

**ATTACHMENT 9 - Updated Transportation Impact  
Analysis, Transportation Engineering NorthWest**

# Lakeside Industries SR 169 Site

King County

Updated Transportation Impact Analysis

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Prepared for:

*Lakeside Industries  
6505 226<sup>th</sup> PI SE, Suite 200  
Issaquah, WA 98027*

Prepared by:



Transportation Engineering NorthWest

11400 SE 8<sup>th</sup> Street, Suite 200

Bellevue, WA 98004

Office: (425) 889-6747

Fax: (425) 889-8369

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## EXECUTIVE SUMMARY

This updated Transportation Impact Analysis (TIA) has been prepared for the proposed Lakeside Industries SR 169 development. The proposed development is located at 18825 SE Renton Maple Valley Road (SR 169) on the south side of SR 169 in King County. The proposed development includes an Asphalt Plant and a Transportation Facility.

This TIA is an update to the previous Level 1 TIA dated June 19, 2017, and is intended to address comments received from WSDOT on December 20, 2017, King County dated April 23, 2018, and City of Renton dated June 4, 2018. The WSDOT comments addressed in this updated TIA provide a *Methods and Assumptions section*, an analysis of two additional intersections, an expanded trip generation analysis and discussion, and updated sight distance analysis. The City of Renton comments addressed in this updated TIA include concerns about neighborhood cut-through traffic and LOS at the 154<sup>th</sup> Place SE intersection.

**Project Proposal.** The proposed Lakeside Industries development includes an Asphalt Plant and a Transportation Facility. The Transportation Facility includes the two elements of Mitigation detailed below — new deceleration/acceleration lanes along SR 169 and a relocated and widened site access connected to the new lanes. The Asphalt Plant includes the manufacturing of hot mix asphalt paving materials for commercial sales for both private and public projects. Operations would include an asphalt drum mix plant, raw material import and storage/stockpiling, and business services including an administrative office and truck and equipment parking. Vehicular access to the site is proposed via an access located approximately 130 feet east (centerline to centerline) of the existing access on SR 169. Project opening is expected in 2020.

**Concurrency.** The proposed development is located within the Soos Creek travel shed which currently passes the King County concurrency standard.

**Trip Generation.** The proposed development is estimated to generate a total of 460 daily trips, with 45 trips occurring during the AM peak hour (23 in, 22 out), and 32 trips occurring during the PM peak hour (10 in, 22 out). Of the 460 total daily trips, 380 trips (83%) are estimated to be truck trips. Of the 45 total AM peak hour trips generated, 43 trips (96%) are estimated to be truck trips and of the 32 total PM peak hour trips, 17 trips (53%) are estimated to be truck trips.

*It should be noted that the trip generation estimates for the proposed Lakeside Industries development on SR 169 should be considered conservative since the estimates are intended to reflect the peak trip generation during the busiest days of anticipated operation with the development operating at full capacity during summer months. During non-summer months, the development is expected to operate at less than full capacity, which would result in a lower trip generation, and on some days the plant would not operate at all.*

**Off-Site Intersection LOS Analysis.** Future year 2020 peak hour LOS analysis were conducted at the study intersections and summarized based on Synchro for overall intersection LOS and delay and SimTraffic for individual movement delay. The results of the LOS analyses indicate that the signalized study intersection of SR 169/154<sup>th</sup> Pl SE is anticipated to operate at LOS D during the AM peak hour and LOS E during the PM peak hour in 2020 without or with the proposed development.

The additional traffic generated by the Lakeside development is estimated to increase the average vehicular delay at the intersection of SR 169/154<sup>th</sup> Pl SE by less than 2 seconds.

The signalized study intersection of SR 169/SE Jones Road is anticipated to operate at LOS E during the AM peak hour and LOS C during the PM peak hour in 2020 without or with the proposed development. The proposed Lakeside development is estimated to increase the average vehicular delay at the intersection of SR 169/SE Jones Rd by less than 1 second.

**Site Access Operations Analysis.** The results of the LOS analyses conducted at the proposed site access on SR 169 show that all controlled movements are expected to operate at LOS C or better in 2020 during the AM peak hour and LOS E during the PM peak hour with the proposed development. Also, all 95<sup>th</sup> percentile queues for controlled movements at the proposed site access are anticipated to be 1 vehicle or less during the AM and PM peak hours with the development.

**Sight Distance Assessment.** Intersection and stopping sight distances were evaluated at the proposed site access on SE Renton Maple Valley Road (SR 169) and were verified to meet or exceed applicable minimum WSDOT standards.

**Parking Demand.** The parking demand from the proposed Lakeside Industries Asphalt Plant is estimated to be 54 vehicles, which would be accommodated by the proposed on-site parking supply of 54 stalls.

**Frontage and Right-of-Way.** Any right-of-way (ROW) dedication for the Transportation Facility on SE Renton Maple Valley Road (SR 169) falls under the jurisdiction of the Washington State Department of Transportation (WSDOT). ROW needs along the proposed Lakeside Industries property frontage are currently being evaluated through the design process.

**Mitigation.** The traffic impacts of the proposed Lakeside Industries SR 169 development are not expected to create a significant adverse impact to the site or adjacent street network. However, the following measures have been identified:

- A new eastbound deceleration/acceleration lane on SR 169 is proposed at the site access as part of the new proposed Transportation Facility. The widening and lane addition would occur along the property frontage.
- Widen proposed access to accommodate a truck-trailer combo for site entry and exit and align access point to optimize new acceleration/deceleration lanes.
- Lakeside Industries will prohibit its trucks from using local neighborhoods (including the Renton Highlands neighborhoods via 154<sup>th</sup> Place SE) as a cut-through route to access SR 405.

## INTRODUCTION

This updated Transportation Impact Analysis (TIA) has been prepared for the proposed Lakeside Industries SR 169 development. The proposed development is located at 18825 SE Renton Maple Valley Road (SR 169) on the south side of SR 169 in King County as shown in the **Figure 1** vicinity map. The proposed development includes an Asphalt Plant and a Transportation Facility.

This TIA is an update to the previous Level 1 TIA dated June 19, 2017, and is intended to address comments received from WSDOT dated December 20, 2017, from King County dated April 23, 2018, and comments received from the City of Renton dated June 4, 2018.

The WSDOT comments addressed in this updated TIA provide a *Methods and Assumptions section*, an analysis of two additional intersections, an expanded trip generation analysis and discussion, and updated sight distance analysis. The City of Renton comments addressed in this updated TIA include concerns about neighborhood cut-through traffic and LOS at the 154<sup>th</sup> Place SE intersection.

## Project Description

The proposed Lakeside Industries development includes an Asphalt Plant and a Transportation Facility. The Transportation Facility includes the two elements of Mitigation detailed below — new deceleration/acceleration lanes along SR 169 and a relocated and widened site access connected to the new lanes. The Asphalt Plant includes the manufacturing of hot mix asphalt paving materials for commercial sales for both private and public projects. Operations will include an asphalt drum mix plant, raw material import and storage/stockpiling, and business services including an administrative office and truck and equipment parking. The site is zoned Industrial (I) and contains several structures that were occupied until recently by Sunset Materials. The existing buildings would be removed with the proposed development.

Vehicular access to the site is proposed via a new Transportation Facility that includes an access located approximately 130 feet east (centerline to centerline) of the existing access on SE Renton Maple Valley Rd (SR 169). The proposed Transportation Facility includes a wider access drive and new acceleration/deceleration lanes on SR 169. The existing access would be removed as part of the proposed development. The anticipated year of opening for the development is 2020. A preliminary site plan is provided in **Figure 2**.

## Methods and Assumptions / Project Approach

Consistent with comments provided by County staff at the project pre-application meeting on December 20, 2016, comments provided by WSDOT dated December 20, 2017, and City of Renton comments dated June 4, 2018, the following describes the tasks, methods, and assumptions included in this Updated *Transportation Impact Analysis*:

- Provided description of proposed Lakeside Industries SR 169 development.
- Assessed existing conditions through field reconnaissance and reviewed existing planning documents.

- Described existing roadway network and pedestrian facilities in the study area. The study area is defined as SR 169 from 154<sup>th</sup> Pl SE/152<sup>nd</sup> Ave SE to SE Jones Rd.
- Documented existing (2018) AM and PM peak hour traffic volumes at two study intersections:
  1. SR 169 / 154<sup>th</sup> Pl SE / 152<sup>nd</sup> Ave SE
  2. SR 169 / SE Jones Rd
- Documented collision history in the study area based on the most recent 3-years of data available (2015-2017).
- Analyzed existing year 2018 Level of Service (LOS) during the weekday AM and PM peak hours at the two study intersections.
- Documented future planned transportation improvements in the development site vicinity.
- Documented transportation concurrency.
- Developed weekday daily, AM, and PM peak hour trip generation estimates for the proposed Lakeside Industries SR 169 development at maximum production capacity based on conservative detailed forecasts of employee trips, truck trips, and other miscellaneous trips provided by the Applicant as follows:
  - Employee Trips – The facility is planned to have 30 total employees arriving at the site between 6:00 and 9:00 AM and leaving the site between 3:00 and 6:00 PM.
  - Truck Trips – The facility estimates a total of 380 asphalt paving truck trips per day (190 in, 190 out) between 6:00 AM and 6:00 PM.
  - Other Trips – Miscellaneous other trips associated with the proposed facility may include up to 20 trips per day (10 in, 10 out) for pick-ups and deliveries, mail trips, etc. which would occur outside of the typical AM and PM peak periods.
- Compared the estimated project-specific trip generation to both the trip generation of the existing Lakeside facility in Covington during peak summer months, and to the trip generation as documented in ITE *Trip Generation manual* for a General Light Industrial development. The project-specific trip generation estimates based on information provided by the Applicant were conservative compared to the existing Lakeside facility and ITE estimates, and were therefore considered to be the most appropriate to use for the traffic analysis in this Updated *Transportation Impact Analysis*.
- Estimated distribution of weekday peak hour project-generated trips and assigned project-generated trips onto the existing road network.
- Estimated future year 2020 weekday AM and PM peak hour traffic volumes without and with the proposed development at the two study intersections based on 2 percent annual background growth rate calculated from historical daily volumes on SR 169.
- Analyzed future year 2020 weekday AM and PM peak hour intersection LOS without and with the proposed development at the two study intersections based on *Synchro*

and *SimTraffic 10.3*. The future year LOS analysis included adjustments to heavy vehicle percentages to account for the proposed Lakeside Industries truck trips.

- Documented future year 2020 95<sup>th</sup>-percentile queues at the two study intersections based on average of five (5) *SimTraffic 10.3* simulation runs.
- Documented future year 2020 LOS and queues during the weekday AM and PM peak hour with the development at the proposed site access on SR 169.
- Evaluated entering and stopping sight distance at the proposed site access per WSDOT *Design Manual* standards. Several access locations were evaluated along the SR-169 frontage to meet sight distance requirements, and the location of the proposed access maximizes sight distance while minimizing impacts to wetland buffers.
- Documented forecast future parking demand based on specific information provided by the project Applicant.
- Documented frontage/right-of-way (ROW) improvements.
- Documented mitigation.

## Primary Data and Information Sources

- King County 2017-2022 Capital Improvement Program (CIP).
- Washington State Department of Transportation (WSDOT) *2018-2021 Statewide Transportation Improvement Program (TIP)*.
- ITE *Trip Generation Manual*, 10<sup>th</sup> Edition, 2017.
- AM and PM Peak Hour traffic counts by All Traffic Data, 2017 and 2018.
- *Highway Capacity Manual (HCM 6<sup>th</sup> Edition)*, 2016.
- Washington State Department of Transportation (WSDOT) Collision Data 2015-2017.
- Washington State Department of Transportation *Design Manual*.
- Synchro and SimTraffic 10.3.





## EXISTING CONDITIONS

### Roadway Network

The primary anticipated travel route to and from the site in King County is SE Renton Maple Valley Road (SR 169). SR 169 is an east-west state route that provides access between Interstate 405 in Renton, through Maple Valley and Black Diamond, and to the City of Enumclaw. In the project site vicinity, the roadway is classified as an urban principal arterial, and the roadway consists of 5 lanes with 2 travel lanes in each direction and a center two-way-left-turn lane. The posted speed limit on SR 169 is 50 miles per hour (mph) adjacent to the site and no sidewalks or bicycle lanes on SR 169 along the project frontage.

### Existing Pedestrian Facilities

Pedestrian facilities in the study area primarily include paved shoulders, which exist on both sides of SR 169 in the project site vicinity. There are no sidewalks on SR 169 in the vicinity of the proposed development. Additionally, the Cedar River Trail is an existing non-motorized trail that is located on the north side of SR-169 that connects Renton and Maple Valley.

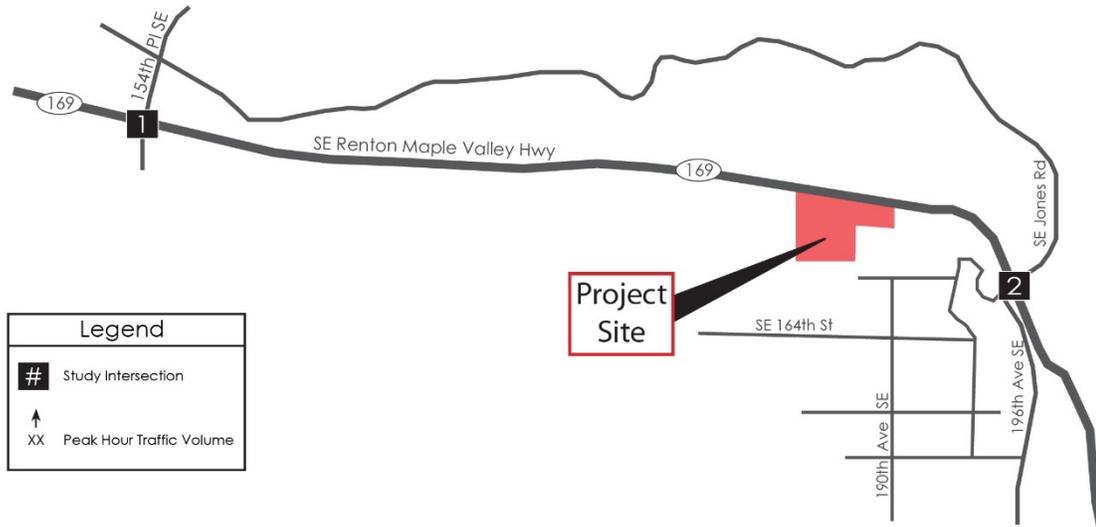
### Existing Traffic Volumes

Existing weekday AM and PM peak hour traffic counts were conducted at the following study intersections on Wednesday, January 3, 2018:

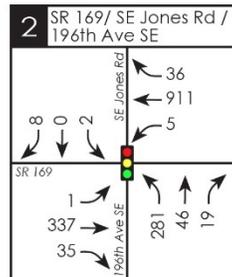
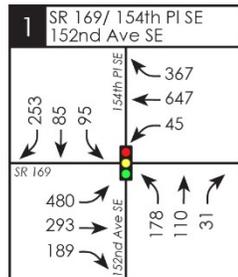
1. SR 169 / 154<sup>th</sup> Pl SE / 152<sup>nd</sup> Ave SE
2. SR 169 / SE Jones Rd

Weekday AM and PM peak period traffic counts were also collected at the existing access on SE Renton Maple Valley Road (SR 169) on Tuesday, January 24, 2017. The existing peak hour traffic volumes represent the highest hour between 7:00-9:00 AM and 4:00-6:00 PM.

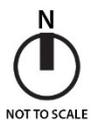
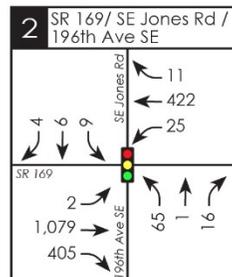
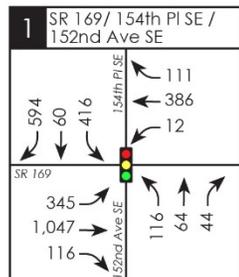
To estimate year 2018 traffic volumes at the proposed site access on SR 169, a 2 percent annual growth rate was applied to the year 2017 count. **Figure 3** illustrates the existing 2018 peak hour traffic volumes at the study intersections. The existing count sheets are included in **Appendix A**.



**AM PEAK HOUR**



**PM PEAK HOUR**



NOT TO SCALE

**Figure 3:** 2018 Existing Peak Hour Traffic Volumes

## Level of Service

Existing weekday AM and PM peak hour level of service (LOS) analyses were conducted at the following two signalized study intersections:

1. SR 169 / 154<sup>th</sup> Pl SE / 152<sup>nd</sup> Ave SE
2. SR 169 / SE Jones Rd

LOS generally refers to the degree of congestion on a roadway or intersection. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. A letter scale from A to F generally describes intersection LOS. At signalized intersections, LOS A represents free-flow conditions (motorists experience little or no delays), and LOS F represents forced-flow conditions where motorists experience an average delay in excess of 80 seconds per vehicle.

The LOS reported for signalized intersections represents the average control delay (sec/veh) and can be reported for the overall intersection, for each approach, and for each lane group (additional v/c ratio criteria apply to lane group LOS only).

The LOS reported at stop-controlled intersections is based on the average control delay and can be reported for each controlled minor approach, controlled minor lane group, and controlled major-street movement (and for the overall intersection at all-way stop controlled intersections. Additional v/c ratio criteria apply to lane group or movement LOS only). 1 outlines the current HCM 6<sup>th</sup> Edition LOS criteria for signalized and stop-controlled intersections based on these methodologies.

**Table 1**  
**LOS Criteria for Signalized and Stop-Controlled Intersections<sup>1</sup>**

SIGNALIZED INTERSECTIONS			STOP-CONTROLLED INTERSECTIONS		
Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio <sup>2</sup>		Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio <sup>3</sup>	
	≤ 1.0	> 1.0		≤ 1.0	> 1.0
≤ 10	A	F	≤ 10	A	F
> 10 to ≤ 20	B	F	> 10 to ≤ 15	B	F
> 20 to ≤ 35	C	F	> 15 to ≤ 25	C	F
> 35 to ≤ 55	D	F	> 25 to ≤ 35	D	F
> 55 to ≤ 80	E	F	> 35 to ≤ 50	E	F
> 80	F	F	> 50	F	F

<sup>1</sup> Source: Highway Capacity Manual (6<sup>th</sup> Edition), Transportation Research Board, 2016.

<sup>2</sup> For approach-based and intersection-wide assessments at signals, LOS is defined solely by control delay.

<sup>3</sup> For two-way stop-controlled intersections, the LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole at two-way stop controlled intersections. For approach-based and intersection-wide assessments at all-way stop controlled intersections, LOS is solely defined by control delay.

Level of service calculations for intersections were based on methodology and procedures outlined in the latest *Highway Capacity Manual (6<sup>th</sup> Edition)* using *Synchro 10.3* traffic analysis software. Existing signal timing used in the analysis was provided by WSDOT and the City of Renton. The 2018 existing AM and PM peak hour LOS analysis results at the study intersections are summarized in **Table 2**. The 2018 existing LOS worksheets are included in **Appendix B**.

**Table 2**  
**2018 Existing Peak Hour Level of Service Summary**

Signalized Study Intersection	AM Peak Hour		PM Peak Hour	
	LOS <sup>1</sup>	Delay (sec) <sup>2</sup>	LOS <sup>1</sup>	Delay (sec) <sup>2</sup>
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup> Ave SE	D	51.7	E	63.7
2. SR 169 / SE Jones Rd	D	51.5	C	22.3

1. LOS = Level of Service

2. Delay refers to average control delay expressed in seconds per vehicle.

As shown in **Table 2**, the signalized study intersections are estimated to currently operate at LOS D or better during the AM and PM peak hours with exception to the intersection of SR 169/154<sup>th</sup> PI SE/152<sup>nd</sup> Ave SE which operates at LOS E during the PM peak hour under 2018 existing conditions.

## Collision History

### Intersection Collisions

Collisions at the study intersections were reviewed for the most recent three-year period from January 1, 2015 to December 31, 2017. Collision data was provided by the Washington State Department of Transportation (WSDOT). Summaries of the total, yearly average, and collisions per million entering vehicles (MEV) are provided in **Table 3**. Summaries of collisions by type are provided in **Table 4**. The detailed collision data is included in **Appendix C**.

**Table 3**  
**Collision Data Summary, January 1, 2015 to December 31, 2017**

Location	2015	2016	2017	3-Year Total Collisions	Average Annual Collisions	Collisions per MEV <sup>1</sup>
<u>Intersections:</u>						
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup> Ave SE	9	7	5	21.0	7.00	0.58
2. SR 169 / SE Jones Rd	3	2	4	9.0	3.00	0.40
<u>Segments:</u>						
SR 169 from 154 <sup>th</sup> PI SE to MP 19.92	7	6	7	20.0	6.67	--
SR 169 from MP 19.92 to SE Jones Rd	5	2	1	8.0	2.67	--

Source: WSDOT Collision Records.

<sup>1</sup> MEV = Million Entering Vehicles.

**Table 4**  
**Collision Data Summary by Type, January 1, 2015 to December 31, 2017**

Intersection	3-Year Total Collisions	Average Annual Collision Rate	Collision Type							
			Approach Turn	Parked Veh/ Fixed Object	Sideswipe	Right Angle	Rear-end	Ped/Bike Involved	Other	
<u>Intersections:</u>										
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup> Ave SE	21.0	7.00	2	2	0	4	12	0	1	
2. SR 169 / SE Jones Rd	9.0	3.00	2	1	2	0	3	0	1	
<u>Segments:</u>										
SR 169 from 154 <sup>th</sup> PI SE to MP 19.92	20.0	6.67	0	6	2	1	3	0	8	
SR 169 from MP 19.92 to SE Jones Rd	8.0	2.67	0	2	0	0	5	0	1	

Source: WSDOT Collision Records.

Intersection collision rates over 1.0 collision per MEV generally warrant further review to determine if any patterns exist. Based on the collision data and ADT volumes, neither of the study intersections has a collision rate that exceeds 1.0 collision per MEV.

### Site Access Collisions

TENW reviewed collisions in the vicinity of the existing access on SR 169. Collision records were provided by WSDOT and reviewed for the three-year period from January 1, 2015 to December 31, 2017. The detailed collision data is included in **Appendix C**. As shown in **Appendix C**, there were no access-related collisions at the existing access on SE Renton Maple Valley Road (SR 169) within the most recent three years of available data.

### WSDOT SR 169 Safety Study

A SR 169 Safety Study (Maple Valley to Renton) was completed by WSDOT in December 2016. Ten locations were identified for analysis and evaluation. For the segment of SR 169 from the Renton City Limits to SE Jones Road (including the proposed Lakeside project frontage), no specific improvements for evaluation were identified except for advanced warning signage for the southbound (eastbound) lane reduction as vehicles approach SE Jones Road.

## FUTURE TRAFFIC CONDITIONS

### Planned Transportation Improvements

Based on a review of King County's 2017-2022 *Capital Improvement Program* (CIP) and WSDOT's 2018-2021 *Statewide Transportation Improvement Program* (STIP), there are no planned improvements on SR 169 in the vicinity of the proposed development.

### Transportation Concurrency

The proposed development is located within the Soos Creek travel shed which currently passes the King County concurrency standard.

### Project Trip Generation

This section describes the proposed trip generation of the Lakeside SR 169 development at maximum production capacity, compares the proposed trip generation to another similar Lakeside Industries facility, compares the proposed trip generation to the most applicable ITE land use, provides a summary of the trip generation of the immediately prior Sunset Materials use, and calculates the net trip generation of the proposed development.

#### Proposed Trip Generation

Based on the information provided by the Applicant, the proposed Lakeside Industries use is highly specialized and will not cater to the general public. Therefore, to estimate peak trip generation associated with the proposed development, the Applicant provided conservative detailed forecasts of employee trips, trucks trips, and other miscellaneous trips based on their proposed maximum production capacity. The trip estimates are described as follows:

*Employee Trips* – The facility is planned to have 30 total employees arriving at the site between 6:00 and 9:00 AM and leaving the site between 3:00 and 6:00 PM.

*Truck Trips* – The facility estimates a total of 380 asphalt paving truck trips per day (190 in, 190 out) between 6:00 AM and 6:00 PM.

*Other Trips* – Miscellaneous other trips associated with the proposed facility may include up to 20 trips per day (10 in, 10 out) for pick-ups and deliveries, mail trips, etc. These other trips would occur outside of the typical AM and PM peak periods.

The resulting weekday daily, AM peak hour, and PM peak hour trip generation for the proposed Lakeside Industries SR 169 development is summarized in **Table 5**. The detailed trip generation calculations are included in **Appendix D**.

**Table 5  
Lakeside Industries Project Trip Generation Summary**

Time Period	Passenger Vehicle Trips Generated			Truck Only Trips Generated			Total Trips Generated (ALL VEHICLES)		
	In	Out	Total	In	Out	Total	In	Out	Total
WEEKDAY DAILY	40	40	80	190	190	380	230	230	460
WEEKDAY AM PEAK HOUR	2	0	2	21	22	43	23	22	45
WEEKDAY PM PEAK HOUR	0	15	15	10	7	17	10	22	32

As shown in **Table 5**, the proposed Lakeside SR 169 development is estimated to generate a total of 460 daily trips, with 45 trips occurring during the AM peak hour (23 in, 22 out), and 32 trips occurring during the PM peak hour (10 in, 22 out). Of the 460 total daily trips generated by the proposed Lakeside development, 380 trips (83%) are estimated to be truck trips. Of the 45 total AM peak hour trips generated by the proposed development, 43 trips (96%) are estimated to be truck trips and of the 32 total PM peak hour trips generated by the proposed development, 17 trips (53%) are estimated to be truck trips.

*It should be noted that the trip generation estimates for the proposed Lakeside Industries development on SR 169 should be considered conservative since the estimates are intended to reflect the peak trip generation during the busiest days of anticipated operation with the development operating at full capacity during summer months. During non-summer months, the development is expected to operate at less than full capacity, which would result in a lower trip generation, and on some days the plant would not operate at all.*

### Comparison to Existing Lakeside Industries Covington Trip Generation

The Applicant (Lakeside Industries) provided data for observed vehicle trips at their Covington location (18808 SE 256<sup>th</sup> Street) from the busiest days of June, July, August, and September 2017. The data showed that the 4-day average trip generation at the Covington location was 357 weekday daily trips, with 27 trips occurring during the AM peak hour and 17 trips occurring during the PM peak hour. Therefore, the trip generation estimates for the proposed Lakeside SR 169 development should be considered conservative. The existing trip generation calculations for the Covington Lakeside facility are included in **Appendix D**.

### Comparison to ITE Trip Generation

Based on the information provided by the Applicant, the proposed Lakeside Industries use on SR 169 is not consistent with any Institute of Transportation Engineers (ITE) *Trip Generation* manual land use category since the proposed use is highly specialized and will not cater to the general public. Therefore, the trip generation was estimated based on specific information for the project Applicant as documented above. Comments received from WSDOT (dated December 20, 2017) stated that the most appropriate ITE Land Use category would be LUC 110 (General Light Industrial).

As a comparison, the trip generation estimates for the proposed Lakeside Industries development were calculated based on data documented in ITE *Trip Generation*, 10<sup>th</sup> Edition, for LUC 110. Based on 30 employees, the proposed development would be estimated to generate 115 weekday daily trips, with 14 trips occurring in the weekday AM peak hour and 12 trips occurring in the weekday PM peak hour. This trip generation estimate based on ITE would be 63 to 75 percent lower than the projected trip generation for the proposed site as documented above. Therefore, the trip generation estimates for the proposed Lakeside SR 169 development should be considered conservative. The ITE trip generation estimates are included in **Appendix E**.

### **Existing Trip Generation**

Until a short time ago, the existing 12.5-acre site was occupied by Sunset Materials (including material stockpiles, office, and equipment shop use in multiple buildings) and therefore it is appropriate to apply trip generation credit for the immediate prior use of the site.

Weekday daily traffic counts were conducted at the existing access to the site on SE Renton Maple Valley Road on January 24 and 25, 2017. Based on the counts, the 2-day average trip generation of the existing site was 53 weekday daily trips with 8 trips occurring during the AM peak hour and 5 trips occurring during the PM peak hour.

Based on information provided by Sunset Materials, at the time of the counts in 2017, the site was running 9 trucks per day as it was in the process of moving its operations to a different location. Typical operations at the site included 28 trucks per day. Therefore, the existing observed trip generation was factored up to account for the trip generation of the existing site at the level of typical operations. The detailed existing trip generation counts and forecasts for typical operation are included in **Appendix F**. At typical operation levels, the existing site is estimated to generate a total of 165 daily trips, with 22 trips occurring in the AM peak hour (16 in, 6 out), and 16 trips occurring during the PM peak hour (6 in, 16 out).

### **Net New Trip Generation**

The net new trips associated with the proposed Lakeside SR 169 development were determined by subtracting the trips generated by the immediate prior use (Sunset Materials at typical operations) from the total trips generated by the proposed development. The resulting weekday daily, AM peak hour, and PM peak hour net new trip generation is summarized in **Table 6**.

**Table 6**  
**Net New Trip Generation Summary**

Time Period	Total Trips Generated		
	In	Out	Total
<b>Weekday Daily</b>			
Proposed Use	230	230	460
Less Existing Use	-82	-83	-165
Net New Daily Trips	148	147	295
<b>Weekday AM Peak Hour</b>			
Proposed Use	23	22	45
Less Existing Use	-16	-6	-22
Net New AM Peak Hour Trips	7	16	23
<b>Weekday PM Peak Hour</b>			
Proposed Use	10	22	32
Less Existing Use	-6	-10	-16
Net New PM Peak Hour Trips	4	12	16

As shown in **Table 6**, with credits for the prior Sunset Materials use applied, the proposed Lakeside Industries development is estimated to generate 295 net new weekday daily trips, with 23 net new trips occurring during the AM peak hour (7 in, 16 out), and 16 net new trips occurring during the PM peak hour (4 in, 12 out).

## Project Trip Distribution and Assignment

The general distribution of peak hour trips generated by the Lakeside development was estimated separately for non-truck vehicles and trucks based on existing travel patterns and truck routing information provided by the Applicant. The weekday project-generated trips were distributed separately generally distributed as follows:

### Non-Truck Trips

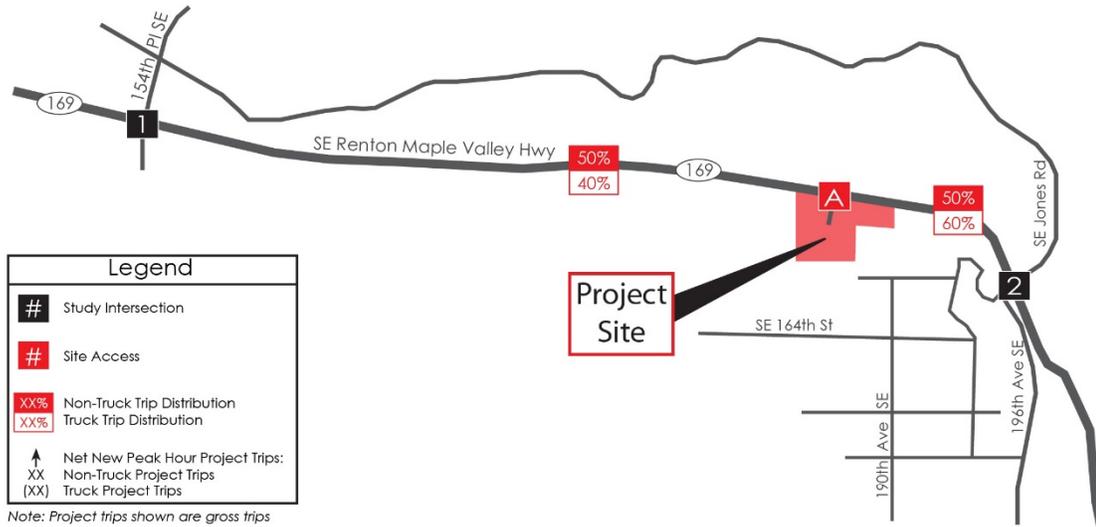
- 50 percent to/from the west on SE Renton Maple Valley Road (SR 169)
- 50 percent to/from the east on SE Renton Maple Valley Road (SR 169)

### Truck Trips

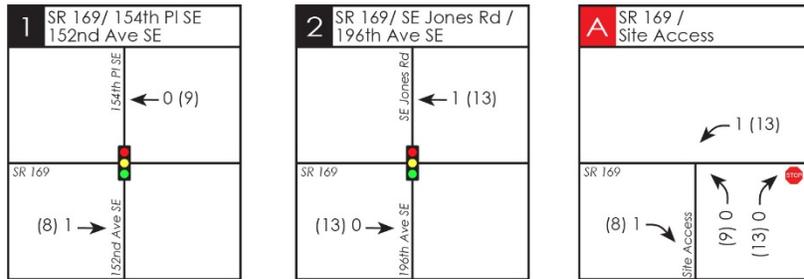
- 40 percent to/from the west on SE Renton Maple Valley Road (SR 169)
- 60 percent to/from the east on SE Renton Maple Valley Road (SR 169)

The estimated trip distribution patterns and assignment of the AM and PM peak hour trips is illustrated in **Figure 4**. It should be noted that the project trips shown on **Figure 4** are gross trips and do not include credit for the prior Sunset Materials use.

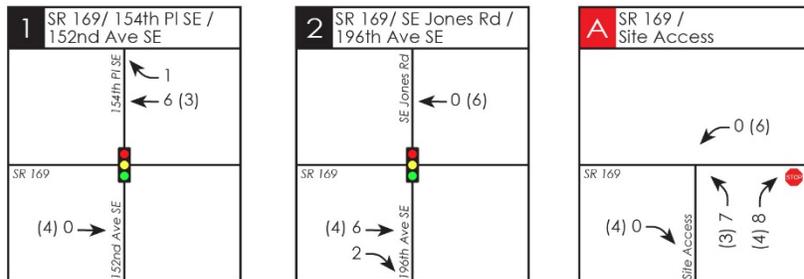
As shown in **Figure 4**, truck trips are expected to travel to/from the west via SE Renton Maple Valley Road (SR 169) only, and no truck trips are anticipated to use 154<sup>th</sup> Pl SE as a cut-through route to travel to/from the proposed Lakeside Industries site. The only exception to that would be if a Lakeside customer from the Renton Highlands area were to request materials.



**AM PEAK HOUR**

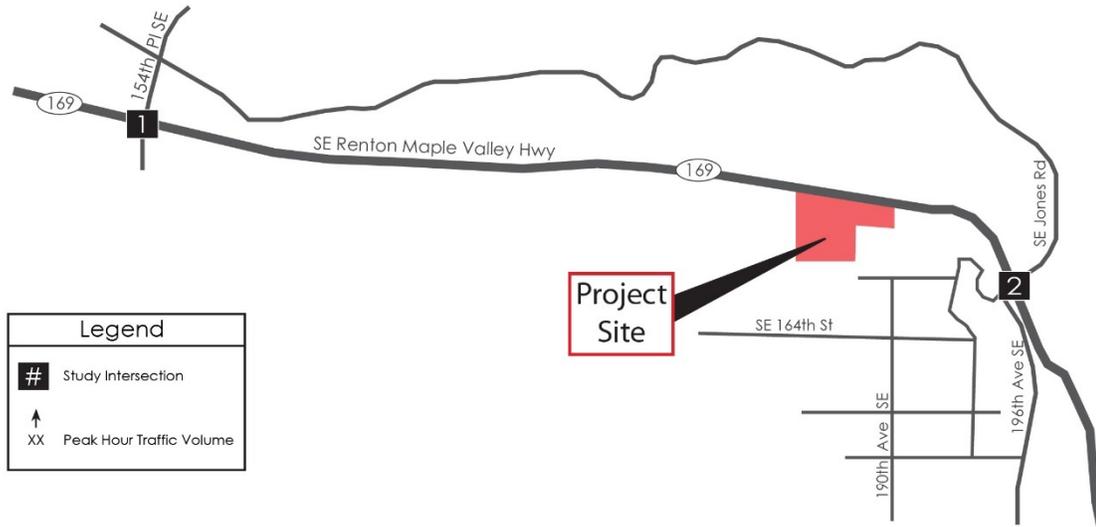


**PM PEAK HOUR**

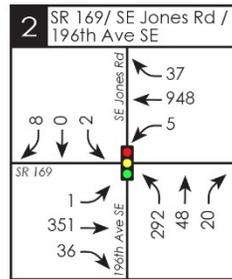
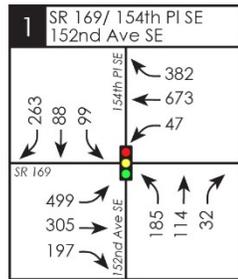


NOT TO SCALE

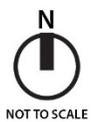
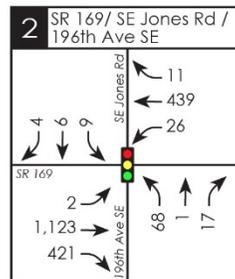
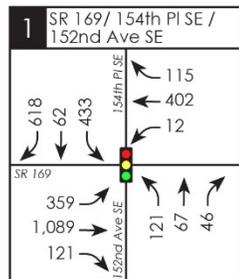
**Figure 4:** Project Trip Distribution and Assignment



**AM PEAK HOUR**

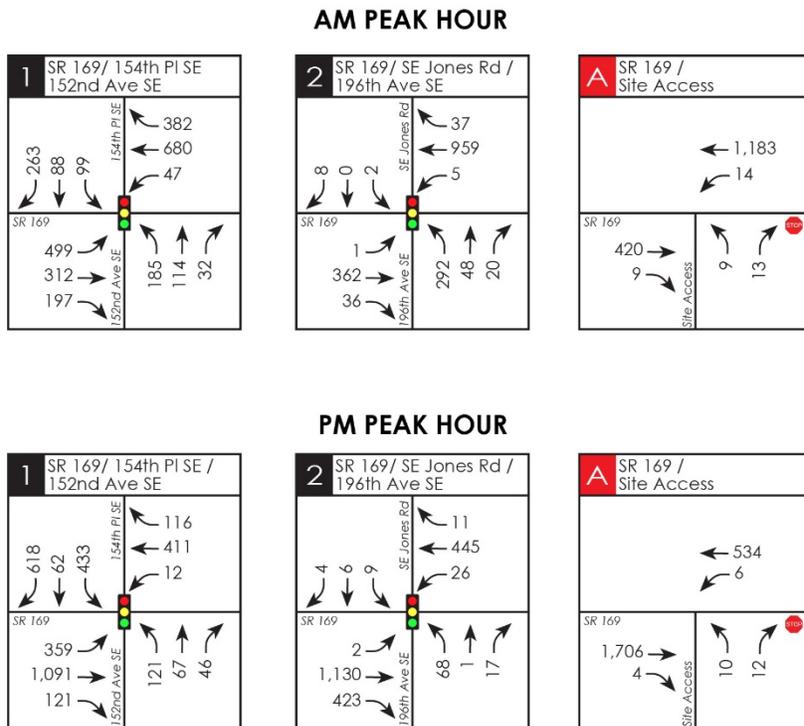
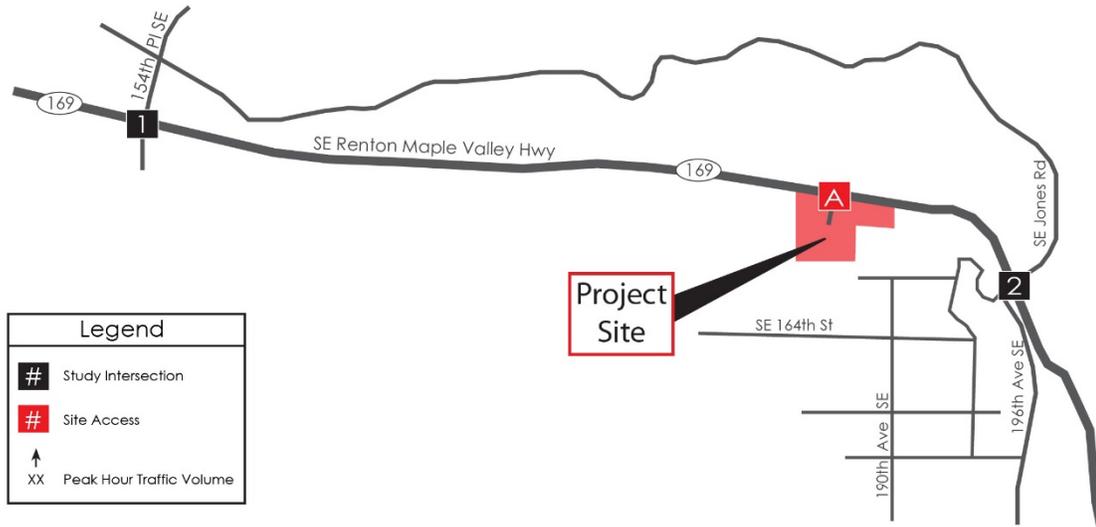


**PM PEAK HOUR**



NOT TO SCALE

**Figure 5:** 2020 No Action Peak Hour Traffic Volumes



NOT TO SCALE

**Figure 6:** 2020 With Project Peak Hour Traffic Volumes

## Future Traffic Volumes

The proposed Lakeside Industries development is anticipated to be occupied and operational in 2020. Future year 2020 No Action (without project) PM peak hour traffic volumes were estimated by applying a 2 percent annual growth rate to the 2018 existing traffic volumes at the study intersections. The growth rate was calculated based on historical volumes on SR 169 and should be considered conservative. The annual growth rate of 2 percent was also applied to the through volumes on SE Renton Maple Valley Rd (SR 169) at the site access location. The resulting future 2020 No Action (without project) AM and PM peak hour traffic volumes are illustrated in **Figure 5**.

Future 2020 With-Project traffic volumes were estimated by adding the peak hour trip assignment from the proposed project (**Figure 4**) to the future year 2020 No Action traffic volumes (**Figure 5**). The resulting 2020 With-Project AM and PM peak hour traffic volumes at the study intersections and proposed site access are illustrated in **Figure 6**.

It should be noted that in the vicinity of the proposed Lakeside development, the average weekday daily traffic (AWDT) volume is approximately 30,000 vehicles per day. The proposed Lakeside development would add approximately 295 weekday daily trips (maximum during peak summer months), resulting in a net increase in weekday vehicular traffic of approximately 1 percent. Specifically, at the intersection of SR 169/154<sup>th</sup> Pl SE, the proposed Lakeside development would be expected to increase the AM and PM peak hour volumes at the intersection of SR 169/154<sup>th</sup> Pl SE by 0.4 to 0.6 percent.

## Future Level of Service and Queuing Analysis

### Level of Service Analysis

Future year 2020 Level of Service (LOS) analyses were conducted at the two study intersections for weekday AM and PM peak hour No Action (without project) and with-project conditions based on the methodology and procedures outlined in the 6<sup>th</sup> Edition of the *Highway Capacity Manual* (HCM) using the *Synchro 10* software program. The signal timing and channelization at the study intersections was based on existing conditions. It should be noted that the future year LOS analyses included adjustments to heavy vehicle percentages to account for the proposed Lakeside Industries truck trips on SR 169.

The future weekday AM and PM peak hour LOS results at the study intersections without and with the proposed development are summarized in **Table 7**. The LOS worksheets are included in **Appendix C**.

**Table 7**  
**Future 2020 Peak Hour Level of Service Summary (Synchro)**

Signalized Study Intersection	2020 No Action		2020 With-Project	
	LOS <sup>1</sup>	Delay (sec) <sup>2</sup>	LOS <sup>1</sup>	Delay (sec) <sup>2</sup>
<b>AM PEAK HOUR</b>				
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup> Ave SE	D	54.5	D	54.9
2. SR 169 / SE Jones Rd	E	57.7	E	59.7
<b>PM PEAK HOUR</b>				
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup> Ave SE	E	69.0	E	68.9
2. SR 169 / SE Jones Rd	C	24.2	C	24.5

1. LOS = Level of Service

2. Delay refers to average control delay expressed in seconds per vehicle.

As shown in **Table 7**, the signalized study intersection of SR 169/154<sup>th</sup> PI SE is anticipated to operate at LOS D during the AM peak hour and LOS E during the PM peak hour in 2020 without or with the proposed development. The proposed Lakeside development is estimated to increase the average vehicular delay at the intersection of SR 169/154<sup>th</sup> PI SE by less than 1 second.

As also shown in **Table 7**, the signalized study intersection of SR 169/SE Jones Road is anticipated to operate at LOS E during the AM peak hour and LOS C during the PM peak hour in 2020 without or with the proposed development. The proposed Lakeside development is estimated to increase the average vehicular delay at the intersection of SR 169/SE Jones Rd by less than 2 seconds.

In response to WSDOT comments, average vehicular movement delay results were also summarized at the study intersections based on the average of five *SimTraffic* simulation runs. The future year 2020 weekday AM and PM peak hour vehicular delay by movement at the study intersections (based on *SimTraffic*) without and with the proposed development are summarized in **Table 8**. The detailed *SimTraffic* worksheets are included in **Appendix G**.

**Table 8**  
**Future 2020 Peak Hour LOS Summary by Movement (based on SimTraffic)**

Signalized Study Intersection / Movement	Total Delay / Vehicle (sec)			
	AM PEAK HOUR		PM PEAK HOUR	
	2020 No Action	2020 With-Project	2020 No Action	2020 With-Project
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup>				
Eastbound Left-Turn	128.4	99.8	148.8	159.7
Eastbound Thru	20.4	19.8	33.9	34.5
Eastbound Right-Turn	6.5	5.9	16.2	16.7
Westbound Left-Turn	84.2	82.3	83.7	74.8
Westbound Thru	52.1	53.4	46.6	47.2
Westbound Right	39.4	41.6	15.6	16.1
Northbound Left-Turn	60.9	60.6	35.9	36.4
Northbound Thru	65.3	60.5	60.1	55.8
Northbound Right-Turn	48.2	40.4	37.5	34.5
Southbound Left-Turn	49.4	49.8	64.5	60.6
Southbound Thru	68.6	63.5	56.5	58.0
Southbound Right-Turn	16.0	16.0	26.1	30.7
2. SR 169 / SE Jones Rd				
Eastbound Left-Turn	93.0	84.9	86.1	62.3
Eastbound Thru	17.5	19.0	28.8	22.3
Eastbound Right-Turn	1.5	1.4	5.7	5.1
Westbound Left-Turn	91.6	84.6	50.9	50.6
Westbound Thru	26.6	29.1	5.5	6.7
Westbound Right-Turn	22.1	24.1	2.9	3.3
Northbound Left-Turn	53.3	58.6	42.9	45.0
Northbound Thru	58.5	58.2	40.0	64.6
Northbound Right-Turn	52.0	56.9	42.6	29.8
Southbound Left-Turn	43.1	51.4	48.1	41.0
Southbound Thru	0.0	0.0	39.4	40.6
Southbound Right-Turn	5.4	6.2	5.6	3.5

## Queuing Analysis

In response to WSDOT comments, future year 2020 AM and PM peak hour 95<sup>th</sup>-percentile queuing results were summarized at the two study intersections based on an average of five *SimTraffic* simulation runs. 95<sup>th</sup>-percentile queues are queues that are exceeded 5 percent of the time during the analysis period.

The 95<sup>th</sup> percentile queues are summarized in **Table 9**. The *SimTraffic* queue worksheets are included in **Appendix G**.

**Table 9**  
**Future 2020 Peak Hour Queue Summary (based on SimTraffic)**

Signalized Study Intersection / Movement	95 <sup>th</sup> Percentile Queue (ft) <sup>1</sup>					
	AM PEAK HOUR			PM PEAK HOUR		
	2020 No Action	2020 With-Project	Project Impact	2020 No Action	2020 With-Project	Project Impact
1. SR 169 / 154 <sup>th</sup> PI SE / 152 <sup>nd</sup>						
Eastbound Left-Turn	700'	675'	-25'	675'	675'	--
Eastbound Thru	1,075'	875'	--	925'	950'	+25'
Eastbound Thru	800'	600'	--	825'	850'	+25'
Eastbound Right-Turn	125'	125'	--	125'	150'	+25'
Westbound Left-Turn	175'	175'	--	50'	25'	-25'
Westbound Thru	450'	425'	-25'	225'	225'	--
Westbound Thru	475'	450'	-25'	200'	200'	--
Westbound Right	375'	375'	--	75'	75'	--
Northbound Left-Turn	200'	200'	--	150'	150'	--
Northbound Thru-Right	375'	350'	-25'	175'	175'	--
Southbound Left-Turn	150'	150'	--	225'	225'	--
Southbound Thru	150'	150'	--	550'	550'	--
Southbound Right-Turn	175'	150'	-25'	450'	475'	+25'
2. SR 169 / SE Jones Rd						
Eastbound Left-Turn	75'	25'	-50'	< 25'	50'	+25'
Eastbound Thru	325'	350'	+25'	850'	625'	--
Eastbound Right-Turn	25'	25'	--	375'	100'	--
Westbound Left-Turn	25'	25'	--	75'	75'	--
Westbound Thru-Right	675'	700'	+25'	150'	175'	+25'
Northbound Left-Thru-Right	400'	400'	--	100'	100'	--
Southbound Left-Turn	25'	25'	--	25'	25'	--
Southbound Thru-Right	50'	50'	--	25'	25'	--

1. Queue results are based on an average of five (5) SimTraffic simulation runs.

As shown in **Table 9**, all of the AM and PM peak hour 95<sup>th</sup>-percentile queues at the two study intersections on SR 169 are expected to increase by no more than 25 feet (1 vehicle) with the addition of Lakeside Industries development traffic in 2020.

## Site Access Analysis

Vehicular access to the site is proposed via a new Transportation Facility that includes an access located approximately 130 feet east (centerline to centerline) of the existing access on SE Renton Maple Valley Rd (SR 169). The proposed Transportation Facility includes a wider access drive and new acceleration/deceleration lanes on SR 169. The existing access would be removed as part of the proposed development.

Future year 2020 With-Project AM and PM peak hour Level of Service (LOS) and queue analyses were conducted at the proposed site access on SE Renton Maple Valley Road (SR 169) based on the methodology and procedures outlined in the 6<sup>th</sup> Edition of the *Highway Capacity Manual* (HCM) using the *Synchro 10* software program. The 2020 With-Project AM and PM peak hour volumes at the site access used in the LOS analyses are as shown on **Figure 6**. The channelization at the proposed Transportation Facility includes a relocated access and new eastbound deceleration/acceleration lanes along the project frontage that would be constructed with the proposed Lakeside Industries development.

The reported queues for the controlled movements at the unsignalized site access are 95<sup>th</sup> percentile queues, which are exceeded only 5 percent of the time during the analysis period.

The weekday AM and PM peak hour LOS and queue results at the site access for 2020 With-Project conditions are summarized in **Table 10**. The detailed LOS and queue worksheets are included in **Appendix H**.

**Table 10**  
**Year 2020 With-Project Peak Hour Level of Service Summary at Site Access**

Site Access	Movement	AM PEAK HOUR			PM PEAK HOUR		
		LOS <sup>1</sup>	Delay (sec)	Queue Length (veh) <sup>2</sup>	LOS <sup>1</sup>	Delay (sec)	Queue Length (veh) <sup>2</sup>
<u>Two-Way Stop Controlled:</u>							
SE Renton Maple Valley Rd (SR 169) / Site Access							
	Northbound left-right (exiting)	C	18.1	< 1 veh	E	49.7	< 1 veh
	Westbound left (entering)	B	10.7	< 1 veh	E	43.9	< 1 veh

2. LOS = Level of Service, reported by movement for unsignalized intersections.

3. Queues are 95<sup>th</sup> Percentile queues. < 1 vehicle indicates 95<sup>th</sup> percentile queue statistically less than 1 vehicle.

As shown in **Table 10**, the results of the LOS analysis show that all controlled movements at the unsignalized site access on SR 169 are expected to operate at LOS C or better in 2020 during the AM peak hour and LOS E during the PM peak hour with the proposed Lakeside SR 169 development. Also, all 95<sup>th</sup> percentile queues for controlled movements at the site access are anticipated to be 1 vehicle or less during the AM and PM peak hours with the development.

## Sight Distance Assessment at Proposed SR 169 Access

Intersection (entering) sight distance (ISD) and stopping sight distance (SSD) were field measured by TENW on March 1, 2017 at the existing site access, and evaluated at the new proposed site access location on SE Renton Maple Valley Road (SR 169). Future ISD and SSD were evaluated based on existing roadway profile and elevations along SR-169 and at the proposed new site access located approximately 130 feet east (centerline to centerline) of the existing access to the site. Along the project frontage, SE Renton Maple Valley Road (SR 169) is five lanes (two in each direction with a center-two way left-turn lane) and has a posted speed limit of 50 mph.

For the future access location, it should be noted that several locations along the SR 169 frontage were evaluated for sight distance requirements. The proposed access location maximizes sight distance while minimizing impacts to wetland buffers.

The intersection sight distance (ISD) standards were based on the Washington State Department of Transportation (WSDOT) *Design Manual* Chapter 1310.05 Intersection Sight Distance (updated November 2015). The setback distance from the intersection sight distance sight triangle is 18 feet from the edge of traveled way, 3.5 feet above the road surface, looking at an object 3.5 feet above the road surface.

Exhibit 1340-3 in WSDOT *Design Manual* Chapter 1340.06 (Driveway Sight Distance) was not used to evaluate sight distance for the proposed Lakeside Industries access due to the fact that combination trucks will be using the access, and evaluation of intersection sight distance (ISD) based on *Design Manual* Chapter 13.10.15 provides a more conservative analysis of sight distance.

Stopping sight distance (SSD) standards were based the WSDOT *Design Manual*/Chapter 1260.03 Stopping Sight Distance (updated July 2016). WSDOT standards use a driver's eye height of 3.5 feet, and an object height of 2.0 feet for stopping sight distance.

ISD and SSD were evaluated for a design speed of 50 mph based on a posted speed limit of 50 mph on SE Renton Maple Valley Road (SR 169) as sight distance values are represented by design speed being equal to posted speed.

### Intersection (Entering) Sight Distance (ISD)

Based on a 50 mph design speed on SE Renton Maple Valley Road (SR 169), the desirable intersection sight distance for a left-turning passenger vehicle is 662 feet and the desirable intersection sight distance for a left-turning combination truck is 1,000 feet (*Design Manual* Exhibit 1310-19a). This assumes a vehicle making a left-turn from the site access and crossing 4 lanes (a proposed future deceleration/acceleration lane, 2 eastbound lanes, and a center two-way left-turn lane). This is a conservative assumption since exiting left-turn vehicles can use the center two-way left-turn lane as a refuge and only crosses 2 lanes.

At the location of the proposed access, the available intersection sight distance looking to the east and west on SR 169 is more than 1,000 feet. A sight distance exhibit is included in **Appendix I**. Therefore, the WSDOT minimum intersection sight distance requirements are met for both a passenger vehicle and a combination truck.

## Stopping Sight Distance (SSD)

For a 50 mph design speed on SE Renton Maple Valley Road (SR 169), the recommended design value for stopping sight distance based on WSDOT *Design Manual* standards is 466 feet for a vehicle travelling westbound and 425 feet for a vehicle travelling eastbound (*Design Manual*/Exhibit 1260-1). Approaching the proposed site access on SE Renton Maple Valley Road from the east and west, the available stopping sight distance was verified to be more than 500 feet, therefore meeting applicable WSDOT standards.

## Parking Demand

Based on information provided by the project Applicant, the proposed Lakeside Industries development estimates a maximum on-site parking demand of 54 vehicles. The maximum parking demand of 54 vehicles would be accommodated by the proposed on-site parking supply of 54 stalls. The parking demand forecasts are included in **Appendix J**.

## Frontage and Right-of-Way

SR 169 (SE Renton Maple Valley Road) is classified as an urban principal arterial per WSDOT. However, since it is a state highway, any right-of-way (ROW) dedication falls under the jurisdiction of the Washington State Department of Transportation (WSDOT). ROW needs along the proposed Lakeside Industries property frontage are currently being evaluated through the design process.

## MITIGATION

The traffic impacts of the proposed Lakeside Industries SR 169 development are not expected to create a significant adverse impact to the site or adjacent street network. However, the following measures have been identified:

- A new eastbound deceleration/acceleration lane is proposed on SR 169 at the site access as part of the new proposed Transportation Facility. The widening and lane addition would occur along the property frontage.
- Widen proposed access to accommodate a truck-trailer combo for site entry and exit and align access point to optimize new acceleration/deceleration lanes.
- Lakeside Industries will prohibit its trucks from using local neighborhoods (including the Renton Highlands neighborhoods via 154<sup>th</sup> Place SE) as a cut-through route to access SR 405.

# Appendix A

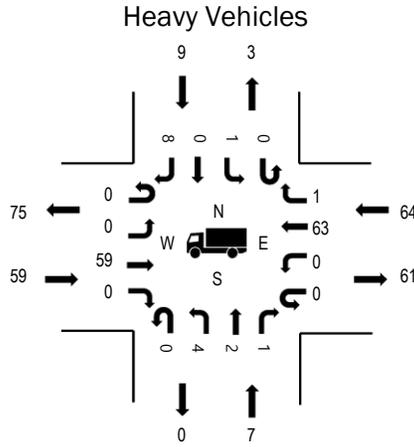
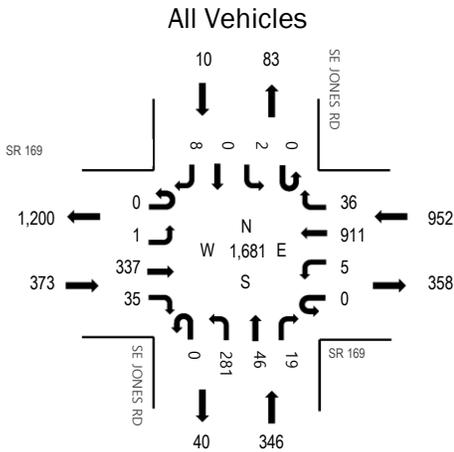
## Peak Hour Turning Movement Counts



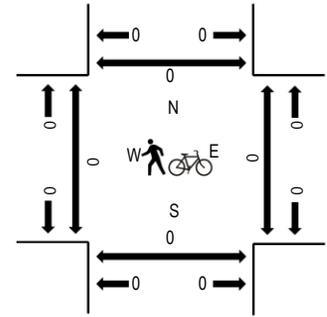
(303) 216-2439  
www.alltrafficdata.net

Location: 1 SE JONES RD & SR 169 AM  
Date and Start Time: Wednesday, January 3, 2018  
Peak Hour: 07:00 AM - 08:00 AM

**Peak Hour**



**Pedestrians/Bicycles in Crosswalk**



	HV%	PHF
EB	15.8%	0.91
WB	6.7%	0.95
NB	2.0%	0.88
SB	90.0%	0.63
All	8.3%	0.97

**Traffic Counts - All Vehicles**

Interval Start Time	SR 169 Eastbound				SR 169 Westbound				SE JONES RD Northbound				SE JONES RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	85	9	0	2	228	12	0	80	16	2	0	0	0	1	435	1,681
7:15 AM	0	1	73	4	0	1	236	13	0	68	16	7	0	0	0	4	423	1,618
7:30 AM	0	0	85	13	0	2	239	7	0	75	5	6	0	1	0	0	433	1,564
7:45 AM	0	0	94	9	0	0	208	4	0	58	9	4	0	1	0	3	390	1,534
8:00 AM	0	2	94	11	0	1	197	2	0	57	4	2	0	1	0	1	372	1,526
8:15 AM	0	0	95	10	0	0	193	4	0	55	3	5	0	3	0	1	369	
8:30 AM	0	0	112	13	0	0	207	2	0	52	6	7	0	1	1	2	403	
8:45 AM	0	1	104	17	0	3	213	1	0	35	0	7	0	0	1	0	382	
Count Total	0	4	742	86	0	9	1,721	45	0	480	59	40	0	7	2	12	3,207	
Peak Hour	0	1	337	35	0	5	911	36	0	281	46	19	0	2	0	8	1,681	

**Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk**

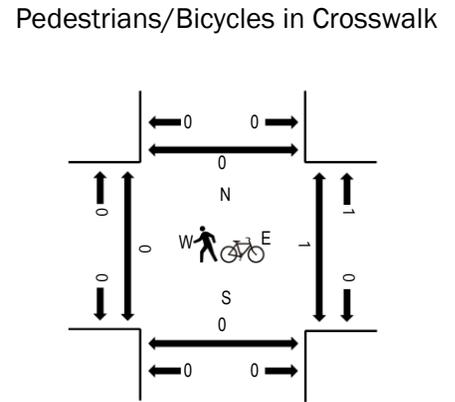
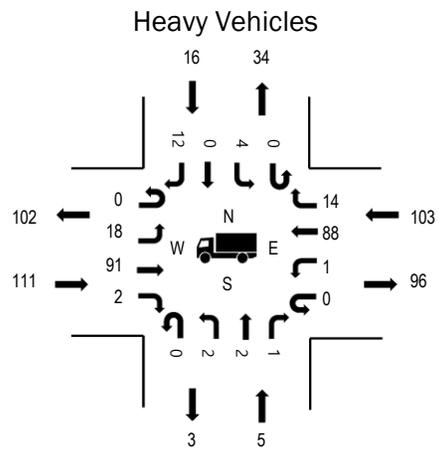
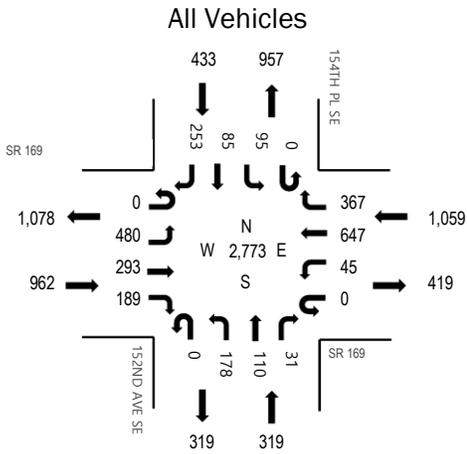
Interval Start Time	Heavy Vehicles					Total	Interval Start Time	Pedestrians/Bicycles on Crosswalk					Total
	EB	NB	WB	SB				EB	NB	WB	SB		
7:00 AM	12	2	9	1	24	7:00 AM	0	0	0	0	0	0	
7:15 AM	9	2	11	4	26	7:15 AM	0	0	0	0	0	0	
7:30 AM	19	2	25	1	47	7:30 AM	0	0	0	0	0	0	
7:45 AM	19	1	19	3	42	7:45 AM	0	0	0	0	0	0	
8:00 AM	28	0	24	0	52	8:00 AM	0	0	0	0	0	0	
8:15 AM	18	3	19	1	41	8:15 AM	0	0	0	0	0	0	
8:30 AM	32	2	23	0	57	8:30 AM	0	0	0	0	0	0	
8:45 AM	36	0	19	0	55	8:45 AM	0	0	0	0	0	0	
Count Total	173	12	149	10	344	Count Total	0	0	0	0	0	0	
Peak Hour	59	7	64	9	139	Peak Hour	0	0	0	0	0	0	



Location: 2 152ND AVE SE & SR 169 AM  
 Date and Start Time: Wednesday, January 3, 2018  
 Peak Hour: 07:45 AM - 08:45 AM

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**Peak Hour**



	HV%	PHF
EB	11.5%	0.83
WB	9.7%	0.93
NB	1.6%	0.75
SB	3.7%	0.89
All	8.5%	0.92

**Traffic Counts - All Vehicles**

Interval Start Time	SR 169 Eastbound				SR 169 Westbound				152ND AVE SE Northbound				154TH PL SE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	131	71	20	0	6	202	130	0	28	34	0	0	28	7	62	719	2,727
7:15 AM	0	101	60	32	0	8	184	113	0	29	26	3	0	23	11	56	646	2,658
7:30 AM	0	134	82	23	0	9	188	107	0	32	24	2	0	37	11	59	708	2,768
7:45 AM	0	137	69	18	0	6	163	116	0	29	15	6	0	30	10	55	654	2,773
8:00 AM	0	85	77	62	0	19	160	79	0	26	30	5	0	13	37	57	650	2,748
8:15 AM	0	130	67	94	0	16	160	73	0	65	29	13	0	19	33	57	756	
8:30 AM	0	128	80	15	0	4	164	99	0	58	36	7	0	33	5	84	713	
8:45 AM	0	113	101	16	0	1	188	82	0	24	14	1	0	19	4	66	629	
Count Total	0	959	607	280	0	69	1,409	799	0	291	208	37	0	202	118	496	5,475	
Peak Hour	0	480	293	189	0	45	647	367	0	178	110	31	0	95	85	253	2,773	

**Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk**

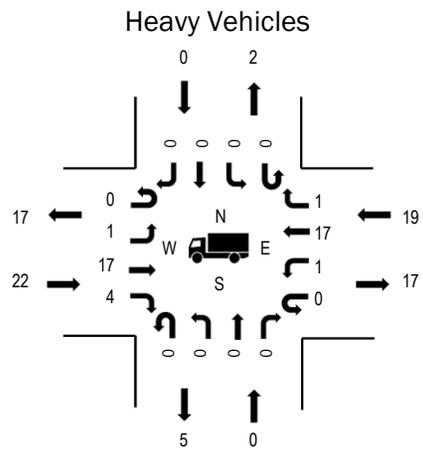
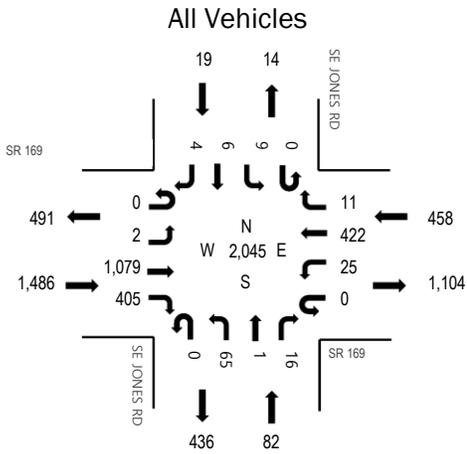
Interval Start Time	Heavy Vehicles					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	18	1	33	4	56	7:00 AM	0	0	0	0	0
7:15 AM	10	0	11	2	23	7:15 AM	3	0	1	0	4
7:30 AM	25	0	27	5	57	7:30 AM	0	0	0	0	0
7:45 AM	25	5	23	7	60	7:45 AM	0	0	0	0	0
8:00 AM	28	0	30	3	61	8:00 AM	0	0	0	0	0
8:15 AM	23	0	23	2	48	8:15 AM	0	0	0	0	0
8:30 AM	35	0	27	4	66	8:30 AM	0	0	1	0	1
8:45 AM	38	1	21	4	64	8:45 AM	1	0	0	0	1
Count Total	202	7	195	31	435	Count Total	4	0	2	0	6
Peak Hour	111	5	103	16	235	Peak Hour	0	0	1	0	1



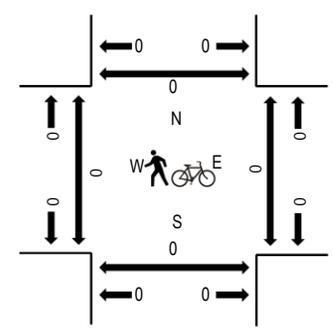
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Location: 1 SE JONES RD & SR 169 PM  
Date and Start Time: Wednesday, January 3, 2018  
Peak Hour: 04:00 PM - 05:00 PM

**Peak Hour**



**Pedestrians/Bicycles in Crosswalk**



	HV%	PHF
EB	1.5%	0.95
WB	4.1%	0.91
NB	0.0%	0.82
SB	0.0%	0.79
All	2.0%	0.97

**Traffic Counts - All Vehicles**

Interval Start Time	SR 169 Eastbound				SR 169 Westbound				SE JONES RD Northbound				SE JONES RD Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	0	271	100	0	8	112	6	0	19	1	5	0	2	1	1	526	2,045
4:15 PM	0	0	270	92	0	3	112	1	0	16	0	2	0	2	3	0	501	2,025
4:30 PM	0	1	269	91	0	7	108	2	0	15	0	8	0	3	0	3	507	1,974
4:45 PM	0	1	269	122	0	7	90	2	0	15	0	1	0	2	2	0	511	1,926
5:00 PM	0	0	284	87	0	2	108	2	0	19	0	4	0	0	0	0	506	1,835
5:15 PM	0	0	238	78	0	13	99	0	0	18	1	2	0	0	1	0	450	
5:30 PM	0	3	262	78	0	7	92	1	0	12	0	1	0	3	0	0	459	
5:45 PM	0	0	248	52	0	7	96	3	0	9	1	3	0	1	0	0	420	
Count Total	0	5	2,111	700	0	54	817	17	0	123	3	26	0	13	7	4	3,880	
Peak Hour	0	2	1,079	405	0	25	422	11	0	65	1	16	0	9	6	4	2,045	

**Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk**

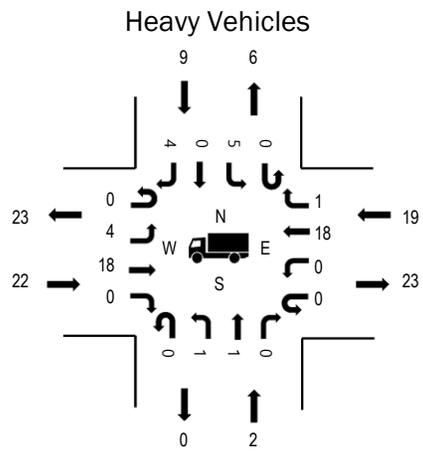
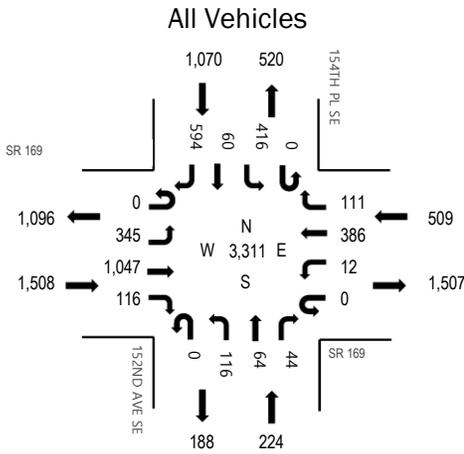
Interval Start Time	Heavy Vehicles					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	3	0	7	0	10	4:00 PM	0	0	0	0	0
4:15 PM	4	0	5	0	9	4:15 PM	0	0	0	0	0
4:30 PM	7	0	5	0	12	4:30 PM	0	0	0	0	0
4:45 PM	8	0	2	0	10	4:45 PM	0	0	0	0	0
5:00 PM	5	0	1	0	6	5:00 PM	0	0	0	0	0
5:15 PM	7	0	4	0	11	5:15 PM	0	0	0	0	0
5:30 PM	7	0	2	1	10	5:30 PM	0	0	0	0	0
5:45 PM	7	1	0	0	8	5:45 PM	0	0	0	0	0
Count Total	48	1	26	1	76	Count Total	0	0	0	0	0
Peak Hour	22	0	19	0	41	Peak Hour	0	0	0	0	0



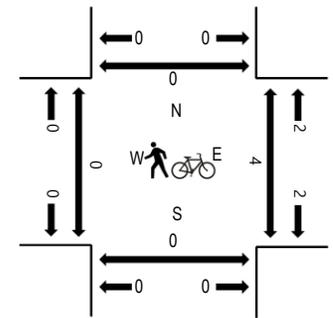
Location: 2 152ND AVE SE & SR 169 PM  
 Date and Start Time: Wednesday, January 3, 2018  
 Peak Hour: 04:00 PM - 05:00 PM

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**Peak Hour**



**Pedestrians/Bicycles in Crosswalk**



	HV%	PHF
EB	1.5%	0.96
WB	3.7%	0.89
NB	0.9%	0.88
SB	0.8%	0.92
All	1.6%	0.97

**Traffic Counts - All Vehicles**

Interval Start Time	SR 169 Eastbound				SR 169 Westbound				152ND AVE SE Northbound				154TH PL SE Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	72	267	23	0	3	112	28	0	31	19	14	0	86	14	141	810	3,311
4:15 PM	0	84	248	35	0	5	75	26	0	41	11	11	0	106	15	167	824	3,249
4:30 PM	0	97	259	32	0	1	103	37	0	17	19	13	0	93	13	143	827	3,190
4:45 PM	0	92	273	26	0	3	96	20	0	27	15	6	0	131	18	143	850	3,119
5:00 PM	0	99	252	23	0	2	76	17	0	21	12	8	0	95	12	131	748	2,943
5:15 PM	0	88	241	24	0	5	103	13	0	21	6	7	0	96	11	150	765	
5:30 PM	0	88	249	27	0	3	84	21	0	26	17	4	0	76	18	143	756	
5:45 PM	0	75	230	22	0	2	72	26	0	25	15	7	0	78	7	115	674	
Count Total	0	695	2,019	212	0	24	721	188	0	209	114	70	0	761	108	1,133	6,254	
Peak Hour	0	345	1,047	116	0	12	386	111	0	116	64	44	0	416	60	594	3,311	

**Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk**

Interval Start Time	Heavy Vehicles					Total	Interval Start Time	Pedestrians/Bicycles on Crosswalk					Total
	EB	NB	WB	SB				EB	NB	WB	SB		
4:00 PM	8	1	7	1	17	4:00 PM	0	0	2	0	2		
4:15 PM	4	1	5	4	14	4:15 PM	0	0	0	0	0		
4:30 PM	2	0	3	1	6	4:30 PM	0	0	2	0	2		
4:45 PM	8	0	4	3	15	4:45 PM	0	0	0	0	0		
5:00 PM	3	0	1	2	6	5:00 PM	0	0	0	0	0		
5:15 PM	9	0	1	2	12	5:15 PM	0	0	0	0	0		
5:30 PM	3	0	2	0	5	5:30 PM	0	0	0	0	0		
5:45 PM	6	0	1	0	7	5:45 PM	0	0	1	0	1		
Count Total	43	2	24	13	82	Count Total	0	0	5	0	5		
Peak Hour	22	2	19	9	52	Peak Hour	0	0	4	0	4		



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Location: 1 SUNSET MATERIALS DWY & RENTON MAPLE VALLEY RD AM

Date and Start Time: Tuesday, January 24, 2017

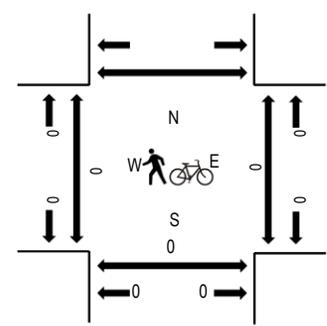
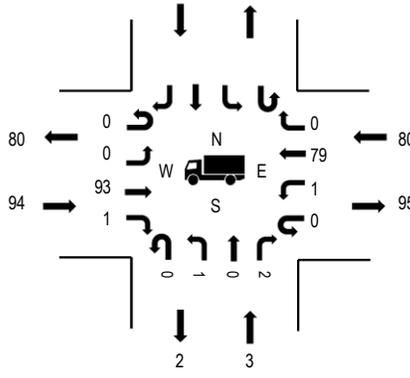
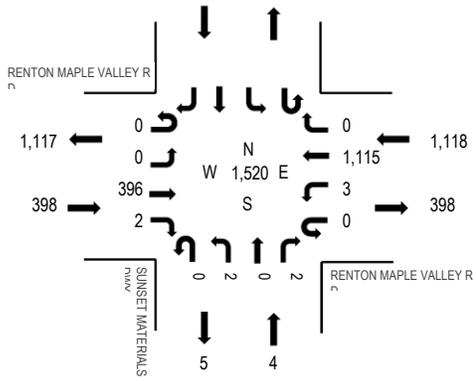
Peak Hour: 08:00 AM - 09:00 AM

**Peak Hour**

All Vehicles

Heavy Vehicles

Pedestrians/Bicycles in Crosswalk



	HV%	PHF
EB	23.6%	0.80
WB	7.2%	0.89
NB	75.0%	0.50
SB		
All	11.6%	0.93

**Traffic Counts - All Vehicles**

Interval Start Time	RENTON MAPLE VALLEY RD Eastbound				RENTON MAPLE VALLEY RD Westbound				SUNSET MATERIALS DWY Northbound				Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
	7:00 AM	0	0	67	0	0	0	320	0	0	0	0	0	0	0	0		
7:15 AM	0	0	76	0	0	0	311	0	0	0	0	0	0	0	0	0	387	1,453
7:30 AM	0	0	87	1	0	1	269	0	0	1	0	0	0	0	0	0	359	1,476
7:45 AM	0	0	94	0	0	1	251	0	0	0	0	0	0	0	0	0	346	1,511
8:00 AM	0	0	92	0	0	1	267	0	0	0	0	1	0	0	0	0	361	1,520
8:15 AM	0	0	93	1	0	2	313	0	0	0	0	1	0	0	0	0	410	
8:30 AM	0	0	124	0	0	0	270	0	0	0	0	0	0	0	0	0	394	
8:45 AM	0	0	87	1	0	0	265	0	0	2	0	0	0	0	0	0	355	
Count Total	0	0	720	3	0	5	2,266	0	0	3	0	2	0	0	0	0	2,999	
Peak Hour	0	0	396	2	0	3	1,115	0	0	2	0	2	0	0	0	0	1,520	

**Traffic Counts - Heavy Vehicles and Pedestrians/Bicycles in Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	7	0	19		26	7:00 AM	0	0	0		0
7:15 AM	4	0	18		22	7:15 AM	0	0	0		0
7:30 AM	7	1	9		17	7:30 AM	0	0	0		0
7:45 AM	16	0	12		28	7:45 AM	0	0	0		0
8:00 AM	22	1	16		39	8:00 AM	0	0	0		0
8:15 AM	22	1	20		43	8:15 AM	0	0	0		0
8:30 AM	27	0	25		52	8:30 AM	0	0	0		0
8:45 AM	23	1	19		43	8:45 AM	0	0	0		0
Count Total	128	4	138		270	Count Total	0	0	0		0
Peak Hour	94	3	80		177	Peak Hour	0	0	0		0



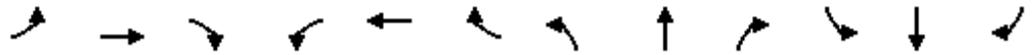
# Appendix B

## Level of Service (LOS) Calculations

2018 Existing

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018

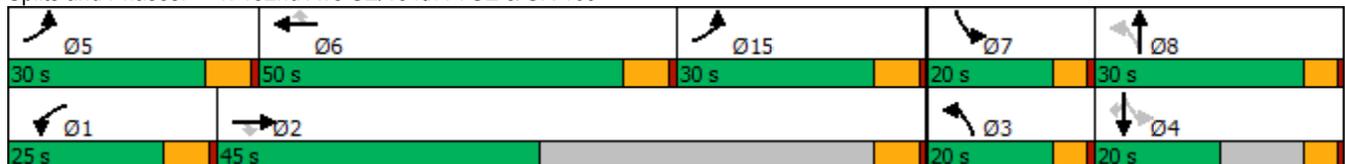


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	480	293	189	45	647	367	178	110	31	95	85	253
Future Volume (vph)	480	293	189	45	647	367	178	110	31	95	85	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	31%	1%	2%	14%	4%	1%	2%	3%	4%	0%	5%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5 15	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5 15	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)		10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)		33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)		45.0	45.0	25.0	50.0	50.0	20.0	30.0		20.0	20.0	20.0
Total Split (%)		28.1%	28.1%	15.6%	31.3%	31.3%	12.5%	18.8%		12.5%	12.5%	12.5%
Yellow Time (s)		5.4	5.4	5.4	5.4	5.4	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0
Lead/Lag		Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode		Min	Min	None	Min	Min	None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 160  
 Actuated Cycle Length: 149  
 Natural Cycle: 145  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



# HCM Signalized Intersection Capacity Analysis

## 1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018

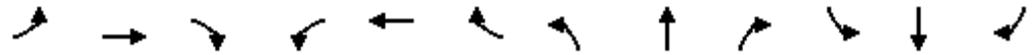


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	480	293	189	45	647	367	178	110	31	95	85	253	
Future Volume (vph)	480	293	189	45	647	367	178	110	31	95	85	253	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.4	6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	
Satd. Flow (prot)	1736	2756	1599	1770	3167	1553	1787	1792		1735	1900	1538	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.53	1.00		0.48	1.00	1.00	
Satd. Flow (perm)	1736	2756	1599	1770	3167	1553	996	1792		881	1900	1538	
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)	522	318	205	49	703	399	193	120	34	103	92	275	
RTOR Reduction (vph)	0	0	86	0	0	274	0	7	0	0	0	244	
Lane Group Flow (vph)	522	318	119	49	703	125	193	147	0	103	92	31	
Confl. Peds. (#/hr)									1	1			
Heavy Vehicles (%)	4%	31%	1%	2%	14%	4%	1%	2%	3%	4%	0%	5%	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	
Protected Phases	5 15	2		1	6		3	8		7	4		
Permitted Phases			2			6	8			4		4	
Actuated Green, G (s)	49.2	87.5	87.5	8.2	40.1	40.1	34.4	19.8		29.2	17.2	17.2	
Effective Green, g (s)	49.2	87.5	87.5	8.2	40.1	40.1	34.4	19.8		29.2	17.2	17.2	
Actuated g/C Ratio	0.33	0.58	0.58	0.05	0.27	0.27	0.23	0.13		0.19	0.11	0.11	
Clearance Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0	
Vehicle Extension (s)		5.0	5.0	3.0	5.0	5.0	3.0	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	568	1604	930	96	844	414	304	236		239	217	176	
v/s Ratio Prot	c0.30	0.12		0.03	c0.22		c0.06	0.08		0.03	0.05		
v/s Ratio Perm			0.07			0.08	c0.08			0.05		0.02	
v/c Ratio	0.92	0.20	0.13	0.51	0.83	0.30	0.63	0.62		0.43	0.42	0.18	
Uniform Delay, d1	48.6	14.8	14.2	69.1	51.9	43.9	50.2	61.7		51.9	61.9	60.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	
Incremental Delay, d2	19.9	0.1	0.1	4.5	7.9	0.9	4.3	5.0		1.2	1.3	0.5	
Delay (s)	68.5	15.0	14.3	73.6	59.8	44.8	54.5	66.8		53.2	63.3	60.7	
Level of Service	E	B	B	E	E	D	D	E		D	E	E	
Approach Delay (s)		41.6			55.2			59.9			59.5		
Approach LOS		D			E			E			E		
<b>Intersection Summary</b>													
HCM 2000 Control Delay			51.7									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.83										
Actuated Cycle Length (s)			150.3									Sum of lost time (s)	29.2
Intersection Capacity Utilization			77.8%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

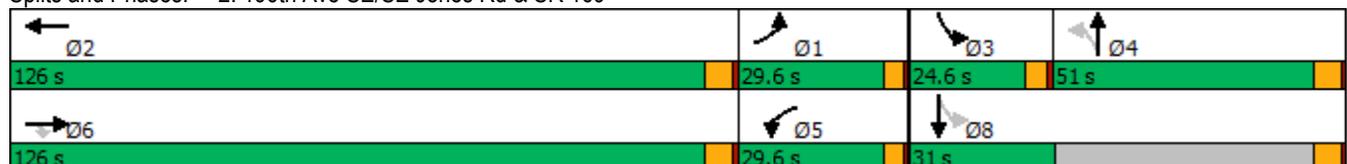


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	337	35	5	911	36	281	46	19	2	0	8
Future Volume (vph)	1	337	35	5	911	36	281	46	19	2	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40				40
Link Distance (ft)		2357			590			404				419
Travel Time (s)		32.1			8.0			6.9				7.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	18%	0%	0%	7%	3%	1%	4%	5%	50%	0%	100%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		11.0	11.0		7.6	30.0	
Total Split (s)	29.6	126.0	126.0	29.6	126.0		51.0	51.0		24.6	31.0	
Total Split (%)	12.8%	54.5%	54.5%	12.8%	54.5%		22.1%	22.1%		10.6%	13.4%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0			6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

Area Type: Other  
 Cycle Length: 231.2  
 Actuated Cycle Length: 181.4  
 Natural Cycle: 130  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



# HCM 6th Signalized Intersection Summary

## 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	337	35	5	911	36	281	46	19	2	0	8
Future Volume (veh/h)	1	337	35	5	911	36	281	46	19	2	0	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1633	1900	1900	1796	1796	2233	2233	2233	570	1311	1311
Adj Flow Rate, veh/h	1	347	36	5	939	37	290	47	20	2	0	8
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	18	0	0	7	7	4	4	4	50	0	0
Cap, veh/h	1	408	402	670	1063	42	371	53	22	162	0	292
Arrive On Green	0.00	0.25	0.25	0.37	0.62	0.62	0.23	0.23	0.23	0.00	0.00	0.26
Sat Flow, veh/h	1810	1633	1610	1810	1716	68	1420	230	98	543	0	1111
Grp Volume(v), veh/h	1	347	36	5	0	976	357	0	0	2	0	8
Grp Sat Flow(s),veh/h/ln	1810	1633	1610	1810	0	1784	1748	0	0	543	0	1111
Q Serve(g_s), s	0.1	28.7	2.4	0.2	0.0	65.3	28.1	0.0	0.0	0.2	0.0	0.8
Cycle Q Clear(g_c), s	0.1	28.7	2.4	0.2	0.0	65.3	28.1	0.0	0.0	0.2	0.0	0.8
Prop In Lane	1.00		1.00	1.00		0.04	0.81		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	1	408	402	670	0	1105	446	0	0	162	0	292
V/C Ratio(X)	0.68	0.85	0.09	0.01	0.00	0.88	0.80	0.00	0.00	0.01	0.00	0.03
Avail Cap(c_a), veh/h	319	1381	1362	670	0	1509	600	0	0	238	0	292
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	70.9	50.7	40.9	28.2	0.0	22.7	53.0	0.0	0.0	40.6	0.0	38.8
Incr Delay (d2), s/veh	219.3	10.1	0.2	0.0	0.0	6.8	6.6	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	12.5	1.0	0.1	0.0	26.3	13.0	0.0	0.0	0.1	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	290.2	60.8	41.1	28.2	0.0	29.5	59.6	0.0	0.0	40.7	0.0	38.9
LnGrp LOS	F	E	D	C	A	C	E	A	A	D	A	D
Approach Vol, veh/h		384			981			357				10
Approach Delay, s/veh		59.6			29.5			59.6				39.2
Approach LOS		E			C			E				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	4.7	93.9	4.8	38.5	57.2	41.4		43.3				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	120.0	20.0	45.0	25.0	120.0		25.0				
Max Q Clear Time (g_c+I1), s	2.1	67.3	2.2	30.1	2.2	30.7		2.8				
Green Ext Time (p_c), s	0.0	20.6	0.0	2.4	0.0	4.7		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			42.4									
HCM 6th LOS			D									

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

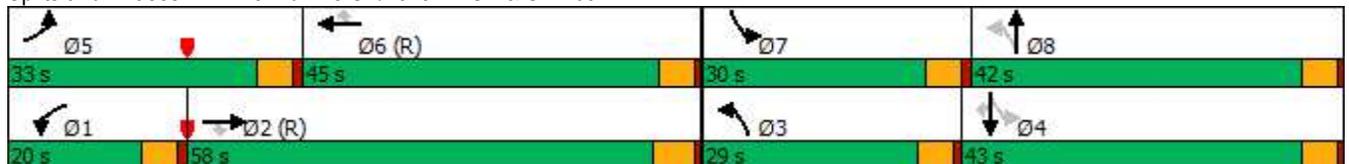
09/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	345	1047	116	12	386	111	116	64	44	416	60	594
Future Volume (vph)	345	1047	116	12	386	111	116	64	44	416	60	594
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									4	4		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	5%	1%	1%	2%	0%	1%	0%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.4	33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)	33.0	58.0	58.0	20.0	45.0	45.0	29.0	42.0		30.0	43.0	43.0
Total Split (%)	22.0%	38.7%	38.7%	13.3%	30.0%	30.0%	19.3%	28.0%		20.0%	28.7%	28.7%
Yellow Time (s)	4.0	4.7	4.7	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.7	5.7	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	None

Intersection Summary

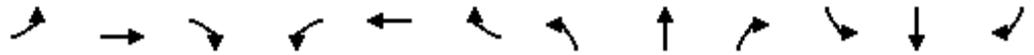
Area Type: Other  
 Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 13 (9%), Referenced to phase 6:WBT and 2:EBT, Start of 1st Green  
 Natural Cycle: 120  
 Control Type: Actuated-Coordinated

Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



HCM 6th Signalized Intersection Summary  
 1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗	↘	↖	↗	↘	↖	↗	↘	↖	↗	↘
Traffic Volume (veh/h)	345	1047	116	12	386	111	116	64	44	416	60	594
Future Volume (veh/h)	345	1047	116	12	386	111	116	64	44	416	60	594
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1900	1900	1826	1885	1885	1870	1870	1885	1900	1885
Adj Flow Rate, veh/h	375	1138	0	13	420	0	126	70	48	452	65	238
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	2	0	0	5	1	1	2	2	1	0	1
Cap, veh/h	335	2040	924	25	1392	641	300	111	76	401	376	314
Arrive On Green	0.19	0.57	0.00	0.01	0.40	0.00	0.08	0.11	0.11	0.17	0.20	0.20
Sat Flow, veh/h	1795	3554	1610	1810	3469	1598	1795	1029	705	1795	1900	1588
Grp Volume(v), veh/h	375	1138	0	13	420	0	126	0	118	452	65	238
Grp Sat Flow(s),veh/h/ln	1795	1777	1610	1810	1735	1598	1795	0	1734	1795	1900	1588
Q Serve(g_s), s	28.0	30.1	0.0	1.1	12.4	0.0	9.2	0.0	9.8	25.0	4.3	21.2
Cycle Q Clear(g_c), s	28.0	30.1	0.0	1.1	12.4	0.0	9.2	0.0	9.8	25.0	4.3	21.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	335	2040	924	25	1392	641	300	0	186	401	376	314
V/C Ratio(X)	1.12	0.56	0.00	0.52	0.30	0.00	0.42	0.00	0.63	1.13	0.17	0.76
Avail Cap(c_a), veh/h	335	2040	924	181	1392	641	451	0	428	401	481	402
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.0	20.0	0.0	73.5	30.6	0.0	53.8	0.0	64.1	51.7	50.0	56.8
Incr Delay (d2), s/veh	85.2	1.1	0.0	15.3	0.6	0.0	0.9	0.0	3.5	84.1	0.2	6.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	20.3	12.0	0.0	0.6	5.2	0.0	4.3	0.0	4.6	12.4	2.1	9.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	146.2	21.1	0.0	88.8	31.1	0.0	54.7	0.0	67.6	135.8	50.2	62.8
LnGrp LOS	F	C	A	F	C	A	D	A	E	F	D	E
Approach Vol, veh/h		1513			433			244			755	
Approach Delay, s/veh		52.1			32.9			61.0			105.4	
Approach LOS		D			C			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.1	91.8	16.4	34.7	33.0	65.9	30.0	21.1				
Change Period (Y+Rc), s	5.0	5.7	5.0	5.0	5.0	* 5.7	5.0	5.0				
Max Green Setting (Gmax), s	15.0	52.3	24.0	38.0	28.0	* 40	25.0	37.0				
Max Q Clear Time (g_c+I1), s	3.1	32.1	11.2	23.2	30.0	14.4	27.0	11.8				
Green Ext Time (p_c), s	0.0	12.3	0.2	1.0	0.0	4.7	0.0	0.7				

Intersection Summary

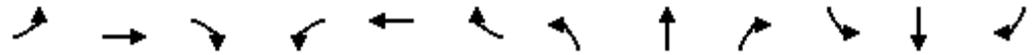
HCM 6th Ctrl Delay	63.7
HCM 6th LOS	E

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

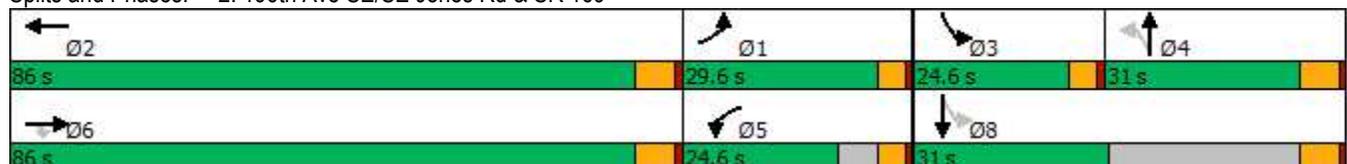


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕		↖	↗	
Traffic Volume (vph)	2	1079	405	25	422	11	65	1	16	9	6	4
Future Volume (vph)	2	1079	405	25	422	11	65	1	16	9	6	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40				40
Link Distance (ft)		2357			590			404				419
Travel Time (s)		32.1			8.0			6.9				7.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	2%	1%	4%	4%	9%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		30.0	30.0		7.6	30.0	
Total Split (s)	29.6	86.0	86.0	24.6	86.0		31.0	31.0		24.6	31.0	
Total Split (%)	17.3%	50.2%	50.2%	14.4%	50.2%		18.1%	18.1%		14.4%	18.1%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0			6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

Area Type: Other  
 Cycle Length: 171.2  
 Actuated Cycle Length: 119.2  
 Natural Cycle: 120  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



# HCM 6th Signalized Intersection Summary

## 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

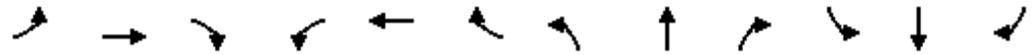


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	1079	405	25	422	11	65	1	16	9	6	4
Future Volume (veh/h)	2	1079	405	25	422	11	65	1	16	9	6	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1870	1885	1841	1841	1841	2293	2293	2293	1311	1311	1311
Adj Flow Rate, veh/h	2	1112	418	26	435	11	67	1	16	9	6	4
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	50	2	1	4	4	4	0	0	0	0	0	0
Cap, veh/h	459	1309	1118	32	540	14	157	1	22	171	86	58
Arrive On Green	0.42	0.70	0.70	0.02	0.30	0.30	0.07	0.07	0.07	0.01	0.12	0.12
Sat Flow, veh/h	1104	1870	1598	1753	1787	45	1409	21	336	1249	734	489
Grp Volume(v), veh/h	2	1112	418	26	0	446	84	0	0	9	0	10
Grp Sat Flow(s),veh/h/ln	1104	1870	1598	1753	0	1833	1766	0	0	1249	0	1223
Q Serve(g_s), s	0.1	44.5	10.7	1.5	0.0	22.7	4.7	0.0	0.0	0.7	0.0	0.7
Cycle Q Clear(g_c), s	0.1	44.5	10.7	1.5	0.0	22.7	4.7	0.0	0.0	0.7	0.0	0.7
Prop In Lane	1.00		1.00	1.00		0.02	0.80		0.19	1.00		0.40
Lane Grp Cap(c), veh/h	459	1309	1118	32	0	554	180	0	0	171	0	144
V/C Ratio(X)	0.00	0.85	0.37	0.82	0.00	0.81	0.47	0.00	0.00	0.05	0.00	0.07
Avail Cap(c_a), veh/h	459	1482	1266	347	0	1452	501	0	0	410	0	303
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.3	11.2	6.2	49.4	0.0	32.5	46.3	0.0	0.0	41.9	0.0	39.6
Incr Delay (d2), s/veh	0.0	5.3	0.4	38.4	0.0	5.8	2.7	0.0	0.0	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	14.7	2.8	1.0	0.0	10.2	2.2	0.0	0.0	0.2	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	16.5	6.6	87.9	0.0	38.3	49.0	0.0	0.0	42.1	0.0	39.9
LnGrp LOS	B	B	A	F	A	D	D	A	A	D	A	D
Approach Vol, veh/h		1532			472			84				19
Approach Delay, s/veh		13.8			41.0			49.0				40.9
Approach LOS		B			D			D				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	46.6	36.5	5.3	12.6	6.4	76.7		17.9				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	80.0	20.0	25.0	20.0	80.0		25.0				
Max Q Clear Time (g_c+I1), s	2.1	24.7	2.7	6.7	3.5	46.5		2.7				
Green Ext Time (p_c), s	0.0	5.9	0.0	0.4	0.0	24.2		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay			21.5									
HCM 6th LOS			C									

2020 No Action

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018

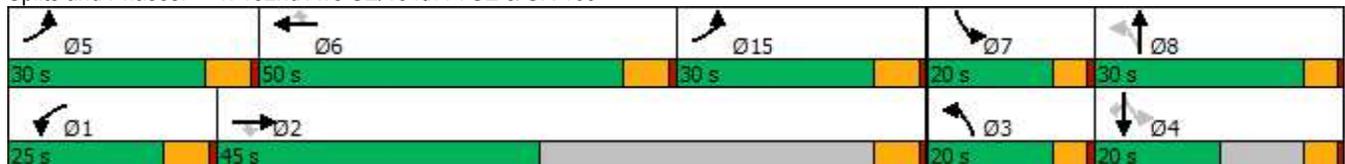


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↗	↘	↑↑	↗	↘	↗		↘	↑	↗
Traffic Volume (vph)	499	305	197	47	673	382	185	114	32	99	88	263
Future Volume (vph)	499	305	197	47	673	382	185	114	32	99	88	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	31%	1%	2%	14%	4%	1%	2%	3%	4%	0%	5%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5 15	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5 15	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)		10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)		33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)		45.0	45.0	25.0	50.0	50.0	20.0	30.0		20.0	20.0	20.0
Total Split (%)		28.1%	28.1%	15.6%	31.3%	31.3%	12.5%	18.8%		12.5%	12.5%	12.5%
Yellow Time (s)		5.4	5.4	5.4	5.4	5.4	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0
Lead/Lag		Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode		Min	Min	None	Min	Min	None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 160  
 Actuated Cycle Length: 150.4  
 Natural Cycle: 145  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



# HCM Signalized Intersection Capacity Analysis

1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	305	197	47	673	382	185	114	32	99	88	263
Future Volume (vph)	499	305	197	47	673	382	185	114	32	99	88	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.4	6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	2756	1599	1770	3167	1553	1787	1792		1735	1900	1538
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.52	1.00		0.46	1.00	1.00
Satd. Flow (perm)	1736	2756	1599	1770	3167	1553	987	1792		838	1900	1538
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)	542	332	214	51	732	415	201	124	35	108	96	286
RTOR Reduction (vph)	0	0	90	0	0	267	0	7	0	0	0	252
Lane Group Flow (vph)	542	332	124	51	732	148	201	152	0	108	96	34
Confl. Peds. (#/hr)									1	1		
Heavy Vehicles (%)	4%	31%	1%	2%	14%	4%	1%	2%	3%	4%	0%	5%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5 15	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Actuated Green, G (s)	49.2	88.1	88.1	8.4	40.9	40.9	34.9	20.2		30.1	17.8	17.8
Effective Green, g (s)	49.2	88.1	88.1	8.4	40.9	40.9	34.9	20.2		30.1	17.8	17.8
Actuated g/C Ratio	0.32	0.58	0.58	0.06	0.27	0.27	0.23	0.13		0.20	0.12	0.12
Clearance Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)		5.0	5.0	3.0	5.0	5.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	562	1599	928	97	853	418	304	238		238	222	180
v/s Ratio Prot	c0.31	0.12		0.03	c0.23		c0.06	0.08		0.04	0.05	
v/s Ratio Perm			0.08			0.10	c0.09			0.05		0.02
v/c Ratio	0.96	0.21	0.13	0.53	0.86	0.35	0.66	0.64		0.45	0.43	0.19
Uniform Delay, d1	50.4	15.2	14.5	69.8	52.7	44.8	50.8	62.3		52.1	62.3	60.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	28.9	0.1	0.1	5.1	9.4	1.1	5.3	5.5		1.4	1.4	0.5
Delay (s)	79.4	15.3	14.6	74.8	62.0	45.9	56.2	67.9		53.5	63.7	61.0
Level of Service	E	B	B	E	E	D	E	E		D	E	E
Approach Delay (s)		47.1			57.0			61.3			59.8	
Approach LOS		D			E			E			E	

## Intersection Summary

HCM 2000 Control Delay	54.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	151.8	Sum of lost time (s)	29.2
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

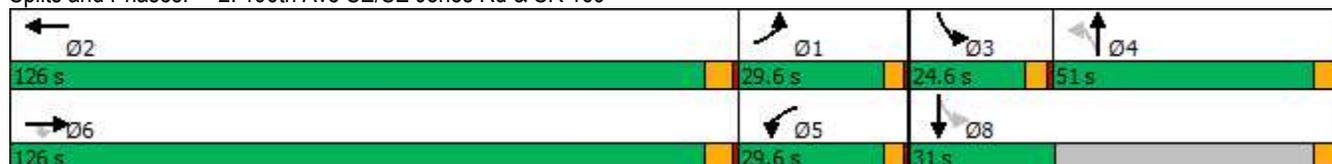


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕		↖	↗	
Traffic Volume (vph)	5	351	36	5	948	37	292	48	20	5	0	8
Future Volume (vph)	5	351	36	5	948	37	292	48	20	5	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40				40
Link Distance (ft)		2357			590			404				419
Travel Time (s)		32.1			8.0			6.9				7.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	18%	0%	0%	7%	3%	1%	4%	5%	50%	0%	100%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		11.0	11.0		7.6	30.0	
Total Split (s)	29.6	126.0	126.0	29.6	126.0		51.0	51.0		24.6	31.0	
Total Split (%)	12.8%	54.5%	54.5%	12.8%	54.5%		22.1%	22.1%		10.6%	13.4%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0			6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

Area Type: Other  
 Cycle Length: 231.2  
 Actuated Cycle Length: 181.8  
 Natural Cycle: 150  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



# HCM 6th Signalized Intersection Summary

## 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	351	36	5	948	37	292	48	20	5	0	8
Future Volume (veh/h)	5	351	36	5	948	37	292	48	20	5	0	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1633	1900	1900	1796	1796	2233	2233	2233	570	1311	1311
Adj Flow Rate, veh/h	5	362	37	5	977	38	301	49	21	5	0	8
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	18	0	0	7	7	4	4	4	50	0	0
Cap, veh/h	7	418	412	679	1077	42	370	54	23	159	0	294
Arrive On Green	0.00	0.26	0.26	0.38	0.63	0.63	0.23	0.23	0.23	0.00	0.00	0.26
Sat Flow, veh/h	1810	1633	1610	1810	1717	67	1419	231	99	543	0	1111
Grp Volume(v), veh/h	5	362	37	5	0	1015	371	0	0	5	0	8
Grp Sat Flow(s),veh/h/ln	1810	1633	1610	1810	0	1784	1749	0	0	543	0	1111
Q Serve(g_s), s	0.4	33.7	2.8	0.3	0.0	78.3	32.9	0.0	0.0	0.6	0.0	0.8
Cycle Q Clear(g_c), s	0.4	33.7	2.8	0.3	0.0	78.3	32.9	0.0	0.0	0.6	0.0	0.8
Prop In Lane	1.00		1.00	1.00		0.04	0.81		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	7	418	412	679	0	1119	447	0	0	159	0	294
V/C Ratio(X)	0.74	0.87	0.09	0.01	0.00	0.91	0.83	0.00	0.00	0.03	0.00	0.03
Avail Cap(c_a), veh/h	284	1231	1214	679	0	1345	535	0	0	225	0	294
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	79.2	56.7	45.1	31.1	0.0	25.6	59.6	0.0	0.0	45.4	0.0	43.3
Incr Delay (d2), s/veh	91.5	11.0	0.2	0.0	0.0	9.4	10.0	0.0	0.0	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	14.8	1.1	0.1	0.0	32.8	15.7	0.0	0.0	0.2	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	170.7	67.6	45.3	31.1	0.0	35.1	69.6	0.0	0.0	45.5	0.0	43.4
LnGrp LOS	F	E	D	C	A	D	E	A	A	D	A	D
Approach Vol, veh/h		404			1020			371				13
Approach Delay, s/veh		66.9			35.0			69.6				44.2
Approach LOS		E			D			E				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	5.2	105.8	5.2	42.9	64.4	46.7		48.1				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	120.0	20.0	45.0	25.0	120.0		25.0				
Max Q Clear Time (g_c+I1), s	2.4	80.3	2.6	34.9	2.3	35.7		2.8				
Green Ext Time (p_c), s	0.0	19.6	0.0	2.0	0.0	4.9		0.0				

### Intersection Summary

HCM 6th Ctrl Delay	49.3
HCM 6th LOS	D

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

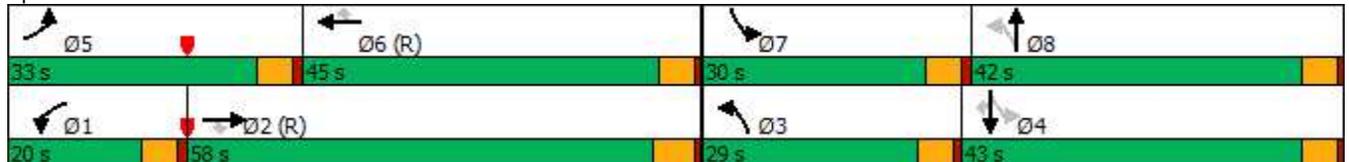
09/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	359	1089	121	12	402	115	121	67	46	433	62	618
Future Volume (vph)	359	1089	121	12	402	115	121	67	46	433	62	618
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									4	4		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	5%	1%	1%	2%	0%	1%	0%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.4	33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)	33.0	58.0	58.0	20.0	45.0	45.0	29.0	42.0		30.0	43.0	43.0
Total Split (%)	22.0%	38.7%	38.7%	13.3%	30.0%	30.0%	19.3%	28.0%		20.0%	28.7%	28.7%
Yellow Time (s)	4.0	4.7	4.7	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.7	5.7	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 13 (9%), Referenced to phase 6:WBT and 2:EBT, Start of 1st Green  
 Natural Cycle: 120  
 Control Type: Actuated-Coordinated

Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



# HCM 6th Signalized Intersection Summary

1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	359	1089	121	12	402	115	121	67	46	433	62	618
Future Volume (veh/h)	359	1089	121	12	402	115	121	67	46	433	62	618
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1900	1900	1826	1885	1885	1870	1870	1885	1900	1885
Adj Flow Rate, veh/h	390	1184	0	13	437	0	132	73	50	471	67	248
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	2	0	0	5	1	1	2	2	1	0	1
Cap, veh/h	335	2031	920	25	1383	637	307	113	78	401	375	314
Arrive On Green	0.19	0.57	0.00	0.01	0.40	0.00	0.08	0.11	0.11	0.17	0.20	0.20
Sat Flow, veh/h	1795	3554	1610	1810	3469	1598	1795	1029	705	1795	1900	1588
Grp Volume(v), veh/h	390	1184	0	13	437	0	132	0	123	471	67	248
Grp Sat Flow(s),veh/h/ln	1795	1777	1610	1810	1735	1598	1795	0	1734	1795	1900	1588
Q Serve(g_s), s	28.0	32.1	0.0	1.1	13.0	0.0	9.7	0.0	10.2	25.0	4.4	22.3
Cycle Q Clear(g_c), s	28.0	32.1	0.0	1.1	13.0	0.0	9.7	0.0	10.2	25.0	4.4	22.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	335	2031	920	25	1383	637	307	0	191	401	375	314
V/C Ratio(X)	1.16	0.58	0.00	0.52	0.32	0.00	0.43	0.00	0.65	1.18	0.18	0.79
Avail Cap(c_a), veh/h	335	2031	920	181	1383	637	452	0	428	401	481	402
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.0	20.7	0.0	73.5	31.0	0.0	53.2	0.0	64.0	51.4	50.1	57.2
Incr Delay (d2), s/veh	101.4	1.2	0.0	15.3	0.6	0.0	1.0	0.0	3.6	102.3	0.2	8.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	21.8	12.8	0.0	0.6	5.4	0.0	4.5	0.0	4.7	14.4	2.1	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	162.4	21.9	0.0	88.8	31.6	0.0	54.2	0.0	67.6	153.7	50.3	65.2
LnGrp LOS	F	C	A	F	C	A	D	A	E	F	D	E
Approach Vol, veh/h		1574			450			255				786
Approach Delay, s/veh		56.7			33.3			60.7				117.0
Approach LOS		E			C			E				F
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.1	91.4	16.9	34.6	33.0	65.5	30.0	21.5				
Change Period (Y+Rc), s	5.0	5.7	5.0	5.0	5.0	* 5.7	5.0	5.0				
Max Green Setting (Gmax), s	15.0	52.3	24.0	38.0	28.0	* 40	25.0	37.0				
Max Q Clear Time (g_c+I1), s	3.1	34.1	11.7	24.3	30.0	15.0	27.0	12.2				
Green Ext Time (p_c), s	0.0	11.9	0.3	1.0	0.0	4.9	0.0	0.7				

## Intersection Summary

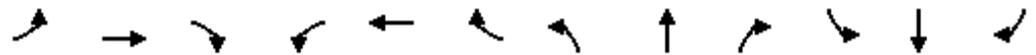
HCM 6th Ctrl Delay	69.0
HCM 6th LOS	E

## Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

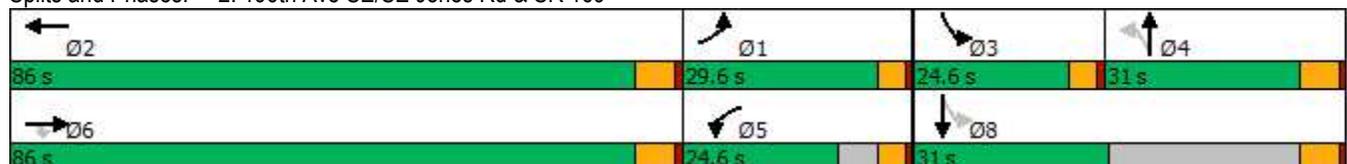


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕		↖	↗	
Traffic Volume (vph)	5	1123	421	26	439	11	68	5	17	9	6	5
Future Volume (vph)	5	1123	421	26	439	11	68	5	17	9	6	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		2357			590			404			419	
Travel Time (s)		32.1			8.0			6.9			7.1	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	2%	1%	4%	4%	9%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		30.0	30.0		7.6	30.0	
Total Split (s)	29.6	86.0	86.0	24.6	86.0		31.0	31.0		24.6	31.0	
Total Split (%)	17.3%	50.2%	50.2%	14.4%	50.2%		18.1%	18.1%		14.4%	18.1%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0		6.0	6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

Area Type: Other  
 Cycle Length: 171.2  
 Actuated Cycle Length: 119.3  
 Natural Cycle: 130  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



# HCM 6th Signalized Intersection Summary

## 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1123	421	26	439	11	68	5	17	9	6	5
Future Volume (veh/h)	5	1123	421	26	439	11	68	5	17	9	6	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1870	1885	1841	1841	1841	2293	2293	2293	1311	1311	1311
Adj Flow Rate, veh/h	5	1158	434	27	453	11	70	5	18	9	6	5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	50	2	1	4	4	4	0	0	0	0	0	0
Cap, veh/h	454	1315	1123	33	556	14	155	7	25	169	80	67
Arrive On Green	0.41	0.70	0.70	0.02	0.31	0.31	0.07	0.07	0.07	0.01	0.12	0.12
Sat Flow, veh/h	1104	1870	1598	1753	1789	43	1343	96	345	1249	661	551
Grp Volume(v), veh/h	5	1158	434	27	0	464	93	0	0	9	0	11
Grp Sat Flow(s),veh/h/ln	1104	1870	1598	1753	0	1833	1784	0	0	1249	0	1212
Q Serve(g_s), s	0.3	51.1	11.7	1.6	0.0	24.7	5.4	0.0	0.0	0.7	0.0	0.9
Cycle Q Clear(g_c), s	0.3	51.1	11.7	1.6	0.0	24.7	5.4	0.0	0.0	0.7	0.0	0.9
Prop In Lane	1.00		1.00	1.00		0.02	0.75		0.19	1.00		0.45
Lane Grp Cap(c), veh/h	454	1315	1123	33	0	570	186	0	0	169	0	147
V/C Ratio(X)	0.01	0.88	0.39	0.81	0.00	0.81	0.50	0.00	0.00	0.05	0.00	0.07
Avail Cap(c_a), veh/h	454	1414	1208	331	0	1386	481	0	0	397	0	286
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.4	12.2	6.4	51.7	0.0	33.6	48.2	0.0	0.0	43.5	0.0	41.2
Incr Delay (d2), s/veh	0.0	7.2	0.5	36.1	0.0	6.0	2.9	0.0	0.0	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	17.7	3.1	1.0	0.0	11.2	2.5	0.0	0.0	0.2	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	19.4	6.9	87.8	0.0	39.6	51.1	0.0	0.0	43.6	0.0	41.5
LnGrp LOS	B	B	A	F	A	D	D	A	A	D	A	D
Approach Vol, veh/h		1597			491			93				20
Approach Delay, s/veh		16.0			42.3			51.1				42.5
Approach LOS		B			D			D				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	48.1	38.9	5.3	13.5	6.6	80.4		18.8				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	80.0	20.0	25.0	20.0	80.0		25.0				
Max Q Clear Time (g_c+I1), s	2.3	26.7	2.7	7.4	3.6	53.1		2.9				
Green Ext Time (p_c), s	0.0	6.2	0.0	0.5	0.0	21.3		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				23.6								
HCM 6th LOS				C								

2020 With-Project

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

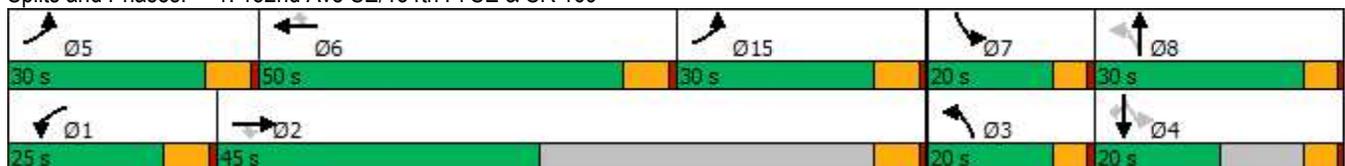
09/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	499	312	197	47	680	382	185	114	32	99	88	263
Future Volume (vph)	499	312	197	47	680	382	185	114	32	99	88	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									1	1		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	33%	1%	2%	15%	4%	1%	2%	3%	4%	0%	5%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5 15	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5 15	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)		10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)		33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)		45.0	45.0	25.0	50.0	50.0	20.0	30.0		20.0	20.0	20.0
Total Split (%)		28.1%	28.1%	15.6%	31.3%	31.3%	12.5%	18.8%		12.5%	12.5%	12.5%
Yellow Time (s)		5.4	5.4	5.4	5.4	5.4	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0
Lead/Lag		Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode		Min	Min	None	Min	Min	None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 160  
 Actuated Cycle Length: 150.8  
 Natural Cycle: 145  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



# HCM Signalized Intersection Capacity Analysis

## 1: 152nd Ave SE/154th PI SE & SR 169

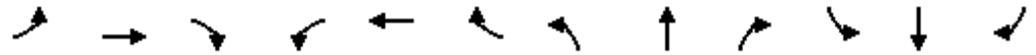
09/11/2018

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations		 			 									
Traffic Volume (vph)	499	312	197	47	680	382	185	114	32	99	88	263		
Future Volume (vph)	499	312	197	47	680	382	185	114	32	99	88	263		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	6.4	6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97		1.00	1.00	0.85		
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00		
Satd. Flow (prot)	1736	2714	1599	1770	3139	1553	1787	1792		1735	1900	1538		
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.53	1.00		0.45	1.00	1.00		
Satd. Flow (perm)	1736	2714	1599	1770	3139	1553	991	1792		829	1900	1538		
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)	542	339	214	51	739	415	201	124	35	108	96	286		
RTOR Reduction (vph)	0	0	90	0	0	266	0	7	0	0	0	253		
Lane Group Flow (vph)	542	339	124	51	739	149	201	152	0	108	96	33		
Confl. Peds. (#/hr)									1	1				
Heavy Vehicles (%)	4%	33%	1%	2%	15%	4%	1%	2%	3%	4%	0%	5%		
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm		
Protected Phases	5 15	2		1	6		3	8		7	4			
Permitted Phases			2			6	8			4		4		
Actuated Green, G (s)	49.1	88.4	88.4	8.4	41.3	41.3	34.8	20.1		30.2	17.8	17.8		
Effective Green, g (s)	49.1	88.4	88.4	8.4	41.3	41.3	34.8	20.1		30.2	17.8	17.8		
Actuated g/C Ratio	0.32	0.58	0.58	0.06	0.27	0.27	0.23	0.13		0.20	0.12	0.12		
Clearance Time (s)		6.4	6.4	6.4	6.4	6.4	5.0	5.0		5.0	5.0	5.0		
Vehicle Extension (s)		5.0	5.0	3.0	5.0	5.0	3.0	3.0		3.0	3.0	3.0		
Lane Grp Cap (vph)	560	1577	929	97	852	421	303	236		238	222	179		
v/s Ratio Prot	c0.31	0.12		0.03	c0.24		c0.06	0.08		0.04	0.05			
v/s Ratio Perm			0.08			0.10	c0.09			0.05		0.02		
v/c Ratio	0.97	0.21	0.13	0.53	0.87	0.35	0.66	0.64		0.45	0.43	0.19		
Uniform Delay, d1	50.7	15.2	14.5	69.9	52.8	44.7	51.1	62.6		52.2	62.5	60.6		
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		
Incremental Delay, d2	29.7	0.1	0.1	5.1	10.1	1.1	5.4	5.9		1.4	1.4	0.5		
Delay (s)	80.4	15.4	14.6	75.0	62.9	45.7	56.5	68.5		53.6	63.8	61.1		
Level of Service	F	B	B	E	E	D	E	E		D	E	E		
Approach Delay (s)		47.4			57.5			61.8			60.0			
Approach LOS		D			E			E			E			
<b>Intersection Summary</b>														
HCM 2000 Control Delay			54.9									HCM 2000 Level of Service	D	
HCM 2000 Volume to Capacity ratio			0.87											
Actuated Cycle Length (s)			152.1							29.2				
Intersection Capacity Utilization			80.3%										ICU Level of Service	D
Analysis Period (min)			15											

c Critical Lane Group

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

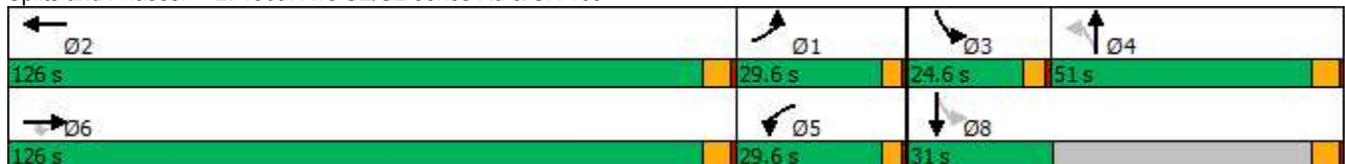


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕		↖	↗	
Traffic Volume (vph)	5	362	36	5	959	37	292	48	20	5	0	8
Future Volume (vph)	5	362	36	5	959	37	292	48	20	5	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		2357			590			404			419	
Travel Time (s)		32.1			8.0			6.9			7.1	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	20%	0%	0%	8%	3%	1%	4%	5%	50%	0%	100%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		11.0	11.0		7.6	30.0	
Total Split (s)	29.6	126.0	126.0	29.6	126.0		51.0	51.0		24.6	31.0	
Total Split (%)	12.8%	54.5%	54.5%	12.8%	54.5%		22.1%	22.1%		10.6%	13.4%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0			6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

Area Type: Other  
 Cycle Length: 231.2  
 Actuated Cycle Length: 181.8  
 Natural Cycle: 140  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



# HCM 6th Signalized Intersection Summary

## 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	362	36	5	959	37	292	48	20	5	0	8
Future Volume (veh/h)	5	362	36	5	959	37	292	48	20	5	0	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1900	1604	1900	1900	1781	1781	2233	2233	2233	570	1311	1311
Adj Flow Rate, veh/h	5	373	37	5	989	38	301	49	21	5	0	8
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	20	0	0	8	8	4	4	4	50	0	0
Cap, veh/h	7	426	428	671	1078	41	367	53	23	157	0	292
Arrive On Green	0.00	0.27	0.27	0.37	0.63	0.63	0.23	0.23	0.23	0.00	0.00	0.26
Sat Flow, veh/h	1810	1604	1610	1810	1704	65	1419	231	99	543	0	1111
Grp Volume(v), veh/h	5	373	37	5	0	1027	371	0	0	5	0	8
Grp Sat Flow(s),veh/h/ln	1810	1604	1610	1810	0	1770	1749	0	0	543	0	1111
Q Serve(g_s), s	0.5	36.5	2.8	0.3	0.0	83.4	34.0	0.0	0.0	0.6	0.0	0.9
Cycle Q Clear(g_c), s	0.5	36.5	2.8	0.3	0.0	83.4	34.0	0.0	0.0	0.6	0.0	0.9
Prop In Lane	1.00		1.00	1.00		0.04	0.81		0.06	1.00		1.00
Lane Grp Cap(c), veh/h	7	426	428	671	0	1120	443	0	0	157	0	292
V/C Ratio(X)	0.74	0.87	0.09	0.01	0.00	0.92	0.84	0.00	0.00	0.03	0.00	0.03
Avail Cap(c_a), veh/h	275	1171	1176	671	0	1293	519	0	0	221	0	292
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	81.7	57.7	45.3	32.6	0.0	26.4	61.7	0.0	0.0	47.1	0.0	45.0
Incr Delay (d2), s/veh	92.3	11.3	0.2	0.0	0.0	10.8	11.0	0.0	0.0	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	15.8	1.1	0.1	0.0	35.1	16.3	0.0	0.0	0.2	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	174.0	69.0	45.5	32.6	0.0	37.1	72.7	0.0	0.0	47.1	0.0	45.1
LnGrp LOS	F	E	D	C	A	D	E	A	A	D	A	D
Approach Vol, veh/h		415			1032			371				13
Approach Delay, s/veh		68.2			37.1			72.7				45.9
Approach LOS		E			D			E				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	5.2	109.9	5.2	43.9	65.5	49.7		49.1				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	120.0	20.0	45.0	25.0	120.0		25.0				
Max Q Clear Time (g_c+I1), s	2.5	85.4	2.6	36.0	2.3	38.5		2.9				
Green Ext Time (p_c), s	0.0	18.5	0.0	1.9	0.0	5.1		0.0				

### Intersection Summary

HCM 6th Ctrl Delay	51.4
HCM 6th LOS	D

Lanes, Volumes, Timings  
 1: 152nd Ave SE/154th PI SE & SR 169

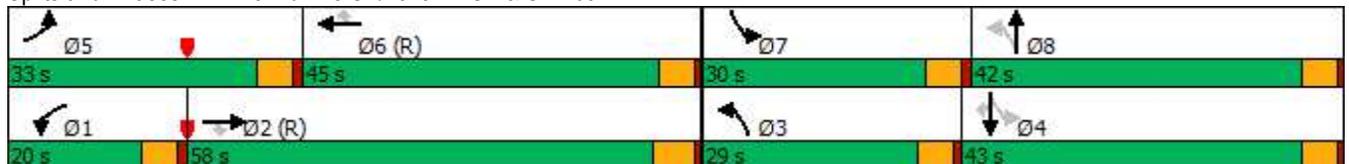
09/11/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	359	1091	121	12	411	116	121	67	46	433	62	618
Future Volume (vph)	359	1091	121	12	411	116	121	67	46	433	62	618
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		100	200		300	150		0	175		0
Storage Lanes	1		1	1		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			25				35
Link Distance (ft)		863			7949			559				465
Travel Time (s)		11.8			108.4			15.2				9.1
Confl. Peds. (#/hr)									4	4		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	2%	0%	0%	5%	1%	1%	2%	0%	1%	0%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA	Perm	pm+pt	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6	8			4		4
Detector Phase	5	2	2	1	6	6	3	8		7	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	5.0		5.0	5.0	5.0
Minimum Split (s)	11.4	33.4	33.4	11.4	35.4	35.4	10.0	41.0		10.0	42.0	42.0
Total Split (s)	33.0	58.0	58.0	20.0	45.0	45.0	29.0	42.0		30.0	43.0	43.0
Total Split (%)	22.0%	38.7%	38.7%	13.3%	30.0%	30.0%	19.3%	28.0%		20.0%	28.7%	28.7%
Yellow Time (s)	4.0	4.7	4.7	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.7	5.7	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None		None	None	None

Intersection Summary

Area Type: Other  
 Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 13 (9%), Referenced to phase 6:WBT and 2:EBT, Start of 1st Green  
 Natural Cycle: 120  
 Control Type: Actuated-Coordinated

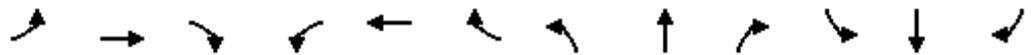
Splits and Phases: 1: 152nd Ave SE/154th PI SE & SR 169



# HCM 6th Signalized Intersection Summary

1: 152nd Ave SE/154th PI SE & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	359	1091	121	12	411	116	121	67	46	433	62	618
Future Volume (veh/h)	359	1091	121	12	411	116	121	67	46	433	62	618
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1870	1900	1900	1826	1885	1885	1870	1870	1885	1900	1885
Adj Flow Rate, veh/h	390	1186	0	13	447	0	132	73	50	471	67	248
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	2	0	0	5	1	1	2	2	1	0	1
Cap, veh/h	335	2031	920	25	1383	637	307	113	78	401	375	314
Arrive On Green	0.19	0.57	0.00	0.01	0.40	0.00	0.08	0.11	0.11	0.17	0.20	0.20
Sat Flow, veh/h	1795	3554	1610	1810	3469	1598	1795	1029	705	1795	1900	1588
Grp Volume(v), veh/h	390	1186	0	13	447	0	132	0	123	471	67	248
Grp Sat Flow(s),veh/h/ln	1795	1777	1610	1810	1735	1598	1795	0	1734	1795	1900	1588
Q Serve(g_s), s	28.0	32.2	0.0	1.1	13.3	0.0	9.7	0.0	10.2	25.0	4.4	22.3
Cycle Q Clear(g_c), s	28.0	32.2	0.0	1.1	13.3	0.0	9.7	0.0	10.2	25.0	4.4	22.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.41	1.00		1.00
Lane Grp Cap(c), veh/h	335	2031	920	25	1383	637	307	0	191	401	375	314
V/C Ratio(X)	1.16	0.58	0.00	0.52	0.32	0.00	0.43	0.00	0.65	1.18	0.18	0.79
Avail Cap(c_a), veh/h	335	2031	920	181	1383	637	452	0	428	401	481	402
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	61.0	20.7	0.0	73.5	31.1	0.0	53.2	0.0	64.0	51.4	50.1	57.2
Incr Delay (d2), s/veh	101.4	1.2	0.0	15.3	0.6	0.0	1.0	0.0	3.6	102.3	0.2	8.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	21.8	12.9	0.0	0.6	5.6	0.0	4.5	0.0	4.7	14.4	2.1	9.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	162.4	21.9	0.0	88.8	31.7	0.0	54.2	0.0	67.6	153.7	50.3	65.2
LnGrp LOS	F	C	A	F	C	A	D	A	E	F	D	E
Approach Vol, veh/h		1576			460			255			786	
Approach Delay, s/veh		56.7			33.4			60.7			117.0	
Approach LOS		E			C			E			F	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.1	91.4	16.9	34.6	33.0	65.5	30.0	21.5				
Change Period (Y+Rc), s	5.0	5.7	5.0	5.0	5.0	* 5.7	5.0	5.0				
Max Green Setting (Gmax), s	15.0	52.3	24.0	38.0	28.0	* 40	25.0	37.0				
Max Q Clear Time (g_c+I1), s	3.1	34.2	11.7	24.3	30.0	15.3	27.0	12.2				
Green Ext Time (p_c), s	0.0	11.8	0.3	1.0	0.0	5.0	0.0	0.7				

## Intersection Summary

HCM 6th Ctrl Delay	68.9
HCM 6th LOS	E

## Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Lanes, Volumes, Timings  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018

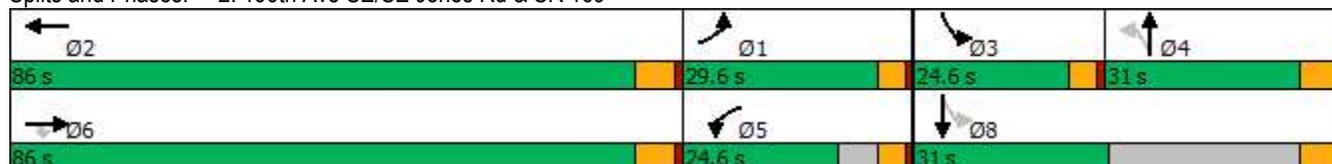


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗			↕		↖	↗	
Traffic Volume (vph)	5	1130	423	26	445	11	68	5	17	9	6	5
Future Volume (vph)	5	1130	423	26	445	11	68	5	17	9	6	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			-10%			10%	
Storage Length (ft)	150		0	150		0	0		0	175		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			40			40	
Link Distance (ft)		2357			590			404			419	
Travel Time (s)		32.1			8.0			6.9			7.1	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	50%	2%	1%	4%	5%	9%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	1	6		5	2			4		3	8	
Permitted Phases			6				4			8		
Detector Phase	1	6	6	5	2		4	4		3	8	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0		5.0	5.0		3.0	5.0	
Minimum Split (s)	7.6	33.0	33.0	7.6	21.0		30.0	30.0		7.6	30.0	
Total Split (s)	29.6	86.0	86.0	24.6	86.0		31.0	31.0		24.6	31.0	
Total Split (%)	17.3%	50.2%	50.2%	14.4%	50.2%		18.1%	18.1%		14.4%	18.1%	
Yellow Time (s)	3.6	5.0	5.0	3.6	5.0		5.0	5.0		3.6	5.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.6	6.0	6.0	4.6	6.0		6.0	6.0		4.6	6.0	
Lead/Lag	Lag	Lead	Lead	Lag	Lead		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes		
Recall Mode	None	Min	Min	None	Min		None	None		None	None	

Intersection Summary

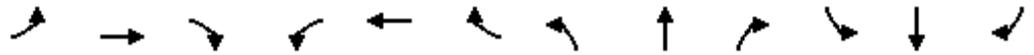
Area Type: Other  
 Cycle Length: 171.2  
 Actuated Cycle Length: 119.3  
 Natural Cycle: 130  
 Control Type: Actuated-Uncoordinated

Splits and Phases: 2: 196th Ave SE/SE Jones Rd & SR 169



HCM 6th Signalized Intersection Summary  
 2: 196th Ave SE/SE Jones Rd & SR 169

09/11/2018



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	1130	423	26	445	11	68	5	17	9	6	5
Future Volume (veh/h)	5	1130	423	26	445	11	68	5	17	9	6	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1870	1885	1841	1826	1826	2293	2293	2293	1311	1311	1311
Adj Flow Rate, veh/h	5	1165	436	27	459	11	70	5	18	9	6	5
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	50	2	1	4	5	5	0	0	0	0	0	0
Cap, veh/h	449	1317	1125	33	561	13	155	7	25	168	80	67
Arrive On Green	0.41	0.70	0.70	0.02	0.32	0.32	0.07	0.07	0.07	0.01	0.12	0.12
Sat Flow, veh/h	1104	1870	1598	1753	1776	43	1343	96	345	1249	661	551
Grp Volume(v), veh/h	5	1165	436	27	0	470	93	0	0	9	0	11
Grp Sat Flow(s),veh/h/ln	1104	1870	1598	1753	0	1818	1784	0	0	1249	0	1212
Q Serve(g_s), s	0.3	51.9	11.8	1.6	0.0	25.3	5.4	0.0	0.0	0.7	0.0	0.9
Cycle Q Clear(g_c), s	0.3	51.9	11.8	1.6	0.0	25.3	5.4	0.0	0.0	0.7	0.0	0.9
Prop In Lane	1.00		1.00	1.00		0.02	0.75		0.19	1.00		0.45
Lane Grp Cap(c), veh/h	449	1317	1125	33	0	575	186	0	0	168	0	146
V/C Ratio(X)	0.01	0.88	0.39	0.81	0.00	0.82	0.50	0.00	0.00	0.05	0.00	0.08
Avail Cap(c_a), veh/h	449	1408	1203	330	0	1369	479	0	0	395	0	285
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.8	12.3	6.4	51.9	0.0	33.5	48.4	0.0	0.0	43.7	0.0	41.4
Incr Delay (d2), s/veh	0.0	7.5	0.5	36.0	0.0	6.0	2.9	0.0	0.0	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	18.0	3.1	1.0	0.0	11.4	2.5	0.0	0.0	0.2	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.8	19.8	6.9	88.0	0.0	39.6	51.3	0.0	0.0	43.8	0.0	41.7
LnGrp LOS	B	B	A	F	A	D	D	A	A	D	A	D
Approach Vol, veh/h		1606			497			93				20
Approach Delay, s/veh		16.3			42.2			51.3				42.7
Approach LOS		B			D			D				D
Timer - Assigned Phs	1	2	3	4	5	6		8				
Phs Duration (G+Y+Rc), s	47.8	39.6	5.3	13.5	6.6	80.8		18.8				
Change Period (Y+Rc), s	4.6	6.0	4.6	6.0	4.6	6.0		6.0				
Max Green Setting (Gmax), s	25.0	80.0	20.0	25.0	20.0	80.0		25.0				
Max Q Clear Time (g_c+I1), s	2.3	27.3	2.7	7.4	3.6	53.9		2.9				
Green Ext Time (p_c), s	0.0	6.3	0.0	0.5	0.0	20.9		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				23.8								
HCM 6th LOS				C								

# Appendix C

## Detailed Collision History

OFFICER REPORTED CRASHES THAT OCCURRED ON STATE ROUTE 169 AT JONES RD  
01/01/2015 - 12/31/2017

Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

JURISDICTION	PRIMARY TRAFFICWAY	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# FATALS	# PERSONS INJURED	# PROPERTY DAMAGE ONLY	VEHICLE 1 TYPE	VEHICLE 2 TYPE	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION	VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
State Route	169	19.22	E443476	07/15/2015	No Injury	0	0	0	Passenger Car	Passenger Car	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped at Signal or Stop Sign	South	North	Vehicle Stopped	Vehicle Stopped
State Route	169	19.22	E458202	09/03/2015	Evident Injury	2	0	0	Passenger Car	Pickup,Panel Truck or Vanette under 10,000 lb	From opposite direction - one left turn - one straight	Making Left Turn	Going Straight Ahead	West	North	East	West
State Route	169	19.22	E490226	12/01/2015	No Injury	0	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Pickup,Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - sideswipe	Changing Lanes	Going Straight Ahead	North	South	North	South
State Route	169	19.22	E611190	11/22/2016	No Apparent Injury	0	0	0	Passenger Car	Passenger Car	From opposite direction - one left turn - one straight	Making Left Turn	Going Straight Ahead	West	North	East	West
State Route	169	19.22	E628209	12/30/2016	Possible Injury	1	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Truck Tractor & Semi-Trailer	From same direction - both going straight - both moving - sideswipe	Changing Lanes	Going Straight Ahead	South	North	South	North
State Route	169	19.22	E676875	05/24/2017	No Apparent Injury	0	0	0	Passenger Car		Guardrail - Through, Over or Under	Making Right Turn		South	East		
State Route	169	19.25	E716643	09/19/2017	No Apparent Injury	0	0	0	Truck & Trailer	Passenger Car	From same direction - all others	Backing	Stopped for Traffic	North	Vehicle Backing	North	Vehicle Stopped
State Route	169	19.25	E720191	11/01/2017	No Apparent Injury	0	0	0	Pickup,Panel Truck or Vanette under 10,000 lb	Pickup,Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - one stopped - rear-end	Starting in Traffic Lane	Stopped for Traffic	North	South	North	Vehicle Stopped
State Route	169	19.20	E749269	12/12/2017	Possible Injury	1	0	0	Passenger Car	Passenger Car	From same direction - both going straight - one stopped - rear-end	Slowing	Stopped at Signal or Stop Sign	West	East	West	Vehicle Stopped

OFFICER REPORTED CRASHES THAT OCCURRED ON STATE ROUTE 169 AT 154TH PL SE  
 01/01/2015 - 12/31/2017

Driveway is at approximately MP 19.92

Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

JURISDICTION	PRIMARY TRAFFICWAY	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# A	# B	# P	# T	# F	# V	# E	# K	# D	# S	VEHICLE 1 TYPE	VEHICLE 2 TYPE	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION	VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
State Route	169	22.07	E476363	10/28/2015	Possible Injury	1	0	2	0	0	0	0	0	0	0	Truck (Flatbed, Van, etc)	Passenger Car	From same direction - all others	Backing	Other*	Vehicle Backing	Vehicle Backing	South	North
State Route	169	22.07	E555261	06/18/2016	Possible Injury	3	0	2	4	0	0	0	0	0	0	Passenger Car	Passenger Car	From same direction - one stopped - rear-end	Going Straight Ahead	Stopped in Roadway	West	East	Vehicle Stopped	Vehicle Stopped
State Route	169	22.07	E751238	12/22/2017	Suspected Minor	1	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	From opposite direction - one left turn - one straight	Making Left Turn	Going Straight Ahead	North	East	South	North
State Route	169	22.08	E557416	06/25/2016	No Apparent Inju	0	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	Southeast	Northwest	Southeast	Northwest
State Route	169	22.08	E561465	06/21/2016	Dead at Scene	0	1	3	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Motorcycle	Entering at angle	Making Right Turn	Going Straight Ahead	North	West	East	West
State Route	169	22.08	E578780	08/29/2016	Suspected Minor	1	0	3	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	Entering at angle	Slowing	Making Left Turn	East	West	North	East
State Route	169	22.08	E597568	10/13/2016	Suspected Minor	0	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From opposite direction - all others	Going Straight Ahead	Stopped for Traffic	East	West	Vehicle Stopped	Vehicle Stopped
State Route	169	22.08	E610889	11/21/2016	No Apparent Inju	0	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	North	South	North	South
State Route	169	22.08	E620234	12/08/2016	Possible Injury	1	0	2	0	0	0	0	0	0	0	Passenger Car	Passenger Car	Entering at angle	Making Right Turn	Stopped at Signal or Stop Sign	South	East	North	Vehicle Stopped
State Route	169	22.08	E644573	02/15/2017	No Apparent Inju	0	0	2	0	0	0	0	0	0	0	Passenger Car	Passenger Car	Entering at angle	Going Straight Ahead	Going Straight Ahead	North	South	East	West
State Route	169	22.08	E677305	06/01/2017	No Apparent Inju	0	1	0	0	0	0	0	0	0	0	Passenger Car	Linear Curb	Entering at angle	Making Left Turn		West	North		
State Route	169	22.08	E407712	03/13/2015	Possible Injury	1	0	2	0	0	0	0	0	0	0	Truck (Flatbed, Van, etc)	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped at Signal or Stop Sign	North	South	Vehicle Stopped	Vehicle Stopped
State Route	169	22.08	E411170	03/22/2015	No Injury	0	0	3	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped for Traffic	West	East	West	Vehicle Stopped
State Route	169	22.08	E436501	06/16/2015	Possible Injury	2	0	2	0	0	0	0	0	0	0	Truck (Flatbed, Van, etc)	Passenger Car	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped for Traffic	South	North	Vehicle Stopped	Vehicle Stopped
State Route	169	22.08	E450979	08/04/2015	Possible Injury	1	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - one stopped - rear-end	Stopped at Signal or Stop Sign	Going Straight Ahead	North	East	North	East
State Route	169	22.08	E480901	11/02/2015	No Injury	0	0	2	0	0	0	0	0	0	0	Passenger Car	Truck & Trailer	From same direction - both going straight - both moving - rear-end	Changing Lanes	Going Straight Ahead	West	East	West	East
State Route	169	22.08	E483808	11/14/2015	Possible Injury	1	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From opposite direction - one left turn - one straight	Going Straight Ahead	Making Left Turn	West	East	East	South
State Route	169	22.08	E497704	12/21/2015	Evident Injury	1	0	1	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Signal Pole	Signal Pole	Making Left Turn		North	East		
State Route	169	22.08	E499904	12/24/2015	Possible Injury	2	0	2	0	0	0	0	0	0	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Going Straight Ahead	West	East	West	East
State Route	169	22.09	E647164	02/24/2017	Possible Injury	2	0	2	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From same direction - both going straight - one stopped - rear-end	Slowing	Stopped at Signal or Stop Sign	Northwest	Southeast	Vehicle Stopped	Vehicle Stopped
State Route	169	22.11	E677184	05/23/2017	Possible Injury	1	0	4	0	0	0	0	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped for Traffic	West	East	West	Vehicle Stopped

OFFICER REPORTED CRASHES THAT OCCURRED ON STATE ROUTE 169 (MP 19.19 - 22.17) FROM JONES RD TO 154th PL  
 01/01/2015 - 12/31/2017 Driveway is at approximately MP 19.92

Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

JURISDICTION	PRIMARY TRAFFICWAY	MILEPOST	REPORT NUMBER	DATE	MOST SEVERE INJURY TYPE	# FATALS	# PERSONS INJURED	# PROPERTY DAMAGE ONLY	VEHICLE 1 TYPE	VEHICLE 2 TYPE	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION	VEHICLE 2 ACTION	VEHICLE 1 COMPASS DIRECTION FROM	VEHICLE 1 COMPASS DIRECTION TO	VEHICLE 2 COMPASS DIRECTION FROM	VEHICLE 2 COMPASS DIRECTION TO
State Route	169	19.27	E748300	12/17/2017	No Apparent Injury	0	2	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - rear-end	Slowing	Slowing	North	South	North	South
State Route	169	19.29	E472090	10/10/2015	Evident Injury	1	0	0	Passenger Car		Crash Cushions - Impact Attenuators	Going Straight Ahead		South	North	North	South
State Route	169	19.30	E388952	01/01/2015	No Injury	0	1	0	Passenger Car		Earth Bank or Ledge	Going Straight Ahead		North	South		
State Route	169	19.40	E412341	03/23/2015	No Injury	0	0	0	Pickup, Panel Truck or Vanette under 10,000 lb		Fire started in vehicle	Other*		North	South		
State Route	169	19.50	E447119	07/29/2015	Possible Injury	1	0	0	Truck (Flatbed, Van, etc)	Passenger Car	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	North	South	North	South
State Route	169	19.50	E474335	10/19/2015	No Injury	0	2	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - rear-end	Slowing	Slowing	South	North	South	North
State Route	169	19.65	E506001	01/14/2016	No Apparent Injury	0	3	0	Pickup, Panel Truck or Vanette under 10,000 lb	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped for Traffic	North	South	Vehicle Stopped	Vehicle Stopped
State Route	169	19.76	E512363	02/04/2016	Possible Injury	1	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Going Straight Ahead	South	North	South	North
State Route	169	19.97	E440290	07/05/2015	Possible Injury	3	0	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - all others	Making U-Turn	Going Straight Ahead	South	South	South	North
State Route	169	20.00	E670381	05/06/2017	Suspected Minor	1	0	0	Motorcycle		Miscellaneous Object or Debris on Road	Going Straight Ahead		South	North		
State Route	169	20.22	E504624	01/06/2016	Died in Hospital	1	1	2	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From opposite direction - both moving - head-on	Going Straight Ahead	Going Straight Ahead	North	South	South	North
State Route	169	20.34	E599008	10/21/2016	No Apparent Injury	0	2	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	Miscellaneous Object or Debris on Road	Changing Lanes	Going Straight Ahead	Northwest	Southeast	Northwest	Southeast
State Route	169	20.42	E650479	03/10/2017	No Apparent Injury	0	2	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From same direction - both going straight - both moving - sideswipe	Overtaking and Passing	Going Straight Ahead	South	North	South	North
State Route	169	20.50	E488502	11/26/2015	No Injury	0	2	0	Passenger Car	Pickup, Panel Truck or Vanette under 10,000 lb	From opposite direction - all others	Going Straight Ahead	Going Straight Ahead	South	North	South	North
State Route	169	20.74	E592067	10/02/2016	Suspected Serious	1	0	0	Motorcycle		Vehicle overturned	Going Straight Ahead		South	North		
State Route	169	20.93	E521483	02/29/2016	No Apparent Injury	0	1	0	Passenger Car		Earth Bank or Ledge	Going Straight Ahead		East	West		
State Route	169	21.00	E445372	07/22/2015	No Injury	0	1	0	Passenger Car		Vehicle Strikes Deer	Going Straight Ahead		South	North		
State Route	169	21.10	E487559	11/28/2015	Possible Injury	1	0	0	Pickup, Panel Truck or Vanette under 10,000 lb		Roadway Ditch	Going Straight Ahead		South	North		
State Route	169	21.32	E484060	11/18/2015	Possible Injury	2	0	0	Pickup, Panel Truck or Vanette under 10,000 lb		Over Embankment - No Guardrail Present	Going Straight Ahead		North	South		
State Route	169	21.45	E698998	07/29/2017	No Apparent Injury	0	2	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Going Straight Ahead	North	South	North	South
State Route	169	21.50	E580057	08/31/2016	No Apparent Injury	0	2	0	Truck Tractor & Semi-Trailer	Passenger Car	From same direction - both going straight - both moving - sideswipe	Changing Lanes	Going Straight Ahead	West	East	West	East
State Route	169	21.50	E697971	07/26/2017	No Apparent Injury	0	1	0	Passenger Car		Vehicle Strikes Deer	Going Straight Ahead		North	South		
State Route	169	21.50	E461268	09/14/2015	Possible Injury	2	0	0	Passenger Car		Entering at angle	Making Left Turn	Going Straight Ahead	South	West		East
State Route	169	21.57	E644659	02/20/2017	Suspected Serious	1	0	0	Pickup, Panel Truck or Vanette under 10,000 lb	Passenger Car	Culvert and/or other Appurtenance in Ditch	Going Straight Ahead		North	South	West	East
State Route	169	21.73	E747463	12/12/2017	No Apparent Injury	0	1	0	Pickup, Panel Truck or Vanette under 10,000 lb		Concrete Barrier/Jersey Barrier - Face	Overtaking and Passing		South	North		
State Route	169	21.97	E391592	01/12/2015	Possible Injury	1	0	0	Passenger Car		Earth Bank or Ledge	Overtaking and Passing		East	West		
State Route	169	21.98	E550267	06/05/2016	No Apparent Injury	0	1	0	Passenger Car		Vehicle Strikes Deer	Going Straight Ahead		South	North		
State Route	169	21.99	E729072	10/26/2017	No Apparent Injury	0	2	0	Pickup, Panel Truck or Vanette under 10,000 lb	Truck Tractor & Semi-Trailer	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	South	North	South	North

# Appendix D

Activities-Based Trip Generation Calculations for Proposed Use

**Estimated Trip Generation Forecasts - Average Weekday by Trip Type**

Time Period	Employee Vehicle Trips		Truck Trips		Other Trips (vendors/delivery, mail, etc)		Total Trips		
	Entering	Exiting	Entering	Exiting	Entering	Exiting	Entering	Exiting	Total
before 6 am							0	0	0
6:00 - 7:00 am	15		14	18			29	18	47
7:00 - 8:00 am	10		11	16			21	16	37
8:00 - 9:00 am	2		21	22			23	22	45
9:00 - 10:00 am			22	22	5		27	22	49
10:00 - 11:00 am			20	20	5		25	20	45
11:00 am - 12:00 pm			16	16			16	16	32
12:00 - 1:00 pm	3	3	20	20			23	23	46
1:00 - 2:00 pm			22	22			22	22	44
2:00 - 3:00 pm			18	15		5	18	20	38
3:00 - 4:00 pm		5	10	7		5	10	17	27
4:00 - 5:00 pm		15	10	7			10	22	32
5:00 - 6:00 pm		7	6	5			6	12	18
after 6 pm							0	0	0
<b>TOTAL TRIPS</b>	<b>30</b>	<b>30</b>	<b>190</b>	<b>190</b>	<b>10</b>	<b>10</b>	<b>230</b>	<b>230</b>	<b>460</b>

# Appendix E

Trip Generation Calculations for Proposed Use based on ITE

**Lakeside SR 169  
 Trip Generation Estimate**

Land Use	Size	Units <sup>1</sup>	ITE LUC <sup>2</sup>	Trip Rate <sup>2</sup>	Directional Split <sup>2</sup>		Vehicle Trip Generation		
					Enter	Exit	Enter	Exit	Total
<b>DAILY</b>									
<b>Proposed Uses:</b>									
Light Industrial	30	employees	110	equation	50%	50%	57	58	115
<b>NEW DAILY TRIP GENERATION:</b>							<b>57</b>	<b>58</b>	<b>115</b>
<b>AM PEAK HOUR</b>									
<b>Proposed Uses:</b>									
Light Industrial	30	employees	110	equation	83%	17%	12	2	14
<b>NEW AM PEAK HOUR TRIP GENERATION:</b>							<b>12</b>	<b>2</b>	<b>14</b>
<b>PM PEAK HOUR</b>									
<b>Proposed Uses:</b>									
Light Industrial	30	employees	110	equation	22%	78%	3	9	12
<b>NEW PM PEAK HOUR TRIP GENERATION:</b>							<b>3</b>	<b>9</b>	<b>12</b>

<sup>1</sup> GFA = Gross Floor Area.

<sup>2</sup> Land Use Code, trip rates, and entering/exiting splits based on ITE *Trip Generation* Manual, 10th Edition, 2017.

# Appendix F

Trip Generation Calculations for Existing Use

Direction	Tuesday 1/24/17		Wednesday 1/25/17	
	SB (enter)	NB (exit)	SB (enter)	NB (exit)
12:00 AM	0	0	0	0
12:15 AM	0	0	0	0
12:30 AM	0	0	0	0
12:45 AM	0	0	0	0
1:00 AM	0	0	0	0
1:15 AM	0	0	0	0
1:30 AM	0	0	0	0
1:45 AM	0	0	0	0
2:00 AM	0	0	0	0
2:15 AM	0	0	0	0
2:30 AM	0	0	0	0
2:45 AM	0	0	0	0
3:00 AM	0	0	0	0
3:15 AM	0	0	0	0
3:30 AM	0	0	0	0
3:45 AM	0	0	0	0
4:00 AM	0	0	0	0
4:15 AM	0	0	0	0
4:30 AM	0	0	0	0
4:45 AM	0	0	1	0
5:00 AM	0	0	0	0
5:15 AM	1	0	0	0
5:30 AM	0	0	0	0
5:45 AM	0	0	0	0
6:00 AM	1	0	1	0
6:15 AM	1	0	2	0
6:30 AM	0	0	0	1
6:45 AM	0	0	0	0
7:00 AM	0	0	0	0
7:15 AM	0	0	0	0
7:30 AM	2	1	1	0
7:45 AM	1	0	2	0
8:00 AM	1	1	2	0
8:15 AM	3	1	0	1
8:30 AM	0	0	1	1
8:45 AM	1	2	0	0
9:00 AM	0	1	0	0
9:15 AM	1	0	0	2
9:30 AM	0	1	0	1
9:45 AM	1	0	0	0
10:00 AM	1	1	0	0
10:15 AM	1	1	0	0
10:30 AM	0	1	0	0
10:45 AM	1	1	0	0
11:00 AM	2	0	1	1
11:15 AM	0	1	2	1
11:30 AM	0	2	0	1
11:45 AM	0	0	0	0
12:00 PM	2	0	0	0
12:15 PM	0	0	0	0
12:30 PM	1	3	1	1
12:45 PM	1	2	1	0
1:00 PM	0	0	1	0
1:15 PM	1	1	1	2
1:30 PM	0	0	0	1
1:45 PM	0	0	0	0
2:00 PM	0	0	1	0
2:15 PM	1	0	0	3
2:30 PM	0	1	0	0
2:45 PM	1	1	1	1
3:00 PM	0	1	2	0
3:15 PM	1	2	0	2
3:30 PM	0	0	0	0
3:45 PM	0	0	0	0
4:00 PM	0	1	0	1
4:15 PM	1	2	1	0
4:30 PM	1	0	0	0
4:45 PM	0	0	0	1
5:00 PM	0	0	1	0
5:15 PM	0	0	0	1
5:30 PM	0	0	0	1
5:45 PM	0	0	1	1
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0
8:15 PM	0	0	0	0
8:30 PM	0	0	0	0
8:45 PM	0	0	0	0
9:00 PM	0	0	0	0
9:15 PM	0	0	0	0
9:30 PM	0	0	0	0
9:45 PM	0	0	0	0
10:00 PM	0	0	0	0
10:15 PM	0	0	0	0
10:30 PM	0	0	0	0
10:45 PM	0	0	0	0
11:00 PM	0	0	0	0
11:15 PM	0	0	0	0
11:30 PM	0	0	0	0
11:45 PM	0	0	0	0
<b>TOTAL</b>	<b>28</b>	<b>28</b>	<b>24</b>	<b>24</b>

**AM PEAK HOUR**

hour	Tuesday 1/24/17			Wednesday 1/25/17			2-Day Average		
	in	out	total	in	out	total	in	out	total
7-8	3	1	4	3	0	3	3	1	4
7:15-8:15	4	2	6	5	0	5	5	1	6
<b>7:30-8:30</b>	<b>7</b>	<b>3</b>	<b>10</b>	<b>5</b>	<b>1</b>	<b>6</b>	<b>6</b>	<b>2</b>	<b>8</b>
7:45-8:45	5	2	7	5	2	7	5	2	7
8-9	5	4	9	3	2	5	4	3	7

**PM PEAK HOUR**

hour	Tuesday 1/24/17			Wednesday 1/25/17			2-Day Average		
	in	out	total	in	out	total	in	out	total
4-5	2	3	5	1	2	3	2	3	5
4:15-5:15	2	2	4	2	1	3	2	2	4
4:30-5:30	1	0	1	1	2	3	1	1	2
4:45-5:45	0	0	0	1	3	4	1	2	3
5-6	0	0	0	2	3	5	1	2	3

**WEEKDAY**

daily	Tuesday 1/24/17			Wednesday 1/25/17			2-Day Average		
	in	out	total	in	out	total	in	out	total
daily	28	28	56	24	24	48	26	26	52

Sunset Materials  
Existing Trip Generation

According to information provided by owner:

Sunset Materials (existing site) is currently running 9 trucks and was running 28 trucks at peak operation. Estimated 150-250 trucks/day total.

	# of trucks per day	Total Trips Generated								
		Weekday Daily			AM Trips			PM Trips		
		in	out	total	in	out	total	in	out	total
January 2017	9	26	27	53	6	2	8	2	3	5
Typical Operations (at full capacity)	28	82	83	165	19	6	25	6	10	16

# Appendix G

SimTraffic LOS and Queue Worksheets

2020 No Action

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	16.9	15.0	17.8	0.0	0.0	0.0	3.9	1.2	1.2	3.3	0.5	0.4
Total Del/Veh (s)	128.4	20.4	6.5	84.2	52.1	39.4	60.9	65.3	48.2	49.4	68.6	16.0

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	6.0
Total Del/Veh (s)	55.7

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	7.1	4.7	5.5	1.2	0.7	0.6	3.8	0.1	2.8
Total Del/Veh (s)	93.0	17.5	1.5	91.6	26.6	22.1	53.3	58.5	52.0	43.1	5.4	29.8

Total Network Performance

Denied Del/Veh (s)	7.3
Total Del/Veh (s)	74.8

Queuing and Blocking Report  
2020 Baseline - AM Peak Hour

09/11/2018

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	T
Maximum Queue (ft)	575	836	791	125	224	472	506	325	174	418	196	194
Average Queue (ft)	492	464	278	48	74	285	288	206	147	194	86	74
95th Queue (ft)	708	1084	791	126	186	443	464	365	205	371	162	158
Link Distance (ft)		818	818			7874	7874			503		406
Upstream Blk Time (%)		29	0							1		
Queuing Penalty (veh)		0	0							0		
Storage Bay Dist (ft)	550			100	200			300	150		175	
Storage Blk Time (%)	41	2	7	0	0	25	7	1	17	8	1	2
Queuing Penalty (veh)	68	9	16	0	0	13	30	4	27	17	1	2

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	SB
Directions Served	R
Maximum Queue (ft)	204
Average Queue (ft)	94
95th Queue (ft)	166
Link Distance (ft)	406
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: 196th Ave SE/SE Jones Rd & SR 169

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	115	429	32	39	601	375	51	76
Average Queue (ft)	10	142	6	7	395	267	5	12
95th Queue (ft)	67	313	23	28	664	403	27	50
Link Distance (ft)		2286	2286		557	356		366
Upstream Blk Time (%)					8	5		
Queuing Penalty (veh)					0	0		
Storage Bay Dist (ft)	150			150			175	
Storage Blk Time (%)		9			22			
Queuing Penalty (veh)		0			1			

Network Summary

Network wide Queuing Penalty: 189

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	2.5	0.8	2.5	0.1	0.0	0.1	3.8	0.5	0.6	45.3	40.2	44.3
Total Del/Veh (s)	118.2	30.9	13.3	85.1	48.7	16.8	37.8	58.6	39.0	70.0	57.4	30.9

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	15.2
Total Del/Veh (s)	47.5

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.5	0.4	0.2	0.2	0.1	4.3	0.1	0.1
Total Del/Veh (s)	74.6	26.4	5.4	50.3	9.4	4.5	43.6	55.3	40.7	48.5	43.2	2.9

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	20.1

Total Network Performance

Denied Del/Veh (s)	15.0
Total Del/Veh (s)	70.1

Queuing and Blocking Report  
2020 Baseline - PM Peak Hour

09/11/2018

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	T
Maximum Queue (ft)	574	840	674	125	87	235	252	98	174	242	200	438
Average Queue (ft)	423	393	319	50	12	145	141	34	91	99	194	355
95th Queue (ft)	626	773	609	139	51	229	231	72	164	190	222	558
Link Distance (ft)		818	818			7874	7874			503		406
Upstream Blk Time (%)		3	0									27
Queuing Penalty (veh)		0	0									0
Storage Bay Dist (ft)	550			100	200			300	150		175	
Storage Blk Time (%)	11	0	28	0		2	0		2	3	51	0
Queuing Penalty (veh)	63	1	37	0		0	0		3	4	34	0

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	SB
Directions Served	R
Maximum Queue (ft)	425
Average Queue (ft)	276
95th Queue (ft)	476
Link Distance (ft)	406
Upstream Blk Time (%)	8
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: 196th Ave SE/SE Jones Rd & SR 169

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	90	726	314	68	367	131	39	42
Average Queue (ft)	10	298	49	22	90	52	7	9
95th Queue (ft)	53	637	157	59	242	107	27	31
Link Distance (ft)		2286	2286		557	356		366
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150			150			175	
Storage Blk Time (%)	0	14			4			
Queuing Penalty (veh)	0	1			1			

Network Summary

Network wide Queuing Penalty: 144

2020 With-Project

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	5.7	3.4	5.4	0.0	0.0	0.0	3.6	0.7	0.8	3.4	0.5	0.3
Total Del/Veh (s)	99.8	19.8	5.9	82.3	53.4	41.6	60.6	60.5	40.4	49.8	63.5	16.0

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	2.1
Total Del/Veh (s)	51.0

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	7.6	5.6	5.8	1.8	1.6	1.7	4.0	0.1	3.4
Total Del/Veh (s)	84.9	19.0	1.4	84.6	29.1	24.1	58.6	58.2	56.9	51.4	6.2	32.1

3: Site Access & SR 169 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	0.2	0.7	0.0	0.1	0.1	0.0
Total Del/Veh (s)	2.5	2.1	3.4	0.7	22.4	4.0	1.3

Total Network Performance

Denied Del/Veh (s)	3.9
Total Del/Veh (s)	71.1

Queuing and Blocking Report  
 2020 With Project - AM Peak Hour

09/11/2018

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	T
Maximum Queue (ft)	548	718	670	125	224	476	518	325	174	418	179	207
Average Queue (ft)	442	307	196	44	72	286	292	219	145	183	76	78
95th Queue (ft)	663	868	608	120	181	429	458	385	201	356	142	152
Link Distance (ft)		818	818			7874	7874			503		406
Upstream Blk Time (%)		10	0							0		
Queuing Penalty (veh)		0	0							0		
Storage Bay Dist (ft)	550			100	200			300	150		175	
Storage Blk Time (%)	24	1	6	0	0	24	7	2	16	10	0	1
Queuing Penalty (veh)	41	3	14	0	0	12	29	6	25	20	0	1

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	SB
Directions Served	R
Maximum Queue (ft)	182
Average Queue (ft)	89
95th Queue (ft)	162
Link Distance (ft)	406
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: 196th Ave SE/SE Jones Rd & SR 169

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	28	496	33	64	614	374	69	68
Average Queue (ft)	5	151	7	7	424	269	7	9
95th Queue (ft)	20	343	24	36	689	409	37	43
Link Distance (ft)		2286	2286		557	356		366
Upstream Blk Time (%)					10	6		
Queuing Penalty (veh)					0	0		
Storage Bay Dist (ft)	150			150			175	
Storage Blk Time (%)		11			23			
Queuing Penalty (veh)		1			1			

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Intersection: 3: Site Access & SR 169

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Movement	EB	EB	WB	NB
Directions Served	T	R	L	LR
Maximum Queue (ft)	8	8	69	118
Average Queue (ft)	0	0	8	35
95th Queue (ft)	6	6	41	90
Link Distance (ft)	3454			175
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		425	100	
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

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Network Summary

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Network wide Queuing Penalty: 153

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1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	6.9	5.3	6.4	0.1	0.0	0.0	3.7	0.6	0.5	48.6	50.3	48.4
Total Del/Veh (s)	131.9	34.7	17.5	85.7	47.0	16.6	35.6	58.6	34.5	71.8	57.3	31.8

1: 152nd Ave SE/154th PI SE & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	18.2
Total Del/Veh (s)	50.6

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	3.0	0.5	0.6	0.2	0.1	0.1	4.0	0.1	0.1
Total Del/Veh (s)	94.3	28.0	5.8	51.8	8.4	4.6	44.5	56.7	38.3	46.7	50.2	4.7

2: 196th Ave SE/SE Jones Rd & SR 169 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	21.4

3: Site Access & SR 169 Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Del/Veh (s)	0.0	2.0	2.9	0.0	0.1	0.1	0.1
Total Del/Veh (s)	8.1	7.8	25.8	0.5	58.1	10.8	6.6

Total Network Performance

Denied Del/Veh (s)	17.2
Total Del/Veh (s)	72.4

Queuing and Blocking Report  
 2020 With Project - PM Peak Hour

09/11/2018

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	L	TR	L	T
Maximum Queue (ft)	574	825	726	125	107	260	264	98	170	180	200	429
Average Queue (ft)	446	455	387	46	18	149	147	36	84	94	195	354
95th Queue (ft)	656	869	746	134	77	233	233	74	150	162	217	547
Link Distance (ft)		818	818			7874	7874			503		406
Upstream Blk Time (%)		10	0									29
Queuing Penalty (veh)		0	0									0
Storage Bay Dist (ft)	550			100	200			300	150		175	
Storage Blk Time (%)	17	1	30	0		3	0		2	2	53	0
Queuing Penalty (veh)	100	4	40	0		0	0		2	2	35	0

Intersection: 1: 152nd Ave SE/154th PI SE & SR 169

Movement	SB
Directions Served	R
Maximum Queue (ft)	429
Average Queue (ft)	280
95th Queue (ft)	487
Link Distance (ft)	406
Upstream Blk Time (%)	10
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: 196th Ave SE/SE Jones Rd & SR 169

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	95	793	344	84	315	143	30	42
Average Queue (ft)	10	362	62	26	80	54	6	9
95th Queue (ft)	52	773	257	65	205	113	24	32
Link Distance (ft)		2286	2286		557	356		366
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150			150			175	
Storage Blk Time (%)	0	17			3			
Queuing Penalty (veh)	0	1			1			

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Intersection: 3: Site Access & SR 169

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Movement	EB	WB	NB
Directions Served	T	L	LR
Maximum Queue (ft)	4	69	82
Average Queue (ft)	0	13	26
95th Queue (ft)	3	50	68
Link Distance (ft)	3454		175
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)		0	
Queuing Penalty (veh)		0	

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Network Summary

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Network wide Queuing Penalty: 186

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# Appendix H

Level of Service (LOS) and Queue Calculations at Site Access

Lanes, Volumes, Timings  
3: Site Access & SR 169

09/11/2018



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Volume (vph)	420	9	14	1183	9	13
Future Volume (vph)	420	9	14	1183	9	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		425	100		0	0
Storage Lanes		1	1		1	0
Taper Length (ft)			25		25	
Link Speed (mph)	50			50	30	
Link Distance (ft)	3513			730	235	
Travel Time (s)	47.9			10.0	5.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	24%	89%	93%	7%	100%	100%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC  
3: Site Access & SR 169

09/11/2018

Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	420	9	14	1183	9	13
Future Vol, veh/h	420	9	14	1183	9	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	425	100	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	24	89	93	7	100	100
Mvmt Flow	457	10	15	1286	10	14

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	467	0	1130
Stage 1	-	-	-	-	457
Stage 2	-	-	-	-	673
Critical Hdwy	-	-	5.96	-	8.8
Critical Hdwy Stg 1	-	-	-	-	7.8
Critical Hdwy Stg 2	-	-	-	-	7.8
Follow-up Hdwy	-	-	3.13	-	4.5
Pot Cap-1 Maneuver	-	-	646	-	94
Stage 1	-	-	-	-	390
Stage 2	-	-	-	-	275
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	646	-	92
Mov Cap-2 Maneuver	-	-	-	-	185
Stage 1	-	-	-	-	390
Stage 2	-	-	-	-	269

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	17.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	303	-	-	646	-
HCM Lane V/C Ratio	0.079	-	-	0.024	-
HCM Control Delay (s)	17.9	-	-	10.7	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Lanes, Volumes, Timings  
3: Site Access & SR 169

09/11/2018



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↓
Traffic Volume (vph)	1706	4	6	534	10	12
Future Volume (vph)	1706	4	6	534	10	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		425	100		0	0
Storage Lanes		1	1		1	0
Taper Length (ft)			25		25	
Link Speed (mph)	50			50	30	
Link Distance (ft)	3513			730	235	
Travel Time (s)	47.9			10.0	5.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	100%	100%	8%	30%	33%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 6th TWSC  
3: Site Access & SR 169

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Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	1706	4	6	534	10	12
Future Vol, veh/h	1706	4	6	534	10	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	425	100	-	0	-
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	100	100	8	30	33
Mvmt Flow	1854	4	7	580	11	13

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1858	0	2158
Stage 1	-	-	-	-	1854
Stage 2	-	-	-	-	304
Critical Hdwy	-	-	6.1	-	7.4
Critical Hdwy Stg 1	-	-	-	-	6.4
Critical Hdwy Stg 2	-	-	-	-	6.4
Follow-up Hdwy	-	-	3.2	-	3.8
Pot Cap-1 Maneuver	-	-	99	-	28
Stage 1	-	-	-	-	80
Stage 2	-	-	-	-	645
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	99	-	26
Mov Cap-2 Maneuver	-	-	-	-	69
Stage 1	-	-	-	-	80
Stage 2	-	-	-	-	599

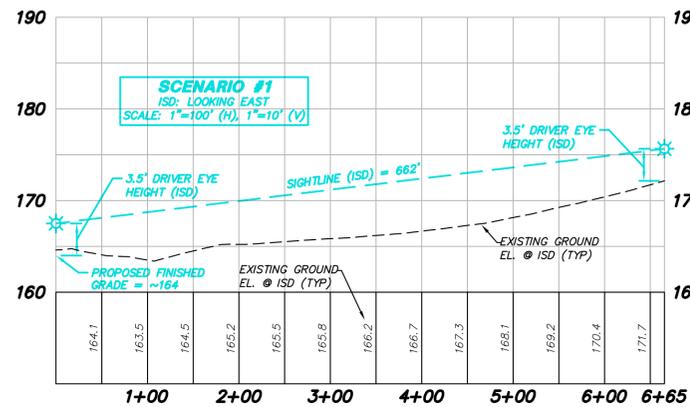
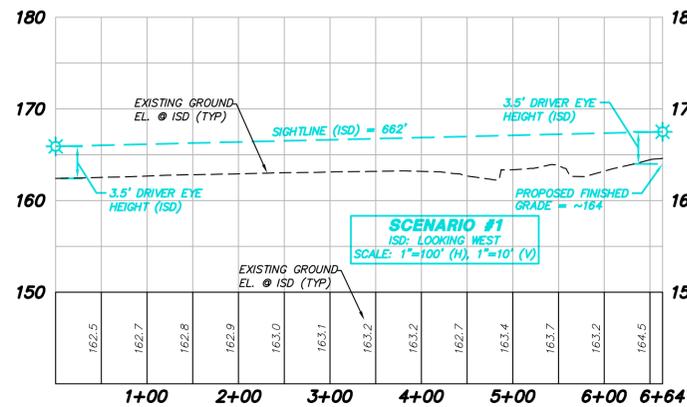
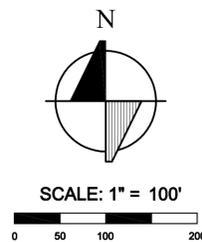
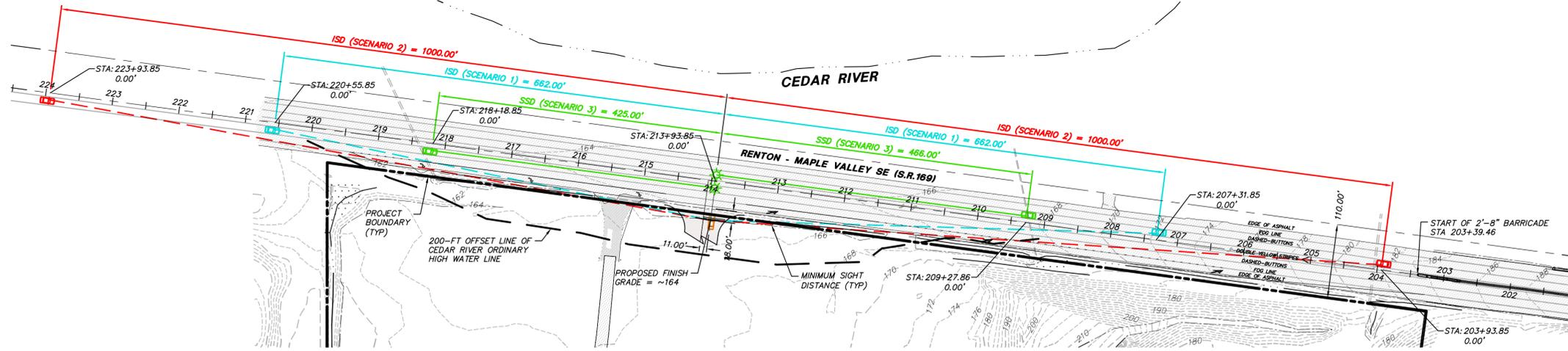
Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	46.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	110	-	-	99	-
HCM Lane V/C Ratio	0.217	-	-	0.066	-
HCM Control Delay (s)	46.6	-	-	43.9	-
HCM Lane LOS	E	-	-	E	-
HCM 95th %tile Q(veh)	0.8	-	-	0.2	-

# Appendix I

## Sight Distance Exhibit

PTN OF THE EAST 1/2 OF THE NE 1/4, SEC. 16, TWP. 24 N., RGE. 6E., W.M.



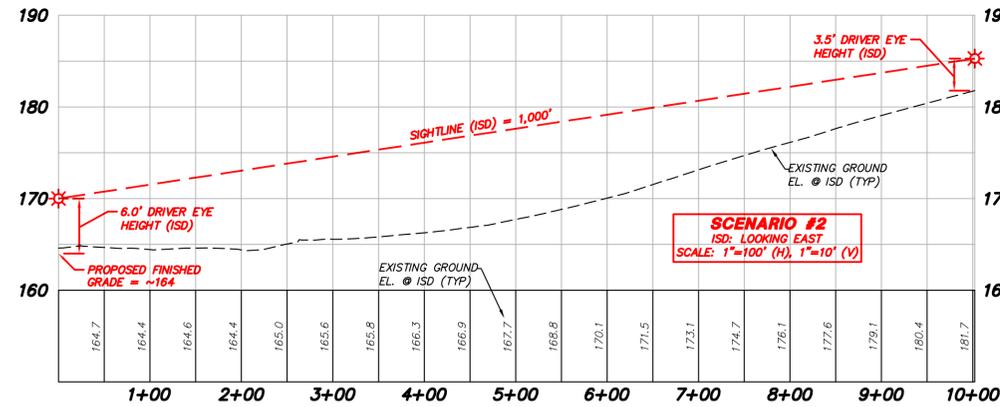
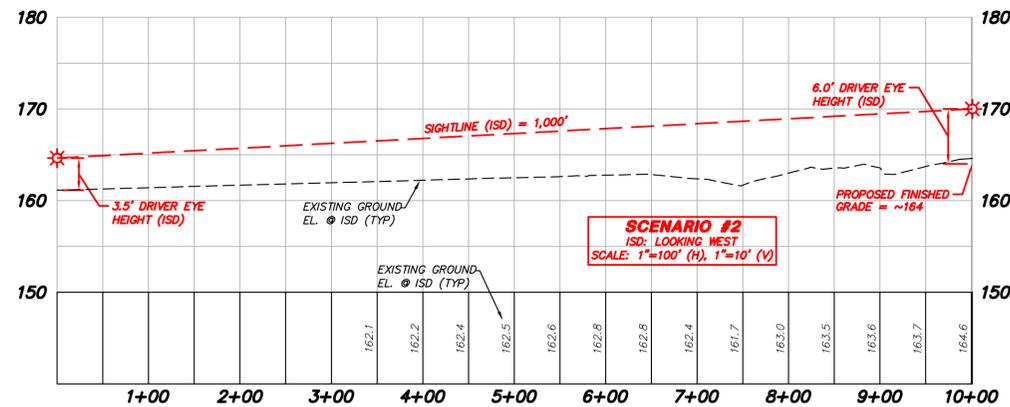
**SCENARIO 1: WSDOT INTERSECTION SIGHT DISTANCE (ISD) - PASSENGER VEHICLE**

POSTED SPEED = 50 MPH  
 DESIGN/TARGET SPEED = 50 MPH  
 SETBACK FROM EDGE OF TRAVEL WAY = 18 FT  
 APPROACHING VEHICLE HEIGHT = 3.5 FT  
 DRIVER'S EYE HEIGHT = 3.5 FT

LEFT TURN OUT (LOOKING EAST AND WEST) - CROSSING 4 LANES OF TRAFFIC (FUTURE DECEL/ACEL LANE, TWO EB LANES, TWLTL)

ISD = 662 FT = 1.47x50 MPHx(7.5 SEC)+(3x0.5 SEC)

REFERENCE WSDOT EXHIBIT 1310-19A



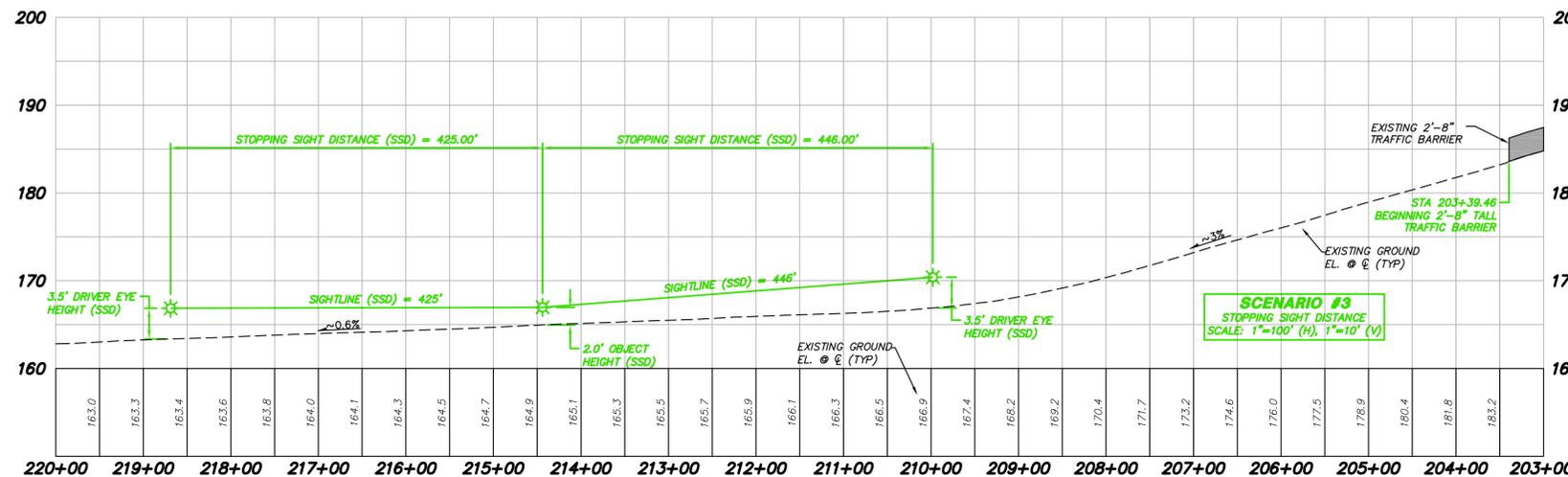
**SCENARIO 2: WSDOT INTERSECTION SIGHT DISTANCE (ISD) - COMBINATION TRUCK**

POSTED SPEED = 50 MPH  
 DESIGN/TARGET SPEED = 50 MPH  
 SETBACK FROM EDGE OF TRAVEL WAY = 18 FT  
 APPROACHING VEHICLE HEIGHT = 3.5 FT  
 DRIVER'S EYE HEIGHT = 6.0 FT

LEFT TURN OUT (LOOKING EAST AND WEST) - CROSSING 4 LANES OF TRAFFIC (FUTURE DECEL/ACEL LANE, TWO EB LANES, TWLTL)

ISD = 1,000 FT = 1.47x50 MPHx(11.5 SEC)+(3x0.7 SEC)

REFERENCE WSDOT EXHIBIT 1310-19A



**SCENARIO 3: STOPPING SIGHT DISTANCE (SSD)**

POSTED SPEED = 50 MPH  
 DESIGN/TARGET SPEED = 50 MPH  
 OBJECT HEIGHT = 2.0 FT  
 DRIVER'S EYE HEIGHT = 3.5 FT

TRAVELING WESTBOUND  
 SSD = 466 FT (APPROX. GRADE -3.0%)

TRAVELING EASTBOUND  
 SSD = 425 FT (APPROX. GRADE 0.6%)

REFERENCE WSDOT EXHIBIT 1260-1

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WSDOT S.R. 169 ISD AND SSD EXHIBIT

LAKESIDE INDUSTRIES, INC.

**MAPLE VALLEY ASPHALT FACILITY**

18825 RENTON-MAPLE VALLEY SE (HWY 169)

KING COUNTY, WASHINGTON

REVIEWED BY:	DATE:	BY:	CHK:
NO.	DATE	REVISION	
RICHARD A. TOMKINS, PE PROJECT MANAGER MARY H. McDOWELL, PLS PROJECT SURVEYOR BEAU J. WILLERT, PE PROJECT ENGINEER			

PROJECT LANDSCAPE ARCHITECT  
 FIRST SUBMITTAL DATE:  
 SCALE: HORIZ: 1"=100' VERT: 1"=10'



STAMP NOT VALID UNLESS SIGNED AND DATED

JOB NUMBER: **LKSD0000-0002**

SHEET NUMBER: **1 OF 1**

File: Aug 16, 2018 - 2:40pm  
 P:\L\00000002\AKDCAD\EC\Exhibits\18-0816 WSDOT Site Distance Exhibit.dwg, WSDOT ISD & SSD

# Appendix J

## Parking Demand Calculations

**Estimated Parking Demand Forecasts**

<b>Vehicle Type</b>	<b># of Parking Stalls Needed</b>
Super Solos	3
Transfer Truck & Trailers	4
Truck & Trailers	3
Lowboy and Trailer	1
Water Truck	1
Tack Truck	1
Equipment Trailers	4
Equipment Storage	6
White Fleet	11
Employee/Vendor	20
<b>TOTAL</b>	<b>54</b>