> :	din A
Intersection Summary		and the second				Sec.						
HCM Average Control D	elay		38.4	· · · · · · · · · · · · · · · · · · ·	CM Le	vel of Se	rvice		D	1.1.1	1943	20 y M y
HCM Volume to Capacit	y ratio		0.76									
Actuated Cycle Length (	s)		100.0	S	um of l	ost time	(s)		12.0			
Intersection Capacity Ut			78.7%			el of Ser			D			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

2006 Existing Weekday PM

1: S 188th St & Millitary Rd

	_#	-	$\mathbf{F}$	4	+	۲	1	۲	6	¥	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	100	1238	22	56	706	269	22	149	453	422	
v/c Ratio	0.33	0.85	0.03	0.37	0.66	0.45	0.17	0.61	0.67	0.70	
Control Delay	42.5	36.4	13.8	40.3	28.0	12.6	46.1	48.2	41.9	34.2	
Queue Delay	0.0	8,6	0.0	0.0	3.8	1.7	0.0	0.0	0.0	0.0	
Total Delay	42.5	45.0	13.8	40.3	31.7	14.4	46.1	48.2	41.9	34.2	
Queue Length 50th (ft)	57	386	3	26	174	51	13	85	139	200	
Queue Length 95th (ft)	115	#624	21	m54	m244	m126	38	150	177	338	
Internal Link Dist (ft)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	307	1455	660	189	1066	597	139	270	884	619	
Starvation Cap Reductn	0	0	0	0	268	187	0	0	0	0	
Spillback Cap Reductn	. 0	197	0	0	0	.0	0	0	14	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.33	0,98	0.03	0.30	0.88	0.66	0.16	0.55	0.52	0.68	

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles. m. Volume for 95th percentile queue is metered by upstream signal.

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#### 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		††	1	۲	<b>^</b>					٦	4>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor	1.11	0.95	1.00	1862 1		Carl II		· · des."	111	0.95	0.95	Ger an
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Flt Protected	19 dir.	1.00	1.00			Constant 1	1		Same -	0.95	0.95	Regen L
Satd. Flow (prot)		3406	1524	1703	3406					1441	1438	an an an
Flt Permitted	1.1	1.00	1.00		1.00		~	e de la	19	0.95	0.95	ON T
Satd. Flow (perm)	10121 H	3406	1524	196	3406	All of Man 1				1441	1438	
Volume (vph)	0	969	620	A fact of the set	991	0	0	0	0	765	0	17
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	: 0	999	639	387	, e , e e ,	Ó	0.	0	~ ^ <b>0</b>	789	0	
RTOR Reduction (vph)	0	0	399	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	999		- S - S - S	1022	0		0	0	425	381	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type		,	Perm	pm+pt		40,002		고학 문		Perm		aliger Aligna da di
Protected Phases		2		1	6						. 8	:
Permitted Phases		200.0	2 36.6	63.7	63.7	1. 1. 1. 1. 1.	r faur.	1114		8 26.3	26.3	ar e constante d
Actuated Green, G (s)	,	36.6	37.6		64.7					20.3	20.3	
Effective Green, g (s) Actuated g/C Ratio		37.6 0.38	0.38	0.65	0.65	9 7 8 6 .		a kata		0.27	0.27	18 5*
Clearance Time (s)		5.0	5.0			arxistar		1.1.2		5.0	5.0	al la X
Vehicle Extension (s)		4.0	4.0	3.0	4.0	der Philippie		n ku waki		3.0	3.0	84 A A.
Lane Grp Cap (vph)	1. 194. 13	1281	573		2204	an a	lal sett	September 14	fill Buy	393	393	
v/s Ratio Prot	1997-17	0.29	_JIJ	c0.19	0.30	10 - 199 pet - 1		- Z 127 - P	1792 1	030	000	109223 ( D , -
v/s Ratio Perm		0.29	0 16	c0.34		120 20	· · ·			c0.29	0.26	12 3
v/c Ratio		0.78	0.42	0.81	0.46	1. NORMA, ,	24.12.92	and Det Car	1.17.1	1.08	0.97	na gariya
Uniform Delay, d1		27.5	23.1			a de Shaire	a. 11	e milio e c		36.4	35.9	and the second s
Progression Factor	1.00	0.75	2.04	1.58	1.08	0.387.996.976		i su i sei li é		1.00	1.00	1.556,000.5
Incremental Delay, d2		2.8				a de la				69.0	36.7	gia C
Delay (s)		23.5	48.4	46.5	10.1					105.3	72.6	h-72855 →
Level of Service	·	C	. the Da		. В.	1.14 8.24		5. C. C. S.	100		7 7 ES	a da
Approach Delay (s)		33.2			20.1			0.0	7, 1		89.8	
Approach LOS		C	an de		С	ar head	e a spaceter	A		1 states	<b></b>	i Latente
Intersection Summary	and the state of the					005			and the second			
HCM Average Control D	elay	11	40.3	۱ × ۱	ICM Le	vel of Se	rvice		D		같은 왜	Street,
HCM Volume to Capacit	y ratio		0.88									
Actuated Cycle Length (			100.0			ost time			8.0	1.11	- 1. ž	* . Č n
Intersection Capacity Ut	ilization	1	05.0%		CU Leve	el of Serv	vice		G			
Analysis Period (min)		· .	15									
c Critical Lane Group												

Queues

2006 Existing Weekday PM

	-	$\mathbf{F}$	1	+	1	Ļ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	999	639	387	1022	425	382	
v/c Ratio	0.78	0.66	0.83	0.46	1.08	0.97	
Control Delay	24.2	6.4	47.6	10.1	105.1	76.4	
Queue Delay	71.5	15.3	0.0	1.1	0.0	0.5	
Total Delay	95.6	21.7	47.6	11.2	105.1	76.8	
Queue Length 50th (ft)	257	48	235	141	~333	~264	
Queue Length 95th (ft)	m216	m75	m316	m228	#530	#467	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1281	972	512	2248	394	394	
Starvation Cap Reductn	414	324	0	468	0	0	
Spillback Cap Reductn	. 0	0	0.	909	0	. 1	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1,15	0.99	0.76	0.76	1.08	0.97	

Intersection Summary

2: S 188th St & I-5 SB

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

m Volume for 95th percentile queue is metered by upstream signal.

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3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday PM

	۶	→	7	٣	-	•	1	¥	3	*	/*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	ሻ	<b>^</b>			<b>^</b>	ৰ			۲	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0.95	1
Frt	1.00	1.00			1.00	0.85			1.00	0.92	
Flt Protected	0.95	1.00		1. 2. 1	1.00				0.95	0.98	
Satd. Flow (prot)	1641	3282			3406	1524			1531	1447	
FIt Permitted	0.14	1.00	- 1 <sup>14</sup>		1.00	1.00	i.		0.95	0.98	and the second second
Satd. Flow (perm)	244	3282			3406	1524			1531	1447	
Volume (vph)	342	1370	0	17	953	942	0	0	449	3	169
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	353	1412	0	0	982	+ <i>.</i> ;	0.	0	463	<u> </u>	174
RTOR Reduction (vph)	0	0	0	0	0	384	0	0	0	44	0
Lane Group Flow (vph)	353	1412	0	0	982	587		. · . 0	319	277	0.
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%
Turn Type	pm+pt		i striit			Perm			Split		a the state is a
Protected Phases	5	2			6				4	4	
Permitted Phases	ୁ 2ୁ	с for a	$(-, \gamma) \in \mathcal{A}$			6_			a de la com		a di karata di
Actuated Green, G (s)	66.8	66.8			40.6	40.6			23.2	23.2	
Effective Green, g (s)	67.8	67.8	sa di Jerri	and the second sec	41.6	41.6	di ka sa	-la la l	24.2	24.2	. Anthe Suid States of
Actuated g/C Ratio	0.68	0.68			0.42	0.42			0.24	0.24	
Clearance Time (s)	5.0	5.0	a tan <sup>ant</sup> ang		5.0	5.0	in Ka	· · · ·	5.0	5.0	alla de la construcción de la const
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	476	2225	승규가 있		1417	634	-39	GANS .	371	350	SAN
v/s Ratio Prot	c0.16	0.43			0.29				c0.21	0.19	
v/s Ratio Perm	0.34		이상 나는 것			c0.39	. + .X <sup>6</sup> 2	der en			
v/c Ratio	0.74	0.63			0.69	0.93			0.86	0.79	
Uniform Delay, d1	19.6	9.1	Sec. Sec.	•	24.0	27.7	1. A.	18241	36.3	35.5	
Progression Factor	1.39	1.24			1.00	1.00			1.00	1.00	
Incremental Delay, d2	2.6		- mar det	1 Carlos	2.8	21.6	and they	1957 -	18.1	11.9	C. H. and States of the
Delay (s)	29.8	11.9			26.8	49.4			54.3	47.4	
Level of Service	<b>C</b> ≥	В	la de califa	a, Sara Ma	C	D	의 문제 문제	GANSS .	D	<i>ି</i> D	In the prosperior
Approach Delay (s)		15.5			38.0		0.0			50.9	
Approach LOS	- gast	B	South and the second		ି, (C, <b>D</b> ≱	Serie de Cartes de C	A		g netro	, D	- AMAR
Intersection Summary											
HCM Average Control E	Delav	2	30.8	- Contraction	ICM Le	vel of Se	rvice	<u> </u>	С	t Spillet	
HCM Volume to Capaci			0.86	· · · .2/		and the second	ee.n. <del></del>	e ser s		···· . 4	<ul> <li>gravity of the gravity</li> </ul>
Actuated Cycle Length		• 4	100.0	S	um of I	ost time	(s)		12.0	10	a trade to 2
Intersection Capacity U			05.0%			el of Ser		- 11 A A	G	a na sa	and the second of
Analysis Period (min)	4.2		15		· · · · ·	1997 - S		1	÷.,		110 - Et A
c Critical Lane Group								l			t satta sa at a

3: S 188th St & I-5 NB

Queues 2006 Existing Weekday PM

	۶	-	+	×	3	*	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	353	1412	982	971	319	321	
v/c Ratio	0.79	0.63	0.69	0.95	0.86	0.81	
Control Delay	36.0	12.7	28.7	30.7	58.8	46.2	
Queue Delay	0.0	0.5	0.0	0.0	0.0	0.0	
Total Delay	36.0	13.1	28.7	30.7	58.8	46.2	
Queue Length 50th (ft)	214	271	285	265	200	164	
Queue Length 95th (ft)	m250	m337	374	#602	#346	#304	
Internal Link Dist (ft)		410	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	502	2224	1414	1017	398	419	
Starvation Cap Reductn	0	351	0	0	0	0	
Spillback Cap Reductn	. 0	0	0	0	0	-0	
Storage Cap Reductn	Ō	Ō	Ō	Ō	Ō	ō	
	0.70	0.75	0.69	0.95	0.80	0.77	
Intersection Summary							
increased of Outfinday	0.000.000	20202020202020	<u></u>	2003018312807	9/25/2010		

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

m Volume for 95th percentile queue is metered by upstream signal.

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#### 4: Orillia Rd & Site Access

HCM Unsignalized Intersection Capacity Analysis 2006 Existing Weekday PM

Avement ane Configurations Sign Control Grade Volume (veh/h) Peak Hour Factor Hourly flow rate (vph) edestrians ane Width (ft) Valking Speed (ft/s)	NBT †     Free 0% 1878 0.93 2019	NBR 9	SBL Ť	SBT †† Free	SWL ሻ	SWR					
Sign Control Srade Volume (veh/h) Peak Hour Factor Hourly flow rate (vph) Pedestrians ane Width (ft) Valking Speed (ft/s)	Free 0% 1878 0.93		J,		٦	*					
Grade Volume (veh/h) Peak Hour Factor Hourly flow rate (vph) Pedestrians ane Width (ft) Valking Speed (ft/s)	0% 1878 0.93			Free		*					
Volume (veh/h) Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft) Valking Speed (ft/s)	1878 0.93				Stop						
Peak Hour Factor Hourly flow rate (vph) Pedestrians Lane Width (ft) Valking Speed (ft/s)	0.93			0%	0%						
Hourly flow rate (vph) Pedestrians ane Width (ft) Valking Speed (ft/s)			10	1535	7	18					
Pedestrians ane Width (ft) Valking Speed (ft/s)	2010	0.93	0.93	0.93	0.93	0.93					
	2019	10	11	1651	8	19					
Percent Blockage Right turn flare (veh)											
Aedian type Aedian storage veh)					None						
Jpstream signal (ft)				66							
X, platoon unblocked				00	0.76						
C, conflicting volume			2029		2871	1015					
C1, stage 1 conf vol			2020		2011						
C2, stage 2 conf vol											
Cu, unblocked vol			2029		3153	1015					
C, single (s)			4.3		7.3	7.4					
C, 2 stage (s)											
F (s)	e 5		2.3		3.7	3.5					
0 queue free %			96		0	90					
M capacity (veh/h)			247		4	201					
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2	E STATISTICS		resinkista	
/olume Total	1346	683	11	825	825	8	19		Jacob Harris		
/olume Left	0	0	11	0	0	8	0				
/olume Right	ŏ	10	0	Ő	. 0.	~ Õ	19				
SH	1700	1700	247	1700	1700	4	201				
/olume to Capacity	0.79	0.40	0.04	0.49	0.49	1.87	0.10				
Queue Length 95th (ft)	0.1.0	0	3	0.40	0.40	48	8				
Control Delay (s)	0.0	0.0	20.2	0.0		1983.9	24.8				
ane LOS	0.0	5.0	C	5.0	5.0	F	C				
Approach Delay (s) Approach LOS	0.0		0.1			573.4 F	, -				
ntersection Summary										S. and S.	a stranger
Average Delay Intersection Capacity Util Analysis Period (min)	lization		4.2 62.2% 15	10	CU Leve	el of Ser	vice	В			

5: S 200th St & Orillia Rd

Queues 2006 Existing Weekday PM

	-	*	*	1	1	Ļ			
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT			
Lane Group Flow (vph)	2	309	984	1229	387	1094			
v/c Ratio	0.01	0.82	0.74	0.79	0.75	0.51			and the
Control Delay	38.5	49.8	17.9	24.7	43.7	8.7			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			- 1 - <u>1</u> - 1
Total Delay	38.5	49.8	17.9	24.7	43.7	8.7			
Queue Length 50th (ft)	1	143	155	256	94	120			a dana a
Queue Length 95th (ft)	8	#320	294	#467	#186	242			
Internal Link Dist (ft)	36			266		3373			
Turn Bay Length (ft)									
Base Capacity (vph)	145	389	1337	1547	515	2166	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	See. 1	5 . N 1 19
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	. 0	0	0	0	<b>0</b> 0		· · ·	
Storage Cap Reductn	0	0	0	0					
Reduced v/c Ratio	0.01	0.79	0.74	0.79	0.75	0.51			

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

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5: S 200th St & Orillia Rd

#### HCM Signalized Intersection Capacity Analysis 2006 Existing Weekday PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		ኻ		ŕŕ	ሻ	†₽-		ኘካ	<b>∱</b> ⊅	
Ideal Flow (vphpl) 1	900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Flt Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3444		3183	3281	
Flt Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3444		3183	3281	
Volume (vph)	1	1	0	294	0	935	0	1108	60	368	1038	1
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1	1	0	309	0	984	0	1166	63	387	1093	1
RTOR Reduction (vph)	0	0	0	0	0	177	0	4	0	0	0	0
Lane Group Flow (vph)	0	2	0	309	0	807	0	1225	0	387	1094	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type P	erm			Prot	c	ustom	Prot	· -		Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4		-				
Actuated Green, G (s)		0.9		16.4		27.4		34.2		11.0	51.2	
Effective Green, g (s)		2.9		17.4		30.4		36.2		13.0	53.2	
Actuated g/C Ratio		0.03		0.20		0.36		0.42		0.15	0.62	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	란지	63	1 d. j.	357		1110		1458		484	2042	
v/s Ratio Prot				c0.18		c0.11		c0.36		0.12	0.33	
v/s Ratio Perm	×	0.00				0.18						
v/c Ratio		0.03		0.87		0.73		0.84		0.80	0.54	
Uniform Delay, d1		39.9		32.9		23.9		22.1		35.0	9.2	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.2		19.1		2.4		6.0		9.0	1.0	
Delay (s)		40.1		52.1		26.4		28.1		44.0	10.2	
Level of Service		D		D		С		С		D	в	
Approach Delay (s)		40.1			32.5			28.1			19.0	
Approach LOS		D			C			С			В	
Intersection Summary												
HCM Average Control Del			26.1	н	ICM Lev	vel of Se	ervice		C.			
HCM Volume to Capacity i			0.77									
Actuated Cycle Length (s)			85.5			ost time			12.0			
Intersection Capacity Utiliz	ation		79.4%	IC	CU Leve	el of Ser	vice		D			
Analysis Period (min)			15									
c Critical Lane Group												

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HCM Signalized Intersection Capacity Analysis 2006 Existing Saturday PM

### 1: S 188th St & Millitary Rd

Queues 2006 Existing Saturday PM

1: S 188th St & Millitary Rd

	_#	-	$\mathbf{\hat{v}}$	4	+	۲	1	۲	6	¥	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	104	911	26	28	536	178	32	202	282	240	
v/c Ratio	0.36	0.56	0.04	0.19	0.46	0.28	0.21	0.70	0.53	0.46	
Control Delay	40.0	22.0	7.8	33.0	22.9	8.2	41.7	45.3	38.4	27.7	
Queue Delay	0.0	0.0	0.0	0.0	2.2	0.8	0.0	0.0	0.0	0.0	
Total Delay	40.0	22.0	7.8	33.0	25.0	9.0	41.7	45.3	38.4	27.7	
Queue Length 50th (ft)	55	222	. 0	17	151	26	17	96	77	106	
Queue Length 95th (ft)	107	305	17	m27	146	74	45	#192	111	176	
Internal Link Dist (ft)		436			126		431			246	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	285	1624	741	212	1157	634	157	308	655	529	
Starvation Cap Reductn	0	0	0	0	462	243	0	0	0	0	
Spillback Cap Reductn	. 0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.36	0.56	0.04	0.13	0.77	0.46	0.20	0.66	0.43	0.45	

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

	_#	-	7	4	+	۲	1	1	1	6	f	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ሻ	<b>^†</b>	۴	ሻ	<b>††</b>	۴	ሻ	Ĩ.		ኻኻ	ኘ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	- : .	0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00	1,00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	Car I
Satd. Flow (prot)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1746	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	·	0.95	0.96	
Satd. Flow (perm)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1746	
Volume (vph)	99	865	25	27	509	169	30	142	50	268	172	56
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	104	911	26	28	536	178	32	149	53	282	181	59
RTOR Reduction (vph)	0	0	15	0	0	120	0	14	0	0	13	0
Lane Group Flow (vph)	104	911	. 11	28	536	58	32	188	Ó	282	227	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type	Prot		Perm	Prot	- ". ·	Perm	Prot	a state of the	0.00	Prot		
Protected Phases	1	6	107, s = e 172 s	5	2	- 1999, -d 1	7	4		3	8	
Permitted Phases		, ,	. 6		, E,	2		2 D		- 4 E -		
Actuated Green, G (s)	12.7	34.9	34.9	4.7	27.0	27.0	3.8	16.1		12.3	24.8	
Effective Green, g (s)	14.4	36.7	36.7	5.4	27.7	27.7	5.5	18.0		13.9	26.4	
Actuated g/C Ratio	0.16	0.41	0.41	0.06	0.31	0.31	0.06	0.20		0.15	0.29	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	the e
Lane Grp Cap (vph)	286	1457	652	104	1068	478	108	317	1 10 1	535	512	349 - E
v/s Ratio Prot	c0.06	c0.25	. n. nî de le nêzder	0.02	0.15	tos Ofisionalia	0.02	c0.12		c0.08	0.13	1. 4
v/s Ratio Perm	rigger og	1.1.1.1	0.01		ц <u>а н</u> .	0.04	<u>,                                     </u>		1.1	1997	·	Se
v/c Ratio	0.36	0.63	0.02	0.27	0.50	0.12	0.30	0.59		0.53	0.44	1979 - 1979 1979 - 1979
Uniform Delay, d1	33.7	21.2	15.9		25.5	22.4	40.4	32.7	2.11 6	35.0	25.8	1.1
Progression Factor	1.00	1.00	1.00	0.80	0.90	1.80	1.00	1.00		1.00	1.00	<i></i>
Incremental Delay, d2	3.6	2.0	0.0	1.4		0.5	1.5	3.0		0.9	0.6	× , 2 , .
Delay (s)	37.3	23.2	15.9	33.6	24.6	40.9	41.9	35.7		36.0	26.5	e a como de com
Level of Service	D	Ċ	В.	C					5 5 S	<sup>™</sup> D′	C	92.94
Approach Delay (s)	·	24.4	i and the		28.8	Sa Taja	36.5	<del>-</del>	4 A A		31.6	da no n
Approach LOS		C	411		Ċ	Cart.	D				C	
Intersection Summary	- the second second	No.										
HCM Average Control D	elav	· · ·	28.3	<sup>™</sup> ~~Ĥ	ICM Le	vel of Se	ervice	i en int	С	1.000 6 1		32.1
HCM Volume to Capacit			0.59		2							
Actuated Cycle Length (			90.0	S	um of l	ost time	(s)		16.0			
Intersection Capacity Ut			58.5%			el of Ser			B			
Analysis Period (min)			15									
c Critical Lane Group												

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#### 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2006 Existing Saturday PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	7	ሻ	**					۳	4	
Ideal Flow (vphpl)	1900		1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	1		17 - 15 M	,	4.0	4.0	3.7.5
Lane Util. Factor	1 Carl	0.95	1.00	1.00	0.95		56	·	.*	0.95	0.95	1. 14
Frt		1.00	0.85	1.00	1.00					1.00	0.94	
Fit Protected		1.00	1.00	0.95	1.00			e 158.		0.95	0.97	ریک ہے۔
Satd. Flow (prot)		3539	1583	1752	3505	, ,				1545	1480	34.5.5
Fit Permitted		1.00	1.00	0.37	1.00			÷.,		0.95	0.97	land a s
Satd. Flow (perm)		3539	1583	683	3505					1545	1480	
Volume (vph)	0	592	562	96	661	0	0	× 10-	0	167	<b>0</b> ^	44
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	617	585	100	689	0	0.	0	0	174	0	46
RTOR Reduction (vph)	0	0	209	0	0	0	0	0	Ó	0	36	0
Lane Group Flow (vph)	0	617	376	100	689	0	0	··· ·0	0	112	72	a a 10
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	11%	11%	11%
Turn Type			Perm	pm+pt		1221	(. č.	14. M. C.	e na kun	Perm	2 <sup>4</sup>	88 - A
Protected Phases		2	,	1	6					14.1 MILLIN	8	¥ .,
Permitted Phases			2	6	the state of the s	n Maria I	1.1			8	. 34	191.472 ·
Actuated Green, G (s)		56.9	56.9	68.6	68.6					11.4	11.4	1.1.1.9
Effective Green, g (s)	· · · · ·	57.9	57.9	69.6	69.6	·				12.4	12.4	1997 - 19
Actuated g/C Ratio		0.64	0.64	0.77	0.77					0.14	0.14	
Clearance Time (s)	All Sec	5.0	5.0	5.0	5.0	A South		1.10		5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)	- 1921 - 2844 y	2277	1018	620	2711	Sele-Single Sp	the Se		5	213	204	
v/s Ratio Prot		0.17		0.01	c0.20							
v/s Ratio Perm	9.12		c0.24	0.11	5	1. The	· ·	1 1. 1º		c0.07	0.05	
v/c Ratio		0.27	0.37	0.16	0.25					0.53	0.35	
Uniform Delay, d1	1 Martin Fr	6.9	7.5	2.8	2.9	a la	· 2.	44 B		36.1	35.2	de la
Progression Factor		0.81	1.86	1.28	1.52					1.00	1.00	
Incremental Delay, d2	1.59	0.2	0.9	0.1	0.2		. X. E	e i tradi		2.3	1.1	all and
Delay (s)		5.8	14.9	3.7	4.6					38.4	36.2	
Level of Service	1.5	Α	<b></b> .	A			2.4	The second		D	D	A. Star
Approach Delay (s)		10.2			4.5			0.0			37.3	
Approach LOS		., °В.	ata in	1 - 4 - <u>1</u> 82			13,4	A			D	
Intersection Summary												
HCM Average Control D	elay	· · · · ·	10.9	H	ICM Le	vel of Ser	vice	Strategy	B	19.21		
HCM Volume to Capacit			0.39		6.2	1997 - A. A. M. B. K. S.		9 17 L		Shar ta		
Actuated Cycle Length (			90.0	S	um of l	ost time (	s)		12.0			
Intersection Capacity Uti			56.1%			of Serv			В	., ,		
Analysis Period (min)			15		5 5 25							
c Critical Lane Group			1257		,							

Queues

2006 Existing Saturday PM

#### \$ Ŧ ≮ -+ $\rightarrow$ EBT EBR WBL WBT SBL SBT Lane Group Lane Group Flow (vph) 617 585 100 689 112 108 v/c Ratio 0.27 0.47 0.20 0.25 0.53 0.45 Control Delay 28.0 6.5 2.9 4.6 5.1 44.4 Queue Delay 0.4 0.5 0.0 0.0 0.0 0.0 Total Delay 6.9 3.4 4.6 5.1 44.4 28.0 Queue Length 50th (ft) 55 16 13 100 63 35 Queue Length 95th (ft) 62 34 m33 140 112 83 Internal Link Dist (ft) 126 410 462 Turn Bay Length (ft) 152 Base Capacity (vph) 2318 1239 671 2712 446 457 Starvation Cap Reductn 1096 292 0 0 0 0 Spillback Cap Reductn 0 0 0 513 0 5 Storage Cap Reductn 0 0 0 0 0 0 Reduced v/c Ratio 0.50 0.62 0.15 0.31 0.25 0.24 Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

2: S 188th St & I-5 SB

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### 3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2006 Existing Saturday PM

	٦	->	7	٣	<b>4</b>	×	5	ų	3	•	/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	۲	<b>^</b>			<u>†</u> †	*			۲	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95	·		0.95	1.00			0.95	0.95	and the second
Frt	1.00	1.00			1.00	0.85			1.00	0.94	
Flt Protected	0.95	1.00			1.00	1.00		26.0	0.95	0.97	a da an
Satd. Flow (prot)	1719	3438			3406	1524			1665	1596	
Fit Permitted	0.46	1.00		÷.,	1.00	1.00		6 T. s.	0.95	0.97	
Satd. Flow (perm)	841	3438			3406	1524			1665	1596	
Volume (vph)	291	486	. 0	0	361	258	0	0	371	. S. 1.	95
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	313	523	0	0	388	277	0	0	399	<u> </u>	102
RTOR Reduction (vph)	0	0	0	0	0	134	0	0	0	31	0
Lane Group Flow (vph)		523	0	17 O -	388	143	. 0	0		214	0
Heavy Vehicles (%)	5%	5%	5%	6%	6%	6%	0%	0%	3%	3%	3%
Turn Type	pm+pt	· .				Perm			Split		
Protected Phases	5	2			6				4	4	
Permitted Phases	2		1.14			6	·	2.,			
Actuated Green, G (s)	61.3	61.3			45.4	45.4			18.7	18.7	
Effective Green, g (s)	62.3	62.3	<i>.</i>		46.4	46.4		1.5.2	19,7	19.7	li desta la com
Actuated g/C Ratio	0.69	0.69			0.52	0.52			0.22	0.22	
Clearance Time (s)	5.0				5.0	5.0			5.0	5.0	an an the <sup>sta</sup>
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	698	2380		i da	1756	786	1.13	전하였다	364	349	
v/s Ratio Prot	c0.06	0.15			0.11				c0.15	0.13	
v/s Ratio Perm	c0.25	é 11	- 14 a 14	이상 등이	- S	0.09		S. A.	····· · · ·	- 97.5	
v/c Ratio	0.45	0.22			0.22	0.18			0.71	0.61	
Uniform Delay, d1	5.5		96 D.N	199	11.9	11.7			32.5	31.7	1. 1. 1. 6.4
Progression Factor	1.23	0.96			1.00	1.00			1.00	1.00	
Incremental Delay, d2	0.3	0.2	가슴지		0.3	0.5	يستمر أي		6.3	3.3	
Delay (s)	7.0	5.0			12.2	12.2			38.8	35.0	
Level of Service	Α	A	21.J.	14	В	В	1.25	2. A.	. D	D	
Approach Delay (s)		5.8			12.2		0.0			37.0	
Approach LOS	50 X	Α.	104	. 121 î.	B	e e se altres	A	gir -	í: -	D	and the and
Intersection Summary											
HCM Average Control E	Vela		15.7	<u> </u>	CMIO	vel of Se	nvice		В	<u>an an a</u>	
HCM Volume to Capaci			0.51	1.144-3	OW LO		N YIUG				
Actuated Cycle Length			90.0	S	um of l	ost time	(c)		8.0		e la tracet
Intersection Capacity UI			56.1%			el of Ser			0.0 B	1 71	1.78 ( 1.66 J
Analysis Period (min)			15	1.120	4			. · ·	U		11 18 1.1
c Critical Lane Group					·	· ··					an an an an an
s Shaba Lano Oloup											

Queues

2006 Existing Saturday PM

#### 3: S 188th St & I-5 NB

	٦	-	+	•	3	•	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	313	523	388	277	257	245	
v/c Ratio	0.51	0.22	0.22	0.30	0.71	0.64	
Control Delay	10.4	5.6	14.0	3.2	42.7	33.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.4	5.6	14.0	3.2	42.7	33.9	
Queue Length 50th (ft)	63	54	58	0	142	111	
Queue Length 95th (ft)	124	87	113	48	210	177	
Internal Link Dist (ft)		410	9			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	774	2381	1756	920	481	490	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.40	0.22	0.22	0.30	0.53	0.50	
Intersection Summary							

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The Transpo Group

	_			_			_	20	006 Exist	ing Satur	day PM
	t	۲	4	Ļ	¥	t					
Vovement	NBT	NBR	SBL	SBT	SWL	SWR					a des gilles
ane Configurations	<u>†</u> î₊		ሻ	<u>†</u> †	ሻ	*					
Sign Control	Free			Free	Stop						
Grade	0%			0%	0%						
/olume (veh/h)	532	30	63	509	18	70					
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94					
lourly flow rate (vph)	566	32	67	541	19	74					
Pedestrians											
ane Width (ft).											
Valking Speed (ft/s)											
ercent Blockage											
Right turn flare (veh)											
ledian type					None						
ledian storage veh)											
lpstream signal (ft)				89							
X, platoon unblocked					0.95						
C, conflicting volume			598		987	299					
C1, stage 1 conf vol											
C2, stage 2 conf vol											
Cu, unblocked vol			598		936	299					
2, single (s)			4.2		6.9	7.0					
C, 2 stage (s)											
= (s)			2.3		3.6	3.4					
0 queue free %			93		92	89					
M capacity (veh/h)			941		227	685					
irection, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	Section 2011	the traction and the second seco	Contraction of the			
olume Total	377	221	67	271	271	19	74				· ' .
olume Left	0	0	67	0	0	19	0				
olume Right	0	32	0	0	0	0	74				· · ·
SH	1700	1700	941	1700	1700	227	685				
olume to Capacity	0.22	0.13	0.07	.0.16	0.16	0.08	0.11				
ueue Length 95th (ft)	0	0	6	0	0	7	9				
ontrol Delay (s)	0.0	0.0	9.1	0.0	0.0	22.3	10.9				
ane LOS	0.0		A			C	В				
pproach Delay (s)	0.0		1.0			13.2					
pproach LOS		00.000000000000 av 4	and an all the second second	aliana dana tata	Second and second	В	alle de la charle de la character anno an				March March 1997
tersection Summary	/ Departure		and the second				108	Sec.	and the second		
verage Delay			1.4								
tersection Capacity Ut	ulization		32.5%	K	CU Leve	el of Ser	vice		A,		
nalysis Period (min)			15								

HCM Unsignalized Intersection Capacity Analysis

WBR 209 0.20 3.2 0.0 3.2	209 0.20 3.2 0.0	NBL 3 0.02 37.0 0.0	↑ NBT 577 0.31 11.8	SBL 199 0.39 31.1	↓ SBT 457 0.18 6.1		
209 0.20 3.2 0.0	209 0.20 3.2 0.0	3 0.02 37.0	577 0.31 11.8	199 0.39	457 0.18		
0.20 3.2 0.0	0.20 3.2 0.0	0.02 37.0	0.31 11.8	0.39	0.18	_	
3.2 0.0	3.2 0.0	37.0	11.8				
0.0	0.0			31.1	61		
		0.0	~ ~		0.1		
32	2.2		0.0	0.0	0.0		
0.4	3.2	37.0	11.8	31.1	6.1		
0	0	1	67	40	24		
23	23	10	154	85	110		
			266		3376		
1009	1009	152	1848	582	2481		
0	0	0	0	0	0		
0	0	0.	0	, . , <b>0</b>	0:		- 46. S. C.
0	0	Ő	0	0	0		
0	0.21	0.02	0.31	0.34	0.18	. ,	
)	)	Õ	0 0	0 0 0	0 0 0 0	0 0 0 0 0	0 0 0 0 0

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4: Orillia Rd & Site Access

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. The Transpo Group

5: S 200th St & Orillia Rd

Queues

2006 Existing Saturday PM

5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2006 Existing Saturday PM

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	۲	+	7	4	+	×.	•	1	*	*	Ļ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		ሻ		77	ሻ	<b>†</b> Ъ		1	<b>↑</b> Ъ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88	1.00	0.95		0.97	0.95	
Frt		0.93		1.00		0.85	1.00	0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1772		1752		2760	1752	3423		3273	3374	
Flt Permitted		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1772		1752		2760	1752	3423		3273	3374	
Volume (vph)	0	2	2	102	0	190	3	443	82	181	416	0
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	2	2	112	0	209	3	487	90	199	457	0
RTOR Reduction (vph)	0	2	0	0	0	157	0	13	0	0	0	0
Lane Group Flow (vph)	0	2	0	112	0	52	3	564	0	199	457	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	3%	3%	3%	7%	7%	7%
Turn Type	Perm			Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		0.8		8.5		17.6	0.8	41.7		9.1	50.0	
Effective Green, g (s)		2.8		9.5		20.6	2.8	43.7		11.1	52.0	
Actuated g/C Ratio		0.03		0.11		0.25	0.03	0.53		0.13	0.63	
Clearance Time (s)		6.0		5.0		6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		60		200		817	59	1800		437	2111	
v/s Ratio Prot		c0.00		c0.06		0.01	0.00	c0.16		c0.06	0.14	
v/s Ratio Perm						0.01			\$			
v/c Ratio		0.03		0.56		0.06	0.05	0.31	,	0.46	0.22	
Uniform Delay, d1		38.8		34.8		23.9	38.9	11.2		33.2	6.7	
Progression Factor		1.00		1.00		1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	. *	0.2		3.6		0.0	0.4	0.5		0.8	0.2	
Delay (s)		39.1		38.4		23.9	39.2	11.6		34.0	7.0	
Level of Service		D		D		C	D	В		С	A	
Approach Delay (s)		39.1			29.0			11.8			15.2	
Approach LOS		D			C			в			в	
Intersection Summary												
HCM Average Control D			16.8	· H	ICM Lev	vel of Se	ervice		В			
HCM Volume to Capacit	y ratio		0.36									
Actuated Cycle Length (			83.1		um of l				16.0			
Intersection Capacity Uti	lization		42.3%	10	CU Leve	el of Ser	vice		Α			
Analysis Period (min)			15									
c Critical Lane Group												

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#### 1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday AM

		-	$\mathbf{\hat{z}}$	¥	-	۲	1	۲	1	6	¥	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	۲	<b>^†</b>	۲	۲	<u>^</u>	1	٢	r.		٦٦	ă.	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.91	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.92	
Flt Protected	0.95	1.00	1	0.95		1.00	0.95	1.00		0.95	0.98	
Satd. Flow (prot)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1448	
Fit Permitted	0.95	1.00	1.00	0,95		1.00	0.95	1.00		0.95	1,00	50. Š.
Satd. Flow (perm)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1479	
Volume (vph)	110	740	5	10	830	355	65	350	85		100	130
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	122	822		11	922	394	72	389	94	356	111	144
RTOR Reduction (vph)	0	0	4	0	0	172	0	11	0	0	35	0
Lane Group Flow (vph)	122	822	2	11	922	222	72	472	0.	356	220	0
Heavy Vehicles (%)	6%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot		Perm	Prot		Perm	Prot		a ta ch	Prot		946 Z
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	100	,	6		, ,	2	a di	in the second		200	- 196	1. 192
Actuated Green, G (s)	5.0	24.5	24.5	1.0	20.6	20.6	6.0	24.3		8.2	34.9	
Effective Green, g (s)	6.7	26.3		1.7	21.3		7.7	26.2		9.8	38.1	జినిత
Actuated g/C Ratio	0.08	0.33	0.33	0.02	0.27	0.27	0.10	0.33		0.12	0.48	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	s 24
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	1120	501	36	898	402	162	494		376	701	방송가 있는
v/s Ratio Prot	c0.07	0.24		0.01	c0.27		0.04	c0.31		c0.12	0.04	
v/s Ratio Perm			0.00			0.15	a shere	M. C.S.		1 4 L	c0.11	13
v/c Ratio	0.85	0.73	0.00	0.31	1.03	0.55	0.44	0.96		0.95	0.31	
Uniform Delay, d1	36.2	23.8	18.0	38.6	29.4	25.3	34.1	26.3	5. S. T.	34.8	12,9	23 A. L.
Progression Factor	1.00	1.00	1.00	1.40	0.97	1.06	1.00	1.00		1.00	1.00	
Incremental Delay, d2	43.9	4.3	0.0	3.9	34,3	4.5	1.9	29.3	1.25	32.6	0.3	See 34
Delay (s)	80.1	28.0	18.1	58.0	62.8	31.3	36.1	55.7		67.5	13.2	
Level of Service	``? <b>∴F</b>		В	E		C		E	-	Ę	В	1.19
Approach Delay (s)		34.7			53.4		53.1				44.8	
Approach LOS	i de la	C	1.1.2.1.4		D		D	. a. e		÷.	D	Alexa -
Intersection Summary	. And the second						1.11			a second		
HCM Average Control D	Delav		46.7		ICM Lev	el of Se	rvice	( A . (	D.			1.11
HCM Volume to Capacit	ty ratio		1.03			83.8658.877 · T						
Actuated Cycle Length (			80.0	S	um of lo	ost time	(s)		20.0			
Intersection Capacity Ut			66.0%			of Ser			С			
Analysis Period (min)			15					gris s				
c Critical Lane Group												

### Queues

2011 Baseline Weekday AM Y ۲ 1 • ¥ € NBL NBR SWL2 SWL EBL EBT EBR WBL WBT WBR Lane Group Lane Group Flow (vph) 122 394 72 483 356 255 822 6 11 922 v/c Ratio 1.00 0.95 0.85 0.62 0.01 0.09 0.97 0.66 0.39 1.08 Control Delay 83.7 23.2 11.4 50.5 49.9 16.0 39.5 70.3 72.0 109.9 Queue Delay 0.0 0.7 0.0 0.0 78.2 0.0 0.5 0.0 5.5 0.0 Total Delay 83.7 23.9 11.4 50.5 128.1 21.6 39.5 70.8 72.0 109.9 Queue Length 50th (ft) 61 161 0 6 248 82 34 ~234 98 ~124 #157 #279 #434 #185 #282 Queue Length 95th (ft) 9 m10 #363 m85 74 Internal Link Dist (ft) 436 431 107 246 Turn Bay Length (ft) 319 192 122 90 Base Capacity (vph) 143 1331 599 120 949 593 194 483 376 236 Starvation Cap Reductn 0 0 0 0 173 142 0 0 0 0 Spillback Cap Reductn -0 211 0 0 0 0 0 1 0 0 Storage Cap Reductn 0 0 0 0 0 0 0 0 0 0 Reduced v/c Ratio 0.85 0.73 0.01 0.37 0.95 0.09 1.19 0.87 1.00 1.08

Intersection Summary

1: S 188th St & Millitary Rd

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

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

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The Transpo Group

#### 2: S 188th St & I-5 SB

# HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday AM

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2011 Baseline Weekday AM	

Queues

	-	$\mathbf{r}$	4	+	5	ţ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	804	424	114	1212	402	364	
v/c Ratio	0.50	0.45	0.34	0.61	0.79	0.72	
Control Delay	11.7	2.7	11.2	11.3	37.4	32.1	
Queue Delay	1.0	1.5	0.0	3.9	0.0	673.9	
Total Delay	12.7	4.3	11.2	15.2	37.4	706.0	
Queue Length 50th (ft)	153	11	23	160	192	164	
Queue Length 95th (ft)	m82	m0	m39	m226	268	234	
Internal Link Dist (ft)	107			326		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1611	942	344	2003	643	643	
Starvation Cap Reductn	507	333	0	174	0	0	
Spillback Cap Reductn	0	0	0	689	0	639	
Storage Cap Reductn	Ó	0	0	0	0	0	
Reduced v/c Ratio	0.73	0.70	0.33	0.92	0.63	91.00	
Intersection Summary							

m Volume for 95th percentile queue is metered by upstream signal.

2: S 188th St & I-5 SB

	/	-	•	- 🖌		$\sim$			1	*	ŧ	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	۴	٦	<b>††</b>					۲	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor	1	0.95	1.00	1.00	0.95	1	· .			0.95	0.95	
Frt		1.00	0.85	1.00	1.00					1.00	0.98	
Fit Protected		1.00	1.00	0.95	1.00					0.95	0.96	<u></u>
Satd. Flow (prot)		3374	1509	1656	3312					1715	1698	
Flt Permitted		1.00	1.00	0.24	1.00					0.95	0.96	
Satd. Flow (perm)		3374	1509	413	3312					1715	1698	
Volume (vph)	0	740	390	105	1115	0	0	0	0	665	0	40
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	804		114	1212	0	. 0	0	· 0.	723	0	43
RTOR Reduction (vph)	0	0	227	0	0	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	804	197		1212	0.	0		. 0	402	357	0
Heavy Vehicles (%)	7%	7%	7%	9%	9%	9%	9%	9%	9%	0%	0%	0%
Turn Type			Perm	pm+pt	- 		- Aller	Metter of	2012	Perm	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
Protected Phases		2		1	6						8	
Permitted Phases			2	6	4. (* 14) 1					8	1.27	Al Mu
Actuated Green, G (s)		36.2	36.2	47.4	47.4					22.6	22.6	
Effective Green, g (s)	11 N.	37.2	37.2	48.4	48,4	S. O	111	e Angel e se se		23.6	23.6	wi nj
Actuated g/C Ratio		0.46	0.46	0.60	0.60					0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0	, Artella	11.5			5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0		-			3.0	3.0	
Lane Grp Cap (vph)	- 건강 작	1569	702	362	2004	M. S. S.		Anna gerleg	21. Y	506	501	
v/s Ratio Prot		0.24		0.03	c0.37							
v/s Ratio Perm	. Anton	,	0.13			the second second	111	anta a	×	c0.23	0.21	and the second
v/c Ratio		0.51	0.28	0.31	0.60					0.79	0.71	
Uniform Delay, d1	i tarri.	15.0	13.2	8.0	9.8	, Say 2 Aug	1.10	dag Tal.		26.0	25.2	
Progression Factor		0.65	0.80	1.17	0.94					1.00	1.00	
Incremental Delay, d2	المحاجر والم	0.8	0.7	0.3	0.8	g hatal taya	ter Al	and shirts		8.4	4.8	S. 4.
Delay (s)		10.6	11.2	9.7	10.0					34.4	29.9	
Level of Service	5,000	B	В	Α	A	5 475	· · · ·	1. 11		C	C	alay in
Approach Delay (s)		10.8			10.0			0.0			32.3	
Approach LOS		· B			Α			<u>`</u> A		2	Ç	
Intersection Summary												
HCM Average Control D	elav	and the networker	15.4	100000000000000000000000000000000000000	ICM Le	vel of Se	rvice	1	В	1,225/7.9		1.0 4
HCM Volume to Capacit			0.67			101. 2.10			7			
Actuated Cycle Length (			80.0		Sum of I	ost time	(s)	2	8.0			di di s
Intersection Capacity Ut		1	01.3%			el of Ser			G			
Analysis Period (min)	2.1	,	15				5 1 2					i.
c Critical Lane Group					<i>.</i>						, ,	

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3: S 188th St & I-5 NB

Queues 2011 Baseline Weekday AM 3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday AM

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Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	290	1420	926	705	429	406	
v/c Ratio	0.78	0.70	0.78	0.73	0.87	0.84	
Control Delay	34.4	14.0	28.0	7.0	45.8	40.5	
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0	·
Total Delay	34.4	14.2	28.0	7.0	45.8	40.5	
Queue Length 50th (ft)	116	232	218	0	205	174	
Queue Length 95th (ft) m	1#205	276	#288	70	#351	#315	
Internal Link Dist (ft)		326	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	379	2027	1189	963	526	512	
Starvation Cap Reductn	0	113	0	0	0	0	•
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.77	0.74	0.78	0.73	0.82	0.79	

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

EBL										,
<u> </u>	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
ň	<b>†</b> †			<u>†</u> †	7			۲	M	
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
4.0	4.0			4.0	4.0			4.0	4.0	
1.00	0.95		1 24	0.95	1.00		4.3	0.95	0.95	
1.00	1.00			1.00	0.85			1.00	0.89	
0.95	1.00			1.00	1.00			0,95	0.99	3 S
1703	3406			3059	1369			1618	1494	
0.15	1.00			1.00	1.00	,		0.95	0.99	a the shirt of
267	3406			3059	1369			1618	1494	
255	1250	0	0	815	620	0	0	470	0	265
0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
290	1420	. 0	0			0	0	534	0	301
0	0	0	0	0	431	0	Ö	0	27	0
290	1420	0	0	926	274	0		429	379	0
	6%						· · · · · · · ·		6%	6%
										1911 44
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	46.6			30.1	. +			23.4	23.4	
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					~~ <b>~~~</b> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2.9		1, ,		2011 X 24
	00.42			0.00	0.20			00.27	0.20	
	0.70		1.1	0.78			and the	0.87	0.83	a na ja kana ya
			1.00				· · .			
1			19 - 19 19 - 19 - 19 - 19 - 19 - 19 - 1	Alder 173 (176)	1		a ta ser d	a state of a	N 2500,000 a.v.	100 BN 3 DV 1 DV 1
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	4.0 1.00 1.00 0.95 1703 0.15 267 255 0.88 290 0 290 6% 0 290 6% 47.6 5 2 46.6 0.60 5.0 2.5 383 0.12 0.62 5 2.5 383 0.12 1.03 0.15 1.03 1.04	4.0 4.0 1.00 0.95 1.00 1.00 0.95 1.00 1703 3406 0.15 1.00 267 3406 255 1250 0.88 0.88 290 1420 0 0 290 1420 0 0 290 1420 6% 6% pm+pt 5 2 2 46.6 46.6 47.6 47.6 0.60 0.60 5.0 5.0 383 2027 0.12 c0.42 c0.33 0.76 0.70 13.6 11.3 1.41 1.02 6.7 1.7 25.8 13.3 C B 15.4 B 15.4 B	4.0       4.0         1.00       0.95         1.00       1.00         0.95       1.00         1703       3406         0.15       1.00         267       3406         255       1250       0         0.88       0.88       0.88         290       1420       0         0       0       0         290       1420       0         6%       6%       6%         pm+pt       5       2         2       46.6       47.6         0.60       0.60       5.0         2.5       4.0       383         383       2027       0.12         0.76       0.70       13.6         13.6       11.3         1.41       1.02         6.7       1.7         25.8       13.3         C       B         15.4       B         elay       24.0         yratio       0.78         38)       80.0	4.0       4.0         1.00       0.95         1.00       1.00         0.95       1.00         1703       3406         0.15       1.00         265       1250       0         0.88       0.88       0.88         290       1420       0         0       0       0         290       1420       0         0       0       0         290       1420       0         0       0       0         0       0       0         6%       6%       18%         pm+pt       5       2         2       46.6       47.6         0.60       0.60       5.0         5.0       5.0       5.0         2.5       4.0       383         283       2027       0.12         0.12       c0.42       c0.33         0.76       0.70       13.6         13.6       11.3       1.41         1.41       1.02       6.7         6.7       1.7       25.8         15.4       B       15.4         8	4.0       4.0       4.0         1.00       0.95       0.95         1.00       1.00       1.00         0.95       1.00       1.00         1703       3406       3059         0.15       1.00       1.00         267       3406       3059         255       1250       0       0         267       3406       3059         255       1250       0       0         267       1420       0       926         0       0       0       0         290       1420       0       0         290       1420       0       0         200       1420       0       0         201       1420       0       0         201       1420       0       0         3059       5.0       5.0       5.0         5.0       5.0       5.0       5.0         383       2027       1189         0.12       0.42       0.30         c0.33       21.4       1.00         6.7       1.7       5.1         25.4       24.0       K	4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00         1.00       1.00       1.00       0.85         0.95       1.00       1.00       1.00         1703       3406       3059       1369         0.15       1.00       1.00       1.00         267       3406       3059       1369         255       1250       0       0       815       620         0.88       0.88       0.88       0.88       0.88       0.88       0.88         290       1420       0       0       926       705       0       0       431         290       1420       0       0       926       275       6       6       6       6       18%       18%       18%       18%       18%       18%       18%       18%       18%       18%       18%       18%       18%       130.1       31.1 <td>4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00         1.00       1.00       1.00       0.85         0.95       1.00       1.00       1.00         1703       3406       3059       1369         0.15       1.00       1.00       1.00         267       3406       3059       1369         255       1250       0       0       815       620       0         0.88       0.88       0.88       0.88       0.88       0.88       0.88         290       1420       0       0       926       705       0         0       0       0       0       431       0         290       1420       0       0       926       274       0         6%       6%       18%       18%       18%       0%         pm+pt       Perm       5       2       6       6         2       6       5.0       5.0       5.0       5.0         383       2027       1189       532       0.12       0.20       0.0         0.76       0.70       0.78       0</td> <td>4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00         1.00       1.00       1.00       0.85         0.95       1.00       1.00       1.00         1703       3406       3059       1369         267       3406       3059       1369         255       1250       0       0       815       620       0       0         0.88       0.88       0.88       0.88       0.88       0.88       0.88       0.88       0.88         290       1420       0       0       926       705       0       0         0       0       0       0       4.0       1.00       0       0         290       1420       0       0       926       274       0       0         6%       6%       18%       18%       18%       0.80       0.88         pm+pt       Perm       5       2       6       6       6         2       6       5.0       5.0       5.0       5.0       5.0       5.0         2.5       4.0       5.0       5.0       5.0       5.0       &lt;</td> <td>4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00       0.95         1.00       1.00       1.00       0.85       1.00         0.95       1.00       1.00       1.00       0.95         1.03       3406       3059       1369       1618         0.15       1.00       1.00       1.00       0.95         265       1250       0       0       815       620       0       470         0.88       <td< td=""><td>4.0       4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00       0.95       0.95       0.95         1.00       1.00       1.00       0.85       1.00       0.95       0.99         1.03       3406       3059       1369       1618       1494         0.15       1.00       1.00       1.00       0.95       0.99         267       3406       3059       1369       1618       1494         255       1250       0       0       815       620       0       0       470       0         0.88       0.89       0.97       0       0       27       290       1420       0       0       926       274       0       0       42</td></td<></td>	4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00         1.00       1.00       1.00       0.85         0.95       1.00       1.00       1.00         1703       3406       3059       1369         0.15       1.00       1.00       1.00         267       3406       3059       1369         255       1250       0       0       815       620       0         0.88       0.88       0.88       0.88       0.88       0.88       0.88         290       1420       0       0       926       705       0         0       0       0       0       431       0         290       1420       0       0       926       274       0         6%       6%       18%       18%       18%       0%         pm+pt       Perm       5       2       6       6         2       6       5.0       5.0       5.0       5.0         383       2027       1189       532       0.12       0.20       0.0         0.76       0.70       0.78       0	4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00         1.00       1.00       1.00       0.85         0.95       1.00       1.00       1.00         1703       3406       3059       1369         267       3406       3059       1369         255       1250       0       0       815       620       0       0         0.88       0.88       0.88       0.88       0.88       0.88       0.88       0.88       0.88         290       1420       0       0       926       705       0       0         0       0       0       0       4.0       1.00       0       0         290       1420       0       0       926       274       0       0         6%       6%       18%       18%       18%       0.80       0.88         pm+pt       Perm       5       2       6       6       6         2       6       5.0       5.0       5.0       5.0       5.0       5.0         2.5       4.0       5.0       5.0       5.0       5.0       <	4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00       0.95         1.00       1.00       1.00       0.85       1.00         0.95       1.00       1.00       1.00       0.95         1.03       3406       3059       1369       1618         0.15       1.00       1.00       1.00       0.95         265       1250       0       0       815       620       0       470         0.88 <td< td=""><td>4.0       4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00       0.95       0.95       0.95         1.00       1.00       1.00       0.85       1.00       0.95       0.99         1.03       3406       3059       1369       1618       1494         0.15       1.00       1.00       1.00       0.95       0.99         267       3406       3059       1369       1618       1494         255       1250       0       0       815       620       0       0       470       0         0.88       0.89       0.97       0       0       27       290       1420       0       0       926       274       0       0       42</td></td<>	4.0       4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       1.00       0.95       0.95       0.95         1.00       1.00       1.00       0.85       1.00       0.95       0.99         1.03       3406       3059       1369       1618       1494         0.15       1.00       1.00       1.00       0.95       0.99         267       3406       3059       1369       1618       1494         255       1250       0       0       815       620       0       0       470       0         0.88       0.89       0.97       0       0       27       290       1420       0       0       926       274       0       0       42

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#### HCM Unsignalized Intersection Capacity Analysis 2011 Baseline Weekday AM

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	Ť	ľ	4	ŧ	¥	ŧ٧					
Novement	NBT	NBR	SBL	SBT	SWL	SWR		a siste			
ane Configurations	<b>≜</b> î⊳		۲	<u>†</u> †	ሻ	۴					
Sign Control	Free			Free	Stop						
Grade	0%			0%	0%						
/olume (veh/h)	1410	21	23	1490	9	20					
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93					
fourly flow rate (vph)	1516	23	25	1602	10	22					
Pedestrians											
ane Width (ft).											
Valking Speed (ft/s)											
Percent Blockage											
Right turn flare (veh)											
ledian type					None						
Median storage veh)											
Jpstream signal (ft)				74							
X, platoon unblocked					0.71						
C, conflicting volume			1539		2378	769					
C1, stage 1 conf vol											
C2, stage 2 conf vol											
Cu, unblocked vol			1539		2532	769					
C, single (s)			4.3		8.4	8,5					
C, 2 stage (s)											
F (s)			2,3		4.3	4.1					
0 queue free %			94		0	90					
M capacity (veh/h)			391		5	216					
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2				
/olume Total	1011	528	25	801	801	10	22				
/olume Left	0	0	25	0	0	10	0				
/olume Right	0	23	· • 0	0	0	- 0	22				
SH	1700	1700	391	1700	1700	5	216				
/olume to Capacity	0.59	0.31	0.06	0.47	0.47	1.98	0.10				
Queue Length 95th (ft)	0	0	5	0	0	56	8				
Control Delay (s)	0.0	0.0	14.8	0.0	0.0	1804.0	23.5				
ane LOS			В			F	С				
Approach Delay (s)	0,0		0.2			576.1					
Approach LOS						F					
ntersection Summary											
Average Delay			5.7								
storestion Consider Litt	lization		51:2%	10		el of Ser	vice		А		
ntersection Capacity Uti Analysis Period (min)	nzauon		01.2.70		20 Feve		100		~		

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Lane Group	EBT	WBL	WBR	NBT	SBL	SBT	and the second		
Lane Group Flow (vph)	10	36	392	1268	696	897			
v/c Ratio	0.07	0.34	0.42	0.75	0.79	0.30			
Control Delay	30.8	46.5	7.3	19.5	35.4	2.3			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		7	
Total Delay	30.8	46.5	7.3	19.5	35.4	2.3			
Queue Length 50th (ft)	2	17	19	248	164	35			· · · · · ·
Queue Length 95th (ft)	19	51	62	#473	#302	112			
Internal Link Dist (ft)	36			266		3370			the court
Turn Bay Length (ft)									
Base Capacity (vph)	150	105	954	1697	899	2944			
Starvation Cap Reductn	o	0	Ó	0	0	0			
Spillback Cap Reductn	0	0 .	0	Q.	0:	0		, 11. J.	in the state
Storage Cap Reductn	0	0	0	Ó	0	0			
Reduced v/c Ratio	0.07	0.34	0.41	0.75	0.77	0.30	7 1	· · · · · · · · · · · · · · · · · · ·	in the second

Intersection Summary

5: S 200th St & Orillia Rd

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

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The Transpo Group

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The Transpo Group

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Queues

2011 Baseline Weekday AM

5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday AM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		11	ኘ	<b>≜</b> t}		11	<b>↑</b> î→	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		0.93		1.00		0.85		0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1772		1410		2221		3197		3273	3371	
Fit Permitted		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1772		1410		2221		3197		3273	3371	
Volume (vph)	0	5	5	35	0	380	0	1090	140	675	865	5
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adi, Flow (vph)	0	5	5	36	0	392	0	1124	144	696	892	5
RTOR Reduction (vph)	0	5	0	0	0	198	0	10	0	0	0	0
Lane Group Flow (vph)	0	5	0	36	0	194	0	1258	0	696	897	0
Heavy Vehicles (%)	0%	0%	0%	28%	28%	28%	11%	11%	11%	7%	7%	7%
Turn Type	Perm		-	Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		0.9		2.8		21.4		38.6		18.6	63.2	
Effective Green, g (s)		2.9		3.8		24.4		40.6		20.6	65.2	
Actuated g/C Ratio		0.03		0.05		0.29		0.48		0.25	0.78	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		61		64		752		1547		804	2620	
v/s Ratio Prot		c0.00		c0.03		0.06		c0.39		c0.21	0.27	
v/s Ratio Perm						0.02						
v/c Ratio		0.08		0.56		0.26	,	0.81		0.87	0.34	
Uniform Delay, d1		39.2		39.2		22.8		18.4		30.3	2.8	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.6		10.8		0.2		4.8		9.7	0.4	
Delay (s)		39.8		50.1		23.0		23.2		40.0	3.2	
Level of Service		D		D		С		° C		D	Α	
Approach Delay (s)		39.8			25.3			23.2			19.3	
Approach LOS		D			С			С			в	
Intersection Summary							0.000					
HCM Average Control E	)elav	NER SERVICE AND A CON	21.6	4	ICM Lev	vel of Se	ervice		C	SARBOOM POLY CONTRA	98,400,400,000 (COM1446	
HCM Volume to Capaci			0.78						-			
Actuated Cycle Length (			83.9	S	Sum of lo	ost time	(s)		16.0			
Intersection Capacity Ut			72.5%		CU Leve				C			
Analysis Period (min)			15						-			
c Critical Lane Group												

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1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday PM

Queues 2011 Baseline Weekday PM

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	107	1301	26	61	740	281	26	158	474	444	
v/c Ratio	0.40	0.81	0.04	0.54	0.61	0.42	0.22	0.62	0.82	0.83	
Control Delay	44.7	29.4	8.4	71.4	18.3	7.7	49.2	48.1	53.0	46.5	
Queue Delay	0.0	2.8	0.0	0.0	1.3	1.4	0.0	3.0	0.9	0.0	
Total Delay	44.7	32.3	8.4	71.4	19.6	9.0	49.2	51.1	53.9	46.5	
Queue Length 50th (ft)	64	393	2	34	169	73	16	88	151	260	
Queue Length 95th (ft)	119	#507	17	m#79	m232	m135	43	155	#225	#439	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	268	1612	733	113	1220	665	116	292	585	536	
Starvation Cap Reductn	0	0	0	0	275	214	0	0	0	0	
Spillback Cap Reductn	0	206	. 0	0	0	0	0	64	20	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0,40	0.93	0.04	0.54	0.78	0.62	0.22	0.69	0.84	0.83	
Internetion Commence	and the second				000000000000000000000000000000000000000			SILVAN BILANDAR	anadan sinanaka s	Extra sector a	

Intersection Summary

The Transpo Group

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

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EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
۲	<b>††</b>	*	٦	<b>^</b>	7	ሻ	đ		ሻሻ	١¥	
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
1.00	0.95	1.00	1.00	0,95	1.00	1.00	1.00		0.97	1.00	
1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
105	1275	25	60	725	275	25	135	20	465	330	105
0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
107	1301	26	61	740	281	26	138	20	474	337	107
Ö	0	12	0	O O	123	0	5	0	0	11	Ó
107	1301	14	61	740	158	26	153	0	47.4	433	0
4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Prot	:	Perm	Prot	4 <sup>1</sup> <sup>1</sup> <sup>1</sup>	Perm	Prot	5a ( ) i		Prot	, i	1
1	6		5	2		7	4		3	8	
		6			2						<sup>.</sup> .
13.7	41.5	41.5	4.7	32.6	32.6	3.0	16.4		15.4	29.0	
15.4	43.3	43.3	5.4	33.3	33.3	4.7	18,3		17.0	30.6	1 . A.
0.15	0.43	0.43	0.05	0.33	0.33	0.05	0.18		0.17	0.31	
5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	2 2
3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
267	1503	672	93	1145	512	82	284	Sec.	578	524	
0.06	c0.37		c0.04	0.22		0.01	0.10	,	c0.14	c0.25	
1.1		0.01	1.111	11 11	0.10	· · Time,	. <sup>6</sup> 2			1.0	
0.40	0.87	0.02	0.66	0.65	0.31	0.32	0.54	<i>,</i>	0.82	0.83	
38.1	25.7	16.2	46.4	28.3	24.8	46.1	37.0	2	40.0	32.2	1. 34
1.00	1.00	1.00	1.23	0.61	0.69	1.00	1.00		1.00	1.00	
4.4	6.9	0.1	13.4	2.4	1.3	2.2	2.0	с 	9.1	10.3	5.437
42.6	32.6	16.3	70.3	19.7	18.5	48.3	39.0		49.1	42.5	
D	C	В	್ ಗೆ 🕰	В	B	D	D.	1.2.2	. D∙	D	12.2
	33.1			22.2		40.3				45.9	
	C		Ĩ	C	en e	D		· • • • • • • • • • • • • • • • • • • •		D	1 d
								ana			
alav	Southern States	33.5	L L	CMIO	ol of Se	nice	- 614001 m 1	<sup>78</sup> -11 - C	<u>1997</u>		<u>9882803399222331</u>
	`.		19	OW LOV		NCG	n ten Store	· ·	-3-		
			S	um of la	ef timo	(c)		120			
							8. J. C. C. C.			1.21	
				C LOVE	000			5			
		10					·		,		
	¶           1900           4.0           1.00           1.00           0.95           1736           0.95           107           0.95           107           4%           107           4%           13.7           15.4           0.57.7           3.0           267.7           0.40           38.1           1.00           4.4	*         ++           1900         1900           4.0         4.0           1900         1900           4.0         4.0           1.00         0.95           1.00         1.00           0.95         1.00           1736         3471           105         1275           0.98         0.98           107         1301           4%         4%           Prot         6           13.7         41.5           15.4         43.3           0.15         0.43           5.7         5.8           3.0         3.0           267         1503           0.06         c0.37           0.40         0.87           38.1         25.7           1.00         1.00           42.6         32.6           D         C           33.1         C	*         +         *         *           1900         1900         1900         1900           4.0         4.0         4.0         1000           1.00         0.95         1.00         1.00           1.00         1.00         1.00         1.00           1.05         1.00         1.00         1.00           1736         3471         1553           0.95         1.00         1.00           1736         3471         1553           105         1275         25           0.98         0.98         0.98           107         1301         14           4%         4%         4%           Prot         Perm         6           13.7         41.5         41.5           15.4         43.3         43.3           5.7         5.8         5.8           3.0         3.0         3.0           267         1503         672           0.06         c0.37         0.01           0.40         0.87         0.02           38.1         25.7         16.2           1.00         1.00         1.00	♥         ↑         ↑         ♥         ♥           1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0           1.00         0.95         1.00         1.00           0.95         1.00         1.00         0.85         1.00           0.95         1.00         1.00         0.95         1.00           0.95         1.00         1.00         0.95         1.736           3471         1553         1719         0.95         1.00         0.95           105         1275         25         60         0.98         0.98         0.98           107         1301         26         61         0         0         12         0           107         1301         14         61         4%         4%         5%           Prot         Perm         Prot         1         6         5           1.5         41.5         4.7         3.0         3.0         3.0           267         1503         672         93         0.06         0.37         c0.04           0.40         0.87         0.02         <	↑         ↑	Ť         Ť         Ť         Ť         Ť         Ť           1900         1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0         4.0         4.0         4.0           1.00         0.95         1.00         1.00         0.95         1.00         1.00         0.85           0.95         1.00         1.00         0.95         1.00         1.00         0.85           0.95         1.00         1.00         0.95         1.00         1.00         1.00           1736         3471         1553         1719         3438         1538           0.95         1.00         1.00         0.95         1.00         1.00           1736         3471         1553         1719         3438         1538           105         1275         25         60         725         275           0.98         0.98         0.98         0.98         0.98         0.98           107         1301         14         61         740         158           4%         4%         5%         5%         5%         5%	↑         ↓         ↓	Ť         Č         Ť         Ž	T         AA         T         T         AA         T         T         AA         T <tht< th="">         T         T         T</tht<>	*         ++         r         *	n         n

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2: S 188th St & I-5 SB

Queues 2011 Baseline Weekday PM

	-	$\mathbf{F}$	4	-	\$	ţ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1052	670	407	1072	449	402	
v/c Ratio	0.90	0.70	0.94	0.53	0.96	0.86	
Control Delay	31.3	5.6	61.6	11.6	66.9	50.6	
Queue Delay	103.2	21.3	0.0	0.8	0.0	0.1	
Total Delay	134.6	27.0	61.6	12.4	66.9	50.7	
Queue Length 50th (ft)	268	51	252	183	290	247	
Queue Length 95th (ft)	#448	m72	m#366	m260	#497	#424	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1173	964	431	2028	476	476	
Starvation Cap Reductn	318	303	0	303	0	0	
Spillback Cap Reductn	0	0	0	589	0	1	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.23	1.01	0.94	0.74	0.94	0.85	

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

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<u>†</u> †	۲	۲	<b>††</b>					۲	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	0.95	ta bayan s				0.95	0.95	an a
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Fit Protected		1.00	1.00	0.95	1.00	65 1 1 1				0.95	0.95	
Satd. Flow (prot)		3406	1524	1703	3406					1441	1437	
Fit Permitted		1.00	1.00	0.10	1.00	4 J		19.00		0.95	0,95	·'
Satd. Flow (perm)		3406	1524	187	3406					1441	1437	
Volume (vph)	· 0	1020	650	395	1040	0	0	0	0	805	<u> </u>	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1052	670	407	1072	0	. 0	0	. 0	830	0	21
RTOR Reduction (vph)	0	0	440	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0.	1052	230	407	1072	0	. 0.	0	<b>0</b>	449	400	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type	e k Muja f	· ``	Perm	pm+pt		and and a second second	5 (SA)		an a la	Perm	1012	Sec.
Protected Phases	· ·	2		1	6	5					8	
Permitted Phases		_	2	6						8		19 8
Actuated Green, G (s)		33.4	33.4	58.5	58.5					31.5	31.5	
Effective Green, g (s)		34.4	34.4	59.5	59.5	· · .				32.5	32.5	1. A.
Actuated g/C Ratio		0.34	0.34	0.60	0.60					0.32	0.32	
Clearance Time (s)		5.0	5.0	5.0	5.0	t park i				5.0	5.0	ta di t
Vehicle Extension (s)		4.0	4.0	3.0	4.0			,. ,		3.0	3.0	
Lane Grp Cap (vph)	14.11	1172	524	431	2027	ol falan s	6 1 3 3	all is a		468	467	·· / m
v/s Ratio Prot		0.31		c0.20	0.31	97 - 96 X Y Y	. , ,,,,	101010			,	
v/s Ratio Perm			0.15	c0.36		1211 -		Selection of the		c0.31	0.28	11.568
v/c Ratio		0.90	0.44	0.94	0.53			and the second second		0.96	0.86	
Uniform Delay, d1		31.1	25.4	29.1	12.0	And A	· ,	dit e		33.1	31.6	1.1
Progression Factor		0.76	1.44	1.41	0.89	terdad an i		1.000 J F P F M <sup>-1</sup> 3		1.00	1.00	
Incremental Delay, d2		6.6	1.5	22.8	0.7	1. A.				31.0	14.3	김 동
Delay (s)		30.4	37.9	63.8	11.4			20.000		64.1	45.9	
Level of Service		C	D	E.	B	Calle S.		10.5		E.	D	
Approach Delay (s)		33.3			25.8			0.0			55.5	
Approach LOS	14.5	C	les de		С	a Lands ( -	Aller .	A		ب م مرد	si si 🗜	1. Walter
Intersection Summary						land the state			New York of L			
HCM Average Control E	)elay		35.2	1 M	ICM Le	vel of Se	rvice	A STAND	D	2020 - C		<u>양</u> 만 연기
HCM Volume to Capacit			0.94									
Actuated Cycle Length (	s)		100.0	S	um of I	ost time	(s)	S. 1914	8.0		P 111	kitan E
Intersection Capacity Ut		1	37.9%	[0	CU Leve	el of Ser	vice	., .	н			
Analysis Period (min)			15	1		Sec.	100	Section				
c Critical Lane Group												

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2: S 188th St & I-5 SB

3: S 188th St & I-5 NB

Queues 2011 Baseline Weekday PM

	٠	-+	+	•	3	•	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	371	1485	1031	1021	335	341	
v/c Ratio	0.91	0.66	0.63	0.93	0.93	0.88	
Control Delay	43.7	11.9	21.5	23.4	70.5	55.9	
Queue Delay	0.0	0.4	0.0	0.0	0.0	0.0	
Total Delay	43.7	12.3	21.5	23.4	70.5	55.9	
Queue Length 50th (ft)	188	238	248	219	218	187	
Queue Length 95th (ft) n	n <b>#221</b>	m263	316	#621	#393	#357	
Internal Link Dist (ft)		410	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	409	2243	1640	1098	367	391	
Starvation Cap Reductn	0	281	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.91	0.76	0.63	0.93	0.91	0.87	

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

	۶	-	7	F	-	×	1	لر
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR
Lane Configurations	*	**			**	*		

3: S 188th St & I-5 NB

	-	_				-	•				/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	۲	<u>†</u> †			<b>^</b>	7			۲	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util, Factor	1.00	0.95			0.95	1.00			0.95	0.95	
Frt	1.00	1.00			1.00	0.85			1.00	0.92	
Fit Protected	0.95	1.00			1.00	1.00			0.95	0.98	· · · · ·
Satd. Flow (prot)	1641	3282			3406	1524			1531	1447	
Fit Permitted	0.16	1.00			1.00	1.00			0.95	0.98	a - 1 - 1
Satd. Flow (perm)	274	3282			3406	1524		· · ·	1531	1447	
Volume (vph)	360	1440	0.	: * 0 >		990	0	0		5	180
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	371	1485	. 0	0	1031		0.2	0	485	5	186
RTOR Reduction (vph)	0	0	0	0	0	365	0	Ő	0	43	0
Lane Group Flow (vph)	371	1485	0	0	1031	656	0	0	335	298	0.
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%
Turn Type	pm+pt		5 Z	1.166.0		Perm	- C.J.	· · ·	Split	11 A	
Protected Phases	5	2		,	6				4	4	
Permitted Phases	2					6					610 - 19 j
Actuated Green, G (s)	67.3	67.3			47.1	47.1			22.7	22.7	
Effective Green, g (s)	68.3	68.3			48.1	48.1			23.7	23.7	
Actuated g/C Ratio	0.68	0.68			0.48	0.48			0.24	0.24	
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0	
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	409	2242		, š.,	1638	733	- B1	198 11	363	343	Althe State of State
v/s Ratio Prot	c0.15	0.45			0.30				c0.22	0.21	
v/s Ratio Perm	c0.47			1.12	. 'Y ''-	0.43				11.5	1.1.54
v/c Ratio	0.91	0.66			0.63	0.90			0.92	0.87	
Uniform Delay, d1	20.2	9.2	1.17		19.3	23.7			37.3	36.6	
Progression Factor	1.86	1.19			1.00	1.00			1.00	1.00	
Incremental Delay, d2	11.5	0.6	1.142			15.7	. *	ē	28.8	20.4	71
Delay (s)	49.1	11.5			21.2	39.4			66.1	57.0	
Level of Service	D	В				D			E	E	
Approach Delay (s)	. —,	19.1			30.2	an a stand	0.0	1. N		61.5	
Approach LOS		В	-3. V		C	Six 5	A			್ಷ್ Е	
	Anoremalikaseetta	_	iernestration allag		un 🛨 -			648035880459415008			
Intersection Summary		and a second									
HCM Average Control I			30.3	8 - A J	ICM Le	vel of Se	ervice	CAN AR	С		
HCM Volume to Capaci			0.90								
Actuated Cycle Length			100.0			ost time		e) ""	8.0	-2	
Intersection Capacity U	tilization	1	37.9%	10	U Leve	of Ser	vice		н		
Analysis Period (min)	7° •		15		,	1.20					
c Critical Lane Group											

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HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday PM

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## HCM Unsignalized Intersection Capacity Analysis 2011 Baseline Weekday PM

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	1	۲	4	ŧ	¥	Ł					
Movement	NBT	NBR	SBL	SBT	SWL	SWR					
Lane Configurations	<b>↑</b> î→		ሻ	ተተ	۲	1					
Sign Control	Free			Free	Stop						
Grade	0%			0%	0%						
Volume (veh/h)	1975	9	10	1615	7	18					
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93					
Hourly flow rate (vph) Pedestrians	2124	10	11	1737	8	19					
Lane Width (ft)											
Walking Speed (ft/s)											
Percent Blockage											
Right turn flare (veh)											
Median type					None						
Median storage veh)											
Upstream signal (ft)				66							
pX, platoon unblocked					0.74						
vC, conflicting volume			2133		3018	1067					
vC1, stage 1 conf vol											
vC2, stage 2 conf vol											
vCu, unblocked vol			2133		3384	1067					
tC, single (s)			4.3		7.3	7.4					
tC, 2 stage (s)											
tF (s)			2.3		3.7	3.5					
p0 queue free %			95 224		0 3	90 184					
cM capacity (veh/h)	wate these formula of the	-			-		A DAY IN COLUMN AND A DAY OF A			and and adding a second adding to the second data	
Direction, Lane #	NB 1	NB 2	Contractory of the second strategy is	SB 2	SB 3	and and second based place pro	SW 2		1991 (A. 1994)		
Volume Total Volume Left	1416	718	11	868	-868 0	8	19				
Volume Leit Volume Right	0	0 10	0	0	0	8 0	0 19				
SH	1700	1700	224	1700	1700	3	184				
Volume to Capacity	0.83	0.42	0.05	0.51	0.51	2.89	0.10				
Queue Length 95th (ft)	0.00	0	4	0.01	0.01	50	9				
Control Delay (s)	0.0	0.0	21.9	0.0	-	3220.6	26.8				
Lane LOS	-,7		c			F	D				
Approach Delay (s)	0.0		0.1			921.1					
Approach LOS						F					
Intersection Summary						nom aposita					
Average Delay	and the second second second		6.4								and a state of the
Intersection Capacity Ut	ilization		64.9%	10	CU Leve	el of Ser	vice		С		
Analysis Period (min)			15								

	+	4	×	t	1	ţ			
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT			
Lane Group Flow (vph)	10	326	1037	1294	405	1152			
v/c Ratio	0.07	0.84	0.80	0.82	0.86	0.54			1. 10
Control Delay	39.8	52.3	21.6	25.2	53.6	9.1			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			and the second
Total Delay	39.8	52.3	21.6	25.2	53.6	9.1			
Queue Length 50th (ft)	5	153	185	271	101	130			
Queue Length 95th (ft)	21	#344	#377	#497	#209	261			
Internal Link Dist (ft)	36			266		3373			
Turn Bay Length (ft)									
Base Capacity (vph)	144	389	1301	1581	472	2151	·		1.11.452.5
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	0	0	0.		÷	and the second
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.07	0.84	0.80	0.82	0.86	0.54			

Intersection Summary

5: S 200th St & Orillia Rd

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

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The Transpo Group

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Queues

2011 Baseline Weekday PM

5: S 200th St & Orillia Rd

# HCM Signalized Intersection Capacity Analysis 2011 Baseline Weekday PM

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	۶	->	$\mathbf{i}$	4	-►	•	1	Ť	1	5	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		77	٢	<b>≜</b> ⊅		ሻሻ	<b>≜</b> †⊅	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3444		3183	3280	
Flt Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3444		3183	3280	
Volume (vph)	5	5	0	310	0	985	0	1165	65	385	1090	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	326	0	1037	0	1226	68	405	1147	5
RTOR Reduction (vph)	0	0	0	0	0	163	0	5	0	0	0	0
Lane Group Flow (vph)	0	10	0	326	0	874	0	1289	0	405	1152	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm			Prot	0	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3	-				4	-	_				
Actuated Green, G (s)	-	0.9		16.9		26.9		35.1		10.0	51.1	
Effective Green, g (s)		2.9		17.9		29.9		37.1		12.0	53.1	
Actuated g/C Ratio		0.03		0.21		0.35		0.43		0.14	0.62	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		63		365		1089		1487		445	2028	
v/s Ratio Prot				c0.19		c0.11		c0.37		0.13	0.35	
v/s Ratio Perm		0.01				0.20						
v/c Ratio		0.16		0.89		0.80		0.87		0.91	0.57	
Uniform Delay, d1		40.3		33.1		25.3		22.2		36.4	9.6	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.2		23.0		4.4		7.1		22.5	1.2	
Delay (s)		41.5		56.1		29.7		29.2		58.9	10.8	
Level of Service		D		E		С		С		E	в	
Approach Delay (s)		41.5			36.0			29.2			23.3	
Approach LOS		D			D			С			С	
Intersection Summary			and the second									
HCM Average Control D	elay		29.3	٢	ICM Le	vel of Se	ervice		C			
HCM Volume to Capacit			0.82									
Actuated Cycle Length (			85.9	S	Sum of I	ost time	(s)		12.0			
Intersection Capacity Ut			82.9%			el of Ser			E			
Analysis Period (min)			15									
c Critical Lane Group												

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. The Transpo Group

1: S 188th St & Millitary Rd

Queues 2011 Baseline Saturday PM

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Lane Group	EBL	EBT	ĖBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	111	958	26	32	563	189	32	216	295	252	
v/c Ratio	0.35	0.58	0.03	0.25	0.52	0.31	0.24	0.68	0.61	0.46	
Control Delay	38.0	21.4	7.2	45.3	23.6	7.5	44.1	41.2	42.2	26.8	
Queue Delay	0.0	0.0	0.0	0.0	3.1	0.9	0.0	0.0	0.0	0.0	
Total Delay	38.0	21.4	7.2	45.3	26.7	8.4	44.1	41.2	42.2	26.8	
Queue Length 50th (ft)	57	234	0	14	162	28	18	104	81	112	
Queue Length 95th (ft)	112	309	16	m45	162	72	46	173	123	178	
Internal Link Dist (ft)		436			126		431			246	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	318	1658	756	127	1084	602	132	380	501	559	
Starvation Cap Reductn	0	0	0	0	405	213	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.35	0.58	0.03	0.25	0.83	0.49	0.24	0.57	0.59	0.45	
ntersection Summary											

m Volume for 95th percentile queue is metered by upstream signal.

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		_	•	•		_	)				•	•
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	2	<u>†</u> †	*	 ĭ	<b>†</b> †	1	۴	đ.		ኻኻ	ሻ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0,96	
Satd. Flow (prot)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1745	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	7
Satd. Flow (perm)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1745	
Volume (vph)	105	910	25	30	535	180	30	150	55	280	180	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	958	26	32	563	189	32	158	58	295	189	63
RTOR Reduction (vph)	0	0	15	0	0	122	0	15	0	0	13	0
Lane Group Flow (vph)	111	958	11	32	563	67	32	201	0	295	239	. 0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type	Prot		Perm	Prot	an a	Perm	Prot	, , , , , , , , , , , , , , , , , , ,		Prot	1 1 100	-1
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			- 2						·
Actuated Green, G (s)	14.3	35.8	35.8	3.6	25.2	25.2	3.0	17.6		11.0	25.8	
Effective Green, g (s)	16.0	37.6	37.6	4,3	25.9	25.9	4.7	19.5		12.6	27.4	- 4
Actuated g/C Ratio	0.18	0.42	0.42	0.05	0.29	0.29	0.05	0.22		0.14	0.30	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5,9		5.6	5.6	í. (

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Level of Service Approach Delay (s) Approach LOS	D	C 24.1 C	B	Dj	C C 27.2 C	D 35.4 D	c	D	C 32.7 C
Intersection Summary									
HCM Average Control D	elay	-27	.8	H	CM Level of Se	rvice	C	$^{\rm A}$	1 Martine Star
HCM Volume to Capacit	y ratio	0.0	61						
Actuated Cycle Length (	s)	90	.0	S	um of lost time	(s)	16.0		1 1 A 1
Intersection Capacity Ut	ilization	60.5	%	IC	U Level of Sen	vice	в		
Analysis Period (min)		· · ·	15						
- Ó. W 11 Ô.									

c Critical Lane Group

Vehicle Extension (s)

Lane Grp Cap (vph)

v/s Ratio Prot

v/s Ratio Perm

Uniform Delay, d1

Progression Factor

Incremental Delay, d2

v/c Ratio

Delay (s)

3.0

0.35

32.4

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318 1493

c0.06 c0.27

35.4 23.0

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34.2

92 343

0.02 c0.13

41.2 31.6

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HCM Signalized Intersection Capacity Analysis 2011 Baseline Saturday PM

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1: S 188th St & Millitary Rd

2: S 188th St & I-5 SB

Queues 2011 Baseline Saturday PM

	-	$\mathbf{i}$	4	←	5	ŧ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	646	615	104	724	117	112	
v/c Ratio	0.28	0.49	0.20	0.27	0.54	0.46	
Control Delay	4.3	2.2	6.0	6.1	44.9	28.2	
Queue Delay	0.3	0.5	0.0	0.0	0.0	0.0	
Total Delay	4.6	2.7	6.0	6.1	44.9	28.2	
Queue Length 50th (ft)	45	10	23	114	66	37	
Queue Length 95th (ft)	17	20	m0	146	116	86	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	2313	1248	561	2707	498	506	
Starvation Cap Reductn	1021	271	0	0	0	0	
Spillback Cap Reductn	0	0	0	404	0	5	
Storage Cap Reductn	Ó	0	0	0	0	0	
Reduced v/c Ratio	0.50	0.63	0.19	0.31	0.23	0.22	

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

2: S 188th St & I-5 SB	
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HCM Signalized Intersection Capacity Analysis 2011 Baseline Saturday PM

	٨	<b>→</b>	7	4	-	×	1	1	1	4	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	7	٦	<u>^</u>					ሻ	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor	÷	0.95	1.00	1.00	0.95	· ·				0.95	0.95	18 x
Frt		1.00	0.85	1.00	1.00					1.00	0.94	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.97	
Satd. Flow (prot)		3539	1583	1752	3505					1545	1481	
Flt Permitted		1.00	1.00	0.36	1.00					0.95	0.97	Cart.
Satd. Flow (perm)	. `	3539	1583	659	3505			,		1545	1481	· · ·
Volume (vph)	0	620	590	100	695	0	. 0	0	. 0	175	0	45
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	646	615	104	724		0.00		0	182	1.00	47
RTOR Reduction (vph)	0	0	220	0	0	ŏ	ő	ŏ	ŏ	0	37	0
Lane Group Flow (vph)	- Õ	646	395	104	724	. ŏ	. ŭ	ŏ	ŏ	117	75	- Jan Ö
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	11%	11%	11%
Turn Type	2.70	2.70		pm+pt	070		0.0		070	Perm	1170	Sale .
Protected Phases		2	Fenn	· · ·	6					Fenn:	8	- 1. C
Permitted Phases		2	2	1 6	0					. 8		
Actuated Green, G (s)	1.6.7	56.8	56.8	68.5	68.5					11.5	11.5	e de c
		57.8	57.8	69.5	69.5					12.5	12.5	
Effective Green, g (s) Actuated g/C Ratio		0.64	0.64		0.77	su ti				0.14	0.14	
		5.0		0.77	5.0					1 - 10 - 1	5.0	
Clearance Time (s)			5.0			×		13.1 A.		3.0	3.0	N. 2017
Vehicle Extension (s)	e je tokan	4.0	4.0	3.0	4.0			- 2° 5				( Leite . )
Lane Grp Cap (vph)	1.1	2273	1017	602	2707	198 B				215	206	
v/s Ratio Prot		0.18		0.01	c0.21							
v/s Ratio Perm			c0.25	0.12				19 N.		c0.08	0.05	e de la composition de
v/c Ratio		0.28	0.39	0.17	0.27					0.54	0.36	
Uniform Delay, d1		7.0	7.7	2.8	2.9	sa di	2. 1			36.1	35.1	2 2 7
Progression Factor		0.50	1.14	1.74	1.79					1.00	1.00	
Incremental Delay, d2		0.3	0.9		0.2	- de	· . · ·		· . ·	2.8	1.1	20-1
Delay (s)		3.8	9.7	5.1	5.5					38.9	36.2	
Level of Service		A	Α	A	Α		1.1			D	D	74. A.
Approach Delay (s)		6.7			5.4			0.0			37.6	
Approach LOS	- A.	A	. 14. Gyv	1.174	A			Α		din a	, <b>D</b>	à.:::::
Intersection Summary	No. St. M.		and the second									
HCM Average Control D	elay	1.15	9.3	iet in 192 <b>6</b>	ICM Lev	el of Se	rvice		Α			
HCM Volume to Capacit			0.41									
Actuated Cycle Length (			90.0	S	Sum of lo	ost time	(s)	48 20	12.0			a
Intersection Capacity Uti			58.3%		CU Leve			and and a	В			
Analysis Period (min)			15		n n ga	100000	9	ing to				9 9
c Critical Lane Group												

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The Transpo Group

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3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2011 Baseline Saturday PM

Lane Configurations         Image: height of the second secon	<b>∖</b> ⊷ ↓	1	*	/
Ideal Flow (vphpi)       1900       1	SBL SBR	NEL2	NEL	NER
Ideal Flow (vphpl)       1900       1		۲	M	
Lane Util. Factor         1.00         0.95         0.95         1.00           Frt         1.00         1.00         1.00         0.85           Fit Protected         0.95         1.00         1.00         1.00           Satd. Flow (prot)         1719         3438         3406         1524           Fit Permitted         0.45         1.00         1.00         1.00           Satd. Flow (perm)         809         3438         3406         1524           Volume (vph)         305         510         0         0         380         270           Peak-hour factor, PHF         0.93	1900 1900		1900	1900
Frt       1.00       1.00       1.00       0.85         Fit Protected       0.95       1.00       1.00       1.00         Satd. Flow (prot)       1719       3438       3406       1524         Fit Permitted       0.45       1.00       1.00       1.00         Satd. Flow (perm)       809       3438       3406       1524         Volume (vph)       305       510       0       0       380       270         Peak-hour factor, PHF       0.93       0.93       0.93       0.93       0.93       0.93       0.93       0.93         Adj. Flow (vph)       328       548       0       0       0       144         Heavy Vehicles (%)       5%       5%       5%       6%       6%       6%       0"         Turn Type       pm+pt       Perm       Perm       Perm       Perm       Perm         Protected Phases       2       6		4.0	4.0	
Fit Protected       0.95       1.00       1.00       1.00         Satd. Flow (prot)       1719       3438       3406       1524         Fit Permitted       0.45       1.00       1.00       1.00       1.00         Satd. Flow (perm)       809       3438       3406       1524         Volume (vph)       305       510       0       0       380       270         Peak-hour factor, PHF       0.93       0.		0.95	0.95	1
Satd. Flow (prot)       1719       3438       3406       1524         Fit Permitted       0.45       1.00       1.00       1.00       1.00         Satd. Flow (perm)       809       3438       3406       1524         Volume (vph)       305       510       0       0       380       270         Peak-hour factor, PHF       0.93       0.93       0.93       0.93       0.93       0.93       0.93         Adj. Flow (vph)       328       548       0       0       0.0       0       144         Lane Group Flow (vph)       328       548       0       0.409       144         Heavy Vehicles (%)       5%       5%       6%       6%       6%       0"         Turn Type       pm+pt       Permitted Phases       2       6 <td></td> <td>1.00</td> <td>0.94</td> <td></td>		1.00	0.94	
Fit Permitted       0.45       1.00       1.00       1.00         Satd. Flow (perm)       809       3438       3406       1524         Volume (vph)       305       510       0       0       380       270         Peak-hour factor, PHF       0.93       0.		0.95	0.97	
Satd. Flow (perm)         809         3438         3406         1524           Volume (vph)         305         510         0         0         380         270           Peak-hour factor, PHF         0.93		1665	1596	
Volume (vph)         305         510         0         0         380         270           Peak-hour factor, PHF         0.93         0.44         144         Heavy Vehicles (%)         0.55         55         55         55         55         55         55 <td></td> <td>0.95</td> <td>0.97</td> <td></td>		0.95	0.97	
Peak-hour factor, PHF         0.93         0.44           Heavy Vehicles (%)         5%         5%         5%         6%         6%         6%         6%         6%         6%		1665	1596	
Peak-hour factor, PHF         0.93         0.44           Heavy Vehicles (%)         5%         5%         5%         5%         5%         5%         5%         50         5.0	0 0	390	5	100
RTOR Reduction (vph)         0         0         0         0         0         146           Lane Group Flow (vph)         328         548         0         0         409         144           Heavy Vehicles (%)         5%         5%         5%         6%         6%         6%         0'           Turn Type         pm+pt         Permited         Permited         Permited         Permited           Protected Phases         5         2         6         6         6         6           Permitted Phases         2         6         6         6         6         6           Actuated Green, G (s)         61.4         61.4         44.6         43.6         6         6           Actuated g/C Ratio         0.68         0.50         5.0	0.93 0.93	0.93	0.93	0.93
Lane Group Flow (vph)         328         548         0         0         409         144           Heavy Vehicles (%)         5%         5%         5%         6%         6%         6%         0°           Turn Type         pm+pt         Permited Phases         2         6           Protected Phases         2         6         6           Actuated Green, G (s)         60.4         60.4         43.6         43.6           Effective Green, g (s)         61.4         61.4         44.6         44.6           Actuated g/C Ratio         0.68         0.68         0.50         5.0         5.0           Clearance Time (s)         5.0         5.0         5.0         5.0         5.0         5.0           V/s Ratio Prot         c0.07         0.16         0.12         v/s Ratio Perm         0.26           v/c Ratio         0.48         0.23         0.24         0.19         100           Inform Delay, d1         5.9         5.4         13.0         12.6         13.4         13.2           Progression Factor         1.49         0.90         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00	0 0	419	5	108
Lane Group Flow (vph)         328         548         0         0         409         144           Heavy Vehicles (%)         5%         5%         5%         6%         6%         6%         0°           Turn Type         pm+pt         Permited Phases         2         6           Protected Phases         2         6         6           Actuated Green, G (s)         60.4         60.4         43.6         43.6           Effective Green, g (s)         61.4         61.4         44.6         44.6           Actuated g/C Ratio         0.68         0.68         0.50         5.0         5.0           Clearance Time (s)         5.0         5.0         5.0         5.0         5.0         5.0           V/s Ratio Prot         c0.07         0.16         0.12         v/s Ratio Perm         0.26           v/c Ratio         0.48         0.23         0.24         0.19         100           Inform Delay, d1         5.9         5.4         13.0         12.6         13.4         13.2           Progression Factor         1.49         0.90         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00	0 0	0	32	0
Heavy Vehicles (%)         5%         5%         6%         6%         6%         09           Turn Type         pm+pt         Permit         6         Actuated Green, G (s)         60.4         60.4         43.6         43.6         43.6         Actuated Green, G (s)         6.14         61.4         64.6         Actuated Green, G (s)         5.0         5.0         5.0         5.0         V////>V///>V///>V///>V///>V///>V///>V	0 0	273	227	0
Protected Phases         5         2         6           Permitted Phases         2         6           Actuated Green, G (s)         60.4         60.4         43.6         43.6           Effective Green, g (s)         61.4         61.4         44.6         44.6           Actuated Green, g (s)         61.4         61.4         44.6         44.6           Actuated g/C Ratio         0.68         0.68         0.50         5.0           Clearance Time (s)         5.0         5.0         5.0         5.0           Vehicle Extension (s)         2.5         4.0         5.0         5.0           Lane Grp Cap (vph)         681         2345         1688         755           v/s Ratio Prot         c0.07         0.16         0.12         v/v           v/s Ratio Perm         c0.26         0.09         v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6         Progression Factor         1.49         0.90         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.03         0.6<	0% 0%	3%	3%	3%
Protected Phases         5         2         6           Permitted Phases         2         6           Actuated Green, G (s)         60.4         60.4         43.6         43.6           Effective Green, g (s)         61.4         61.4         44.6         44.6           Actuated Green, g (s)         61.4         61.4         44.6         44.6           Actuated g/C Ratio         0.68         0.68         0.50         5.0           Clearance Time (s)         5.0         5.0         5.0         5.0           Vehicle Extension (s)         2.5         4.0         5.0         5.0           Lane Grp Cap (vph)         681         2345         1688         755           v/s Ratio Prot         c0.07         0.16         0.12         v/v           v/s Ratio Perm         c0.26         0.09         v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6         Progression Factor         1.49         0.90         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.00         1.03         0.6<		Split	11 Sec. 14	1 1 264
Permitted Phases         2         6           Actuated Green, G (s)         60.4         60.4         43.6         43.6           Effective Green, g (s)         61.4         61.4         44.6         44.6           Actuated g/C Ratio         0.68         0.68         0.50         50           Clearance Time (s)         5.0         5.0         5.0         50           Vehicle Extension (s)         2.5         4.0         5.0         5.0           Lane Grp Cap (vph)         681         2345         1688         755           v/s Ratio Prot         c0.07         0.16         0.12         v/s Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6         Progression Factor         1.49         0.90         1.00<		4	4	
Effective Green, g (s)       61.4       61.4       44.6       44.6         Actuated g/C Ratio       0.68       0.68       0.50       0.50         Clearance Time (s)       5.0       5.0       5.0       5.0         Vehicle Extension (s)       2.5       4.0       5.0       5.0         Lane Grp Cap (vph)       681       2345       1688       755         v/s Ratio Port       c0.07       0.16       0.12         v/s Ratio Perm       c0.26       0.09       0.04       0.12         v/s Ratio       0.48       0.23       0.24       0.19         Uniform Delay, d1       5.9       5.4       13.0       12.6         Progression Factor       1.49       0.90       1.00       1.00         Incremental Delay, d2       0.4       0.2       0.3       0.6         Delay (s)       9.2       5.1       13.4       13.2         Level of Service       A       A       B       B         Approach LOS       A       B       B       A         Intersection Summary       16.4       HCM Level of Service       0.54         HCM Average Control Delay, HCM Average Control Delay, HCM Volume to Capacity ratio       0.54				,
Effective Green, g (s)       61.4       61.4       44.6       44.6         Actuated g/C Ratio       0.68       0.68       0.50       0.50         Clearance Time (s)       5.0       5.0       5.0       5.0         Vehicle Extension (s)       2.5       4.0       5.0       5.0         Lane Grp Cap (vph)       681       2345       1688       755         v/s Ratio Port       c0.07       0.16       0.12         v/s Ratio Port       c0.26       0.09       0.24       0.19         Uniform Delay, d1       5.9       5.4       13.0       12.6         Progression Factor       1.49       0.90       1.00       1.00         Incremental Delay, d2       0.4       0.2       0.3       0.6         Delay (s)       9.2       5.1       13.4       13.2         Level of Service       A       B       B       A         Approach LOS       A       B       B       A         Intersection Summary       16.4       HCM Level of Service       0.54         HCM Average Control Delay, HCM Average Con		19.6	19.6	
Clearance Time (s)         5.0         5.0         5.0         5.0         5.0           Vehicle Extension (s)         2.5         4.0         5.0         5.0         5.0           Lane Grp Cap (vph)         681         2345         1688         755           v/s Ratio Pert         c0.07         0.16         0.12         v/s Ratio Perm         c0.26         0.09           v/s Ratio Perm         c0.26         0.09         v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6         Progression Factor         1.49         0.90         1.00         1.00         Incomental Delay, d2         0.4         0.2         0.3         0.6         Delay (s)         9.2         5.1         13.4         13.2         Level of Service         A         A         B         B         A         Approach LOS         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B         A         B		20.6	20.6	
Vehicle Extension (s)         2.5         4.0         5.0         5.0           Lane Grp Cap (vph)         681         2345         1688         755           V/s Ratio Prot         c0.07         0.16         0.12         0.09           V/s Ratio Perm         c0.26         0.09         0.19         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6           Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach LOS         A         B         A           HCM Average Control Delay         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         0.54           Actuated Cycle Length (s)         90.0         Sum of lost time (s)		0.23	0.23	
Lane Grp Cap (vph)         681         2345         1688         755           v/s Ratio Prot         c0.07         0.16         0.12           v/s Ratio Perm         c0.26         0.09           v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6           Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         A           HCM Average Control Delay,         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         0.54           Actuated Cycle Length (s)         90.0         Sum of lost time (s)		5.0	5.0	1 1 1 1
v/s Ratio Prot       c0.07       0.16       0.12         v/s Ratio Perm       c0.26       0.09         v/s Ratio 0.48       0.23       0.24       0.19         Uniform Delay, d1       5.9       5.4       13.0       12.6         Progression Factor       1.49       0.90       1.00       1.00         Incremental Delay, d2       0.4       0.2       0.3       0.6         Delay (s)       9.2       5.1       13.4       13.2         Level of Service       A       A       B       B         Approach Delay (s)       6.7       13.3       0.         Approach LOS       A       B       B         Intersection Summary       16.4       HCM Level of Service         HCM Volume to Capacity ratio       0.54       0.54         Actuated Cycle Length (s)       90.0       Sum of lost time (s)		3.5	3.5	
v/s Ratio Perm         c0.26         0.09           v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6           Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         A           Intersection Summary         HCM Average Control Delay         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         0.54         30.0         Sum of lost time (s)	- 24 C	381	365	e na sej sej se
v/c Ratio         0.48         0.23         0.24         0.19           Uniform Delay, d1         5.9         5.4         13.0         12.6           Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         B           Intersection Summary         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         0.54           Actuated Cycle Length (s)         90.0         Sum of lost time (s)		c0.16	0.14	• •
Uniform Delay, d1         5.9         5.4         13.0         12.6           Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         B           HCM Average Control Delay, HCM Volume to Capacity ratio         0.54         HCM Level of Service           Actuated Cycle Length (s)         90.0         Sum of lost time (s)         Sum of lost time (s)	- 1		S	یا در در محمد از در
Progression Factor         1.49         0.90         1.00         1.00           Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         B           Intersection Summary         Intersection Summary         Intersection Summary           HCM Average Control Delay (ratio         0.54         Actuated Cycle Length (s)         90.0		0.72	0.62	-
Incremental Delay, d2         0.4         0.2         0.3         0.6           Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         B           Intersection Summary         HCM Average Control Delay         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         0.54         4           Actuated Cycle Length (s)         90.0         Sum of lost time (s)	- Second	32.0	31.2	i uku
Delay (s)         9.2         5.1         13.4         13.2           Level of Service         A         A         B         B           Approach Delay (s)         6.7         13.3         0.           Approach LOS         A         B         B           Intersection Summary         HCM Average Control Delay         16.4         HCM Level of Service           HCM Volume to Capacity ratio         0.54         Actuated Cycle Length (s)         90.0         Sum of lost time (s)	n in starte	1.00	1.00	
Level of Service A A B B Approach Delay (s) 6.7 13.3 0. Approach LOS A B . Intersection Summary HCM Average Control Delay, 16.4 HCM Level of Service HCM Volume to Capacity ratio 0.54 Actuated Cycle Length (s) 90.0 Sum of lost time (s)		6.5	3.4	1. 1. 1. 1. 1.
Approach Delay (s)       6.7       13.3       0.         Approach LOS       A       B       0.         Intersection Summary       HCM Average Control Delay       16.4       HCM Level of Service         HCM Volume to Capacity ratio       0.54       0.54         Actuated Cycle Length (s)       90.0       Sum of lost time (s)	· · · ·	38.5	34.6	
Approach Delay (s)     6.7     13.3     0.       Approach LOS     A     B     0.       Intersection Summary     Intersection Summary     16.4     HCM Level of Service       HCM Average Control Delay     16.4     HCM Level of Service       HCM Volume to Capacity ratio     0.54       Actuated Cycle Length (s)     90.0     Sum of lost time (s)		, • , D	С	an de la comercia
Approach LOS     A     B       Intersection Summary     Intersection Summary       HCM Average Control Delay     16.4     HCM Level of Service       HCM Volume to Capacity ratio     0.54       Actuated Cycle Length (s)     90.0     Sum of lost time (s)	0.0	, -	36.6	
HCM Average Control Delay.     16.4     HCM Level of Service       HCM Volume to Capacity ratio     0.54       Actuated Cycle Length (s)     90.0     Sum of lost time (s)	A		<b>D</b> .	i de la composition
HCM Average Control Delay     16.4     HCM Level of Service       HCM Volume to Capacity ratio     0.54       Actuated Cycle Length (s)     90.0     Sum of lost time (s)				
HCM Volume to Capacity ratio 0.54 Actuated Cycle Length (s) 90.0 Sum of lost time (s)	/ice	B		4 7 7 7 7 9 7 8 7
Actuated Cycle Length (s) 90.0 Sum of lost time (s)				
	) · · · · · · · · · · · · · · · · · · ·	8.0	i den i	Secondaria
		В	1396	·
Analysis Period (min) 15	· · · .			

c Critical Lane Group

3: S 188th St & I-5 NB

Queues 2011 Baseline Saturday PM

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Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	328	548	409	290	273	259	
v/c Ratio	0.57	0.23	0.24	0.32	0.72	0.65	
Control Delay	13.9	5.8	15.7	3.6	42.2	33.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.9	5.8	15.7	3.6	42.2	33.3	
Queue Length 50th (ft)	63	35	64	0	151	117	
Queue Length 95th (ft)	183	110	131	53	216	182	
Internal Link Dist (ft)		410	9			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	738	2345	1686	901	537	543	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.44	0.23	0.24	0.32	0.51	0.48	
Intersection Summary							

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The Transpo Group

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The Transpo Group

HCM Unsignalized Intersection Capacity Analysis 2011 Baseline Saturday PM

	1	۲	4	Ļ	¥	t	
Movement	NBT	NBR	SBL	SBT	SWL	SWR	
ane Configurations	<u></u> ↑î→		ľ	<u>†</u> †	ř	۴	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Volume (veh/h)	560	30	63	535	18	70	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	
Hourly flow rate (vph)	596	32	67	569	19	74	
Pedestrians							
_ane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					None		
Median storage veh)							
Jpstream signal (ft)				89			
oX, platoon unblocked					0.95		
/C, conflicting volume			628		1030	314	
/C1, stage 1 conf vol							
/C2, stage 2 conf vol							
Cu, unblocked vol			628		976	314	
C, single (s)			4.2		6.9	7.0	
C, 2 stage (s)							
F (s)			2.3		3.6	3.4	
p0 queue free %			93		91	89	
cM capacity (veh/h)			917		212	670	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2
/olume Total	397	230	67	285	285	19	74
√olume Left	0	0	67	0	0	19	0
/olume Right	Q	32	0	0	. 0	0	74
SH	1700	1700	917	1700	1700	212	670
✓olume to Capacity	0.23	0.14	0.07	0.17	0,17	0.09	0.11
Queue Length 95th (ft)	0	0	6	0	0	7	9
Control Delay (s)	0.0	0.0	9.2	0.0	0.0	23.7	11.0
Lane LOS			А			С	В
Approach Delay (s)	0,0		1:0			13.6	
Approach LOS						В	
ntersection Summary							
Average Delay			1.4				
ntersection Capacity Ut	ilization		33.3%	10	CU Leve	l of Ser	rvice A
Analysis Period (min)			15				

<b>→</b>	∢	•	•	 $\checkmark$	
energian ( manager a transport of the second s	And Personality			 	

5: S 200th St & Orillia Rd

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Lane Group	EBT	WBL	WBR	NBL	NBT	SBL	SBT	
Lane Group Flow (vph)	10	121	220	5	604	209	478	
v/c Ratio	0.06	0.47	0.21	0.03	0.33	0.41	0.19	
Control Delay	28.6	35.9	3.3	36.4	12.3	31.5	6.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	28.6	35.9	3.3	36.4	12.3	31.5	6.7	
Queue Length 50th (ft)	2	49	0	2	73	42	26	
Queue Length 95th (ft)	18	114	25	13	165	90	122	
Internal Link Dist (ft)	36				266		3376	
Turn Bay Length (ft)								
Base Capacity (vph)	219	339	1047	212	1824	586	2459	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	.0	0,	0	0	0	and the second
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.05	0.36	0,21	0.02	0.33	0.36	0.19	
Intersection Summary								

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. The Transpo Group Page 7

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The Transpo Group

Queues

2011 Baseline Saturday PM

# 5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2011 Baseline Saturday PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		ሻ		11	۳	<b>≜</b> ⊅		ኘካ	<b>†</b> 1>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88	1.00	0.95		0.97	0.95	
Frt		0.93		1.00		0.85	1.00	0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1772		1752		2760	1752	3424		3273	3374	
Fit Permitted		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1772		1752		2760	1752	3424		3273	3374	
Volume (vph)	0	5	5	110	0	200	5	465	85	190	435	0
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	5	5	121	0	220	5	511	93	209	478	0
RTOR Reduction (vph)	Ō	5	ō	0	Ō	165	Ō	13	0	0	0	0
Lane Group Flow (vph)	ŏ	5	Ő	121	õ	55	5	591	ŏ	209	478	õ
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	3%	3%	3%	7%	7%	7%
Turn Type	Perm		0.0	Prot		ustom	Prot			Prot		
Protected Phases	1 0111	3		4		1	5	2		1	6	
Permitted Phases	3	0		-		4	Ū	~			v	
Actuated Green, G (s)	0	1.1		8.4		17.7	1.1	41.1		9.3	49.3	
Effective Green, g (s)		3.1		9.4		20.7	3.1	43.1		11.3	51.3	
Actuated g/C Ratio		0.04		0.11		0.25	0.04	0.52		0.14	0.62	
Clearance Time (s)		6.0		5.0		6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0	3.0	3.0		3.0	3.0	
		66		199		822	66	1780		446	2088	
Lane Grp Cap (vph)						0.01	0.00	c0.17		446 c0.06	2000	
v/s Ratio Prot		c0.00		c0.07			0.00	CU. 17		CU.U6	0.14	
v/s Ratio Perm		0.00		0.04		0.01	0.00	0.00		0.47	0.00	
v/c Ratio		0.08		0.61		0.07	0.08	0.33		0.47	0.23	
Uniform Delay, d1		38.5		35.0		23.7	38.5	11.5		33.0	7.0	
Progression Factor		1.00		1.00		1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5		5.2		0.0	0.5	0.5		0.8	0.3	
Delay (s)		39.0		40.2		23.8	39.0	12.0		33.8	7.3	
Level of Service		D		D		С	D	В		С	A	
Approach Delay (s)		39.0			29.6			12.3			15.3	
Approach LOS		D			С			в			В	
Intersection Summary												
HCM Average Control D			17.3	н	ICM Lev	el of Se	ervice		B			
HCM Volume to Capacit			0.38									
Actuated Cycle Length (			82.9			ost time			16.0			
Intersection Capacity Ut	ilization		43.7%	10	CU Leve	el of Ser	vice		А			
Analysis Period (min)			15									
c Critical Lane Group												

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1: S 188th St & Millitary Rd

1+2 • \_#  $\mathbf{r}$ 6 ¥ EBL EBR WBL WBT WBR NBL NBR SWL2 SWL Lane Group EBT Lane Group Flow (vph) 122 823 922 394 72 483 356 255 6 11 1.00 0.95 1.08 v/c Ratio 0.85 0.62 0.01 0.09 0.97 0.66 0.39 Control Delay 83.7 23.2 11.4 50.5 49.8 16.0 39.5 70.3 72.0 109.9 Queue Delay 0.0 0.7 0.0 0.0 78.2 5.5 0.0 0.5 0.0 0.0 39.5 72.0 109.9 Total Delay 83.7 23.9 11.4 50.5 128.1 21.5 70.8 Queue Length 50th (ft) 61 162 0 6 248 80 34 ~234 98 ~124 Queue Length 95th (ft) #157 #281 9 m10 #363 85 74 #434 #185 #282 Internal Link Dist (ft) 436 107 431 246 Turn Bay Length (ft) 319 192 122 90 236 Base Capacity (vph) 143 1331 599 120 949 593 194 483 376 Starvation Cap Reductn 0 0 0 0 173 142 0 0 0 0 Spillback Cap Reductn 215 0 0 0 0 0 0 0 0 1 Storage Cap Reductn 0 0 0 0 0 0 0 0 0 0 Reduced v/c Ratio 0.85 0.74 0.01 0.09 1.19 0.87 0.37 1.00 0.95 1.08

#### Intersection Summary

The Transpo Group

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

1: S 188th St & Millitary Rd

Queues

2011 With-Project AM-Weekday

HCM Signalized Intersection Capacity Analysis 2011 With-Project AM-Weekday

	_#	-	7	4		۲	•	۲	~	6	4	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	٦	<b>^</b>	۴	٦	<b>^</b>	1	۲	Ĭ.		ሻካ	A	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.91	0.91	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.92	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.98	
Satd. Flow (prot)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1448	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd, Flow (perm)	1703	3406	1524	1687	3374	1509	1687	1509		3070	1479	
Volume (vph)	110	741	5	10	830	355	65	350	85	320	100	130
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	122	823	6	11	922	394	72	389	94	356	111	144
RTOR Reduction (vph)	0	0_0	4	0	0	172	0	11	0	0	35	0
Lane Group Flow (vph)	122	823	2	11	922	222	72	472	· õ	356	220	0
Heavy Vehicles (%)	6%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Turn Type	Prot	070	Perm	Prot		Perm	Prot			Prot		
Protected Phases	1	6		5	2	,,	7	4		3	8	
Permitted Phases		Ū	6		~	2	,			•		
Actuated Green, G (s)	5.0	24.5	24.5	1.0	20.6	20.6	6.0	24.3		8.2	34.9	
Effective Green, g (s)	6.7	26.3	26.3	1.7	21.3	21.3	7.7	26.2		9.8	38.1	
Actuated g/C Ratio	0.08	0.33	0.33	0.02	0.27	0.27	0.10	0.33		0.12	0.48	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7		5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	143	1120	501	36	898	402	162	494	-	376		1. I. I. V
v/s Ratio Prot	c0.07	0.24	001	0.01	c0.27	402	0.04	c0.31		c0.12	0.04	
v/s Ratio Prot	CU.U7	0.24	0.00	0.01	CU.27	0.15		CU.31			c0.11	
v/c Ratio	0.85	0.73	0.00	0.31	1.03	0.55	0.44	0.96		0.95	0.31	Salara.
Uniform Delay; d1	36.2	23.8	18.0	38.6		25.3	34.1	26.3		34.8	12.9	
					0.97	, , ,	1.00	1.00		1.00	1.00	
Progression Factor	1.00	1.00	1.00 0.0	1.40 3.9		1.06	1.9			32.6	0.3	
Incremental Delay, d2	43,9	4.3	, , _,_,		34.3		100	29,3	1 T - 1		13.2	
Delay (s)	80.1	28.1	18.1	58.0	62.8 E	31.3	36.1	55.7		67.5 E		
Level of Service	`∽F∙	C C	В	Ε		C.	D	E		- <b>C</b>		
Approach Delay (s)		34.7			53.4		53.1				44.8	
Approach LOS		C			D	te se	D		·		, D	6.2. 35
Intersection Summary	C. Alerter			1. 1. 1. 1. 1.		113	Vice and	and the second				
HCM Average Control D	)elay	1. 1. 1. 1.	46.6	100 S.F	ICM Lev	vel of Se	rvice		D			S. Prof.
HCM Volume to Capacit	ty ratio		1.03									
Actuated Cycle Length (	s)		80.0		um of le	ost time	(s)	Sec. 14	20.0		1. Junio -	947 1942 - A
Intersection Capacity Ut	ilization		66.0%	10	CU Leve	ol of Ser	vice		С			
Analysis Period (min)			15			2.4.22						ing in
c Critical Lane Group												

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#### 2: S 188th St & I-5 SB

Queues 2011 With-Project AM-Weekday

	->	$\mathbf{i}$	1	←	5	Ļ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	805	424	115	1212	403	364	
v/c Ratio	0.50	0.45	0.34	0.61	0.79	0.71	
Control Delay	11.7	2.7	11.3	11.3	37.3	32.0	
Queue Delay	1.0	1.5	0.0	3.9	0.0	673.9	
Total Delay	12.7	4.3	11.3	15.1	37.3	705.9	
Queue Length 50th (ft)	155	13	23	160	192	164	
Queue Length 95th (ft)	m81	m0	m40	m225	269	234	
Internal Link Dist (ft)	107			326		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1608	941	342	2001	643	643	
Starvation Cap Reductn	505	332	0	173	0	0	
Spillback Cap Reductn	0	0	0	685	0	639	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.73	0.70	0.34	0.92	0.63	91.00	
Intersection Summary							

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized	Intersection	Capacity Analysis
· ·	2011 With	-Project AM-Weekday

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	٦	-	7	¥	+	×	•	t	1	1	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	7	۲	<b>^</b>					۲	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	.1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frt		1.00	0.85	1.00	1.00					1.00	0.98	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.96	
Satd. Flow (prot)		3374	1509	1656	3312					1715	1698	
Flt Permitted		1.00	1.00	0.24	1.00					0.95	0.96	
Satd. Flow (perm)		3374	1509	411	3312					1715	1698	
	0	741	390		1115		0	0	0	666	0	. 40
Volume (vph)	0			106		0.92	0.92	0 0.92	0.92	0.92	0.92	0.92
Peak-hour factor, PHF	0.92	0.92 805	0.92 424	0.92	0.92 1212		0.92	0.92	0.92	724	0.92	43
Adj. Flow (vph)	0			115		0	-	-	0	724	7	43
RTOR Reduction (vph)	0	0	227	0	0	0	0	0	-	-		0
Lane Group Flow (vph)	0	805	197	115	1212	0	0	0	.0	403	357	
Heavy Vehicles (%)	7%	7%	7%	9%	9%	9%	9%	9%	9%	0%	0%	0%
Turn Type			Perm	pm+pt	_	· · ·				Perm		111
Protected Phases		2		1	6						8	
Permitted Phases			2	6						8	1. N.	
Actuated Green, G (s)		36.1	36.1	47.3	47.3					22.7	22.7	
Effective Green, g (s)		37.1	37.1	48.3	48.3					23.7	23.7	
Actuated g/C Ratio		0.46	0.46	0.60	0.60					0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0	4. C. C.		1.945		5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)	1.257	1565	700	360	2000	월 <sup>5</sup> 위험	· 93		1 n. 1	508	503	
v/s Ratio Prot		0.24		0.03	c0.37							
v/s Ratio Perm			0.13	0.16						c0.24	0.21	91
v/c Ratio		0.51	0.28	0.32	0.61					0.79	0.71	
Uniform Delay, d1	e 1	15.1	13.2	8.1	9.9		í			25.9	25.1	
Progression Factor		0.65	0.81	1.18	0.94					1.00	1.00	
Incremental Delay, d2		0.8	0.7	0.3	0.8	1.11				8.3	4.6	
Delay (s)		10.7	11.3	9.8	10.0					34.2	29.6	
Level of Service	~	В	В		В			· · ·		С	C	
Approach Delay (s)		10.9			10.0			0.0			32.0	
Approach LOS		B			B			A			~~ C	
	STAN AVAILABLE MADE			-		of defendent and a second s	0100-040000000		secolaris/hetioi	0.0004608484868	un anti anteri data da	Received and and
Intersection Summary	(de la compañía	No. of the second									Constanting of the	
HCM Average Control D			15.4	1	ICM Le	vel of Se	rvice		<b>₿</b> :			S. S. S. S.
HCM Volume to Capacit			0.67									
Actuated Cycle Length (			80.0			ost time			8.0		1.238	Steel 1
Intersection Capacity Uti	lization	1	01.5%	l.	CU Lev	el of Ser	vice		G			
Analysis Period (min)			15			1.7.4						
c Critical Lane Group												

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2: S 188th St & I-5 SB

3: S 188th St & I-5 NB

Que	ues
2011 With-Project AM-Wee	kday

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Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL
Lane Group Flow (vph)	290	1423	927	707	430	406
v/c Ratio	0.78	0.70	0.78	0.73	0.87	0.84
Control Delay	34.4	14.0	28.1	7.0	46.1	40.7
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	34.4	14.2	28.1	7.0	46.1	40.7
Queue Length 50th (ft)	116	233	218	0	205	174
Queue Length 95th (ft) n	n#205	276	#288	70	#352	#316
Internal Link Dist (ft)		326	1			232
Turn Bay Length (ft)	170					
Base Capacity (vph)	379	2027	1189	964	526	511
Starvation Cap Reductn	0	113	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.74	0.78	0.73	0.82	0.79

#### Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles. m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2011 With-Project AM-Weekday

	٦	-	7	*	+	×.	1	Ļ	3	*	/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	۲	<b>†</b> †			<b>^</b>	۲			٦	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0.95	
Frt	1.00	1.00			1.00	0.85			1.00	0.89	
Fit Protected	0.95	1.00			1.00	1.00			0.95	0.99	
Satd, Flow (prot)	1703	3406			3059	1369			1618	1494	
Fit Permitted	0.15	1.00			1.00	1:00			0.95	0.99	
Satd. Flow (perm)	266	3406			3059	1369			1618	1494	
Volume (vph)	255	1252	0	0	816	622	0.	0	470	<u> </u>	266
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	290	1423	0	0	927	707	0	0	534	0	302
RTOR Reduction (vph)	0	0	Ō	0	0	432	Ō	Ó	0	27	0
Lane Group Flow (vph)	290	1423	0	0	927	275	0	0	430	.379	0
Heavy Vehicles (%)	6%	6%	6%	18%	18%	18%	0%	0%	6%	6%	6%
Turn Type	pm+pt				· · · · ·	Perm			Split	0	- <u>82</u>
Protected Phases	5	2			6				. 4	4	
Permitted Phases	2					6					
Actuated Green, G (s)	46.6	46.6			30.1	30.1			23.4	23.4	,
Effective Green, g (s)	47.6	47.6			31.1	31.1			24.4	24.4	- C. 21
Actuated g/C Ratio	0.60	0.60			0.39	0.39			0.30	0.30	
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0	1 3
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	383	2027	S 2	1.19-3	1189	532		-1 11 T	493	456	
v/s Ratio Prot	0.12	c0.42			0.30				c0.27	0.25	
v/s Ratio Perm	c0.33					0.20				· · · · ·	
v/c Ratio	0.76	0.70			0.78	0.52			0.87	0.83	
Uniform Delay, d1	13.6	11.3			21.4	18.7		1510	26.3	25.9	1 . And the b
Progression Factor	1.41	1.02			1.00	1.00			1.00	1.00	22 - 12 - 24 - 2 - 1
Incremental Delay, d2	6.7	1.7			5.1	3.6		1.20	15.9	12.5	
Delay (s)	25.9	13.3		,	26.5	22.3			42.2	38.3	
Level of Service	С	в	1		C	C		1.18	D	n D	
Approach Delay (s)	~	15.4			24.7	/	0.0			40.3	
Approach LOS		В			C	1.59	Α	den la la		- 25 <b>D</b> .	1.281.201
Intersection Summary											
HCM Average Control E	Delay	- 1 C.	24.0	. Àt H	ICM Le	vel of Se	rvice	and a stranger	С		Al Carl
HCM Volume to Capaci	ty ratio		0.79								
Actuated Cycle Length	(s)		80.0	\$ <b>S</b>	um of l	ost time	(s)		8.0		1. Sugar
Intersection Capacity Ut		1	01.5%			el of Ser			G		
Analysis Period (min)			15			5. Z				· ·	a ser
c Critical Lane Group			, -								
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#### HCM Unsignalized Intersection Capacity Analysis 2011 With-Project AM-Weekday

	Ť	۲	4	Ļ	¥	t				
Movement	NBT	NBR	SBL	SBT	SWL	SWR				
ane Configurations	<b>↑</b> ⊅		٦	<u>†</u> †	ሻ	۴				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Volume (veh/h)	1410	25	26	1490	11	23				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph)	1516	27	28	1602	12	25				
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s) Percent Blockage										
Right turn flare (veh)										
Median type					None					
Median storage veh)					None					
Jpstream signal (ft)				74						
X, platoon unblocked				74	0.71					
C, conflicting volume			1543		2387	772				
C1, stage 1 conf vol						··-				
C2, stage 2 conf vol										
Cu, unblocked vol			1543		2545	772				
C, single (s)			4.3		8.4	8.5				
C, 2 stage (s)										
F (s)			2.3		4.3	4.1				
00 queue free %			93		0	88				
cM capacity (veh/h)			390		5	215				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2			
/olume Total	1011	532	28	801	801	12	25			
/olume Left	0	0	28	0	0	12	0			
/olume Right	0	27	0	0	0	0	25			
SH	1700	1700	390	1700	1700	5	215			
Volume to Capacity	0.59	0.31	0.07	0.47	0.47	2.51	0.12			
Queue Length 95th (ft)	0	0	6	0	0	65	10			
Control Delay (s)	0.0	0.0	14.9	0.0	0.0 2	2099.5	23.9			
ane LOS	0.0		В			F	С			
Approach Delay (s)	0.0		0.3			695.4				
Approach LOS						F				
ntersection Summary								Cale Vielon		
Average Delay			8.1							
ntersection Capacity Uti	lization		51.2%	10	JU Leve	of Ser	vice		A	

#### 5: S 200th St & Orillia Rd

Queues 2011 With-Project AM-Weekday

	-	*	×	1	5	ţ	
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT	
Lane Group Flow (vph)	10	36	392	1272	697	898	
v/c Ratio	0.07	0.34	0.42	0.75	0.79	0.31	
Control Delay	30.8	46.5	7.3	19.5	35.4	2.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	,
Total Delay	30.8	46.5	7.3	19.5	35.4	2.4	
Queue Length 50th (ft)	2	17	19	250	164	35	
Queue Length 95th (ft)	19	51	62	#476	#303	112	
Internal Link Dist (ft)	36			266		3370	
Turn Bay Length (ft)							
Base Capacity (vph)	150	105	954	1696	899	2944	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.34	0.41	0.75	0.78	0.31	
	NO CONTRACTOR OF THE			15X 7420 MARINA	\$100000000000		

#### Intersection Summary

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

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# 5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2011 With-Project AM-Weekday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		77	۲	<b>∱</b> ⊅		ሻሻ	<b>↑</b> î>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		0.93		1.00		0.85		0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1772		1410		2221		3197		3273	3371	
Fit Permitted		1.00		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1772		1410		2221		3197		3273	3371	
Volume (vph)	0	5	5	35	0	380	0	1094	140	676	866	5
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	5	5	36	0	392	0	1128	144	697	893	5
RTOR Reduction (vph)	0	5	0	0	0	198	0	10	0	0	0	0
Lane Group Flow (vph)	0	5	0	36	0	194	0	1262	0	697	898	0
Heavy Vehicles (%)	0%	0%	0%	28%	28%	28%	1 <b>1</b> %	11%	11%	7%	7%	7%
Turn Type	Perm			Prot		ustom	Prot	_		Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	. 3	-				4						
Actuated Green, G (s)	-	0.9		2.8		21.5		38.5		18.7	63.2	
Effective Green, g (s)		2.9		3.8		24.5		40.5		20.7	65.2	
Actuated g/C Ratio		0.03		0.05		0.29		0.48		0.25	0.78	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		61		64		754		1543		808	2620	
v/s Ratio Prot		c0.00		c0.03		0.06		c0.39		c0.21	0.27	
v/s Ratio Perm		00.00		00.00		0.02						
v/c Ratio		0.08		0.56		0.26		0.82		0.86	0.34	
Uniform Delay, d1		39.2		39.2		22.7		18.5		30.2	2.8	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		0.6		10.8		0.2		4.9		9.4	0.4	
Delay (s)		39.8		50.1		22.9		23.5		39.7	3.2	
Level of Service		00.0 D		D		C		C		D	A	
Approach Delay (s)		39.8		5	25.2	Ŭ		23.5		-	19.1	
Approach LOS		D			C			C			В	
Intersection Summary					George State							
HCM Average Control D			21.7	ł	ICM Le	vel of Se	ervice		С			
HCM Volume to Capaci			0.79	_					10.5			
Actuated Cycle Length			83.9		Sum of l				16.0			
Intersection Capacity Ut	ilization		72.6%	1	CU Leve	el of Sei	vice		С			
Analysis Period (min)			15									
c Critical Lane Group												

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# 1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Weekday

	_#	-	$\mathbf{i}$	1		٤	•	۲	1	4	f	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ሻ	<b>††</b>	ŕ	٢	<b>^†</b>	۴	ሻ	r.		ኘካ	¥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0,96	
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
Volume (vph)	105	1275	25	60	726	275	25	135	20	465	330	105
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	107	1301	26	61	741	281		138	20	474	337	107
RTOR Reduction (vph)	0	0	12	0	0	123	0	5	0	ŏ	11	0
Lane Group Flow (vph)	107	1301	14	61	741	158	26	153	0	474	433	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot	1.5		Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2					· · ·	
Actuated Green, G (s)	13.7	41.5	41.5	4.7	32.6	32.6	3.0	16.4		15.4	29.0	
Effective Green, g (s)	15.4	43.3	43.3	5.4	33.3	33.3	4.7	18.3		17.0	30.6	
Actuated g/C Ratio	0.15	0.43	0.43	0.05	0.33	0.33	0.05	0.18		0.17	0.31	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	1503	672	93	1145	512	82	284	1.1.1.	578	524	a le f
v/s Ratio Prot	0.06	c0.37		c0.04	0.22		0.01	0.10		c0.14	c0.25	
v/s Ratio Perm	1.1		0.01		- 1.5	0.10		13 11 1			12 22	s*
v/c Ratio	0.40	0.87	0.02	0.66	0.65	0.31	0.32	0.54		0.82	0.83	
Uniform Delay, d1	38.1	25.7	16.2	46.4	28.4	24.8	46.1	37.0		40.0	32.2	
Progression Factor	1.00	1.00	1.00	1.23	0.61	0.69	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.4	6.9	0.1	13.3	2.4	1.3	2.2	2.0		9.1	10.3	مەركى يەلى
Delay (s)	42.6	32.6	16.3	70.3	19.7	18.5	48.3	39.0		49.1	42.5	
Level of Service	D	C	B	E	В	В	D	D		<b>D</b> .	D	
Approach Delay (s)		33.1			22.3		40.3				45.9	
Approach LOS		C			C		1 <b>D</b> %		2		D	
Intersection Summary												
HCM Average Control D	elay		33.5	н	CM Le	vel of Se	ervice		C		12.2	<u> (s. 19</u>
HCM Volume to Capacity	y ratio		0.82									
Actuated Cycle Length (	s)		100.0	S	um of l	ost time	(s)		12.0	130	1.1	
Intersection Capacity Uti	lization		81.6%	10	CU Leve	of Ser	vice		D			
Analysis Period (min)	1997 - 1997 1998 - 1998		15		1.12					11.1	1.21.2.	
c Critical Lane Group												

# 1: S 188th St & Millitary Rd

Queues 2011 With-Project PM-Weekday

		-+	7	¥	4	۲	•	۲	Ļ	f
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL
Lane Group Flow (vph)	107	1301	26	61	741	281	26	158	474	444
v/c Ratio	0.40	0.81	0.04	0.54	0.61	0.42	0.22	0.62	0.82	0.83
Control Delay	44.7	29.4	8.4	71.4	18.3	7.7	49.2	48.1	53.0	46.5
Queue Delay	0.0	2.8	0.0	0.0	1.4	1.4	0.0	3.0	0.9	0.0
Total Delay	44.7	32.3	8.4	71.4	19.7	9.0	49.2	51.1	53.9	46.5
Queue Length 50th (ft)	64	393	2	34	170	73	16	88	151	260
Queue Length 95th (ft)	119	#507	17	m#79	m232	m135	43	155	#225	#439
nternal Link Dist (ft)		436			126		426			253
urn Bay Length (ft)	319		192	122		90				
Base Capacity (vph)	268	1612	733	113	1220	665	116	292	585	536
Starvation Cap Reductn	0	0	0	0	275	214	0	0	0	0
Spillback Cap Reductn	0	206	0	0	0	0	0	64	20	0
torage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.93	0.04	0.54	0.78	0.62	0.22	0.69	0,84	0.83
	000000000000000000000000000000000000000	45753793553300444644	06807-0808464907	Caracter Material Course	Van belander (d. 1993)	10.1500-60.589836460	000000000000000000000000000000000000000	05/00/00/00/00/00/00	10000000000000000000000000000000000000	March Observation Provide

 Intersection Summary

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

 m
 Volume for 95th percentile queue is metered by upstream signal.

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The Transpo Group

2: S 188th St & I-5 SB

Queues 2011 With-Project PM-Weekday

	<b>→</b>	$\mathbf{i}$	¥	←	\$	ţ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1052	670	408	1073	449	403	
v/c Ratio	0.90	0.70	0.94	0.53	0.96	0.86	
Control Delay	31.4	5.6	61.8	11.6	66.9	50.8	
Queue Delay	103.9	21.3	0.0	0.8	0.0	0.1	
Total Delay	135.2	27.0	61.8	12.4	66.9	50.9	
Queue Length 50th (ft)	268	51	253	183	290	248	
Queue Length 95th (ft)	#448	m72	m#367	m260	#497	#425	
nternal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1172	964	432	2028	476	476	
Starvation Cap Reductn	318	303	0	303	0	0	
Spillback Cap Reductn	0	0	0	588	0	1	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.23	1.01	0.94	0.75	0.94	0.85	

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles. m Volume for 95th percentile queue is metered by upstream signal.

2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Weekday

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Movement	EBL	EBT	EBR	WBL	and an	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>†</b> †	۴	ሻ	<b>††</b>					ሻ	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Fit Protected		1.00	1.00	0.95	1.00					0.95	0.95	
Satd. Flow (prot)		3406	1524	1703	3406					1441	1437	
Fit Permitted		1.00	1.00	0.10	1.00					0.95	0.95	2 - E
Satd. Flow (perm)		3406	1524	187	3406					1441	1437	
Volume (vph)	0	1020	650	396	1041	0	0	- 0	0	806	0	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0.	1052	670	408	1073	0	0	0	0	831	. 0	21
RTOR Reduction (vph)	0	0	440	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	1052	230	408	1073	. 0	0	0	0	449	401	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type			Perm	pm+pt						Perm	11	1.1
Protected Phases		2		1	6						8	
Permitted Phases			2	6						. 8		
Actuated Green, G (s)		33.4	33.4	58.5	58.5					31.5	31.5	
Effective Green, g (s)		34.4	34.4	59.5	59.5					32.5	32.5	
Actuated g/C Ratio		0.34	0.34	0.60	0.60					0.32	0.32	
Clearance Time (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)	1.5.4.1	1172	524		2027	1947 - 1947 Salat - 1949	Z	4, 1, 1, 1	<i></i>	468	467	17.98
v/s Ratio Prot		0.31		c0.20	0.32					2000.		
v/s Ratio Perm			0.15	c0.36						c0.31	0.28	
v/c Ratio		0.90	0.44	0.95	0.53	5		1 - 1		0.96	0.86	· · · · · ·
Uniform Delay, d1		31.1	25.4							33.1		se s
Progression Factor		0.76	1.44	1.41	0.89					1.00	1.00	252.2
Incremental Delay, d2		6.6								31.0		
Delay (s)		30.4	38.0	64.2	11.4					64.1	46.1	· .
Level of Service		C	D			· .				Ē		-213
Approach Delay (s)		33.3	. –.	· · · · <del>-</del> ,	25.9			0.0			55.6	a New and
Approach LOS		C			C C			Ă				17.03
Intersection Summary			le server			(						
HCM Average Control D	elav	· ,	35.3	ł	ICM Lev	el of Se	rvice	20 - C	D	Contraction of Contraction		
HCM Volume to Capacit			0.94									
Actuated Cycle Length (			100.0		Sum of lo	ost time	(s)		.8.0	2.52		
Intersection Capacity Uti		1	38.0%			l of Ser			Н			
Analysis Period (min)	· · ·		15			· · ·						
c Critical Lane Group										<i></i>		

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#### 3: S 188th St & I-5 NB

Queues 2011 With-Project PM-Weekday

	٦	-+	-	•	3	*	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	371	1486	1033	1022	335	341	
v/c Ratio	0.91	0.66	0.63	0.93	0.93	0.88	
Control Delay	44.0	11.9	21.5	23.7	70.5	55.9	
Queue Delay	0.0	0.4	0.0	0.0	0.0	0.0	
Total Delay	44.0	12.3	21.5	23.7	70.5	55.9	
Queue Length 50th (ft)	188	238	249	222	218	187	
Queue Length 95th (ft)	m#221	m263	317	#624	#393	#357	
Internal Link Dist (ft)		410	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	408	2243	1638	1098	367	391	
Starvation Cap Reductn	0	281	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.91	0.76	0.63	0.93	0.91	0.87	

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

m Volume for 95th percentile queue is metered by upstream signal.

3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Weekday

	۶	-	7	۲	-	×.	1	k	•	*	/	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER	
Lane Configurations	۲	<b>††</b>			竹	۲			۲	M		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0		
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0,95		
Frt	1.00	1.00			1.00	0.85			1.00	0.92		
Fit Protected	0.95	1.00			1.00	1.00			0.95	0.98		
Satd. Flow (prot)	1641	3282			3406	1524			1531	1447		
Fit Permitted	0.16	1.00			1.00	1.00			0.95	0.98		
Satd. Flow (perm)	272	3282			3406	1524			1531	1447		
Volume (vph)	360	1441	0	0	1002	991	0	• 0	470	5	180	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
Adj. Flow (vph)	371	1486	0	0	1033	1022	Q	.0	485	5	186	
RTOR Reduction (vph)	0	0	0	0	0	365	0	0	0	43	0	
Lane Group Flow (vph)	371	1486	0	0	1033	657	0	0	335	298	0	
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%	
Turn Type	pm+pt					Perm			Split			
Protected Phases	5	2			6				4	4		
Permitted Phases	2					6.				÷		
Actuated Green, G (s)	67.3	67.3			47.0	47.0			22.7	22.7		
Effective Green, g (s)	68.3	68.3			48.0	48.0			23.7	23.7		
Actuated g/C Ratio	0.68	0.68			0.48	0.48			0.24	0.24		
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0		
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5		1.0
Lane Grp Cap (vph)	409	2242		1.05	1635	732			363	343	t space of	194 AN 1
v/s Ratio Prot	c0.15	0.45			0.30				c0.22	0.21		
v/s Ratio Perm	c0.47					0.43					1	S. 171
v/c Ratio	0.91	0.66			0.63	0.90			0.92	0.87		
Uniform Delay, d1	20.4	9.2			19.4	23.8			37.3	36.6		
Progression Factor	1.85	1.19			1.00	1.00			1.00	1.00		
Incremental Delay, d2	11.5	0.6			1.9				28.8	20.4		120
Delay (s) Level of Service	49.2 D	11.6 B			21.3 C	39.7			66.1	57.0 E		,
	U .	19.1			30.5	<b>D</b>	0.0		Ę			· "
Approach Delay (s) Approach LOS		19.1 B			30.5 C		0.0 A			61.5 E		and and
Approach LOS		D			<u>,</u>	a set i	<b>A</b>			<b></b>	1. A.	
Intersection Summary												
HCM Average Control D	elay		30.4	ंिं।	CM Lev	el of Se	rvice		Ç.	fel pro	- 222	
HCM Volume to Capacit			0.90									
Actuated Cycle Length (			100.0			ost time			8.0		1 76	10
Intersection Capacity Ut	ilization	1:	38.0%	lÒ	U Leve	el of Ser	vice		н			
Analysis Period (min)			15									114
c Critical Lane Group												

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HCM Unsignalized Intersection Capacity Analysis 2011 With-Project PM-Weekday

	Ť	۲	L.	Ļ	¥	t		
Movement	W0530260055900400302	NBR	SBL	SBT	SWL	SWR		
Lane Configurations	<b>↑</b> î→		ሻ	<b>††</b>	٦	۳		
Sign Control	Free			Free	Stop			
Grade	0%			0%	0%			
Volume (veh/h)	1975	11	11	1615	8	21		
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93		
Hourly flow rate (vph)	2124	12	12	1737	9	23		
Pedestrians								
Lane Width (ft)								
Walking Speed (ft/s)								
Percent Blockage								
Right turn flare (veh)					N			
Median type Median storage veh)					None			
Upstream signal (ft)				66				
oX, platoon unblocked				00	0.74			
C, conflicting volume			2135		3022	1068		
vC1, stage 1 conf vol			2100		3022	1000		
vC2, stage 2 conf vol								
Cu, unblocked vol			2135		3389	1068		
C, single (s)			4.3		7.3	7.4		
C, 2 stage (s)			4.0		7.0	1.4		
F (s)			2.3		3.7	3.5		
00 queue free %			95		0	88		
M capacity (veh/h)			224		3	184		
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3		SW 2	
/olume Total	1416	720	12	868	868	9	23	
Volume Left	0	0	12	000	000	9	0	
Volume Right	ŏ	12	0	ŏ	ŏ	ŏ	23	
SH	1700	1700	224	1700	1700	3	184	
olume to Capacity	0.83	0.42	0.05	0.51	0.51	3.35	0.12	
Queue Length 95th (ft)	0	0	4	0	0	Err	10	
Control Delay (s)	0.0	0.0	22.0	0.0	0.0	Err	27.3	
ane LOS			С			F	D	
Approach Delay (s)	0.0		0.1		1	2778.1		
Approach LOS						F		
ntersection Summary			1					
Average Delay			22.2	and an and a second period			1997 1997 1997 1997 1997 1997 1997 1997	and the second particular second s
ntersection Capacity Ut	lization		64.9%	IC	CU Leve	l of Ser	ce C	
Analysis Period (min)			15					

#### 5: S 200th St & Orillia Rd

#### Queues 2011 With-Project PM-Weekday

	-	4	×.	Ť	1	Ļ		
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT		
Lane Group Flow (vph)	10	326	1038	1295	405	1153		
v/c Ratio	0.07	0.84	0.80	0.82	0.86	0.54		
Control Delay	39.8	52.3	21.7	25.2	53.6	9.1		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Total Delay	39.8	52.3	21.7	25.2	53.6	9.1		
Queue Length 50th (ft)	5	153	184	271	101	130		
Queue Length 95th (ft)	21	#344	#377	#497	#209	261		
Internal Link Dist (ft)	36			266		3373		
Turn Bay Length (ft)								
Base Capacity (vph)	144	389	1301	1581	472	2151	· · ·	1
Starvation Cap Reductn	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	Ó	0	0		
Reduced v/c Ratio	0.07	0.84	0.80	0.82	0.86	0.54		1. 1. 1. 1.
Intersection Summarv								

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

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5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Weekday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		**	۲	<b>↑</b> î→		ኘካ	<b>↑</b> ⊅	
Ideal Flow (vphpi)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3444		3183	3280	
Flt Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3444		3183	3280	
Volume (vph)	5	5	0	310	0	986	0	1166	65	385	1091	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	326	0	1038	0	1227	68	405	1148	5
RTOR Reduction (vph)	0	0	0	0	0	163	0	5	0	0	0	0
Lane Group Flow (vph)	0	10	0	326	0	875	0	1290	0	405	1153	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm	,		Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		0.9		16.9		26.9		35.1		10.0	51.1	
Effective Green, g (s)		2.9		17.9		29.9		37.1		12.0	53.1	
Actuated g/C Ratio		0.03		0.21		0.35		0.43		0.14	0.62	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		63		365		1089		1487		445	2028	
v/s Ratio Prot				c0.19		c0.11		c0.37		0.13	0.35	
v/s Ratio Perm		0.01				0.20						
v/c Ratio		0.16		0.89		0.80		0.87		0.91	0.57	
Uniform Delay, d1		40.3		33.1		25.3		22.2		36.4	9.7	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.2		23.0		4.4		7.1		22.5	1.2	
Delay (s)		41.5		56.1		29.7		29.3		58.9	10.8	
Level of Service		D		E		С		C		E	В	
Approach Delay (s)		41.5			36.0	-		29.3		_	23.3	
Approach LOS		D			D			С			С	
Intersection Summary										000000000		
HCM Average Control D	alay	2010/01/01/01/01	29.3	COLUMN COLUMN		/el of Se			· c		180,000,000,000,000	
HCM Volume to Capacit			29.3		CW Lev	ver or Se	IVICE		C			
Actuated Cycle Length (			85.9	c	um of k	ost time	(0)		12.0			
Intersection Capacity Ut			83.0%			el of Ser			12.0 E			
Analysis Period (min)	nzau011		15		JU LEVE	0 38	100		2			
c Critical Lane Group			15									
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1: S 188th St & Millitary Rd

1: S 188th St & Millitary Rd

**← १** 6 • ۲ ¥ ≮ \_#  $\mathbf{i}$ Lane Group EBL EBT EBR WBL WBT WBR NBL NBR SWL2 SWL Lane Group Flow (vph) 111 960 26 33 564 191 32 216 295 252 v/c Ratio 0.35 0.58 0.03 0.26 0.52 0.32 0.24 0.68 0.61 0.46 Control Delay 23.7 7.5 41.2 42.2 26.8 38.0 21.4 7.2 45.8 44.1 Queue Delay 0.0 0.0 0.0 0.0 3.1 0.9 0.0 0.0 0.0 0.0 41.2 Total Delay 42.2 26.8 38.0 21.4 7.2 45.8 26.8 8.4 44.1 Queue Length 50th (ft) 18 104 112 57 234 0 14 162 28 81 Queue Length 95th (ft) 310 m46 165 72 46 173 123 178 112 16 Internal Link Dist (ft) 246 436 126 431 Turn Bay Length (ft) 319 192 122 90 Base Capacity (vph) 318 1658 756 127 1084 603 132 380 501 559 Starvation Cap Reductn 0 0 0 0 403 212 0 0 0 0 Spillback Cap Reductn 0 0 0 0 0 0 0 0 0 0 0 0 Storage Cap Reductn 0 0 0 0 0 0 0 0 Reduced v/c Ratio 0.59 0.45 0.35 0.58 0.03 0.26 0.83 0.49 0.24 0.57 Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized	Intersection Ca	apacity	Analysis
	2011 With-Pi	roject PN	I-Saturday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ኘ	<b>††</b>	*	۲	<u>†</u> †	۲	ኘ	Ĭ.		ሻሻ	ኘ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (prot)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1745	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (perm)	1787	3574	1599	1736	3471	1553	1770	1583		3467	1745	
Volume (vph)	105	912	25	31	536	181	30	150	55	280	180	60
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	111	960	26	33	564	191	32	158	58	295	189	63
RTOR Reduction (vph)	0	0	15	0	0	123	0	15	0	0	13	0
Lane Group Flow (vph)	111	960	11	33	564	68	32	201	0.	295	239	0
Heavy Vehicles (%)	1%	1%	1%	4%	4%	4%	2%	2%	2%	1%	1%	1%
Turn Type	Prot	· · ·	Perm	Prot		Perm	Prot			Prot		16
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2						1. S.
Actuated Green, G (s)	14.3	35.8	35.8	3.6	25.2	25.2	3.0	17.6		11.0	25.8	
Effective Green, g (s)	16.0	37.6	37.6	4.3	25.9	25.9	4.7	19.5		12.6	27.4	
Actuated g/C Ratio	0.18	0.42	0.42	0.05	0.29	0.29	0.05	0.22		0.14	0.30	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9	-	5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	1493	668	83	999	447	92	343		485	531	and the second s
v/s Ratio Prot	c0.06	c0.27	, , , , ,	0.02	0.16		0.02	c0.13		c0.09	0.14	
v/s Ratio Perm			0.01	1911	· .	0.04	۰. <u>ب</u>					
v/c Ratio	0.35	0.64	0.02	0.40	0.56	0.15	0.35	0.59		0.61	0.45	
Uniform Delay, d1	32.4	20.9	15.4	41.6	27.3	23.9	41.2	31.6		36.4	25.2	
Progression Factor	1.00	1.00	1.00	1.02	0.85	1.20	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	2.1	0.0	3.0	2.3	0.7	2.3	2.6		2.2	0.6	14 A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.
Delay (s)	35.4	23.0	15.4	45.5	25.5	29.3	43.4	34.2		38.5	25.8	
Level of Service	D	C	. B	D	C	C	D	C	5 1 1	Ď	C	ba pri
Approach Delay (s)		24.1			27.2		35.4				32.7	
Approach LOS		C		1.10	C	20.0	D	t de la			C	
Intersection Summary												
HCM Average Control D			27.8	- îr îr Ĥ	ICM Le	el of Se	rvice	걸었다.	C		1 - A.Y	
HCM Volume to Capacit	y ratio		0.61									
Actuated Cycle Length (	s)		90.0			ost time			16.0			
Intersection Capacity Ut	ilization		60.5%	10	CU Leve	of Ser	vice		В			
Analysis Period (min)			15									1.1.1
c Critical Lane Group												

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Queues

2011 With-Project PM-Saturday

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#### 2: S 188th St & I-5 SB

Queues 2011 With-Project PM-Saturday

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Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	648	615	107	727	121	114	
v/c Ratio	0.28	0.49	0.20	0.27	0.55	0.47	
Control Delay	4.3	2.2	6.2	6.2	44.9	28.8	
Queue Delay	0.3	0.5	0.0	0.0	0.0	0.0	
Total Delay	4.6	2.8	6.2	6.2	44.9	28.8	
Queue Length 50th (ft)	45	10	24	113	68	40	
Queue Length 95th (ft)	17	21	m0	146	118	89	
nternal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	2300	1244	559	2697	498	505	
Starvation Cap Reductn	1006	270	0	0	0	0	
Spillback Cap Reductn	0	0	0	398	0	5	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.50	0.63	0.19	0.32	0.24	0.23	

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations		<u>†</u> †	*	۲	<u>^</u>					ĥ	\$
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95
Frt		1.00	0.85	1.00	1.00					1.00	0.94
Fit Protected		1.00	1.00	0.95	1.00					0,95	0.97
Satd. Flow (prot)		3539	1583	1752	3505					1545	1482
Fit Permitted		1.00	1.00	0.36	1.00					0.95	0.97
Satd. Flow (perm)		3539	1583	656	3505					1545	1482
Volume (vph)	0	622	590	103	698	. 0	0	0	0	180	0
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	648	615	107	727	0	0	0	0	188	. 0.
RTOR Reduction (vph)	0	0	222	0	0	0	0	0	0	0	35
Lane Group Flow (vph)	0	648	393	107	727	.0	0		0	121	79
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	11%	11%
Turn Type			Perm	pm+pt	57				,	Perm	240

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Adj. Flow (vpil)		040	010	107	121	<b>U</b> .			<b>v</b> ,	100		
RTOR Reduction (vph)	0	0	222	0	0	0	0	0	0	0	35	0
Lane Group Flow (vph)	0	648	393	107	727	0	0	. 0	0	121	79	. 0
Heavy Vehicles (%)	2%	2%	2%	3%	3%	3%	0%	0%	0%	11%	11%	11%
Turn Type			Perm	pm+pt	57	- 47		,,		Perm	1.0400	la l
Protected Phases		2		1	6						8	
Permitted Phases			2	6	,					. 8	28.9	
Actuated Green, G (s)		56.5	56.5	68.3	68.3					11.7	11.7	
Effective Green, g (s)		57.5	57.5	69.3	69.3			See.		12.7	12.7	
Actuated g/C Ratio		0.64	0.64	0.77	0.77					0.14	0.14	
Clearance Time (s)		5.0	5.0	5.0	5.0	1.19				5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		2261	1011	600	2699	ting i	1.100	18,00	1.1	218	209	
v/s Ratio Prot		0.18		0.02	c0.21							
v/s Ratio Perm			c0.25	0.12		· · .				c0.08	0.05	
v/c Ratio		0.29	0.39	0.18	0.27					0.56	0.38	
Uniform Delay, d1		7.2	7.8		3.0					36.0	35.1	. 11 A.
Progression Factor		0.50	1.12	1.73	1.76					1.00	1.00	
Incremental Delay, d2		0.3	0.9	0.1						3.0	୍ ୁ ଅଂମ୍	4,1
Delay (s)		3.8	9.6	5.2	5.5					39.1	36.2	
Level of Service		A	· A	A	Α.		<ul> <li></li> </ul>			D	D	
Approach Delay (s)		6.7			5.5			0.0			37.7	
Approach LOS		A			A			A			D	
Intersection Summary			a section of					and the second	200			
HCM Average Control De	lav		9.4	······································	ICM Lev	el of Sen	vice		A	1-25-27		5 3
HCM Volume to Capacity			0.41		2 N. 17 N. 17 N.	94.5° 1808747						
Actuated Cycle Length (s)			90.0		Sum of lo	st time (s	s).		12.0	e ger e s	21.	6. C.J.
Intersection Capacity Utili			58.6%		CU Level				В			
Analysis Period (min)			15		40.	2.14				1.1	and the second	5
c Critical Lane Group												

c Critical Lane Group

2: S 188th St & I-5 SB

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HCM Signalized Intersection Capacity Analysis \_\_\_\_\_2011 With-Project PM-Saturday

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3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Saturday

# Queues 2011 With-Project PM-Saturday

	3:	S	188th	St &	I-5 NB	
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Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	328	556	415	295	274	261	
v/c Ratio	0.57	0.24	0.25	0.33	0.72	0.65	
Control Delay	14.1	5.8	15.9	3.7	42.1	33.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	14.1	5.8	15.9	3.7	42.1	33.0	
Queue Length 50th (ft)	65	38	66	0	151	117	
Queue Length 95th (ft)	187	112	134	55	216	182	
Internal Link Dist (ft)		410	9			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	734	2342	1677	900	537	543	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.45	0.24	0.25	0.33	0.51	0.48	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SB <u>R</u>	NEL2	NEL	NER
Lane Configurations	ľ	<b>^</b>			<b>††</b>	1			ሻ	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900 :	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0.95	a second
Frt	1.00	1.00			1.00	0.85			1.00	0.94	
Fit Protected	0.95	1.00			1.00	1.00			0.95	0,97	
Satd. Flow (prot)	1719	3438			3406	1524			1665	1595	
Fit Permitted	0.44	1.00			1.00	1.00			0.95	0.97	
Satd. Flow (perm)	801	3438			3406	1524			1665	1595	
Volume (vph)	305	517	0	0	386	274	0	0	390	5	103
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	328	556	0	0	415	295	0	0	419	5	111
RTOR Reduction (vph)	0	0	0	0	0	150	Ó	0	0	34	0
Lane Group Flow (vph)	328	556	0	0	415	145	0	0	274	227	0
Heavy Vehicles (%)	5%	5%	5%	6%	6%	6%	0%	0%	3%	3%	3%
Turn Type	pm+pt					Perm			Split	,	
Protected Phases	5	2			6				. 4	4	
Permitted Phases	2					6					
Actuated Green, G (s)	60.3	60.3			43.3	43.3			19.7	19.7	
Effective Green, g (s)	61,3	61.3			44.3	44.3			20.7	20.7	and the second
Actuated g/C Ratio	0.68	0.68			0.49	0.49			0.23	0.23	
Clearance Time (s)	5.0	5.0			5.0	5.0		· .	5.0	5.0	
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	678	2342			1677	750	·		383	367	1997 - 1982 - 19
v/s Ratio Prot	c0.07	0.16			0.12				c0.16	0.14	
v/s Ratio Perm	c0.26					0.10					
v/c Ratio	0.48	0.24			0.25	0.19			0.72	0.62	
Uniform Delay, d1	6.0	5.5			13.2	12.8			31.9	31.1	
Progression Factor	1.51	0.90			1.00	1.00			1.00	1.00	
Incremental Delay, d2	0.4	0.2			0.4	0.6			6,5	3.3	
Delay (s)	9.4	5.2			13.6	13.4			38.4	34.4	
Level of Service	А	А			B	·B			· D	C	
Approach Delay (s)		6.8			13.5		0.0			36.4	
Approach LOS		А			- <b>B</b>		Α			D	and the states
Intersection Summary											
HCM Average Control E			16.5	· H	CM Lev	vel of Se	rvice	- 4	В		and the first of the
HCM Volume to Capaci			0.54								
Actuated Cycle Length (			90.0	S	um of lo	ost time	(s) ·		8.0		1. 1. 1.
Intersection Capacity Ut	tilization		58.6%	10	CU Leve	el of Ser	vice		В		
Analysis Period (min)			15			1.21.2		é p		81	die soe
c Critical Lane Group											

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HCM Unsignalized Intersection Capacity Analysis 2011 With-Project PM-Saturday

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Movement	NBT	NBR	SBL	SBT	SWL	SWR			
Lane Configurations	<b>↑</b> ⊅		ሻ	<u>†</u> †	ሻ	۴			
Sign Control	Free			Free	Stop				
Grade	0%			0%	0%				
Volume (veh/h)	560	35	73	535	22	80			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94			
Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage Right turn flare (veh)	596	37	78	569	23	85			
Median type Median storage veh)					None				
Upstream signal (ft)				89					
pX, platoon unblocked					0.95				
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol			633		1054	316			
vCu, unblocked vol			633		1001	316			
C, single (s) C, 2 stage (s)			4.2		6.9	7.0			
tF (s)			2.3		3.6	3.4			
p0 queue free %			91		88	87			
cM capacity (veh/h)			913		201	668			
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2		
Volume Total	397	236	78	285	285	23	85		
Volume Left	0	0	78	0	0	23	0		
Volume Right	0	37	0	0	0	0	85		
cSH	1700	1700	913	1700	1700	201	668		
Volume to Capacity	0.23	0.14	0.09	0.17	0.17	0.12	0.13		
Queue Length 95th (ft)	0	0	7	0	0	10	11		
Control Delay (s)	0.0	0.0	9.3	0.0	0.0	25.2	11.2		
Lane LOS			Α			D	В		
Approach Delay (s) Approach LOS	0.0		1.1			14.2 В			
Intersection Summary	AN COMPLET					and the second			
Average Delay Intersection Capacity Ut Analysis Period (min)	ilization		1.6 <b>34.0%</b> 15	10	CU Leve	el of Ser	vice	A	

	-	1	×.	4	t	5	Ŧ			
Lane Group	EBT	WBL	WBR	NBL	NBT	SBL	SBT			
Lane Group Flow (vph)	10	121	222	5	607	210	481			
v/c Ratio	0.06	0.47	0.21	0.03	0.33	0.41	0.20			
Control Delay	28.6	35.9	3.3	36.4	12.3	31.5	6.7			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	· · · ·		
Total Delay	28.6	35.9	3.3	36.4	12.3	31.5	6.7			
Queue Length 50th (ft)	2	49	O.	2	74	42	26			1.1
Queue Length 95th (ft)	18	114	25	13	166	90	122			
nternal Link Dist (ft)	36				266		3376			
Turn Bay Length (ft)										
Base Capacity (vph)	219	339	1049	212	1822	587	2459			
Starvation Cap Reductn	0	0	0	0	0	0	0			
Spillback Cap Reductn	0	0	0	.0	0	0	0			
Storage Cap Reductn	0	0	0	0	0	0	0			
Reduced v/c Ratio	0.05	0.36	0.21	0.02	0.33	0.36	0.20			

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5: S 200th St & Orillia Rd

Queues

# 5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2011 With-Project PM-Saturday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		٦		**	۲	<b>≜</b> ⊅		ኘ	<b>↑</b> î→	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88	1.00	0.95		0.97	0.95	
Frt		0.93		1.00		0.85	1.00	0.98		1.00	1.00	
Fit Protected		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1772		1752		2760	1752	3424		3273	3374	
Flt Permitted		1.00		0.95		1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1772		1752		2760	1752	3424		3273	3374	
Volume (vph)	. 0	5	5	110	0	202	5	468	85	191	438	0
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	5	5	121	0	222	5	514	93	210	481	0
RTOR Reduction (vph)	0	5	0	0	0	167	0	13	0	0	0	0
Lane Group Flow (vph)	0	5	0	121	0	55	5	594	0	210	481	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	3%	3%	3%	7%	7%	7%
Turn Type	Perm			Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		1.1		8.4		17.7	1.1	41.1		9.3	49.3	
Effective Green, g (s)		3.1		9.4		20.7	3.1	43.1		11.3	51.3	
Actuated g/C Ratio		0.04		0.11		0.25	0.04	0.52		0.14	0.62	
Clearance Time (s)		6.0		5.0		6.0	6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		66		199		822	66	1780		446	2088	
v/s Ratio Prot		c0.00		c0.07		0.01	0.00	c0.17		c0.06	0.14	
v/s Ratio Perm						0.01						
v/c Ratio		0.08		0.61		0.07	0.08	0.33		0.47	0.23	
Uniform Delay, d1		38.5		35.0		23.7	38.5	11.6		33.0	7.0	
Progression Factor		1.00		1.00		1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.5		5.2		0.0	0.5	0.5		0.8	0.3	
Delay (s)		39.0		40.2		23.8	39.0	12.1		33.8	7.3	
Level of Service		D		D		С	D	В		С	А	
Approach Delay (s)		39.0			29.6			12.3			15.3	
Approach LOS		D			С			в			в	
Intersection Summary				4-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1								
HCM Average Control D	elay		17.3	H	ICM Lev	el of Se	ervice		В			
HCM Volume to Capacit	y ratio		0.38									
Actuated Cycle Length (	s)		82.9	S	um of lo	ost time	(s)		16.0			
Intersection Capacity Ut	ilization		43.9%	10	CU Leve	l of Ser	vice		А			
Analysis Period (min)			15									
c Critical Lane Group												

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1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2030 Baseline PM-Weeday

#### Queues -Weeday

				_	2030	Baseline	PM-Weeday
4	┥	٤	•	۲	6	¥	
WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
71	000	342	21	104	677	526	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	128	1571	31	71	898	342	31	194	577	536	
v/c Ratio	0.51	0.99	0.04	0.78	0.72	0.52	0.32	0.80	0.83	0.91	
Control Delay	56.1	54.0	10.6	111.4	17.2	7.8	63.6	70.6	57.3	59.0	
Queue Delay	0.0	19.4	0.0	0.0	6.4	3.2	0.0	0.0	42.4	0.0	
Total Delay	56.1	73.4	10.6	111.4	23.5	11.0	63.6	70.6	99.6	59.0	
Queue Length 50th (ft)	94	622	5	52	181	83	24	141	223	406	
Queue Length 95th (ft)	159	#802	24	m#110	m314	m139	57	#252	#308	#644	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	249	1581	717	91	1255	661	97	257	695	589	
Starvation Cap Reductn	0	0	0	0	304	220	0	0	0	0	
Spillback Cap Reductn	0	92	0	0	0	0	0	0	160	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.51	1.06	0.04	0.78	0.94	0.78	0.32	0.75	1.08	0.91	
		2472344655494.0645	00000000000000	80/755333559255	SAMENTI GARGAN	si a si			NIGANAGINAS	E E E E E E E E E E E E E E E E E E E	

Intersection Summary

1: S 188th St & Millitary Rd

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# 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	٦	<u>^</u>	*	۲	<b>^†</b>	۲	``ĭ	K.		ሻካ	- ¥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1,00	0.95	1.00		0.95	0.96	
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Volume (vph)	125	1540	30	70	880	335	30	165	25	565	395	130
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	128	1571	31	71	898	342	31	168	26	577	403	133
RTOR Reduction (vph)	0	0	10	0	0	103	0	5	0	0	9	0
Lane Group Flow (vph)	128	1571	21	71	898	239	31	189	0	577	527	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot		Perm	Prot	r	Perm	Prot	· · · · ·	· ·	Prot		1.1
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			2						
Actuated Green, G (s)	15.5	50.6	50.6	5.6	40.8	40.8	3.0	16.6		25.2	39.0	
Effective Green, g (s)	17.2	52.4	52.4	6.3	41.5	41.5	4.7	18.5		26.8	40.6	
Actuated g/C Ratio	0.14	0.44	0.44	0.05	0.35	0.35	0.04	0.15		0.22	0.34	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	1516	678	90	1189	532	68	239	* 12	759	579	Street of
v/s Ratio Prot	0.07	c0.45		c0.04	0.26		0.02	c0.12		0.17	c0.31	
v/s Ratio Perm			0.01			0.16						
v/c Ratio	0.51	1.04	0.03	0.79	0.76	0.45	0.46	0.79		0.76	0.91	1
Uniform Delay, d1	47.5	33.8	19.3	56.2	34.8	30.4	56.4	48.9		43.6	37.9	
Progression Factor	1.00	1.00	1.00	1.32	0.44	0.35	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.4	33.1	0.1	28.6	3.5	2.1	4.8	16.2		4.5	18.2	11 1
Delay (s)	54.9	66.9	19.4	102.7	18.6	12.9	61.2	65.0		48.1	56.1	
Level of Service	D	E	В	F	В	B	Ē	E		- <sup>15</sup> D	E	
Approach Delay (s)		65.1			21.7		64.5				52.0	1.000
Approach LOS		É			C		Ę				, D,	
Intersection Summary									an a			
HCM Average Control D			48.7	H	CM Lev	el of Se	rvice		D	2.47		Y
HCM Volume to Capacity	y ratio		0.97									
Actuated Cycle Length (s	5)		120.0	S	um of lo	ost time	(s)		16.0			
Intersection Capacity Uti	lization		94.1%	10	CU Leve	of Ser	vice		F			
Analysis Period (min)			15									
c Critical Lane Group												

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#### 2: S 188th St & I-5 SB

Queues 2030 Baseline PM-Weeday

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Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1268	809	490	1299	538	483	
v/c Ratio	1.06	0.87	1.14	0.64	1.12	1.01	
Control Delay	59.9	12.2	118.7	5.7	116.3	82.9	
Queue Delay	201.1	84.3	0.0	1.8	0.0	0.0	
Total Delay	261.0	96.4	118.7	7.5	116.3	82.9	
Queue Length 50th (ft)	~560	104	~400	80	~505	~395	
Queue Length 95th (ft) r	n#603	m259	m#522	m132	#732	#634	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1192	934	429	2044	480	480	
Starvation Cap Reductn	358	251	0	314	0	0	
Spillback Cap Reductn	0	0	0	543	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.52	1.18	1.14	0.87	1.12	1.01	

Intersection Summary

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

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

## 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2030 Baseline PM-Weeday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>††</b>	7	۲	<b>^</b>					ሻ	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	0.95					0.95	0.95	
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Fit Protected		1.00	1.00	0.95	1.00					0.95	0,95	
Satd. Flow (prot)		3406	1524	1703	3406					1441	1438	
Fit Permitted		1.00	1.00	0.09	1.00					0.95	0.95	
Satd. Flow (perm)		3406	1524	156	3406					1441	1438	
Volume (vph)	0	1230	785	475	1260		0	. 0	0	970	0	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1268	809	490	1299	0	0	0	0	1000	0	21
RTOR Reduction (vph)	0	0	400	0	0	0	0	0	0	0	1	0
Lane Group Flow (vph)	0	1268	409	490	1299	.0	0	0	0	538	482	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type		,	Perm	pm+pt			<i>'</i>			Perm	1 g. A.	,
Protected Phases		2		1	6						8	
Permitted Phases			2	6						8		11.3
Actuated Green, G (s)		41.0	41.0	71.0	71.0					39.0	39.0	, . ,
Effective Green, g (s)		42.0	42.0	72.0	72.0					40.0	40.0	
Actuated g/C Ratio		0.35	0.35	0.60	0.60					0.33	0.33	
Clearance Time (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1192	533	429	2044			× • • •	10.00	480	479	, in
v/s Ratio Prot		0.37	000	c0.25	0.38					,	-,	
v/s Ratio Perm		0.07	0.27	c0.44	0.00					c0.37	0.33	
v/c Ratio		1.06	0.77	1.14	0.64			, .		1.12	1.01	
Uniform Delay, d1		39.0	34.6	38.5	15.5		-			40.0	40.0	
Progression Factor		0.59	0.92	1.31	0.32					1.00	1.00	
Incremental Delay, d2		35.4	3.5	77.0	0.7					78.5	42.5	
Delay (s)		58.4	35.3	127.6	5.6				~	118.5	82.5	14.14
Level of Service		50.4 E	D.0	127.0 F	A.					F	- F	
Approach Delay (s)		49.4	,D	'	39.1			0.0		,	101.5	
Approach LOS		43.4 D			D			. A			F	
Intersection Summary				C. A. Martin	and the second				New States		1000	
HCM Average Control D		,'	56.5		ICM Lev	el of Se	ervice	1	. E			
HCM Volume to Capacit			1.12						-			
Actuated Cycle Length (			120.0	S	um of lo	ost time	(s)		8.0			
Intersection Capacity Uti		1	67.4%		CU Leve				H			
Analysis Period (min)			15		;	1 11 1 11				· 14.,		12.
c Critical Lane Group											,	

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#### 3: S 188th St & I-5 NB

Queues 2030 Baseline PM-Weeday

→ ← < 1 ۶ ٦ EBL EBT WBT WBR NEL2 NEL Lane Group Lane Group Flow (vph) 448 1794 1247 1232 415 400 v/c Ratio 1.16 0.79 0.76 1.12 1.07 1.14 Control Delay 10.1 92.5 126.1 106.5 108.0 29.0 Queue Delay 0.0 3.9 0.0 0.0 0.0 0.0 Total Delay 108.0 14.0 29.0 92.5 126.1 106.5 Queue Length 50th (ft) ~326 234 403 ~841 ~390 ~340 Queue Length 95th (ft) m#284 m220 492 #1105 #601 #550 Internal Link Dist (ft) 410 232 1 Turn Bay Length (ft) 170 Base Capacity (vph) 385 2270 1646 1076 370 374 Starvation Cap Reductn 0 389 0 0 0 0 Spillback Cap Reductn 0 0 0 0 0 0 Storage Cap Reductn 0 0 0 0 0 0 Reduced v/c Ratio 1.16 0.95 0.76 1.14 1.12 1.07

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

m' Volume for 95th percentile queue is metered by upstream signal.

3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2030 Baseline PM-Weeday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	ሻ	<u>††</u>			<b>††</b>	1			٣	M	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	1.00		1. A.	0.95	0.95	1.2. 1.4
Frt	1.00	1.00			1.00	0.85			1.00	0.92	
Fit Protected	0,95	1.00			1.00	1.00	1 - N		0.95	0.98	Star Barrier
Satd. Flow (prot)	1641	3282			3406	1524			1531	1445	
Flt Permitted	0.11	1.00			1.00	1.00			0.95	0.98	· ·
Satd. Flow (perm)	190	3282			3406	1524			1531	1445	
Volume (vph)	435	1740	-0	0	1210	1195	0.	0	570	5	215
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	448	1794	0	0	1247	1232	0	.0	588	5	222
RTOR Reduction (vph)	0	0	0	0	0	339	0	0	0	25	0
Lane Group Flow (vph)	448	1794	0	0	1247	893	0	0	415	375	0
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%
Turn Type	pm+pt					Perm		. M	Split		lage they
Protected Phases	5	2			6				4	4	
Permitted Phases	2					6					
Actuated Green, G (s)	82.0	82.0			57.0	57.0			28.0	28.0	
Effective Green, g (s)	83.0	83.0			58.0	58.0			29.0	29,0	
Actuated g/C Ratio	0.69	0.69			0.48	0.48			0.24	0.24	
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0	
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	385	2270			1646	737			370	349	
v/s Ratio Prot	c0.20	0.55			0.37				c0.27	0.26	
v/s Ratio Perm	0.60					c0.59				18 M	
v/c Ratio	1.16	0.79			0.76	1.21			1.12	1.07	
Uniform Delay, d1	34.4	12.6			25.3	31.0			45.5	45.5	
Progression Factor	0.83	0.75			1.00	1.00			1.00	1.00	
Incremental Delay, d2	76.5	0.3			3.3	107.7			84.0	69.4	a National States
Delay (s)	105.0	9.7			28.6	138.7			129.5	114.9	
Level of Service	F	А			· C	F			F	F	1 Carlo Carlo
Approach Delay (s)		28.8			83.3		0.0			122.3	
Approach LOS		С			F	· *.	A			F	
Intersection Summary							an a				
HCM Average Control E	elay	,	67.0	H	ICM Lev	el of Se	rvice		E	. X -	the testing of the test
HCM Volume to Capacit			1.14								
Actuated Cycle Length (			120.0	s	um of l	ost time	(s)		8.0		1. 24
Intersection Capacity Ut		10	57.4%			el of Ser			н		
Analysis Period (min)			15								
c Critical Lane Group											,

c Critical Lane Group

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## HCM Unsignalized Intersection Capacity Analysis 2030 Baseline PM-Weeday

	Ť	۲	4	Ļ	4	ŧ٧				
Movement	NBT	NBR	SBL	SBT	SWL	SWR			AL STOL	
Lane Configurations	<b>≜</b> †⊅		۲	<u>†</u> †	۲	ť				
Sign Control	Free			Free	Stop	-				
Grade	0%			0%	0%					
Volume (veh/h)	2385	9	15	1950	7	18				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s)	2565	10	16	2097	8	19				
Percent Blockage Right turn flare (veh) Median type Median storage veh)					None					
Upstream signal (ft)				66						
pX, platoon unblocked				00	0.62					
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol			2574		3650	1287				
vCu, unblocked vol			2574		4657	1287				
tC, single (s) tC, 2 stage (s)			4.3		7.3	7.4				
tF (s)			2.3		3.7	3.5				
p0 queue free %			89		0	85				
cM capacity (veh/h)			147		ŏ	128				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3		SW 2	10235638		
Volume Total	1710	865	16	1048	1048	8	19			000000000000000000000000000000000000000
Volume Left	0	0	16	0	0	8	0			
Volume Right	ő	10	0	ŏ	ŏ	ŏ	19			
cSH	1700	1700	147	1700	1700	õ	128			
Volume to Capacity	1.01	0.51	0.11	0.62	0.62	35.66	0.15			
Queue Length 95th (ft)	0	0.01	9	0.02	0.02	Err	13			
Control Delay (s)	0.0	0.0	32.4	0.0	0.0	Err	38.0			
Lane LOS	0.0	0.0	D	0.0	0.0	F	E			
Approach Delay (s) Approach LOS	0.0		0.2			2827.1 F	_			
Intersection Summary			and the second							
Average Delay Intersection Capacity Ut Analysis Period (min)	ilization		16.2 76.2% 15	10	CU Lev	el of Sei	rvice	D		

#### 5: S 200th St & Orillia Rd

#### Queues 2030 Baseline PM-Weeday

	+	•	•	Ť	1	ţ	
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT	
Lane Group Flow (vph)	10	395	1247	1558	489	1394	
v/c Ratio	0.10	0.98	0.95	0.96	0.85	0.62	ビー・ション 二部 二部 とうけつみ
Control Delay	60.9	85.8	43.4	46.0	62.7	12.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	60.9	85.8	43.4	46.0	62.7	12.4	
Queue Length 50th (ft)	7	301	455	580	188	266	
Queue Length 95th (ft)	27	#563	#728	#880	#309	437	
Internal Link Dist (ft)	36			266		3373	
Turn Bay Length (ft)					. ,	1.11	
Base Capacity (vph)	100	405	1319	1624	578	2248	
Starvation Cap Reductn	0	Ó	0	0	0	0	
Spillback Cap Reductn	0	0	. 0	0	. 0	0	
Storage Cap Reductn	0	0	0	0	0	Ó	
Reduced v/c Ratio	0.10	0.98	0.95	0.96	0.85	0.62	Ref. 1. A. Strander
Intersection Summary				and the second		and the second	

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

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# 5: S 200th St & Orillia Rd

HCM Signalized Intersection Capacity Analysis 2030 Baseline PM-Weeday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		11	٦	<b>↑</b> ⊅		ሻሻ	<b>†</b> Þ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3445		3183	3280	
Fit Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3445		3183	3280	
Volume (vph)	5	5	0	375	0	1185	0	1405	75	465	1320	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	395	0	1247	0	1479	79	489	1389	5
RTOR Reduction (vph)	0	0	0	0	0	96	0	3	0	0	0	0
Lane Group Flow (vph)	0	10	0	395	0	1151	0	1555	0	489	1394	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm			Prot	C	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		0.9		27.0		47.0		55.1		20.0	81.1	
Effective Green, g (s)		2.9		28.0		50.0		57.1		22.0	83.1	
Actuated g/C Ratio		0.02		0.22		0.40		0.45		0.17	0.66	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		43	-	389		1183		1561		556	2163	
v/s Ratio Prot		10		0.23		c0.17		c0.45		0.15	0.42	
v/s Ratio Perm		0.01		0.20		0.25		00.40		0.10	0.42	
v/c Ratio		0.23		1.02		0.97		1.00		0.88	0.64	
Uniform Delay, d1		60.5		49.0		37.3		34.3		50.7	12.7	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		2.8		49.6		19.8		21.9		14.7	1.5	
Delay (s)		63.2		98.6		57.2		56.3		65.4	14.2	
Level of Service		E		50.0 F		E		50.0 E		60.4 E	14.2 B	
Approach Delay (s)		63.2			67.1	-		56.3		-	27.5	
Approach LOS		63.2 E			E			50.5 E			27.5 C	
Intersection Summary							100000000	10234065				
HCM Average Control D	elav	min-18003350639963	49.2	H	CM Lev	el of Se	rvice		D			2010/01/02/2010/2
HCM Volume to Capacit			0.97			0.0100			5			
Actuated Cycle Length (			126.0	S	um of h	ost time	(s)		12.0			
Intersection Capacity Ut			96.8%			of Ser	<b>··</b>		720 F			
Analysis Period (min)	Lation		15			. 51 081						
c Critical Lane Group			.0									

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HCM Signalized Intersection Capacity Analysis 2030 With-Project PM-Weeday

1: S 188th St & Millitary Rd

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	128	1572	31	72	900	343	31	195	577	536	
v/c Ratio	0.51	1.00	0.04	0.78	0.72	0.52	0.32	0.80	0.83	0.91	
Control Delay	56.1	54.6	10.7	111.0	17.3	7.8	63.6	70.8	57.4	59.0	
Queue Delay	0.0	19.7	0.0	0.0	6.5	3.2	0.0	0.0	44.7	0.0	
Total Delay	56.1	74.3	10.7	111.0	23.8	11.0	63.6	70.8	102.0	59.0	
Queue Length 50th (ft)	94	624	5	53	182	83	24	142	223	406	
Queue Length 95th (ft)	159	#804	24	m#111	m315	m140	57	#255	#308	#644	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	249	1578	716	92	1255	661	97	257	694	589	
Starvation Cap Reductn	0	0	0	0	304	220	0	0	0	0	
Spillback Cap Reductn	0	91	0	0	0	0	0	0	162	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.51	1.06	0.04	0.78	0.95	0.78	0.32	0.76	1.08	0.91	

# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

	_#	-	$\mathbf{r}$	4	←	۲	•	۲	1	4	¥	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	٦	<b>^</b>	7	ኘ	<u>†</u> †	۴	ሻ	r.		ሻሻ	۳	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Volume (vph)	125	1541	30	71	882	336	30	165	26	565	395	130
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	128	1572	31	72	900	343	31	168	27	577	403	133
RTOR Reduction (vph)	0	0	10	0	0	103	0	5	0	0	9	0
Lane Group Flow (vph)	128	1572	21	72	900	240	31	190	0	577	527	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases		· ·	6		-	2				•		
Actuated Green, G (s)	15.5	50.5	50.5	5.7	40.8	40.8	3.0	16.6		25.2	39.0	
Effective Green, g (s)	17.2	52.3	52.3	6.4	41.5	41.5	4.7	18.5		26.8	40.6	
Actuated g/C Ratio	0.14	0.44	0.44	0.05	0.35	0.35	0.04	0.15		0.22	0.34	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	1513	677	92	1189	532	68	239		759	579	• . • •
v/s Ratio Prot	0.07	c0.45	0//	c0.04	0.26	002	0.02	c0.12		0.17	c0.31	
v/s Ratio Perm	0.07	00.40	0.01	0.04	0.20	0.16	0.02	00.12		0.17	00.01	
v/c Ratio	0.51	1.04	0.03	0.78	0.76	0.45	0.46	0.79		0.76	0.91	
Uniform Delay, d1	47.5	33.8	19.4	56.1	34.8	30.4	56.4	48.9		43.6	37.9	
Progression Factor	1.00	1.00	1.00	1.32	0.44	0.35	1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.4	33.9	0.1	27.3	3.5	2.1	4.8	16.5		4.5	18.2	
Delay (s)	54.9	67.8	19.4	101.2	18.7	12.9	61.2	65.4		48.1	56.1	
Level of Service	D	07.0 E	13.4 B	101.2 F	B	B	E.	E		-40.1	E	
Approach Delay (s)	. 0	66.0	D	Г	21.7	D,	64.8	, : <b>G</b>		Ņ	52.0	3 C - 1
Approach LOS		-00.0 E			21.7 C		04.0 E				2	
		E					, ⊑				uD,	stur.
Intersection Summary	34932 (0)	die e	er stander		1 States					A STATE OF		
HCM Average Control D	elay		49.1	Ĥ	ICM Le	vel of Se	rvice	-77	D		1.1.1.1	
HCM Volume to Capacit			0.97									
Actuated Cycle Length (	s)		120.0	· · S	um of l	ost time	(s)		16.0			Sec. 6
Intersection Capacity Uti	lization		94.1%	10	CU Leve	el of Ser	vice		F			
Analysis Period (min)			15			10.0	· · ·					
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Queues 2030 With-Project PM-Weeday

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Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1270	809	493	1303	539	484	
v/c Ratio	1.07	0.87	1.15	0.64	1.12	1.01	
Control Delay	60.5	12.1	121.1	5.8	117.0	83.4	
Queue Delay	201.6	85.0	0.0	1.9	0.0	0.0	
Total Delay	262.0	97.1	121.1	7.6	117.0	83.4	
Queue Length 50th (ft)	~561	97	~405	81	~507	~397	
Queue Length 95th (ft)	m#603	m247	m#527	m135	#734	#636	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1192	933	429	2044	480	480	
Starvation Cap Reductn	358	251	0	315	0	0	
Spillback Cap Reductn	0	0	0	546	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.52	1.19	1.15	0.87	1.12	1.01	

#### Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.

#### 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2030 With-Project PM-Weeday

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Movement	EBL		EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	1	ሻ	<u>^</u>					ኘ	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	0.95	a de tar				0.95	0,95	eg Starley
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Flt Protected		1.00	1.00	0.95	1.00					0.95	0.95	
Satd. Flow (prot)		3406	1524	1703	3406					1441	1438	
Flt Permitted		1.00	1.00	0.09	1.00					0.95	0.95	
Satd. Flow (perm)		3406	1524	156	3406					1441	1438	
Volume (vph)	0	1232	785	478	1264	. 0	0 -	0	· 0	972	0	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1270	809	493	1303	0	0	0	: 0	1002	0	21
RTOR Reduction (vph)	Ó	0	400	0	0	Ó	Ó	Ó	Ő	0	1	0
Lane Group Flow (vph)	Ó	1270	409	493	1303	0	0	0	0	539	483	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type	,			pm+pt						Perm		:
Protected Phases		2		1	6						8	
Permitted Phases			2	6	Ū					8		
Actuated Green, G (s)		41.0	41.0	71.0	71.0					39.0	39.0	
Effective Green, g (s)		42.0	42.0	72.0	72.0					40.0	40.0	
Actuated g/C Ratio		0.35	0.35	0.60	0.60					0.33	0.33	
Clearance Time (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1192	533	429	2044	~			2.2	480	479	
v/s Ratio Prot		0.37	000	c0.25	0.38					-0,0	470	
v/s Ratio Perm		0.07	0.27	c0.44	0.00					c0.37	0.34	2.1
v/c Ratio		1.07	0.77	1.15	0.64					1.12	1.01	
Uniform Delay, d1		39.0	34.7	49.2	15.5					40.0	40.0	
Progression Factor		0.59	0.91	1.31	0.32					1.00	1.00	
Incremental Delay, d2		36.0	3.5	79.7	0.52					79.2	43.0	
Delay (s)		59.0	35.1	144.4	5.7					119.2	83.0	
Level of Service		55.0 E	00.1 D	F	0.7 A					F	50.0	
Approach Delay (s)		49.7	0	1-	43.8			0.0			102.1	
Approach LOS		49.7 D			40.0 D -			- A			F.	
••	010000000000000000000000000000000000000			000000000000000000000000000000000000000			635-015-Wax2027808		a a constantina		, La Management	ini a canala da secondaria.
Intersection Summary HCM Average Control D	olay .		58.5		CMLO	el of Se	n lino		E	<u></u>	<u> </u>	
HCM Volume to Capacity			1.13	ſ		er or Se	VICE		E			ler i
			120.0			at time	(n)		8.0			
Actuated Cycle Length (a Intersection Capacity Uti		4	67.8%			ost time I of Ser			8.0 H		1	1997 - B
Analysis Period (min)	nzation	1	67.8% 15	R		a or ser	NICE		н		,	
			10									
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3: S 188th St & I-5 NB

# Queues

2030 With-Project PM-Weeday

- + < 9 ≯ • EBL EBT WBT WBR NEL2 NEL Lane Group Lane Group Flow (vph) 448 1798 1255 1236 416 401 v/c Ratio 1.17 0.79 0.76 1.15 1.12 1.07 Control Delay 109.4 10.1 29.2 94.5 127.0 107.3 Queue Delay 0.0 4.0 0.0 0.0 0.0 0.0 Total Delay 109.4 14.1 29.2 94.5 127.0 107.3 Queue Length 50th (ft) ~329 235 406 ~848 ~391 ~342 Queue Length 95th (ft) m#285 m220 496 #1114 #602 #552 Internal Link Dist (ft) 410 232 1 Turn Bay Length (ft) 170 Base Capacity (vph) 370 384 2270 1646 1075 374 Starvation Cap Reductn 0 388 0 0 0 0 Spillback Cap Reductn 0 0 0 0 0 0 Storage Cap Reductn 0 0 0 0 0 0 Reduced v/c Ratio 1.17 0.96 0.76 1.15 1.12 1.07

#### Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

	٨	→	7	*	-	•	1	¥	3	•	/	
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER	100000
Lane Configurations	۲	<b>††</b>			<b>††</b>	7			۲	M	1000	

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3: S 188th St & I-5 NB

MOAEILICH			LUN		44 10 1	TADIX	ODE	ODIX	INFER	(Inc.	10 1 4 here 1 \$ 150	
Lane Configurations	ሻ	<b>††</b>			<b>††</b>	1			٦	M		
Ideal Flow (vphpl)	1900	1900	1900	1900		1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0		
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0.95	10.00	
Frt	1.00	1.00			1.00	0.85			1.00	0.92		
Fit Protected	0.95	1.00			1.00	1.00			0.95	0.98		
Satd. Flow (prot)	1641	3282			3406	1524			1531	1445		
Fit Permitted	0.11	1.00	۰.,	21	1.00	1.00			0.95	0.98	1.100	tin y
Satd. Flow (perm)	186	3282			3406	1524			1531	1445		
Volume (vph)	435	1744	0	0	1217	1199	0	0	570	5	217	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
Adj. Flow (vph)	448	1798	0,1	0	1255	1236	0.	· . · O	588	5	224	
RTOR Reduction (vph)		0	0	0	0	338	0	0	0	25	0	
Lane Group Flow (vph)		1798	0	0.	1255	898	0	0 .	416	376	0	
Heavy Vehicles (%)	10%	10%	10%	6%	6%_	6%	0%	0%	12%	12%	12%	
Turn Type	pm+pt		21.1.1			Perm			Split	· · ·		1 - T
Protected Phases	5	2			6				4	4		
Permitted Phases	2					6						1.
Actuated Green, G (s)	82.0	82.0			57.0	57.0			28.0	28.0		
Effective Green, g (s)	83.0	83.0			58.0	58.0			29.0	29.0	: 1	
Actuated g/C Ratio	0.69	0.69			0.48	0.48			0.24	0.24		
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0		
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5		
Lane Grp Cap (vph)	383	2270			1646	737			370	349	1	1.1
v/s Ratio Prot	c0.20	0.55			0.37				c0.27	0.26		
v/s Ratio Perm	0.60					c0.59						
v/c Ratio	1.17	0.79			0.76	1.22			1.12	1.08		
Uniform Delay, d1	34.6	12.6			25.4	31.0			45.5	45.5		
Progression Factor	0.83	0.75			1.00	1.00			1.00	1.00		
Incremental Delay, d2	79.2	0.3			3.4	110.2			84.9	70.3		
Delay (s)	107.8	9.8			28.8	141.2			130.4	115.8		
Level of Service	F	А			C	F			F	F	1. ľ	
Approach Delay (s)		29.3			84.6		0.0			123.3		
Approach LOS		С			F		A			~F		-
Intersection Summary												
			07.0		011	-1-60-				<u> </u>		
HCM Average Control			67.9	' H	CIM Lev	vel of Se	rvice		ं ्) <b>E</b>		с. С.	2.7
HCM Volume to Capaci			1.14	~			(-)					
Actuated Cycle Length			120.0			ost time		. ^	8.0			1247
Intersection Capacity U	unzation	1	67.8%	10	JU Leve	el of Serv	vice		н			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2030 With-Project PM-Weeday

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HCM Unsignalized Intersection Capacity Analysis 2030 With-Project PM-Weeday

	t	۲	L.	ţ	4	Ł				
Movement	NBT	NBR	SBL	SBT	SWL	SWR	1. States and the			
Lane Configurations	<b>∱</b> ⊅		۲	<b>†</b> †	٦	۲				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Volume (veh/h)	2385	15	21	1950	11	29				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage	2565	16	23	2097	12	31				
Right turn flare (veh)										
Median type Median storage veh)					None					
Upstream signal (ft)				66						
pX, platoon unblocked					0.62					
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol			2581		3666	1290				
vCu, unblocked vol			2581		4690	1290				
C, single (s)			4.3		7.3	7.4				
tC, 2 stage (s)										
tF (s)			2.3		3.7	3.5				
p0 queue free %			85		0	76				
cM capacity (veh/h)			146		0	127				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2			
Volume Total	1710	871	23	1048	1048	12	31		 	
Volume Left	0	0	23	0	0	12	0			
Volume Right	0	16	0	0	0	0	31			
cSH	1700	1700	146	1700	1700	0	127			
Volume to Capacity	1.01	0.51	0.15	0.62	0.62	62.84	0.24			
Queue Length 95th (ft)	0	0	13	0	0	Err	23			
Control Delay (s)	0.0	0.0	34.0	0.0	0.0	Err	42.2			
Lane LOS			D			F	E			
Approach Delay (s) Approach LOS	0.0		0.4			2780.3 F				
Intersection Summary										
Average Delay			25.4							
Intersection Capacity Ut Analysis Period (min)	ilization		76.4% 15	10	CU Lev	el of Ser	vice	D		

5: S 200th St & Orillia Rd

Queues 2030 With-Project PM-Weeday

	-	4	×.	Ť	1	Ļ				
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT				
Lane Group Flow (vph)	10	395	1249	1562	491	1398				
v/c Ratio	0,10	0.98	0.95	0.96	0.85	0.62	·			Store the
Control Delay	60.9	85.8	43.6	46.4	63.0	12.4				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	60.9	85.8	43.6	46.4	63.0	12.4				
Queue Length 50th (ft)	7	301	456	583	189	267				
Queue Length 95th (ft)	27	#563	#731	#884	#311	441				
Internal Link Dist (ft)	36			266		3373	الديني من المح		1	
Turn Bay Length (ft)										
Base Capacity (vph)	100	405	1319	1624	578	2248		~	1.1	St. New York
Starvation Cap Reductn	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	· · 0	0	0		and the			- 61 M 1
Storage Cap Reductn	0	0	0	0	0	0				
Reduced v/c Ratio	0,10	0.98	0.95	0.96	0.85	0.62				an bhaile an t
Intersection Summary										
# 05th a said sattle sattle		- 4				1.000	S	1 1 1	. 1 <sup>2</sup> .1	1 2 4 1 2 4 1 2 4 1

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

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The Transpo Group

HCM Signalized Intersection Capacity Analysis 2030 With-Project PM-Weeday

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		77	۲	<b>↑</b> Դ		ሻሻ	<b>ተ</b> ጉ	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3445		3183	3280	
Fit Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3445		3183	3280	
Volume (vph)	5	5	.0	375	0	1187	0	1409	75	466	1323	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	395	0	1249	0	1483	79	491	1393	5
RTOR Reduction (vph)	0	0	0	0	0	96	0	з	0	0	0	0
Lane Group Flow (vph)	0	10	0	395	0.	1153	0	1559	0	491	1398	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm	4	. · ·	Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4						
Actuated Green, G (s)		0.9		27.0		47.0		55.1		20.0	81.1	
Effective Green, g (s)		2.9		28.0		50.0		57.1		22.0	83.1	
Actuated g/C Ratio		0.02		0.22		0.40		0.45		0.17	0.66	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		43		389		1183		1561		556	2163	
v/s Ratio Prot				0.23		c0.17		c0.45		0.15	0.43	
v/s Ratio Perm		0.01				0.25						
v/c Ratio		0.23		1.02		0.97		1.00		0.88	0.65	
Uniform Delay, d1		60.5		49.0		37.4		34.4		50.7	12.7	
Progression Factor		1.00		1.00		1.00		1,00		1.00	1.00	
Incremental Delay, d2		2.8		49.6		20.2		22.5		15.3	1.5	
Delay (s)		63.2		98.6		57.5		56.9		66.1	14.2	
Level of Service		E		F		E		E		E	В	
Approach Delay (s)		63.2		•	67.4	_		56.9			27.7	
Approach LOS		E			E			E			C	
Intersection Summary		-								YANGKAN	-	000000000
HCM Average Control D			49.5	<u></u>		vel of Se	nvice		D			
HCM Volume to Capacit			0.97						5			
Actuated Cycle Length (			126.0	0	um of k	ost time	(s)		12.0			
Intersection Capacity Ut			97.0%			el of Ser			12.0 F			
Analysis Period (min)	mzauon		97.0% 15	I.		101.961	100		F.			
			10									
c Critical Lane Group												

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1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2011 Baseline (with Tukwila south) PM

# 2011 Baseline (with Tukwila south) PM

	_#	-	$\mathbf{F}$	*	+	۲	1	۲	6	¥	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	107	1327	26	61	796	388	26	158	526	444	
v/c Ratio	0.41	0.83	0.04	0.54	0.65	0.55	0.22	0.66	0.83	0.81	
Control Delay	45.5	31.0	8.8	64.5	19.6	11.5	49.2	51.9	51.9	44.9	
Queue Delay	0.0	0.1	0.0	0.0	3.1	2.2	0.0	333.4	7.5	0.0	
Total Delay	45.5	31.0	8.8	64.5	22.6	13.8	49.2	385.3	59.4	44.9	
Queue Length 50th (ft)	64	406	2	31	203	131	16	90	167	260	
Queue Length 95th (ft)	119	#550	18	m#62	m260	m205	43	159	#244	#439	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	258	1592	723	113	1220	700	116	266	643	546	
Starvation Cap Reductn	0	0	0	0	311	188	0	0	0	0	
Spillback Cap Reductn	0	9	0	0	0	0	0	174	85	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.41	0.84	0.04	0.54	0.88	0.76	0.22	1.72	0.94	0.81	
Intersection Summary									the last state		

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

1: S 188th St & Millitary Rd

m Volume for 95th percentile queue is metered by upstream signal.

	_#	-	$\mathbf{i}$	4	+	۲	1	۲	1	6	¥	*
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ሻ	<b>^</b>	7	۲	<b>†</b> †	7	۲	đ.		ካካ	Y	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0,95	0.96	
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1713	
Volume (vph)	105	1300	25	60	780	380	25	135	20	515	330	105
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	107	1327	26	61	796	388	26	138	20	526	337	107
RTOR Reduction (vph)	0	0	11	0	0	159	0	5	0	0	11	0
Lane Group Flow (vph)	107	1327	15	61	796	229	26	153	0	526	433	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	0	Perm	Prot	0	Perm	Prot			Prot		
Protected Phases	1	6	6	5	2	0	7	4		3	8	
Permitted Phases	12.0	40.0	6 40.9	4.7	32.5	2 32.5	3.0	15.4		17.0	29.6	
Actuated Green, G (s) Effective Green, g (s)	13.2 14.9	40.9 42.7	40.9	4.7 5.4	33.2	33.2	4.7	17.3		18.6	31.2	
Actuated g/C Ratio	0.15	0.43	0.43	0.05	0.33	0.33	0.05	0.17		0.19	0.31	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	259	1482	663	93	1141	511	82	269		632	534	<i>P</i>
v/s Ratio Prot	0.06	c0.38	000	c0.04	0.23	017	0.01	0.10		c0.15	c0.25	
v/s Ratio Perm	0.00	00.00	0.01	00101	0.20	0.15						
v/c Ratio	0.41	0.90	0.02	0.66	0.70	0.45	0.32	0.57		0.83	0.81	
Uniform Delay, d1	38.6	26.6	16.6	46.4	29.0	26.2	46.1	37.9		39.2	31.7	
Progression Factor	1.00	1.00	1.00	1.08	0.63	0.92	1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	8.8	0.1	12:7	2.9	2.3	2.2	2.8		9.2	9.1	
Delay (s)	43.4	35.3	16.6	63.0	21.2	26.4	48.3	40.7		48.4	40.8	
Level of Service	D	D	В	Ē	C	C .	D	D.		D	D,	
Approach Delay (s)		35.6			24.9		41.8				44.9	
Approach LOS		D			C C		D				٦D.	$(a_{1,1},a_{2,1})$
Intersection Summary												
HCM Average Control D	elav	, ,	34.8	H	CM Le	vel of Se	ervice	,	C		<u>nngno ausaappaa</u> g	rizgegeneen minning
HCM Volume to Capacit			0.83						-	^		
Actuated Cycle Length (			100.0	S	um of l	ost time	(s)		12.0			
Intersection Capacity Uti			82.3%			el of Ser			E			
Analysis Period (min)			15									
c Critical Lane Group												

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Queues

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The Transpo Group

#### 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2011 Baseline (with Tukwila south) PM

### Queues

2011 Baseline (with Tukwila south) PM

		$\mathbf{r}$	1	<b>4</b>	1	Ļ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1124	670	613	1232	486	437	
v/c Ratio	1.06	0.75	1.15	0.58	1.12	1.01	
Control Delay	69.0	7.3	112.6	16.9	116.2	81.2	
Queue Delay	158.3	44.5	0.0	2.0	0.0	0.6	
Total Delay	227.3	51.8	112.6	18.9	116.2	81.8	
Queue Length 50th (ft)	~406	61	~433	286	~378	~295	
Queue Length 95th (ft)	#540	m90	m#512	m336	#586	#511	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1056	895	531	2112	432	434	
Starvation Cap Reductn	268	276	0	512	0	0	
Spillback Cap Reductn	0	0	0	689	0	1	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.43	1.08	1.15	0.87	1.13	1.01	
Intersection Summary							

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

2: S 188th St & I-5 SB

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

m Volume for 95th percentile queue is metered by upstream signal.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<b>^</b>	7	ሻ	<b>^†</b>					٦	4	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00		n a sí		1.1		0.95	0.95	e la seconda
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Flt Protected	~	1.00	1.00	÷ • • •	1.00					0.95	0.95	1999 - A.
Satd. Flow (prot)		3406	1524	1703	3406					1441	1437	
Flt Permitted	, ,,,	1.00	1.00	0.11	1.00					0,95	0,95	e aga t
Satd. Flow (perm)		3406	1524	205	3406					1441	1437	
Volume (vph)	0	1090	650	595	1195	0	0	0	<u>;</u> 0	875		
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	· 0	1124	670	613		. 0	0	,	, Q	902	0	21
RTOR Reduction (vph)	0	0	423	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	°0	1124	247	613	1232	Q	0	,0	. 0	486	435	
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%_	0%	19%	19%	19%
Turn Type			Perm	pm+pt				a a straight a		Perm		
Protected Phases		2		1	6						8	
Permitted Phases			2	6						8		ч. Дарыны
Actuated Green, G (s)		30.0	30.0	61.0	61.0					29.0	29.0	
Effective Green, g (s)		31.0	31.0	62.0	62.0					30.0	30.0	
Actuated g/C Ratio		0.31	0.31	0.62	0.62					0.30	0.30	
Clearance Time (s)		5.0	5.0	5.0	5.0					5.0	5.0	
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1056	472	532	2112		. 16	1	1.1	432	431	
v/s Ratio Prot		0.33		c0.31	0.36							
v/s Ratio Perm			0.16	c0.40						c0.34	0.30	113.1
v/c Ratio		1.06	0.52	1.15	0.58					1.12	1.01	
Uniform Delay, d1		34.5	28.4	29.5	11.3			1.1		35.0	35.0	
Progression Factor		0.82	1.03	1.35	1.43					1.00	1.00	
Incremental Delay, d2		39.8	2.2	77:1	0.5					82.0	45.6	
Delay (s)		68.0	31.6	117.1	16.6					117.0	80.6	
Level of Service		Е	С	F	В	~				F	F	신한 것이
Approach Delay (s)		54.4			50.0			0.0			99.8	
Approach LOS		D,			- D			A			F	. 1
Intersection Summary												
HCM Average Control D			61.8	4	ICM Lev	el of Se	rvice		Е	-	1. 1.	
HCM Volume to Capacit			1.13									
Actuated Cycle Length (			100.0			st time			8.0	14 A.	1977 - 19	$\{ e_i \}_{i \in \mathbb{N}}^{d}$
Intersection Capacity Uti	lization	1	52.1%	10	CU Leve	l of Serv	/ice		H			
Analysis Period (min)			15								18.1	1.11
c Critical Lane Group												

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### 3: S 188th St & I-5 NB

Queues 2011 Baseline (with Tukwila south) PM

	٦		←	•	3	•	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	371	1634	1397	1175	390	384	
v/c Ratio	1.07	0.73	0.87	1.10	1.06	1.03	
Control Delay	74.2	12.9	31.3	71.2	102.6	90.0	
Queue Delay	0.0	0.8	0.0	0.0	0.0	0.0	
Total Delay	74.2	13.7	31.3	71.2	102.6	90.0	
Queue Length 50th (ft)	~227	257	407	~608	~289	~254	
Queue Length 95th (ft)	m208	m241	512	#863	#482	#448	
Internal Link Dist (ft)		410	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	348	2232	1601	1072	367	372	
Starvation Cap Reductn	0	299	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.07	0.85	0.87	1.10	1.06	1.03	

### Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis 2011 Baseline (with Tukwila south) PM

	٦	+	7	*	<b>∢</b>	×.	1	لر	3	*	/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	ľ	<u>†</u> †			<u>†</u> †	1			٦	X	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	1.00			0.95	0,95	
Frt	1.00	1.00			1.00	0.85			1.00	0.89	
Fit Protected	0.95	1.00			1.00	1.00		× .	0.95	0.99	
Satd. Flow (prot)	1641	3282			3406	1524			1531	1414	
Flt Permitted	0.08	1.00		. i form	1.00	1.00		ک ویل ا	0.95	0.99	der dasile
Satd. Flow (perm)	135	3282			3406	1524			1531	1414	
Volume (vph)	360	1585	0	0	1355	1140	0	°′	470	5	275
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	371	1634	0	0	1397	1175	0	0	485	5	284
RTOR Reduction (vph)	0	0	0	0	0	356	0	0	0	33	0
Lane Group Flow (vph)	371	1634	0	0	1397	819	0	0	390	351	0
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%
Turn Type	pm+pt		,		÷	Perm		17. <sup>1</sup> 1	Split	and the second	
Protected Phases	5	2			6				4	4	
Permitted Phases	2					6.				**	1
Actuated Green, G (s)	67.0	67.0			46.0	46.0			23.0	23.0	
Effective Green, g (s)	68.0	68.0			47.0	47.0			24.0	24.0	1 640
Actuated g/C Ratio	0.68	0.68			0.47	0.47			0.24	0.24	
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0	And the second second
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	348	2232	~		1601	716	,	24	367	339	hely and hely
v/s Ratio Prot	c0.18	0.50			0.41				c0.25	0.25	
v/s Ratio Perm	0.54					c0.54					1.11
v/c Ratio	1.07	0.73			0.87	1.14			1.06	1.04	
Uniform Delay, d1	32.0	10.2			23.8	26.5			38.0	38.0	
Progression Factor	1.41	1.20			1.00	1.00			1.00	1.00	
Incremental Delay, d2	36.0	0.2			6.9	81.0			64.5	58.6	
Delay (s)	81.1	12.5			30.7	107.5			102.5	96.6	
Level of Service	F	в			С	, F			F	F	11 A.
Approach Delay (s)		25.2			65.8		0.0			99.6	
Approach LOS		С			E		Α			F	
Intersection Summary										and the second	
HCM Average Control D	Delav		55.4	H	ICM Le	vel of Se	rvice		E	199	1 2 2 2 2 2 2 2
HCM Volume to Capaci			1.11								
Actuated Cycle Length			100.0	S	um of I	ost time	(s)		12.0		
Intersection Capacity U		1	52.1%			el of Sen			Н		
Analysis Period (min)			15		,						
c Critical Lane Group											

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3: S 188th St & I-5 NB

#### 4: Orillia Rd & Site Access

# HCM Unsignalized Intersection Capacity Analysis 2011 Baseline (with Tukwila south) PM

	1	۲	<del>ب</del> ا	ţ	4	t					
Novement	NBT	NBR	SBL	SBT	SWL	SWR					
ane Configurations	<b>↑</b> 1≽		ሻ	<b>†</b> †	٦	*					
Sign Control	Free			Free	Stop						
Grade	0%			0%	0%						
/olume (veh/h)	2480	9	10	1850	7	18					
eak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93					
lourly flow rate (vph) Pedestrians ane Width (ft) Valking Speed (ft/s) Percent Blockage	2667	10	11	1989	8	19					
Right turn flare (veh) Nedian type Nedian storage veh)				66	None						
Ipstream signal (ft)				66	0.00						
X, platoon unblocked			0070		0.68	4000					
C, conflicting volume C1, stage 1 conf vol C2, stage 2 conf vol			2676		3688	1338					
Cu, unblocked vol			2676		4489	1338					
C, single (s)			4.3		7.3	7.4					
C, 2 stage (s)											
= (s)			2,3		3.7	3.5					
0 queue free %			92		0	84					
M capacity (veh/h)			134		0	118					
)irection, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2				
olume Total	1778	899	11	995	995	8	19	· · · · · ·		 	
olume Left	0	0	11	0	0	8	0				
olume Right	. 0	10	0	0	0	0	19				
SH	1700	1700	134	1700	1700	0	118				
olume to Capacity	1.05	0.53	0.08	0.59	0.59	23.35	0.16				
Queue Length 95th (ft)	0	0	6	0	0	Err	14				
Control Delay (s)	0.0	0.0	34.3	0.0	0.0	Err	41.5				
ane LOS			D			F	E				
pproach Delay (s) pproach LOS	0.0		0.2			2829.6 F					
ntersection Summary											
verage Delay			16.3							 	
ntersection Capacity Uti nalysis Period (min)	lization		78.8% 15	10	CU Leve	el of Ser	vice		D		

# 5: S 200th St & Orillia Rd

#### Queues 2011 Baseline (with Tukwila south) PM

	-	4	×.	t	1	¥			
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT			
Lane Group Flow (vph)	10	458	1568	1358	658	1152			
v/c Ratio	0.07	1,18	1.15	0.91	1.20	0.54			a definita de
Control Delay	39.8	134.8	95.5	33.1	137.2	9.2			
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0			
Total Delay	39.8	134.8	95.5	33.1	137.2	9.2			
Queue Length 50th (ft)	5	~269	~474	308	~202	130			1. A. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Queue Length 95th (ft)	21	#523	#736	#564	#360	261			
Internal Link Dist (ft)	36			266		3373		1. A.	e e stran
Turn Bay Length (ft)									
Base Capacity (vph)	144	389	1369	1486	550	2146	and the second second		1. 1. 1. 1. <u>1</u> . 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	0.	0	. 0	0	0.5			and the second
Storage Cap Reductn	Ó	0	0	0	0	0			
Reduced v/c Ratio	0,07	1.18	1.15	0.91	1.20	0.54			ы. <sup>с</sup> .,
Intersection Summary							1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		

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

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

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HCM Signalized Intersection Capacity Analysis 2011 Baseline (with Tukwila south) PM

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	٠	-	$\mathbf{F}$	4	+	×	1	t	1	1	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		11	۲	<b>≜</b> ⊅		ሻሻ	<b>≜</b> ⊅	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util, Factor	, · .	1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3421		3183	3280	
Flt Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3421		3183	3280	
Volume (vph)	5	5	0	435	0	1490	0	1165	125	625	1090	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	458	0	1568	0	1226	132	658	1147	5
RTOR Reduction (vph)	ŏ	õ	õ	0	õ	160	õ	0	0	0	0	õ
Lane Group Flow (vph)	0	10	ŏ	458	õ	1408	ŏ	1349	ŏ	658	1152	Ő
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
	Perm	• / •		Prot		ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3	ŗ	· .			4	0	-		•	Ũ	
Actuated Green, G (s)	` <i>4</i> ■	0.9		17.0		29.0		33.1		12.0	51.1	
Effective Green, g (s)		2.9		18.0		32.0		35.1		14.0	53.1	
Actuated g/C Ratio		0.03		0.21		0.37		0.41		0.16	0.62	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)	1.10	63		367		1155		1396		518	2025	
v/s Ratio Prot		00		0.26		c0.20		c0.39		0.21	0.35	
v/s Ratio Perm		0.01		0.20		0.31		00.00		0121	0.00	
v/c Ratio		0.16		1.25		1.22		0.97		1.27	0.57	
Uniform Delay, d1		40.4		34.0		27.0		24.9		36.0	9.7	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.2		132.4		106.5		17.3		136.2	1.2	
Delay (s)		41.5		166.4		133.5		42.2		172.2	10.9	
Level of Service		D		F		F		D		F	B	
Approach Delay (s)		41.5		•	141.0	•		42.2		•	69.5	
Approach LOS		-11.0 D			F			D			E	
••		-					0000355550				-	1000000
Intersection Summary	. f		00 4	1	011-	vel of Se		NAMES NO.	F			
HCM Average Control De			90.1	F		vel or Se	a vice		٣			
HCM Volume to Capacity			1.06	_			(a)		12.0			
Actuated Cycle Length (s		4	86.0			ost time						
Intersection Capacity Util	ization	1	02.5%	10	JU Leve	el of Ser	vice		G			
Analysis Period (min)			15									
c Critical Lane Group												

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1: S 188th St & Millitary Rd

Queues 2011 With-Project (with Tukwila south) PM

	<b>_</b> #	-	$\mathbf{i}$	4	+	۲	۸	۲	<b>G</b>	¥	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	107	1327	26	61	797	388	26	158	526	444	
v/c Ratio	0.41	0.83	0.04	0.54	0.65	0.55	0.22	0.66	0.83	0.81	
Control Delay	45.5	31.0	8.8	64.5	19.6	11.5	49.2	51.9	51.9	44.9	
Queue Delay	0.0	0.1	0.0	0.0	3.1	2.2	0.0	333.4	7.5	0.0	
Total Delay	45.5	31.0	8.8	64.5	22.7	13.8	49.2	385.3	59.4	44.9	
Queue Length 50th (ft)	64	406	2	31	204	131	16	90	167	260	
Queue Length 95th (ft)	119	#550	18	m#62	m260	m205	43	159	#244	#439	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	258	1592	723	113	1220	700	116	266	643	546	
Starvation Cap Reductn	0	0	0	0	311	188	0	0	0	0	
Spillback Cap Reductn	0	9	0	0	0	0	0	174	85	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.41	0.84	0.04	0.54	0.88	0.76	0.22	1.72	0.94	0.81	
Intersection Summary											

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

m Volume for 95th percentile queue is metered by upstream signal.

朴朴 ñ 1900 1900 1900 1900 1900 Ideal Flow (vphpl) 1900 1900 1900 1900 Total Lost time (s) 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 Lane Util. Factor 1.00 1.00 0.95 1.00 1.00 0.95 1.00 1.00 Frt 1.00 1.00 0.85 1.00 1.00 0.85 1.00 0.85 Fit Protected 0.95 1.00 1.00 0.95 1.00 1.00 0.95 1:00 Satd. Flow (prot) 1736 3471 1553 1719 3438 1538 1736 1553 Flt Permitted 0.95 1.00 1.00 0.95 1.00 1.00 0.95 1.00 Satd. Flow (perm) 1736 3471 1553 1719 3438 1538 1736 1553 Volume (vph) 105 1300 25 781 380 25 135 20 60 Peak-hour factor, PHF 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 0.98 Adj. Flow (vph) 107 1327 26 61 797 388 26 138 20 RTOR Reduction (vph) 0 0 11 0 0 159 0 5 0 Lane Group Flow (vph) 107 1327 15 61 797 229 26 153 0 Heavy Vehicles (%) 4% 4% 4% 5% 5% 5% 4% 4% 4% Turn Type Prot Perm Prot Perm Prot Protected Phases 2 1 6 5 7 4 Permitted Phases 6 2 Actuated Green, G (s) 13.2 40.9 40.9 4.7 32.5 32.5 3.0 15.4 42.7 33.2 Effective Green, g (s) 14.9 42.7 5.4 33.2 4.7 17.3 Actuated g/C Ratio 0.15 0.43 0.43 0.05 0.33 0.33 0.05 0.17 Clearance Time (s) 5.7 5.8 5.8 4.7 4.7 4.7 5.7 5.9 Vehicle Extension (s) 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 Lane Grp Cap (vph) 259 1482 663 93 1141 511 82 269

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1: S 188th St & Millitary Rd

Movement Lane Configurations \_#

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v/s Ratio Prot	0.06	c0.38		c0.04	0.23		0.01	0.10	c0.15	c0.25	
v/s Ratio Perm			0.01			0.15					
v/c Ratio	0.41	0.90	0.02	0.66	0.70	0.45	0.32	0.57	0.83	0.81	
Uniform Delay, d1	38.6	26.6	16.6	46.4	29.0	26.2	46.1	37.9	39.2	31.7	
Progression Factor	1.00	1.00	1.00	1.08	0.63	0.92	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.8	8.8	0.1	12.7	2.9	2.3	2.2	2.8	9.2	9.1	
Delay (s)	43.4	35.3	16.6	63.0	21.3	26.4	48.3	40.7	48.4	40.8	
Level of Service	Ď	D	В	E	. C	C	D	D.	D	D	
Approach Delay (s)		35.6			24.9		41.8			44.9	
Approach LOS		D			C		D			D	
Intersection Summary											
HCM Average Control D	elay		34.8	Н	CM Lev	el of Se	rvice		C	· · · ·	
HCM Volume to Capacit	y ratio		0.83								
Actuated Cycle Length (	s)		100.0	S	um of lo	st time	(s)		12.0		
Intersection Capacity Uti	ilization		82.3%	IC	U Leve	l of Ser	vice		Е		
Analysis Period (min)			15								
c Critical Lane Group											

HCM Signalized Intersection Capacity Analysis

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EBL EBT EBR WBL WBT WBR NBL NBR NBR2 SWL2 SWL SWR

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2011 With-Project (with Tukwila south) PM

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2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2011 With-Project (with Tukwila south) PM

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2011 With-Project (with Tukwila south) PM

Queues

-	$\mathbf{r}$	1	-	1	ŧ	
EBT	EBR	WBL	WBT	SBL	SBT	
1124	670	614	1233	486	438	
1.06	0.75	1.16	0.58	1.12	1.01	
69.0	7.3	113.3	17.0	116.2	81.8	
158.3	44.5	0.0	2.0	0.0	0.6	
227.3	51.8	113.3	18.9	116.2	82.4	
~406	61	~435	287	~378	~297	
#540	m90	m#515	m336	#586	#514	
126			410		462	
		152				
1056	895	531	2112	432	434	
268	276	0	512	0	0	
0	0	0	686	0	1	
0	0	0	0	0	0	
1.43	1.08	1.16	0.86	1.13	1.01	
	1124 1.06 69.0 158.3 227.3 ~406 #540 126 1056 268 0 0	1124         670           1.06         0.75           69.0         7.3           158.3         44.5           227.3         51.8           ~406         61           #540         m90           126         1056           1056         895           268         276           0         0           0         0	$\begin{array}{cccccccc} 1124 & 670 & 614 \\ 1.06 & 0.75 & 1.16 \\ 69.0 & 7.3 & 113.3 \\ 158.3 & 44.5 & 0.0 \\ 227.3 & 51.8 & 113.3 \\ *406 & 61 & \sim 435 \\ *540 & m90 \ m\#515 \\ 126 & & & \\ 152 \\ 1056 & 895 & 531 \\ 268 & 276 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{array}$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

Intersection Summary

2: S 188th St & I-5 SB

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

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<u>^</u>	۴	ሻ	<b>^</b>					ሻ	\$	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0					4.0	4.0	
Lane Util. Factor	÷.,	0.95	1.00	1.00	0.95	1 14		-51 - 1		0.95	0.95	
Frt		1.00	0.85	1.00	1.00					1.00	0.99	
Flt Protected		1.00	1.00	0.95	1.00	197 I.J				0.95	0.95	tar t
Satd. Flow (prot)		3406	1524	1703	3406					1441	1437	
Fit Permitted		1.00	1.00	0.11	1.00	s on the				0.95	0.95	24.6
Satd. Flow (perm)		3406	1524	205	3406					1441	1437	
Volume (vph)	0	1090	650	596	1196	0	0	0	0	876	0	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1124	670		1233	0	,0	0	0	903	0	21
RTOR Reduction (vph)	0	0	423	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	1124	247	614	1233	0	0	.0	0	486	436	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type		`	Perm	pm+pt	· ·		- 1 ar	1		Perm		
Protected Phases		2	•	1	6						8	
Permitted Phases		20.0	2.	6						8	00.0	
Actuated Green, G (s) Effective Green, g (s)		30.0	30.0	61.0	61.0					29.0	29.0	
Actuated g/C Ratio		<b>31.0</b> 0.31	31.0 0.31	62.0 0.62	62.0 0.62					30.0 0.30	<b>30.0</b> 0.30	
Clearance Time (s)		5.0	5.0	5.0	0.62 5.0					5.0	5.0	
Vehicle Extension (s)		4.0	4.0	5.0 3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1056	472	532 <sup>5</sup>	2112					432		ija i č
v/s Ratio Prot		0.33	472	c0.31	0.36	· · ·				402	431	
v/s Ratio Perm		0.55	0.16	c0.31	0.30					c0.34	0.30	
v/c Ratio		1.06	0.52	1.15	0.58					1.12	1.01	
Uniform Delay, d1		34.5	28.4	29.5	11.3					35.0	35.0	
Progression Factor		0.82	1.03	1.35	1.43					1.00	1.00	
Incremental Delay, d2		39.8	2.2	77.9	0.4					82.0	46.2	
Delay (s)		68.0	31.6	117.8	16.6					117.0	81.2	
Level of Service		E	C	F	B					F	F	
Approach Delay (s)		54.4	-		50.3			0.0			100.0	
Approach LOS		D			D			A			F	
		801203-0103-018	Selennengele	0.0000000000000000000000000000000000000		For the second			100000000	anan ana ang ang ang ang ang ang ang ang	STRINGSTON	STORES STORES
Intersection Summary		<u> </u>					C		-	<u></u>		
HCM Average Control D			62.0	н	CMLe	el of Ser	vice		E			
HCM Volume to Capacit Actuated Cycle Length (			1.13	~			-)					
Intersection Capacity Uti		1	100.0 52.2%			ost time ( el of Serv			8.0 H			
Analysis Period (min)	nzau011	1	52.2% 15		O Leve	a or serv	ice		п			
c Critical Lane Group			13									
o oncoar carle Group												

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#### 3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2011 With-Project (with Tukwila south) PM

#### 3: S 188th St & I-5 NB

Queues 2011 With-Project (with Tukwila south) PM

	٠	-	+	•	7	•	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	
Lane Group Flow (vph)	371	1635	1399	1176	390	384	
v/c Ratio	1.07	0.73	0.87	1.10	1.06	1.03	
Control Delay	74.2	12.9	31.4	71.6	102.6	90.0	
Queue Delay	0.0	0.8	0.0	0.0	0.0	0.0	
Total Delay	74.2	13.7	31.4	71.6	102.6	90.0	
Queue Length 50th (ft)	~226	257	408	~610	~289	~254	
Queue Length 95th (ft)	m208	m242	513	#864	#482	#448	
Internal Link Dist (ft)		410	1			232	
Turn Bay Length (ft)	170						
Base Capacity (vph)	348	2232	1601	1072	367	372	
Starvation Cap Reductn	0	299	0	0	0	0	
Spillback Cap Reductn	0	0.	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.07	0.85	0.87	1.10	1.06	1.03	

Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.

	۶	-	7	۴	-	×	1	¥	3	•	/
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER
Lane Configurations	۲	<b>††</b>			<b>††</b>	۴			٦	M	
Ideal Flow (vphpl)	1900	1900	1900	1900		1900	1900	1900		1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	
Lane Util. Factor	1.00	0.95	12.2	- 2 M	0.95	1.00		1 <sup>196</sup>	0.95	0.95	
Frt	1.00	1.00			1.00	0.85			1.00	0.89	
Fit Protected	0.95	1.00				1.00	, · · ,		0.95	0.99	1 . A . A
Satd. Flow (prot)	1641	3282			3406	1524			1531	1414	
Fit Permitted	0.08	1.00			1.00	1.00	,		0.95	0.99	and the star
Satd. Flow (perm)	135	3282			3406	1524			1531	1414	
Volume (vph)	360	1586	0	0	1357	1141	0	0	470	. 5	275
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	371	1635	0	0.	1399	1176	. 0	0	485	5	284
RTOR Reduction (vph)	0	0	0	0	0	356	0	0	0	33	0
Lane Group Flow (vph)	371	1635	. 0	.0.	1399	820	. 0	. 0	390	351	0
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%
Turn Type	pm+pt	e de la composición d	10	1.27	200 X X	Perm	194	i e je li	Split	- 19 - N	in participation de
Protected Phases	5	2			6				4	4	
Permitted Phases	2					6				1	
Actuated Green, G (s)	67.0	67.0			46.0	46.0			23.0	23.0	
Effective Green, g (s)	68.0	68.0			47.0	47.0			24.0	24.0	
Actuated g/C Ratio	0.68	0.68			0.47	0.47	,		0.24	0.24	
Clearance Time (s)	5.0	5.0			5.0	5.0			5.0	5.0	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	
Lane Grp Cap (vph)	348	2232	·		1601	716		1	367	339	공학에 관하는 것
v/s Ratio Prot	c0.18	0.50			0.41				c0.25	0.25	
v/s Ratio Perm	0.54					c0.54					
v/c Ratio	1.07	0.73			0.87	1.15			1.06	1.04	
Uniform Delay, d1	32.0	10.2			23.8	26.5		'	38.0	38.0	1. See 1.
Progression Factor	1.41	1.20			1.00	1.00			1.00	1.00	
Incremental Delay, d2	36.0	0.2			6.9	81.5			64.5	58.6	
Delay (s)	81.0	12.5			30.8	108.0			102.5	96.6	
Level of Service	F	B			C.	F		1.	F	۳.	1.1
Approach Delay (s)		25.1			66.0		0.0			99.6	
Approach LOS		С			E		Α			· F	
Intersection Summary	CONTRACTOR OF THE	00.2400252						Sec. Sec. 14			
HCM Average Control I	Deleur		55.6	L	CMLa	vel of Se	n de o		. E		
HCM Volume to Capaci			1.11		Civi Le	vei or Se	IVICE		· . ⊑		
Actuated Cycle Length				c	um of l	ost time	(c)		12.0		
Intersection Capacity U		1	100.0 52.2%			el of Ser			12.0 H		
Analysis Period (min)	unzauon		52.2% 15	R	D Lev	5101 381	AIC B		r1		
c Critical Lane Group			15								
c Gritical Lane Group											

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### 4: Orillia Rd & Site Access

# HCM Unsignalized Intersection Capacity Analysis 2011 With-Project (with Tukwila south) PM

	Ť	۲	4	¥	¥	ŧ				
Movement	NBT	NBR	SBL	SBT	SWL	SWR				
Lane Configurations	<b>↑</b> }		۲	<u>†</u> †	٦	۲				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Volume (veh/h)	2480	11	11	1850	8	21				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph) Pedestrians	2667	12	12	1989	9	23				
Lane Width (ft) Walking Speed (ft/s) Percent Blockage										
Right turn flare (veh)										
Median type Median storage veh)					None					
Jpstream signal (ft)				66						
X, platoon unblocked					0.68					
C, conflicting volume			2678		3691	1339				
C1, stage 1 conf vol										
C2, stage 2 conf vol										
/Cu, unblocked vol			2678		4496	1339				
C, single (s)			4.3		7.3	7,4				
C, 2 stage (s)										
F (s)			2.3		3.7	3.5				
0 queue free %			91		0	81				
M capacity (veh/h)			133		0	117				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2			
/olume Total	1778	901	12	995	995	9	23	-	-	
/olume Left	0	0	12	0	0	9	0			
/olume Right	0	12	0	0	0	0	23			
:SH	1700	1700	133	1700	1700	0	117			
/olume to Capacity	1.05	0.53	0.09	0.59	0.59	27,25	0.19			
Queue Length 95th (ft)	0	0	7	0	0	Err	17			
Control Delay (s)	0.0	0.0	34.6	0.0	0.0	Err	42.8			
ane LOS			D			F	Ε			
Approach Delay (s)	0.0		0.2			2789.3				
Approach LOS						F				
ntersection Summary										
Average Delay			18.6							
ntersection Capacity Ut	ilization		78.9%	10	CU Lev	el of Ser	vice		D	
Analysis Period (min)			15							

5: S 200th St & Orillia Rd

Queues 2011 With-Project (with Tukwila south) PM

	->	4	۰.	t	6	Ļ			
Lane Group	EBT	WBL	WBR	NBT	SBL	SBT			
Lane Group Flow (vph)	10	458	1569	1359	658	1153			
v/c Ratio	0.07	1.18	1.15	0.91	1.20	0.54			
Control Delay	39.8	134.8	95.8	33.2	137.2	9.2			
Queue Delay	0.0	0,0	0.0	0.0	0.0	0.0			
Total Delay	39.8	134.8	95.8	33.2	137.2	9.2			
Queue Length 50th (ft)	5	~269	~475	310	~202	130		·	1
Queue Length 95th (ft)	21	#523	#738	#566	#360	261			
Internal Link Dist (ft)	36			266		3373		1. A.	. ·
Turn Bay Length (ft)									
Base Capacity (vph)	144	389	1369	1486	550	2146	S. 1. S. 1.		1.11.2
Starvation Cap Reductn	0	0	0	0	0	0			
Spillback Cap Reductn	0	J 0.	0	0	. 0	0			1 <u>1</u> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Storage Cap Reductn	0	0	0	0	0	0			
Reduced v/c Ratio	0.07	1.18	1.15	0.91	1.20	0.54	, s. š.,		24 - S
Intersection Summary									

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

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HCM Signalized Intersection Capacity Analysis 2011 With-Project (with Tukwila south) PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		\$		۲		**	ሻ	<b>↑</b> ⊅		ኘካ	<b>†</b> î>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0		4.0	4.0	
Lane Util. Factor		1.00		1.00		0.88		0.95		0.97	0.95	
Frt		1.00		1.00		0.85		0.99		1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (prot)		1854		1752		2760		3421		3183	3280	
Fit Permitted		0.98		0.95		1.00		1.00		0.95	1.00	
Satd. Flow (perm)		1854		1752		2760		3421		3183	3280	
Volume (vph)	5	5	0	435	0	1491	0	1166	125	625	1091	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	458	0	1569	0	1227	132	658	1148	5
RTOR Reduction (vph)	0	0	0	0	0	160	0	9	0	0	0	0
Lane Group Flow (vph)	0	10	0	458	0	1409	0	1350	0	658	1153	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm			Prot	c	ustom	Prot			Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					- 4 .						
Actuated Green, G (s)		0.9		17.0		29.0		33.1		12.0	51.1	
Effective Green, g (s)		2.9		18.0		32.0		35.1		14.0	53.1	
Actuated g/C Ratio		0.03		0.21		0.37		0.41		0.16	0.62	
Clearance Time (s)		6.0		5.0		6.0		6.0		6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)		63		367		1155		1396		518	2025	
v/s Ratio Prot				0.26		c0.20		c0.39		0.21	0.35	
v/s Ratio Perm		0.01				0.31						
v/c Ratio		0.16		1.25		1.22		0.97		1.27	0.57	
Uniform Delay, d1		40.4		34.0		27.0		24.9		36.0	9.7	
Progression Factor		1.00		1.00		1.00		1.00		1.00	1.00	
Incremental Delay, d2		1.2		132.4		106.9		17.4		136.2	1.2	
Delay (s)		41.5		166.4		133.9		42.3		172.2	10.9	
Level of Service		D		F		F		D		F	В	
Approach Delay (s)		41.5			141.3			42.3			69.5	
Approach LOS		D			F			D			E	
Intersection Summary					le la compositione de la composi							
HCM Average Control D	elay		90.3	ł	ICM Lev	vel of Se	ervice		F			
HCM Volume to Capacit	ty ratio		1.06									
Actuated Cycle Length (	s)		86.0			ost time			12.0			
Intersection Capacity Ut	ilization	1	02.5%	10	CU Leve	el of Ser	vice		G			
Analysis Period (min)			15									
c Critical Lane Group												

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1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2030 Baseline (with Tukwila south) Weekday-PM

2030 Baseline (with Tukwila south) Weekday-PM

						2030	Dasei	ne (with		a south)	vveeкday-Pi
	_#	-+	$\mathbf{\hat{v}}$	4	+	۲	*	ľ	4	¥	
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	
Lane Group Flow (vph)	128	1658	31	71	1092	735	31	194	750	536	
v/c Ratio	0.90	1.00	0.04	0.88	0.72	0.87	0.35	0.91	1.02	0.93	
Control Delay	112.0	55.6	11.1	117.2	19.8	14.2	70.6	96.3	87.4	64.9	
Queue Delay	0.0	28.0	0.0	0.0	49.8	44.2	0.0	0.0	173.9	0.0	
Total Delay	112.0	83.7	11.1	117.2	69.6	58.4	70.6	96.3	261.3	64.9	
Queue Length 50th (ft)	109	717	7	59	194	114	26	160	~343	~473	
Queue Length 95th (ft)	#232	#901	25	m65	m263	m153	60	#308	#468	#697	
Internal Link Dist (ft)		436			126		426			253	
Turn Bay Length (ft)	319		192	122		90					
Base Capacity (vph)	142	1661	751	81	1526	846	89	213	738	579	
Starvation Cap Reductn	0	0	0	0	534	171	0	0	0	0	
Spillback Cap Reductn	0	124	0	0	0	0	0	0	213	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.90	1.08	0.04	0.88	1.10	1.09	0.35	0.91	1.43	0.93	

Intersection Summary

1: S 188th St & Millitary Rd

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

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

	_#	-	$\mathbf{r}$	4	+	٤	1	۲	1	Ļ	¥	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	٦	<u>†</u> †	1	٦	<b>††</b>	1	ሻ	ž		ኘሻ	¥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1,00	0.95	1.00	1.00	0.95	1.00	2 C	0,95	0.96	di ta presente de la companya de la comp
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Fit Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0,95	0.96	· . ·
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Volume (vph)	125	1625	30	70	1070	720	30	165	25	735	395	130
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	128	1658	31	71	1092	735	31	168	26	750	403	133
RTOR Reduction (vph)	0	0	9	0	0	168	0	4	0	0	9	0
Lane Group Flow (vph)	128	1658	22	71	1092	567	31	190	0	750	527	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	. î	Perm	Prot		Perm	Prot			Prot		7
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	a spira		6			2	4	2.11	140	e i	1.20	an a
Actuated Green, G (s)	8.9	58.1	58.1	5.4	54.7	54.7	3.0	15.6		28.9	41.7	
Effective Green, g (s)	10,6	59.9	59.9	6.1	55.4	55.4	4.7	17.5	égy (* 1	30.5	43.3	y na na na Anna na na
Actuated g/C Ratio	0.08	0.46	0.46	0.05	0.43	0.43	0.04	0.13		0.23	0.33	
Clearance Time (s)	5.7		5.8	4.7	4,7		5.7	5.9	ha ha	5.6	5.6	et de la composition de la composition La composition de la c
Vehicle Extension (s)	3.0_	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	1599	716	81	1465	655	63	209	27-52	798	570	
v/s Ratio Prot	0.07	c0.48		0.04	0.32		0.02	c0.12		0.22	c0.31	
v/s Ratio Perm	1. A.		0,01			c0.37	1.44		e , 1 , 1	and the	1777 (2) 2779	
v/c Ratio	0.90	1.04	0.03	0.88	0.75	0.87	0.49	0.91		0.94	0.93	
Uniform Delay, d1	59.2	35.0	19.2		31.4	33.9	61.5	55.5	4. <sup>10</sup> 1	48.8	41.8	2011
Progression Factor	1.00	1.00	1.00	1.35	0.63	0.42	1.00	1.00		1.00	1.00	
Incremental Delay, d2	52.9	32.7	0.1	31,9	1.4		5.9	37.4		18.6	21.0	an a
Delay (s)	112.1	67.7	19.3	115.3	21.0	20.7	67.4	92.8		67.4	62.8	
Level of Service	F	. <b>E</b> :	В	F	С	C		्रे <b>F</b>		, ., ., <b>E</b> ,	Ę	late 1
Approach Delay (s)		70.0			24.4		89.3				65.5	
Approach LOS		E			, C	i di Lita	F		and a	÷.,	E	si i
Intersection Summary												
HCM Average Control D	elav	<li>56.</li>	53.2	기가가	ICM Le	vel of Se	ervice	1. 1 <sup>91</sup> -	D	. 가장은		Mere -
HCM Volume to Capacit			0.98									
Actuated Cycle Length (			130.0	S	um of I	ost time	(s)		12.0			
Intersection Capacity Ut			96.4%			el of Ser			F			
Analysis Period (min)			15									
c Critical Lane Group												

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The Transpo Group

Queues

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The Transpo Group

### 2: S 188th St & I-5 SB

Queues 2030 Baseline (with Tukwila south) Weekday-PM

	→	$\mathbf{r}$	*	←	1	Ļ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1536	809	1289	1897	1268	21	
v/c Ratio	1.30	0.66	1.48	0.92	1.30	0.05	
Control Delay	164.8	9.7	252.9	13.4	180.3	16.2	
Queue Delay	217.9	52.0	0.0	87.6	4.2	0.0	
Total Delay	382.7	61.7	252.9	101.0	184.5	16.2	
Queue Length 50th (ft)	~866	107	~718	316	~705	3	
Queue Length 95th (ft)	m#863	m106	m#448	m212	#840	23	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1179	1233	870	2070	973	459	
Starvation Cap Reductn	320	499	0	484	0	0	
Spillback Cap Reductn	0	0	0	302	7	151	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.79	1.10	1.48	1.20	1.31	0.07	

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

 Queue shown is maximum after two cycles.

 # 95th percentile volume exceeds capacity, queue may be longer.

 Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

### 2: S 188th St & I-5 SB

HCM Signalized Intersection Capacity Analysis 2030 Baseline (with Tukwila south) Weekday-PM

											,	
	٨	→	7	4	+	×.	•	t	~	4	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		**	77	ኘሻ	<b>^</b>					ሻሻ	٦ ډ	
Ideal Flow (vphpl)	1900	1900		1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	·				4.0	4.0	
Lane Util. Factor		0.95	0.88	0.97	0.95	e en state				0.97	1.00	, p. 1.
Frt		1.00	0.85	1.00	1.00	, , , , , , , , , , , , , , , , , , ,				1.00	0.85	
Flt Protected		1.00			1.00	1. A.				0.95	1.00	
Satd. Flow (prot)		3406	2682	3303	3406					2943	1357	
Flt Permitted		1.00	1.00		1.00	•				0.95	1.00	12.14
Satd. Flow (perm)		3406	2682	284	3406					2943	1357	
Volume (vph)	0	1490	785		1840	· - 0	0		0:	1230	0	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0.97	1536	809	1289		0.57		0.57	.0	1268	0.37	21
RTOR Reduction (vph)	0	0	305	1209	0	0	0	0	0	1200	10	0
Lane Group Flow (vph)	.0	1536	504	1289	1897	0	0	ŏ	0	1268	11	ŏ
	6%	6%	504 6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Heavy Vehicles (%)	0%	0%			0%	0%	0%	0%	0%		19%	1970
Turn Type			Perm	pm+pt		14 B. A.		, í, s		Perm		2.0
Protected Phases		2		1	6						8	
Permitted Phases			2					á ta sa s		8		1215
Actuated Green, G (s)		44.0	44.0	78.0	78.0					42.0	42.0	
Effective Green, g (s)		45.0	45.0	79.0			· * •			43.0	43.0	strin at
Actuated g/C Ratio		0.35	0.35	0.61	0.61					0.33	0.33	
Clearance Time (s)		5.0	5.0		5.0	18 N S S S				5.0		949 M
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)	1929 - 19	1179	928		2070					973		
v/s Ratio Prot		0.45		c0.34	0.56						0.01	
v/s Ratio Perm	· · .		0.19	c0.56	ter te	a na Stalla gan		al parts i		c0.43	M.	1421
v/c Ratio		1.30	0.54	1.48	0.92					1.30	0.02	
Uniform Delay, d1	1. 18	42.5	34.2	52.2	22.6	61. etc.		W. C.	1.12	43.5	29.3	14 J. 1
Progression Factor		0.69	0.66	1.27	0.53					1.00	1.00	
Incremental Delay, d2	1.10	136.8	0.2	218.1	0.8	and i			·	144.0	0.0	As . C.
Delay (s)		166.1	22.7	284.3	12.7					187.5	29.4	
Level of Service		F	C	್ ್ ೯	В	et. 15			· , ··	3 F	С	la sera
Approach Delay (s)		116.6			122.6			0.0			184.9	
Approach LOS		F	· _ ~ ~		F	9. 13 F.S.,	È	A., 2			. <b>F</b>	
Intersection Summary			and the									
HCM Average Control D	)elay	1.1.1	132.3	1 1 T	ICM Le	vel of Se	rvice	Martin party	F	- alterna	111	
HCM Volume to Capacit	ty ratio		1.40									
Actuated Cycle Length (	s)		130.0		Sum of I	ost time	(s)	3.00	8.0	1.11		
Intersection Capacity Ut		1	65.1%			el of Serv			н			
Analysis Period (min)			15		r tak ing	10	· '	1.1.1				
c Critical Lane Group	,											

c Critical Lane Group

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3: S 188th St & I-5 NB

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_ane Group	EBL	EBT	WBT	WBR	NEL2	NEL	NER	
ane Group Flow (vph)	448	2325	2644	1830	588	293	289	
/c Ratio	1,41	0.94	1.38	0.96	1.02	1.05	1.09	
Control Delay	218.1	14.6	202.2	26.9	94.3	114.6	126.7	
Queue Delay	0.0	45.0	18.0	0.0	0.0	0.0	0.0	
Total Delay	218.1	59.5	220.2	26.9	94.3	114.6	126.7	
Queue Length 50th (ft)	~456	350	~1555	514	~270	~256	~275	
Queue Length 95th (ft)	m#271	m259	#1680	#817	#387	#441	#468	
nternal Link Dist (ft)		410	1			232		
Turn Bay Length (ft)	170							
Base Capacity (vph)	318	2474	1913	1906	577	280	266	
Starvation Cap Reductn	0	362	0	0	0	0	0	
Spillback Cap Reductn	0	0	54	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	1.41	1.10	1.42	0.96	1.02	1.05	1.09	

#### Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.

3: S 188th St & I-5 NB	
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HCM Signalized Intersection Capacity Analysis 2030 Baseline (with Tukwila south) Weekday-PM

EBL					-		•		/	1	
C D L	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER	
ሻ	<b>^†</b>			<u>†</u> †	**			ካካ	¥	۴	
1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
4.0	4.0			4.0	4.0			4.0	4.0	4.0	
1.00	0.95			0.95	0.88			0.97	1.00	0.95	
1.00	1.00			1.00	0.85			1.00	0.85	0.85	
0.95	1.00			1.00	1.00			0.95	1.00	1.00	
1641	3282			3406	2682			3127	1445	1370	
0.05	1.00			1.00	1.00			0.95	1,00	1.00	
90	3282			3406	2682			3127	1445	1370	
435	2255	0	0	2565	1775	0	0	570	5	560	1 A. J.
0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
448	2325	0	0	2644	1830		0	588	5	577	
0	0	0	0	0	400	0	0	0	13	13	
	2325	0	0	2644	1430	0	0	588	280	276	
		10%	6%	6%		0%	0%	12%	12%	12%	
	1.11				Perm			Split	375 S. S. S.	Perm	2
	2			6					4		
	-			•	6				•	. 4	
	97.0			72.0			<i>´</i>	23.0	23.0	23.0	
						· · · · · ·	and a star				
			· `	- 1- 1-4p	1			Pri			
		5 11									
			,				12.57				1.5.1
-,					1000	,		<i>;</i>		200	
				0.70	0 52			0.19		-0.20	
			- 55	1 20		21 9.7		1 00			1215
		*									
			1 sec.		-2	1.1.23	and the	2.22 6 2		· 7 · 600 · -	
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2				1 2 1 2 1 2							2011
						.,					
- F					<b>D</b> .	·		г		1 <b>F</b>	· ·
					2.10						
	· · D	11.2	1.00	9 ( <b>F</b> 9	17. 24 6	<b>. A</b> :	Sec. 1	$1.5 \times 10^{-1}$	- 10 E	1. sta 11	100
	Stores.			and the second	and the set				1.199		
elay	•	104.4	 ₩~Ĥ	CM Le	vel of Se	rvice		× ×F	1.1	. <u>1</u> . 457	al mai
v ratio		1.32		,							
5) ~			S	um of l	ost time	(s)		8.0			1. 11
	1	1 - 12 0						H			
						· ·		·			
	1900 4.0 1.00 0.95 1641 0.05 90 435 0.97 448 10% 0 448 10% 0 448 0 448 0 97.0 98.0 0.75 5.0 2.5 318 c.0.23 318 c.0.24 1.41 5.1.1 0.86 F F	1900         1900           4.0         4.0           1.00         0.95           1.00         0.95           1.00         1.00           0.95         1.00           1641         3282           435         2255           0.97         0.97           448         2325           10%         10%           pm+pt         5           2         2           97.0         97.0           98.0         0.75           0.55.0         5.0           2.5         4.0           318         2474           c0.23         0.71           c0.84         51.1           1.41         0.94           51.1         13.5           0.86         0.95           185.7         1.0           229.5         13.8           F         B           48.6         D           29.5         13.8	1900         1900         1900           4.0         4.0           1.00         0.95           1.00         1.00           0.95         1.00           1.641         3282           435         2255         0           0.97         0.97         0.97           448         2325         0           0         0         0           0.07         0.97         0.97           448         2325         0           0.0         0         0           0.05         1.0%         10%           0.97         0.97         0.97           448         2325         0           0.0         0         0           0.05         1.0%         10%           pm+pt         5         2           97.0         97.0         98.0           0.75         5.0         5.0           2.5         4.0         1.31           2.5         4.0         1.32           318         2474         .0.23           0.86         0.95         185.7           1.41         0.94         1.32 </td <td>1900       1900       1900       1900       1900         4.0       4.0       4.0       1900       1900       1900         1.00       0.95       1.00       100       100       100       100       100       100       100       100       100       100       105       1.00       100       105       1.00       100       100       100       100       107       107       107       107       448       2325       0       <t< td=""><td>1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.95           1.00         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           903282         3406         3406           448         2325         0         0         2644           0         0         0         0         0         0           97.0         97.0         72.0         98.0         6%         6%           97.0         97.0         72.0         5.3         1.0</td><td>1900         1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.88         0.95         0.88           0.95         1.00         1.00         1.00         1.00         1.00           1641         3282         3406         2682         0.05         1.00         1.00           90         3282         3406         2682         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           448         2325         0         0         2644         1430           10%         10%         10%         6%         6%         6%           97.0         97.0         72.0         72.0         72.0         73.0           0.75         0.75         0.56         0.50         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0         <t< td=""><td>1900       1900       1900       1900       1900       1900       1900         4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       0.88      </td><td>1900       1900</td><td>1900       1900</td><td>1900       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       0.0       <td< td=""><td><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td<></td></t<></td></t<></td>	1900       1900       1900       1900       1900         4.0       4.0       4.0       1900       1900       1900         1.00       0.95       1.00       100       100       100       100       100       100       100       100       100       100       105       1.00       100       105       1.00       100       100       100       100       107       107       107       107       448       2325       0 <t< td=""><td>1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.95           1.00         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           903282         3406         3406           448         2325         0         0         2644           0         0         0         0         0         0           97.0         97.0         72.0         98.0         6%         6%           97.0         97.0         72.0         5.3         1.0</td><td>1900         1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.88         0.95         0.88           0.95         1.00         1.00         1.00         1.00         1.00           1641         3282         3406         2682         0.05         1.00         1.00           90         3282         3406         2682         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           448         2325         0         0         2644         1430           10%         10%         10%         6%         6%         6%           97.0         97.0         72.0         72.0         72.0         73.0           0.75         0.75         0.56         0.50         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0         <t< td=""><td>1900       1900       1900       1900       1900       1900       1900         4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       0.88      </td><td>1900       1900</td><td>1900       1900</td><td>1900       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       0.0       <td< td=""><td><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td<></td></t<></td></t<>	1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.95           1.00         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           0.95         1.00         1.00         1.00           903282         3406         3406           448         2325         0         0         2644           0         0         0         0         0         0           97.0         97.0         72.0         98.0         6%         6%           97.0         97.0         72.0         5.3         1.0	1900         1900         1900         1900         1900         1900         1900           4.0         4.0         4.0         4.0         4.0         4.0           1.00         0.95         0.95         0.88         0.95         0.88           0.95         1.00         1.00         1.00         1.00         1.00           1641         3282         3406         2682         0.05         1.00         1.00           90         3282         3406         2682         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           0.97         0.97         0.97         0.97         0.97         0.97         0.97           448         2325         0         0         2644         1430           10%         10%         10%         6%         6%         6%           97.0         97.0         72.0         72.0         72.0         73.0           0.75         0.75         0.56         0.50         5.0         5.0         5.0         5.0         5.0         5.0         5.0         5.0 <t< td=""><td>1900       1900       1900       1900       1900       1900       1900         4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       0.88      </td><td>1900       1900</td><td>1900       1900</td><td>1900       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       0.0       <td< td=""><td><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td<></td></t<>	1900       1900       1900       1900       1900       1900       1900         4.0       4.0       4.0       4.0       4.0       4.0         1.00       0.95       0.95       0.88	1900       1900	1900       1900	1900       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       4.0       0.0 <td< td=""><td><math display="block">\begin{array}{c ccccccccccccccccccccccccccccccccccc</math></td></td<>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

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#### 4: Orillia Rd & Site Access

HCM Unsignalized Intersection Capacity Analysis 2030 Baseline (with Tukwila south) Weekday-PM

	1	ľ	4	Ļ	¥	ŧ٧				
Movement	NBT	NBR	SBL	SBT	SWL	SWR	an a	S. A. B.		
Lane Configurations	†î⇒		٣	<b>^</b>	٣	۲				
Sign Control	Free			Free	Stop					
Grade	0%			0%	0%					
Volume (veh/h)	4320	9	15	2810	7	18				
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93				
Hourly flow rate (vph) Pedestrians Lane Width (ft) Walking Speed (ft/s) Percent Blockage	4645	10	16	3022	8	19				
Right turn flare (veh) Median type Median storage veh)					None					
Upstream signal (ft)				66						
pX, platoon unblocked				00	0.25					
vC, conflicting volume vC1, stage 1 conf vol vC2, stage 2 conf vol			4655		6193	2327				
/Cu, unblocked vol			4655		18654	2327				
C, single (s)			4.3		7.3	7.4				
C, 2 stage (s)			1.0							
F (s)			2.3		3.7	3.5				
00 queue free %			15		0	12				
cM capacity (veh/h)			19		Ō	22				
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2			
/olume Total	3097	1558	16	1511	1511	8	19		<u></u>	
/olume Left	0	0	16	0	0	8	ő			
/olume Right	Ő.	10	õ	ŏ	ŏ	. Ŭ	19			
SH	1700	1700	19	1700	1700	õ	22			
/olume to Capacity	1.82	0.92	0.85	0.89	0.89	Err	0.88			
Queue Length 95th (ft)	0	0	57	0	0	Err	63			
Control Delay (s)	0.0	0.0	435.6	0.0	0.0	Err	399.2			
ane LOS	,		F			F	F			
Approach Delay (s) Approach LOS	0.0		2.3		:	3087.2 F				
ntersection Summary								1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		
Average Delay Intersection Capacity UI Analysis Period (min)	tilization	. 1	11.7 29;7% 15	· 1	CU Leve	el of Sei	vice		н	 

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5: S 200th St & Orillia Rd

Queues 2030 Baseline (with Tukwila south) Weekday-PM

	-	4	×.	t	1	1	Ļ	
Lane Group	EBT	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Group Flow (vph)	10	900	3284	1479	305	1400	1394	
v/c Ratio	0.11	1.65	1.78	1.09	0.54	0.97	0.56	
Control Delay	71.6	336.1	375.4	100.5	19.1	55.7	9.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	71.6	336.1	375.4	100.5	19.1	55.7	9.1	
Queue Length 50th (ft)	- 9	~598	~2475	~535	74	609	222	
Queue Length 95th (ft)	31	#802	#2844	#714	185	#880	375	
Internal Link Dist (ft)	36			266			3373	
Turn Bay Length (ft)								
Base Capacity (vph)	87)	546	1844	1359	569	1444	2473	이 같은 것 같은
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	Q	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.11	1.65	1.78	1.09	0.54	0.97	0.56	and the second
Intersection Summary								
~ Volume exceeds cap	acity, c	ueue is	theoret	ically in	finite.			CENTRAL CONTRACTOR CONTRACTOR
Queue shown is maxi	mum a	fter two	cycles.	-				

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

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HCM Signalized Intersection Capacity Analysis 2030 Baseline (with Tukwila south) Weekday-PM

	۶	-	$\mathbf{r}$	4	+	×.	•	Ť	1	1	ţ	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4		ሻሻ		11	۲	ተተተ	۴	ሻሻ	<b>↑</b> î→	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.97		0.88		0.91	1.00	0.97	0.95	
Frt		1.00		1.00		0.85		1.00	0.85	1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1854		3400		2760		4988	1553	3183	3280	
Fit Permitted		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1854		3400		2760		4988	1553	3183	3280	
Volume (vph)	5	5	0	855	0	3120	0	1405	290	1330	1320	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	900	0	3284	0	1479	305	1400	1389	5
RTOR Reduction (vph)	0	0	0	0	0	80	0	0	148	0	0	0
Lane Group Flow (vph)	0	10	0	900	0	3204	0	1479	157	1400	1394	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm			Prot	C	ustom	Prot		Perm	Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	3					4			2			
Actuated Green, G (s)		1.9		22.0		85.1		37.1	37.1	63.1	106.2	
Effective Green, g (s)		3.9		23.0		88.1		39.1	39.1	65.1	108.2	
Actuated g/C Ratio		0.03		0.16		0.60		0.27	0.27	0.44	0.74	
Clearance Time (s)		6.0		5.0		6.0		6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		49		532	· ·	1728		1326	413	1409	2413	
v/s Ratio Prot				0.26		c0.82		c0.30		0.44	0.42	
v/s Ratio Perm		0.01				0.34			0.10			
v/c Ratio		0.20		1.69		1.85		1.12	0.38	0.99	0.58	
Uniform Delay, d1		70.1		62.0		29.5		54.0	44.1	40.8	8.9	
Progression Factor		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.1		319.3		386.6		62.8	2.7	22.3	1.0	
Delay (s)		72.1		381.4		416.1		116.8	46.8	63.1	10.0	
Level of Service		E		F	100.0	F		F	D	E	A	
Approach Delay (s)		72.1 E			408.6 F			104.8 F			36.6	
Approach LOS		E			۲			F			D	
Intersection Summary								Sec. Sec.		Sec.		
HCM Average Control D	elay		227.9	н	ICM Lev	el of Se	ervice		F			
HCM Volume to Capacit	y ratio		1.59									
Actuated Cycle Length (			147.1	S	um of lo	ost time	(s)		12.0			
Intersection Capacity Uti	ilization	1	50.5%	IC	CU Leve	el of Ser	vice		н			
Analysis Period (min)			15									
c Critical Lane Group												

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#### 1: S 188th St & Millitary Rd

HCM Signalized Intersection Capacity Analysis 2030 With-Project (with Tukwila south) Weekday-PM

	_#	-	$\mathbf{r}$	4	←	۲	•	۲	1	6	¥	~
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	NBR2	SWL2	SWL	SWR
Lane Configurations	ŗ	<u>^</u>	1	ሻ	<b>^</b>	1	ኻ	ž		ኻኻ	¥	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		0.97	1.00	
Frt	1.00	· 1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.96	
Fit Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (prot)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	0.96	
Satd. Flow (perm)	1736	3471	1553	1719	3438	1538	1736	1553		3400	1712	
Volume (vph)	125	1626	30	71	1072	721	30	165	26	735	395	130
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	128	1659	31	72	1094	736	31	168	27	750	403	133
RTOR Reduction (vph)	0	0	9	0	0	168	0	4	0	0	9	0
Lane Group Flow (vph)	128	1659	22	.72	1094	568	31	191	0	750	527	0
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	3%	3%	3%
Turn Type	Prot		Perm	Prot		Perm	Prot			Prot		
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6			- 2						
Actuated Green, G (s)	8.9	58.1	58.1	5.4	54.7	54.7	3.0	15.6		28.9	41.7	
Effective Green, g (s)	10.6	59.9	59,9	6.1	55.4	55.4	4.7	17.5		30.5	43.3	
Actuated g/C Ratio	0.08	0.46	0.46	0.05	0.43	0.43	0.04	0.13		0.23	0.33	
Clearance Time (s)	5.7	5.8	5.8	4.7	4.7	4.7	5.7	5.9		5.6	5.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	142	1599	716	81	1465	655	63	209		798	570	
v/s Ratio Prot	0.07	c0.48		0.04	0.32		0.02	c0.12		0.22	c0.31	
v/s Ratio Perm			0.01			c0.37						
v/c Ratio	0.90	1.04	0.03	0.89	0.75	0.87	0.49	0.91		0.94	0.93	
Uniform Delay, d1	59.2	35.0	19.2	61.6	31.4	33.9	61.5	55.5		48.8	41.8	
Progression Factor	1.00	1.00	1.00	1.35	0.63	0.42	1.00	1.00		1.00	1.00	
incremental Delay, d2	52.9	32.9	0.1	34.1	1.4	6.4	5.9	38.7		18.6	21.0	
Delay (s)	112.1	67.9	19.3	117.2	21.1	20.8	67.4	94.2		67.4	62.8	
Level of Service	F	E	в	, F	C	С	,E	F		E	E	
Approach Delay (s)		70.2			24.6		90.5				65.5	
Approach LOS		E			С		F				Ĕ	
Intersection Summary	a de la compañía de l	the Parts	Sec.	tin states		Ser all						
HCM Average Control D			53.3	· 1	ICM Lev	vel of Se	rvice		. D	* (	A	
HCM Volume to Capacit			0:98									
Actuated Cycle Length (			130.0			ost time			12.0			
Intersection Capacity Ut	ilization		96.4%		CU Leve	el of Ser	vice		F			
Analysis Period (min)			15									
c Critical Lane Group												

Queues 2030 With-Project (with Tukwila south) Weekday-PM

#### 1: S 188th St & Millitary Rd

\_₹ ٢ EBL EBR WBL WBT WBR NBL NBR SWL2 SWL Lane Group EBT Lane Group Flow (vph) 128 1659 31 72 1094 736 31 195 750 536 v/c Ratio 1.00 0.89 0.72 0.87 0.35 0.92 1.02 0.93 0.90 0.04 Control Delay 112.0 11.1 118.7 19.9 55.8 14.3 70.6 97.2 87.4 64.9 Queue Delay 0.0 28.2 0.0 0.0 50.6 45.4 0.0 0.0 173.9 0.0 Total Delay 11.1 118.7 70.5 112.0 83.9 59.7 70.6 97.2 261.3 64.9 Queue Length 50th (ft) 109 718 7 60 195 115 26 161 ~343 ~473 Queue Length 95th (ft) #232 #903 25 m66 m262 m153 60 #308 #468 #697 Internal Link Dist (ft) 436 126 426 253 Turn Bay Length (ft) 319 192 122 90 Base Capacity (vph) 751 1526 89 142 1661 81 846 213 738 579 Starvation Cap Reductn 534 172 0 0 0 0 0 0 0 0 Spillback Cap Reductn 124 0 0 213 0 0 0 0 0 0 Storage Cap Reductn 0 0 0 0 0 0 0 0 0 0 Reduced v/c Ratio 0.04 0.92 0.93 0.90 1.08 0.89 1.10 1.09 0.35 1.43

#### Intersection Summary

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

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

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#### 2: S 188th St & I-5 SB

		$\mathbf{r}$	1	←	1	Ļ	
Lane Group	EBT	EBR	WBL	WBT	SBL	SBT	
Lane Group Flow (vph)	1538	809	1292	1901	1270	21	
v/c Ratio	1.30	0.66	1.49	0.92	1.31	0.05	
Control Delay	165.6	9.7	254.4	13.4	181.1	16.2	
Queue Delay	218.2	52.0	0.0	88.7	6.0	0.0	
Total Delay	383.7	61.7	254.4	102.1	187.2	16.2	
Queue Length 50th (ft)	~868	107	~721	316	~706	3	
Queue Length 95th (ft)	m#865	m106	m#448	m212	#842	23	
Internal Link Dist (ft)	126			410		462	
Turn Bay Length (ft)			152				
Base Capacity (vph)	1179	1233	870	2070	973	459	
Starvation Cap Reductr	320	499	0	484	0	0	
Spillback Cap Reductn	ΰ0	0	0	302	10	151	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	1.79	1.10	1.49	1.20	1.32	0.07	

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# Stith percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
 m Volume for 95th percentile queue is metered by upstream signal.

2:	S	188th	St &	1-5	SB
· · ·	0	10001	0.0	1.0	00

HCM Signalized Intersection Capacity Analysis 2030 With-Project (with Tukwila south) Weekday-PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		<u>†</u> †	11	ሻሻ	††					ኘካ	ĥ	
Ideal Flow (vphpl)	1900		1900			1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			12.17		4.0	4.0	
Lane Util. Factor		0.95	0.88	0.97	0.95					0.97	1.00	,
Frt		1.00	0.85	1.00	1.00					1.00	0.85	
Flt Protected		1.00	1.00	0.95	1.00					0.95	1.00	$\{x_i\}_{i \in \mathbb{N}}$
Satd. Flow (prot)		3406	2682	3303	3406					2943	1357	
Fit Permitted	(	1.00	1.00	0.08	1.00					0.95	1.00	5 m
Satd. Flow (perm)		3406	2682	284	3406					2943	1357	
Volume (vph)	0	1492	785	1253	1844	0	0	0	· 0	1232	0	20
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1538	809	1292	1901	0	0	0	0	1270	0	21
RTOR Reduction (vph)	0	0	305	0	0	0	0	0	0	0	10	0
Lane Group Flow (vph)	0	1538	504	1292	1901	0	0.	0 1	· _0	1270	.11	0
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	0%	0%	0%	19%	19%	19%
Turn Type	1.00		Perm	pm+pt	r en fre		ĺ.			Perm		
Protected Phases		2		1	6						8	
Permitted Phases			2	6						8		
Actuated Green, G (s)		44.0	44.0	78.0	78.0					42.0	42.0	
Effective Green, g (s)		45.0	45.0	79,0	79.0					43.0	43.0	
Actuated g/C Ratio		0.35	0.35	0.61	0.61					0.33	0.33	
Clearance Time (s)		5.0	5.0	5.0	5.0					5.0	5.0	5
Vehicle Extension (s)		4.0	4.0	3.0	4.0					3.0	3.0	
Lane Grp Cap (vph)		1179	928	869	2070					973	449	1211
v/s Ratio Prot		0.45		c0.34	0.56						0.01	
v/s Ratio Perm			0.19	c0.56						c0.43		
v/c Ratio		1.30	0.54	1.49	0.92					1.31	0.02	
Uniform Delay, d1		42.5	34.2	52.2	22.6					43.5	29.3	
Progression Factor		0.69	0.66	1.27	0.53					1.00	1.00	
Incremental Delay, d2		137.6	0.2	219.6	0.9					144.9	0.0	
Delay (s)		166.9	22.6	285.9	12.8					188.4	29.4	
Level of Service		F	С	F	В					F	C	
Approach Delay (s)		117.2			123.3			0.0			185.8	
Approach LOS		F			F			А			F	
Intersection Summary												
HCM Average Control De			133.0	F	ICM Le	vel of Se	rvice		F	141		·
HCM Volume to Capacity			1.41									
Actuated Cycle Length (s			130.0			ost time (			8.0			
Intersection Capacity Util	lization	1	65.5%	10	CU Lev	el of Serv	/ice		н			
Analysis Period (min)			15									

c Critical Lane Group

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#### 3: S 188th St & I-5 NB

HCM Signalized Intersection Capacity Analysis 2030 With-Project (with Tukwila south) Weekday-PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	SBL	SBR	NEL2	NEL	NER	
Lane Configurations	ሻ	<b>^</b>			<b>††</b>	77			ኻኻ	Y	7	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0	4.0			4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95			0.95	0.88			0.97	1.00	0.95	
Frt	1.00	1.00			1.00	0.85			1.00	0.85	0.85	
Flt Protected	0.95	1.00			1.00	1.00			0.95	1.00	1.00	S
Satd. Flow (prot)	1641	3282			3406	2682			3127	1445	1370	
Fit Permitted	0.05	1.00			1.00	1.00		7697 g	0.95	1.00	1.00	Marine .
Satd. Flow (perm)	90	3282			3406	2682			3127	1445	1370	
Volume (vph)	435	2259	0	0	2572	1779	0	0	570	5	562	de de
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	
Adj. Flow (vph)	448	2329	0	0	2652	1834	0	0	588	5	579	6 1.93
RTOR Reduction (vph)	0	0	0	0	0	400	0	0	0	13	13	
Lane Group Flow (vph)	448	2329	. 0	0	2652	1434	0	0	588	281	277	
Heavy Vehicles (%)	10%	10%	10%	6%	6%	6%	0%	0%	12%	12%	12%	
Turn Type	pm+pt	6 C (	5.141	1.127	8 Y Y	Perm	- 11 A. 1	1. A	Split	hand -	Perm	4555 · · ·
Protected Phases	5	2		5.	6	-23-2004	. 1		4	4	· · · · 5626295	
Permitted Phases	2		÷.,		. 5	6					. 4	-{
Actuated Green, G (s)	97.0	97.0			72.0	72.0			23.0	23.0	23.0	
Effective Green, g (s)	98.0	98.0			73.0	73.0			24.0	24.0	24.0	
Actuated g/C Ratio	0.75	0.75			0.56	0.56			0.18	0.18	0.18	
Clearance Time (s)	5.0	5.0		,	5.0	5.0	, · · ·		5.0	5.0	5.0	
Vehicle Extension (s)	2.5	4.0			5.0	5.0			3.5	3.5	3.5	
Lane Grp Cap (vph)	318	2474			1913	1506	e de e	George I.	577	267	253	
v/s Ratio Prot	c0.23	0.71			0.78	0.0 <b>4</b> .000		17	0.19	0.19		
v/s Ratio Perm	c0.84		- C		<b>,</b>	0.53			0,10		c0.20	
v/c Ratio	1.41	0.94			1.39	0.95		ć	1.02	1.05	1.09	
Uniform Delay, d1	51.1		·		28.5	26.8		1.3	53.0	53.0	53.0	
Progression Factor	0.86	0.95			1.00	1.00			1.00	1.00	1.00	
Incremental Delay, d2	185.7	1.0			177.2	14.3			42.4	69.5	84.2	
Delay (s)	229.6	13.9			205.7	41.1			95.4	122.5	137.2	
Level of Service	F	B			F	D			F	F	27%F	
Approach Delay (s)	•	48.7			138.4		0.0		.,	112.5	,,	
Approach LOS		D			F		A			F	an the second	
Intersection Summary											and the second	
HCM Average Control E	)elay		105.3	н	CM Lev	el of Se	rvice		F	184 J	e hyd	
HCM Volume to Capaci	ty ratio		1.32									
Actuated Cycle Length (	s)		130.0	S	um of lo	ost time	(s)		8.0			
Intersection Capacity Ut	ilization	1	65.5%	10	U Leve	of Sen	vice		н			
Analysis Period (min)			15									
c Critical Lane Group												

3: S 188th St & I-5 NB

Queues

2030 With-Project (with Tukwila south) Weekday-PM

	٭	-	+	×.	•	•	/	
Lane Group	EBL	EBT	WBT	WBR	NEL2	NEL	NER	
Lane Group Flow (vph)	448	2329	2652	1834	588	294	290	
v/c Ratio	1.41	0.94	1.39	0.96	1.02	1.05	1.09	
Control Delay	218.1	14.7	204.0	27.3	94.3	115.5	127.8	
Queue Delay	0,0	45.5	18.4	0.0	0.0	0.0	0.0	
Total Delay	218.1	60.1	222.5	27.3	94.3	115.5	127.8	
Queue Length 50th (ft)	~457	352	~1562	519	~270	~258	~277	
Queue Length 95th (ft)	m#271	m259	#1687	#822	#387	#443	#470	
Internal Link Dist (ft)		410	1			232		
Turn Bay Length (ft)	170							
Base Capacity (vph)	318	2474	1913	1906	577	280	266	
Starvation Cap Reductn	0	361	0	0	0	0	0	
Spillback Cap Reductn	0	0	55	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	1.41	1.10	1.43	0.96	1.02	1.05	1.09	

#### Intersection Summary

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

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

m Volume for 95th percentile queue is metered by upstream signal.

M:\02\02150 Bow Lake TS\\$2006 TIA\LOS\PM-Future 2030-wpipeline.sy7

M:\02\02150 Bow Lake TS\\$2006 TIA\LOS\PM-Future 2030-wpipeline.sy7

The Transpo Group

Page 6

4: Orillia Rd & Site Access

HCM Unsignalized Intersection Capacity Analysis 2030 With-Project (with Tukwila south) Weekday-PM

ane Configurations $\uparrow$ </th <th></th> <th>Ť</th> <th>۲</th> <th>L.</th> <th>ţ</th> <th>¥</th> <th>ŧ</th> <th></th> <th></th> <th></th>		Ť	۲	L.	ţ	¥	ŧ			
ign Control       Free       Free       Stop         irade       0%       0%       0%       0%         olume (ve/ht)       4320       15       21       2810       11       29         eak Hour Factor       0.93       0.93       0.93       0.93       0.93       0.93         lourly flow rate (vph)       4645       16       23       3022       12       31         edestrians       ane Width (ft)       ////////////////////////////////////	Movement	NBT	NBR	SBL	SBT	SWL	SWR			
Trade       0%       0%       0%       0%         olume (veh/h)       4320       15       21       2810       11       29         eak Hour Factor       0.93       0.93       0.93       0.93       0.93       0.93         lourly flow rate (vph)       4645       16       23       3022       12       31         edestrians       ane Width (ft)       4645       16       23       3022       12       31         valking Speed (ft/s)       ercent Blockage       ight urn flare (veh)       fedian storage veh)       pstream signal (ft)       66         X, platoon unblocked       0.25       .       .       .       .         C1, stage 1 conf vol       233       3.7       3.5       .       .         C1, stage 1 conf vol       4661       18716       2331       .       .         S, single (s)       4.3       7.3       7.4       .       .       .       .         C2, stage 2 conf vol       .<	Lane Configurations	<b>≜</b> †≽		۲	<u>†</u> †	 ۲	7			
Oume (veh/h)       4320       15       21       2810       11       29         eak Hour Factor       0.93       0.93       0.93       0.93       0.93       0.93         oundy flow rate (vph)       4645       16       23       3022       12       31         edestrians       ane Width (ft)       ////////////////////////////////////	Sign Control	Free			Free	Stop				
eak Hour Factor       0.93       0.93       0.93       0.93       0.93         lourly flow rate (vph)       4645       16       23       3022       12       31         edestrians ane Width (ft)       4645       16       23       3022       12       31         valking Speed (ft/s) ercent Blockage       ercent Blockage       None       Image: Speed (ft/s)         ledian storage veh)       66	Grade	0%			0%	0%				
bourdy flow rate (vph)       4645       16       23       3022       12       31         edestrians       ane Width (ft)       valking Speed (ft/s)       ercent Blockage       ight run flare (veh)         ledian type       None       None       ledian type       None         ledian storage veh)       66       X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       C2, stage 2 conf vol       C2, stage 2 conf vol         C2, stage 2 conf vol       23       3.7       3.5         O queue free %       0       0       0         V, zage (s)       2.3       3.7       3.5         o queue free %       0       0       0         O queue free %       0       0       22         irrection, Lane #       NB 1       NB 2       SB 2       SB 3       SW 1       SW 2         olume Right       0       16       0       0       3.1       SH       SH       SH       2.2         olume Left       0       0       7.9       0       2.2       0       0       2.2       0         olume Right       0       16       0.0<	Volume (veh/h)	4320	15	21	2810	11	29			
edestrians       ane Width (ft)         Valking Speed (ft/s)       ercent Blockage         light turn flare (veh)       ledian storage veh)         ledian storage veh)       0         pstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       2       2331       2         C2, stage 2 conf vol       0       4661       18716       2331         C, single (s)       4.3       7.3       7.4         C, 2 stage 2 conf vol       0       0       0         C1, stage 1 conf vol       2.3       3.7       3.5       0         C2, stage 2 conf vol       2.3       3.7       3.5       0       0       0         C3, single (s)       2.3       3.7       3.5       0       0       0       0         K capacity (veh/h)       19       0       2.2       0       0       0       0         Irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12 <t< td=""><td>Peak Hour Factor</td><td>0.93</td><td>0.93</td><td>0.93</td><td>0.93</td><td>0.93</td><td>0.93</td><td></td><td></td><td></td></t<>	Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93			
ane Width (ft)         Valking Speed (ft/s) ercent Blockage ight turn flare (veh) tedian storage veh) pstream signal (ft)       None         Iedian storage veh) pstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       2331       C1       C2, stage 2 conf vol         C2, stage 2 conf vol       4.3       7.3       7.4         C, single (s)       4.3       7.3       7.4         C, stage (s)       5       2.3       3.7       3.5         C queue free %       0       0       0         M capacity (veh/h)       19       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Ctal       3097       1565       2.3       1511       151       12       31         olume Left       0       0       2.3       0       12       0         olume to Capacity       1.82       0.92       1.20       0.89       0.89       Err       1.43         ueue Length 95th (ft)       0       0       79       0       Err       F	Hourly flow rate (vph)	4645	16	23	3022	12	31			
Valking Speed (ff/s)       ercent Blockage         ight turn flare (veh)       ight turn flare (veh)         ledian storage veh)       66         x, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       62       2331         C2, stage 2 conf vol       61       18716       2331         C, single (s)       4.3       7.3       7.4         C, stage 2 conf vol       2.3       3.7       3.5         O queue free %       0       0       0         O queue free %       0       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Total       3097       1565       23       1511       151       2       31         SH       T00       1700       19       1700       0       22       0         olume Total       3097       1565       23       0.89       Err       1.43         ueue Length 951(ft)       0       0       7	Pedestrians									
ercent Blockage       None.         ledian type       None.         ledian storage veh)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209         C1, stage 1 conf vol       6209         C2, stage 2 conf vol       661         C2, stage 2 conf vol       7.3         C3, stage (s)       4.3       7.3         r(s)       2.3       3.7         Single (s)       4.3       7.3         .2 stage (s)       7.4       2.2         r(s)       2.3       3.7       3.5         0 queue free %       0       0       0         0 queue free %       0       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Left       0       0       23       0       12       0         olume Right       0       16       0       0       22       0         olume Left       0       0.2       1700       12       0         olume Kight       0       16       0       0       22       0         olume	Lane Width (ft)									
light turn flare (veh)       None         ledian type       None         tedian storage veh)       Pstream signal (ft)         pstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol	Walking Speed (ft/s)									
Tedian type       None.         ledian storage veh)       istantian storage veh)         ipstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       22, stage 2 conf vol       2331         C2, stage 2 conf vol       4.3       7.3       7.4         C, single (s)       4.3       7.3       7.4         C, 2 stage (s)       -       -       -         c (s)       2.3       3.7       3.5         0 queue free %       0       0       0         0 queue free %       0       0       12         olume Total       3097       1565       23       1511       12       31         olume Total       3097       1565       23       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       1700       0       22       143         ueue Length 95th (ft)       0       0       0.89       Err       1.43         ueue Length 95th (ft)       0       0       0       Err	Percent Blockage									
ledian storage veh)       66         /pstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       2331       2331         C2, stage 2 conf vol       4661       18716       2331         C, single (s)       4:3       7.3       7.4         >, 2 stage (s)       7:3       3.7       3.5         0 queue free %       0       0       0         0 queue free %       0       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Right       0       16       0       0       0       31         SH       1700       1700       1700       0       22       0         olume Left       0       0       0.89       Berr<	Right turn flare (veh)									
pstream signal (ft)       66         X, platoon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       66       6209       2331         C2, stage 2 conf vol       7.3       7.4       7.4         C2, stage (s)       4.3       7.3       7.4         C3, stage (s)       2.3       3.7       3.5         O queue free %       0       0       0         O queue free %       0       0       0         O queue free %       0       0       0         Irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Left       0       0       0       0       0       22         olume Left       0       0       79       0       Err       1.43         ueue Length 95th (ft)       0	Median type					None				
X, platon unblocked       0.25         C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol       22, stage 2 conf vol       231         C2, stage 2 conf vol       0       4661       18716       2331         C, single (s)       4:3       7.3       7.4         C, 2 stage (s)       2.3       3.7       3.5         O queue free %       0       0       0         M capacity (veh/h)       19       0       22         lirection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Right       0       166       0       0       0       31         SH       1700       1700       12       0       0       0         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Right       0       0.89       Err       1.43         ueue Length 95th (ft)       0       0       0       Err       F         pproach LOS       F       F       F       F       F	Median storage veh)									
C, conflicting volume       4661       6209       2331         C1, stage 1 conf vol	Upstream signal (ft)	1.1			66					
C1, stage 1 conf vol         C2, stage 2 conf vol         Cu, unblocked vol       4661       18716       2331         C, single (s)       4.3       7.3       7.4         C, 2 stage (s)       -       -       -         * (s)       2.3       3.7       3.5         0 queue free %       0       0       0         M capacity (veh/h)       19       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Left       0       0.79       0       Err       143         ueue Length 95th (ft)       0       0.79       0       Err       666.4         ane LOS       F<	pX, platoon unblocked					0.25				
C2, stage 2 conf vol         Cu, unblocked vol       4661       18716       2331         C, single (s)       4.3       7.3       7.4         C, stage (s)       -       -       -         F(s)       2.3       3.7       3.5         0 queue free %       0       0       0         M capacity (veh/h)       19       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Total       3097       1565       23       1511       111       12       31         olume Left       0       0       2       0       0       12       0         olume Left       0       16       0       0       0       31       SH       1700       1700       12       0         olume Left       0       0       79       0       Err       143       143         ueue Length 95th (ft)       0       0       79       0       Err       606.4         ane LOS       F       F	vC, conflicting volume	· .		4661		6209	2331			
Cu, unblocked vol       4661       18716       2331         C, single (s)       4.3       7.3       7.4         C, 2 stage (s)       -       -       -         '(s)       2.3       3.7       3.5         O queue free %       0       0       0         O queue free %       0       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Left       0       0       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Left       0       0       79       0       22         olume to Capacity       1.82       0.92       1.20       0.89       Err       1.43         tueue Length 95th (ft)       0       0       79       0       Err       101         ontrol Delay (s)       0.0       4.2       Err       Err       F         pproach LOS       F       F       F       F       F <tr< td=""><td>vC1, stage 1 conf vol</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr<>	vC1, stage 1 conf vol									
C, single (s)       4.3       7.3       7.4         C, 2 stage (s)       2.3       3.7       3.5         O queue free %       0       0       0         M capacity (veh/h)       19       0       22         Iirection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       1700       0       22         olume Left       0       16       0       0       0       31         SH       1700       1700       1700       0       22       0         olume to Capacity       1.82       0.92       1.20       0.89       Err       1.43         ueue Length 95th (ft)       0       0       79       0       Err       606.4         ane LOS       F       F       F       F       proach LOS       F       F         itersection Summary       F       F       F       F       F       F	vC2, stage 2 conf vol									
C) 2 stage (s)       2.3       3.7       3.5         C (s)       2.3       3.7       3.5         0 queue free %       0       0       0         M capacity (veh/h)       19       0       22         vertice model       3097       1565       23       1511       112       31         olume Total       3097       1565       23       1511       12       31         olume Right       0       16       0       0       0       31         SH       1700       1700       1700       0       22         olume Right       0       16       0       0       0       31         SH       1700       1700       1700       0       22       0         olume Left       0       0.29       1.20       0.89       Berr       1.43         ueue Length 95th (ft)       0       0       79       0       Err       101         tontrol Delay (s)       0.0       4.2       Err       Err       F       F         pproach LOS       F       F       F       F       F       F         tersection Summary       Err       ICU Level of S	vCu, unblocked vol			4661		18716	2331			
is       2.3       3.7       3.5         0 queue free %       0       0       0         M capacity (veh/h)       19       0       22         sirrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Left       0       0       23       0       0       12       0         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Left       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume Legth 95th (ft)       0       0.79       0       Err       143         ueue Length 95th (ft)       0       0.79       0       Err       666.4         ane LOS       F       F       F       F         pproach LOS       F       F       F       F         itersection Summary       Err       I	tC, single (s)			4.3		7.3	7.4			
0         0         0         0         0         0           M capacity (veh/h)         19         0         22           irrection, Lane #         NB 1         NB 2         SB 1         SB 2         SB 3         SW 1         SW 2           olume Total         3097         1565         23         1511         1511         12         31           olume Left         0         0         23         0         0         12         0           olume Right         0         16         0         0         0         31           SH         1700         1700         19         1700         1700         0         22           olume to Capacity         1.82         0.92         1.20         0.89         Err         1.43           tueue Length 95th (ft)         0         0         79         0         Err         606.4           ane LOS         F         F         F         F         proach LOS         F         F           tersection Summary         Err         F         F         F         F           tersection Capacity Utilization         129.9%         ICU Level of Service         H	tC, 2 stage (s)									
M capacity (veh/h)       19       0       22         irrection, Lane #       NB 1       NB 2       SB 1       SB 2       SB 3       SW 1       SW 2         olume Total       3097       1565       23       1511       1511       12       31         olume Total       0       0       23       0       0       12       0         olume Right       0       16       0       0       0       0       31         SH       1700       1700       19       1700       1700       0       22         olume Capacity       1.82       0.92       1.20       0.89       Err       1.43         oucue Length 95th (ft)       0       0       79       0       0.89       Err       66.4         ane LOS       F       F       F       F       F         oproach LOS       0       4.2       Err       Err       F         tersection Summary       Err       ICU Level of Service       H	tF (s)			2.3		3.7	3.5			
Irrection, Lane #         NB 1         NB 2         SB 1         SB 2         SB 3         SW 1         SW 2           olume Total         3097         1565         23         1511         1511         12         31           olume Right         0         16         0         0         0         31           SH         1700         1700         1700         0         22           olume Right         0         16         0         0         0         31           SH         1700         1700         1700         0         22         0lume to Capacity         1.82         0.92         1.20         0.89         Err         1.43           ueue Length 95th (ft)         0         0         79         0         Err         606.4           ane LOS         F         F         F         F         proach Los         F         rerr         proach LOS         F         F         F         F         F         F         F         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P         P <td>p0 queue free %</td> <td></td> <td></td> <td>0</td> <td></td> <td>0</td> <td>0</td> <td></td> <td></td> <td></td>	p0 queue free %			0		0	0			
olume Total         3097         1565         23         1511         1511         12         31           olume Left         0         0         23         0         0         12         0           olume Right         0         16         0         0         0         31           SH         1700         1700         19         1700         1700         22           olume to Capacity         1.82         0.92         1.20         0.89         Err         1.43           tueue Length 95th (ft)         0         0         79         0         Err         101           tontrol Delay (s)         0.0         0.0         568.4         0.0         0.0         Err         606.4           ane LOS         F         F         F         F         proach LOS         F         F           pproach LOS         Itersection Summary         Frr         F         F         F           tersection Summary         Err         ICU Level of Service         H	cM capacity (veh/h)	· · ·		19		0	22			
olume Left       0       0       23       0       0       12       0         olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume to Capacity       1.82       0.92       1.20       0.89       0.89       Err       1.43         ueue Length 95th (ft)       0       0       79       0       Err       101         tontrol Delay (s)       0.0       0.0       568.4       0.0       0.0       Err       606.4         ane LOS       F       F       F       F       proach LoS       F       remer         verage Delay       Err       F       F       H       F       H	Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	SW 1	SW 2		
olume Right       0       16       0       0       0       31         SH       1700       1700       19       1700       0       22         olume to Capacity       1.82       0.92       1.20       0.89       0.89       Err       1.43         twee Length 95th (ft)       0       0       79       0       0       Err       101         ontrol Delay (s)       0.0       0.0       568.4       0.0       0.0       Err       606.4         ane LOS       F       F       F       F       Image: Comparison of the temperature of the temperature of t	Volume Total	3097	1565	23	1511	1511	12	31		
SH       1700       1700       19       1700       1700       0       22         olume to Capacity       1.82       0.92       1.20       0.89       0.89       Err       1.43         ueue Length 95th (ft)       0       0       79       0       0       Err       101         iontrol Delay (s)       0.0       0.0       568.4       0.0       0.0       Err       606.4         ane LOS       F       F       F       proach Delay (s)       0.0       4.2       Err         pproach Dols       F       F       F       F       F       F         verage Delay       Err       F       F       F       F         verage Delay       Err       129.9%       ICU Level of Service       H	Volume Left	0	0	23	0	0	12	0		
olume to Capacity         1.82         0.92         1.20         0.89         0.89         Err         1.43           tueue Length 95th (ft)         0         0         79         0         0         Err         101           tootrol Delay (s)         0.0         0.0         568.4         0.0         0.0         Err         606.4           ane LOS         F         F         F         F         proach Delay (s)         0.0         4.2         Err           pproach LOS         F	Volume Right	0	16	. 0	0	0	0	31		
tueue Length 95th (ft)       0       0       79       0       0       Err       101         control Delay (s)       0.0       0.0       568.4       0.0       0.0       Err       606.4         ane LOS       F       F       F       F         pproach Delay (s)       0.0       4.2       Err         pproach LOS       F       F       F         tersection Summary       Verage Delay       Fr         tersection Capacity Utilization       129.9%       ICU Level of Service       H	SH	1700	1700	19	1700	1700	0	22		
ontrol Delay (s)         0.0         0.0         568.4         0.0         0.0         Err         606.4           ane LOS         F         F         F         F         proach Delay (s)         0.0         4.2         Err           pproach LOS         F	Volume to Capacity	1.82	0.92	1.20	0.89	0.89	Err	1.43		
ane LOS F F F pproach Delay (s) 0.0 4.2 Err pproach LOS F Itersection Summary verage Delay Err Itersection Capacity Utilization 129.9% ICU Level of Service H	Queue Length 95th (ft)	0	0	79	0	0	Err	101		
proach Delay (s) 0.0 4.2 Err pproach LOS F Itersection Summary verage Delay Err Itersection Capacity Utilization 129.9% ICU Level of Service H	Control Delay (s)	0.0	0.0	568.4	0.0	0.0	Err	606.4		
pproach LOS F tersection Summary verage Delay Err tersection Capacity Utilization 129.9% ICU Level of Service H	Lane LOS			F			F	F		
itersection Summary verage Delay Err itersection Capacity Utilization 129.9% ICU Level of Service H	Approach Delay (s)	0.0		4,2						
verage Delay Err ttersection Capacity Utilization 129.9% ICU Level of Service H	Approach LOS						F			
ICU Level of Service H	Intersection Summary									
	Average Delay									
nalysis Period (min) 15		ilization	1		li I	CU Leve	el of Sei	vice	Н	
	Analysis Period (min)			15						

5: S 200th St & Orillia Rd

Queues 2030 With-Project (with Tukwila south) Weekday-PM

	-	4	•	t	1	1	Ļ					
Lane Group	EBT	WBL	WBR	NBT	NBR	SBL	SBT					
Lane Group Flow (vph)	10	900	3286	1483	305	1401	1398					
v/c Ratio	0.11	1.65	1.78	1.09	0.54	0.97	0.57					
Control Delay	71.6	336.1	375.9	101.5	19.2	55.9	9.1					
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0				4	
Total Delay	71.6	336.1	375.9	101.5	19.2	55.9	9.1				,	
Queue Length 50th (ft)	9	~598	~2477	~538	75	609	223					
Queue Length 95th (ft)	31	#802	#2846	#717	186	#881	376					
Internal Link Dist (ft)	36			266		des pre	3373				1.1.1.1	
Turn Bay Length (ft)							11 Mar 1					
Base Capacity (vph)	87	546	1844	1359	569	1444	2473				1.1	,
Starvation Cap Reductn	Ó	0	0	0	0	0	0					
Spillback Cap Reductn	0	0	0	- Ó -		0	· · · 0:,,					
Storage Cap Reductn	Ő	0	0	Ó	0	0	0				·	
Reduced v/c Ratio	0.11	1.65	1.78	1.09	0.54	0.97	0.57			,		
Intersection Summary												
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Volume exceeds capacity; queue is theoretically infinite.
 Queue shown is maximum after two cycles.

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

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HCM Signalized Intersection Capacity Analysis 2030 With-Project (with Tukwila south) Weekday-PM

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		÷		ኘሻ		77	ሻ	<u></u>	۴	ሻሻ	<b>†</b> ‡>	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0		4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.97		0.88		0.91	1.00	0.97	0.95	
Frt		1.00		1.00		0.85		1.00	0.85	1.00	1.00	
Fit Protected		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1854		3400		2760		4988	1553	3183	3280	
Fit Permitted		0.98		0.95		1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1854		3400		2760		4988	1553	3183	3280	
Volume (vph)	5	5	0	855	0	3122	0	1409	290	1331	1323	5
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	5	0	900	0	3286	0	1483	305	1401	1393	5
RTOR Reduction (vph)	0	0	0	0	0	80	0	0	147	0	0	0
Lane Group Flow (vph)	. 0	-10	0	900	0	3206	0	1483	158	1401	1398	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	4%	4%	4%	10%	10%	10%
Turn Type	Perm		,	Prot	0	ustom	Prot		Perm	Prot		
Protected Phases		3		4		1	5	2		1	6	
Permitted Phases	. 3					4			2			
Actuated Green, G (s)		1.9		22.0		85.1		37.1	37.1	63.1	106.2	
Effective Green, g (s)		3.9		23.0		88.1		39.1	39.1	65.1	108.2	
Actuated g/C Ratio		0.03		0.16		0.60		0.27	0.27	0.44	0.74	
Clearance Time (s)		6.0		5.0		6.0		6.0	6.0	6.0	6.0	
Vehicle Extension (s)		3.0		3.0		3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		49		532		1728		1326	413	1409	2413	-
v/s Ratio Prot				0.26		c0.82		c0.30		0.44	0.43	
v/s Ratio Perm		0.01				0.34			0.10	•,••		
v/c Ratio		0.20		1.69		1.86		1.12	0.38	0.99	0.58	
Uniform Delay, d1		70.1		62.0		29.5		54.0	44.1	40.8	9.0	
Progression Factor		1.00		1.00		1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.1		319.3		387.1		64.0	2.7	22.5	1.0	
Delay (s)		72.1		381.4		416.6		118.0	46.8	63.3	10.0	
Level of Service		E		F		F		F	D	E	A	
Approach Delay (s)		72.1		•	409.0	·		105.8	-	-	36.7	
Approach LOS		E			F			F			D	
••	1203-4412/001441/0					ceica facadoriais				ndanandikasi	antexterences	talananatat
Intersection Summary		<u> </u>		<u></u>	10111		100000000000000000000000000000000000000			kan an a		
HCM Average Control D			228.3	F	ICM Le	vel of Se	ervice		F			
HCM Volume to Capacity ratio			1.59	-			(-)		40.0			
Actuated Cycle Length (s)			147.1		Sum of lost time (s)				12.0			
Intersection Capacity Utilization		1	150.6% ICU Level of Service				vice		н			
Analysis Period (min)			15									
c Critical Lane Group												

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