

Draft Transportation Analysis

NAVY AND MARINE CORPS RESERVE CENTER (NMCRC) TACOMA DISPOSAL AND REUSE

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February 2009

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Executive Summary

This section provides an executive summary of the transportation for the NMCRC Tacoma disposal and reuse.

What Alternatives were evaluated?

No Action Alternative represents 2013 conditions similar to the Proposed Action but without redevelopment on the NMCRC site. The site would remain in caretaker status.

Proposed Action represents 2013 conditions with closure of the NMCRC Tacoma and redevelopment of the site consistent with the *Blair-Hylebos Terminal Redevelopment Project (BHTRP) Draft EIS*, October 2008.

Alternative 1 represents 2013 conditions with development of the Port of Tacoma's currently adopted Master Plan.

What are impacts of the Alternatives?

The Proposed Action and Alternative 1 are not anticipated to have street system, non-motorized, transit, rail, or parking impacts. Transportation improvements proposed as part of the BHTRP would improve intersection operations and access to and from the Port under the No Action and Proposed Action conditions. For Alternative 1, the transportation improvements provided as part of the Port's current master plan would improve operations at some of the intersections.

What mitigation measures are proposed?

No significant transportation related impacts were identified from the development of the Proposed Action or Alternative 1; therefore, no mitigation measures are proposed. It should be noted that as part of the BHTRP, improvements are being proposed that would improve the transportation system within the Port as well as off-site.

Chapter 1: Introduction

The transportation analysis is an integral part of the Navy and Marine Corps Reserve Center (NMCRC) disposal and reuse Environmental Assessment (EA) and describes the transportation related impacts of the Proposed Action and Alternatives for the site. It identifies and compares the transportation impacts associated with the Proposed Action and each alternative and outlines suggested mitigation strategies to meet City of Tacoma and Fife operational standards and accommodate the projected growth in travel demand from each alternative.

NMCRC Tacoma was designated for closure in 2005 under the Amendment to Defense Base Closure and Realignment Act (DBCRA). With the closure of this base, the Department of Defense would turn the property over to the Port of Tacoma for reuse. The property would become part of the Blair-Hylebos Peninsula Terminal Redevelopment Project (BHTRP) which would relocate the existing Totem Ocean Trailer Express (TOTE) terminal, construct the new Yusen Terminal Tacoma, Inc. (YTTI) Terminal, and expand the wharf for the Washington United Terminal (WUT). Figure 1 show the location of the new TOTE and YTTI as well as the NMCRC site. The site is part of the YTTI redevelopment.

The following describes the BHTRP in more detail:

- **TOTE** – This would redevelop approximately 56 acres on the northern tip of the Blair-Hylebos peninsula to accommodate relocation, consolidation and modernization of the existing TOTE operations. Redevelopment activities would include demolition of existing onsite and in-water structures and construction of new buildings, storage facilities and gate and access facilities. A new “roll-on/roll-off” facility consisting of multiple piers would be constructed on the east side of the Blair Waterway.
- **YTTI** – This would redevelop the approximately 167-acre YTTI (including the area vacated by TOTE) to accommodate operations of a new container shipping tenant. Redevelopment activities would include demolition of certain existing onsite and inwater structures and construction of new elements including container yard, intermodal yard and gate and access facilities. A new wharf structure with two berths and associated cranes would be constructed on the east side of the Blair Waterway.
- **WUT** – This would expand an existing, operating wharf on approximately 3 acres of the 102-acre existing WUT site to accommodate ongoing operations on the west side of the Blair Waterway. This portion of the project would involve demolition of certain inwater structures, dredging and construction of the expanded wharf.

The EA presents the background and analyses of environmental impacts with the NMCRC disposal and reuse (i.e., the Proposed Action) as well as Alternative 1 and No Action Alternative scenarios.

Report Organization

The Transportation Discipline Report comprises the following chapters:

- **Chapter 2: Methodology** describes the analysis methods used to determine the impacts of each alternative.
- **Chapter 3: Affected Environment** discusses the existing transportation conditions for each of the major transportation modes.
- **Chapter 4: Impacts and Alternatives Comparison** describes the future impacts of each alternative on different components of the transportation system.

- **Chapter 5: Mitigation Measures** presents the required mitigation measures and suggested strategies to help address the identified impacts, while also highlighting the significant and unavoidable adverse impacts.

Study Area

The NMCRC site is located in the City of Tacoma, Washington. It is located within the Port of Tacoma, between the Blair and Hylebos Waterways on the northeast corner of Alexander Avenue and E 11th Street. As shown in Figure 1, the NMCRC site is within the proposed YTTI redevelopment area. The property fronts Alexander Avenue and E 11th Street as well as the Hylebos Waterway.

Specific study locations were selected based on travel patterns to and from the site. The locations represent areas where the Port's redevelopment project would have the highest level of traffic impact. With the redevelopment, the site would accommodate both truck and rail access to facilitate the Port of Tacoma activities. Figure 1 illustrates the study area. The study area is consistent with the Port of Tacoma's *Blair-Hylebos Terminal Redevelopment Project (BHTRP) Draft EIS*, October 2008 herein referred to as *BHTRP Draft EIS*.

The following is a list of the 20 existing and future study intersections evaluated in this report:

1. Taylor Way/SR 509 – Marine View Drive
2. Taylor Way – 54th Avenue E/4th Street E
3. 54th Avenue E/8th Street E
4. 54th Avenue E/12th Street E
5. 54th Avenue E/Pacific Highway E (SR 99)
6. 54th Avenue E/I-5 SB Ramps
7. 54th Avenue E/I-5 NB Ramps
8. 54th Avenue E/20th Street E
9. Alexander Avenue/North Frontage Road (SR 509)
10. Alexander Avenue/South Frontage Road (SR 509)
11. Norpoint Way NE/Marine View Drive (SR 509)
12. Port of Tacoma Road/North Frontage Road
13. Port of Tacoma Road/South Frontage Road
14. Port of Tacoma Road/Pacific Highway E
15. Port of Tacoma Road/I-5 SB Ramps
16. Port of Tacoma Road/I-5 NB Ramp
17. Port of Tacoma Road/20th Street E
18. Lincoln Avenue/Taylor Way
19. E 11th Street/Taylor Way
20. Taylor Way/Taylor Overpass (future intersection)

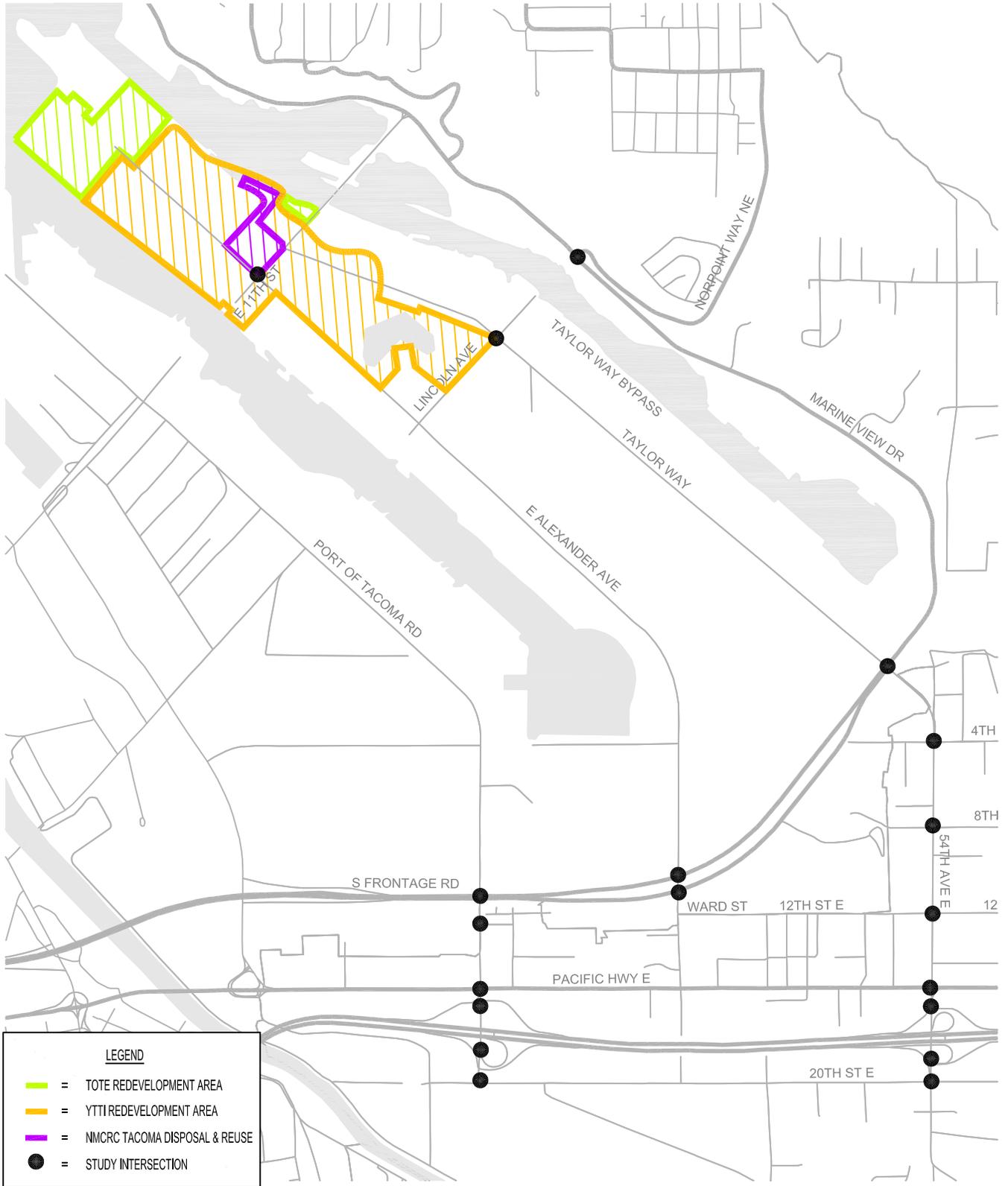
Analysis Scenarios

This analysis builds on the work completed as part of the *BHTRP Draft EIS*. The following scenarios were evaluated:

- **Existing Conditions** represents current 2008 conditions based on recent transportation data.
- **No Action Alternative** represents 2013 conditions similar to the Proposed Action but without redevelopment on the NMCRC site. The site would remain in caretaker status.
- **Proposed Action** represents 2013 conditions with closure of the NMCRC Tacoma and redevelopment of the site consistent with the *BHTRP Draft EIS*.
- **Alternative 1** represents 2013 conditions with development of the Port of Tacoma's currently adopted Master Plan.



NOT TO SCALE



Study Area

NMCR Tacoma Disposal & Reuse

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FIGURE

1

Chapter 2: Methodology

This chapter summarizes the overall approach to evaluating the transportation system. It describes the transportation data that were collected and the measures used to assess the performance of each of the major transportation system components for the Proposed Action and each alternative.

Approach to Alternatives Evaluation

The evaluation of the transportation system and identification of transportation impacts included an evaluation of traffic volumes, operations, pedestrians, bicycle, transit, rail and parking. The Proposed Action and alternatives were evaluated for the 2013 horizon year. This analysis focuses on weekday PM peak hour conditions when the NMCRC site is likely to have most impacts on the transportation system. This study included the collection of transportation data, evaluation of the existing transportation system conditions, development of travel forecasts, and an assessment of projected future conditions. The evaluation of the transportation system included a number of transportation-related performance measures grouped by area of focus (street system, non-motorized, transit, rail, and parking). Each of these specific elements is described in detail below.

The 2013 No Action Alternative was developed to represent the future transportation system operations assuming no redevelopment on the NMCRC Tacoma site. This alternative serves as a future baseline against which the Proposed Action and Alternative 1 are compared. The same performance measures evaluated for existing conditions were again assessed for the 2013 Alternatives.

Data Collection Summary

The evaluation included the collection and assimilation of data for each of the major transportation elements. A majority of the data were provided by the Port of Tacoma and is consistent with the work completed as part of the *BHTRP Draft EIS*. Additional data were provided by agencies including Washington State Department of Transportation (WSDOT), City of Tacoma, City of Fife, and Pierce Transit. The existing data were supplemented by data collected in the field through general field surveys. A summary of the data collection activities is provided below.

Street System

Traffic data were collected for major intersections in the study area (see Chapter 1: Introduction for a complete list of the study intersections). The turning movement counts (TMCs) were collected during the weekday PM peak hour. The TMCs also included heavy vehicle (truck) counts at all intersections. Data were collected for two hours during the PM peak period (4:00 – 6:00 p.m.) and summarized in 15-minute intervals in order to capture the one hour PM peak. Traffic data was collected in late 2007 and early 2008 as part of the *BHTRP Draft EIS*.

Signal timing and phasing data were obtained from WSDOT and the City of Fife. The timing and phasing was compared against field observations. Intersection geometry at each study intersections was obtained from field surveys and aerial photographs.

Traffic collision records at the study intersection were obtained from WSDOT. These records represent the most recent three-year period for which complete collision data are available.

Non-Motorized

Pedestrian and bicycle usage and facilities within the study area were observed through field surveys.

Transit

Transit information related to service coverage and frequency for bus routes within the study area were identified through published schedules provided by Pierce Transit.

Rail

At-grade crossings and locations with gates were verified using field surveys, aerial photographs, and information provided on the Port of Tacoma's website. In addition, rail operations information was obtained from the *BHTRP Draft EIS*.

Parking

Parking information was obtained from field surveys and a review of aerial photographs.

Development of Future Traffic Volumes

Future (2013) background traffic volumes were determined by applying a two percent per year growth rate to existing traffic volumes. In addition, the Port's existing operations as well as operations with the BHTRP were determined. The existing and future trip generation estimates were based on information provided by the Port of Tacoma, terminal designers, and operators. The existing trip generation estimates were validated against the Institute of Transportation Engineers (ITE) *Trip Generation*, 7th Edition, 2003.

The BHTRP would displace or remove some level of traffic from the existing transportation system with the closure of businesses or uses. The estimate of traffic removed from the transportation system was based on ITE *Trip Generation* applied to employee information provided by the Port of Tacoma and building sizes obtained from Pierce County Assessor's website. It should be noted that the existing uses on the NMCRC site are part of the uses assumed to be displaced with the BHTRP. This study considers the NMCRC site separately, and therefore, its trip generation was removed from the background forecasts.

In addition to the BHTRP, the background traffic forecasts considered development of pipeline projects including The Point at Northshore, Emerald Queen Casino Expansion, and EB1 Terminal. This forecasting method was used to determine No Action, Proposed Action, and Alternative 1 background traffic volumes and is consistent with the *BHTRP Draft EIS*.

Identification of Performance Measures

Performance measures were identified and evaluated for Existing, No Action, Proposed Action, and Alternative 1 conditions. The measures characterize the relative differences in performance between each alternative and establish transportation impacts that could be expected. The measures address each of the modes of travel.

Street System

The performance measures used for analyzing and assessing the street system are focused on intersection delay-based level of service (LOS) as well as traffic safety for study intersections. Intersection LOS and safety are useful measurements to depict traffic

conditions. The *Highway Capacity Manual* (HCM) Transportation Research Board¹, 2000 presents clear guidelines on quantifying signalized and unsignalized intersection LOS. Table 1 summarizes the HCM intersection LOS definitions.

Table 1. Qualitative Description of Level of Service

Level of Service	Description
A	Describes primarily free-flow operations with motorist traveling at average travel speeds. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. All drivers are generally served by one green signal phase at signalized intersections. At stop-controlled approaches, drivers experience little or no conflicting traffic.
B	Describes reasonably unimpeded operations at average travel speeds. The ability to maneuver within the traffic stream is only slightly restricted. Drivers experience only slight delays and are generally served by one green signal phase at signalized intersections. At stop-controlled approaches, there are fewer available gaps to enter the traffic stream.
C	Describes stable operations; however, the ability to maneuver and change lanes is more restricted than LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds. Occasionally, drivers do not clear signalized intersections in one green phase. At stop-controlled intersections, drivers experience delay as they wait for available gaps.
D	Describes operations which are approaching unstable flow and small increases in flow may cause substantial increases in delay and decrease in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. The ability to maneuver and change lanes within the traffic stream is difficult. Multiple drivers wait through more than one green phase at signalized intersections. Drivers experience queuing due to a reduction in available gaps at stop-controlled approaches.
E	Describes unstable flow with intolerable delay. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing. Travel speed is substantially reduced, brief periods of stop-and-go traffic may occur, and lane changes are minimal. Long vehicle queues form at signalized intersections and drivers wait through several green phases. At stop-controlled approaches, drivers may make high-risk or unexpected maneuvers rather than wait for an acceptable gap.
F	Describes forced flow or stop-and-go conditions. Traffic flow is constrained and lane changes are minimal. Drivers at signalized intersections may wait through several green phases to be served. Drivers at stop-controlled approaches experience insufficient gaps to cross safely through the major traffic stream and often rely on courteous drivers to yield in order to cross.

Source: Transpo Group (interpreted from 2000 *Highway Capacity Manual*)

The average delay in vehicles-per-second at intersections is measured against free-flow intersection operations and used to determine the operating intersection LOS. The intersection operations are dependent on many variables including intersection traffic control, signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Signalized and all-way, stop-controlled intersection operations are defined in terms of the average total vehicle delay of all movements through an intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. Table 2 summarizes descriptions that characterize delay based on LOS at intersections.

¹ The Transportation Research Board is a division of the National Research Council, which serves as an independent adviser to the federal government and others on scientific and technical questions related to transportation. This organization sets many transportation industry standards including those used to evaluate operations of street systems.

Table 2. Level of Service Criteria

Level of Service	Intersection Average Control Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	≤10	≤10
B	>10 - 20	>10 - 15
C	>20 - 35	>15 - 25
D	>35 - 55	>25 - 35
E	>55 - 80	>35 - 50
F	>80	>50

Source: *Highway Capacity Manual*, Transportation Research Board, 2000

Intersections were evaluated using the Synchro 7.0 software using the HCM methodology to determine delay and LOS. As part of the future conditions, there are planned improvements at the study intersection which include additional capacity, roadway closures, and changes to the intersection geometrics. A discussion of the planned improvements is provided in Chapter 4.

LOS standards for the study intersections are established by the jurisdictions in which they reside. The study intersections are within the City of Tacoma, City of Fife, and WSDOT jurisdictions. The standard for the study intersections is LOS D. The Proposed Action and Alternative 1 would have a significant impact on the street system if the addition of alternative traffic causes intersection operations (as compared to the No Action) to degrade from:

- Acceptable LOS D or better to unacceptable LOS E or worse conditions.
- Unacceptable LOS E to unacceptable LOS F conditions.

Existing traffic safety issues were determined by reviewing three years of collision records. Typically, intersections with more than 10 collisions per year for signalized intersections and more than five collisions per year for unsignalized intersections are earmarked for continued evaluation and potential safety improvements.

Non-Motorized

Performance of the pedestrian and bicycle facilities were not evaluated for the future conditions. Currently the pedestrian and bicycle activity within the study area is very low and would continue to be with the Proposed Action and each of the alternatives.

Transit

Performance of transit services were not evaluated for the future conditions. It is assumed that transit service would not change and ridership would not increase due to the Proposed Action or the alternatives.

Rail

The rail system was evaluated in terms of delay ratio which is expected train movement time divided by unimpeded train movement time. The Port of Tacoma defines an internal guideline of 1.30 or less as an acceptable delay ratio. In addition, the potential for trains blocking roadway access was also evaluated for the Proposed Action and each alternative.

Parking

Parking was evaluated in terms of adequacy of available parking spaces as well as queuing space to serve truck loading.

Chapter 3: Affected Environment

This section describes the street system, non-motorized, transit, rail and parking components of the existing transportation system in the vicinity of NMCRC site.

Street System

The study area primarily focuses on the local and regional facilities providing access to the site.

Major Corridors

I-5 is a freeway which extends through the western United States from the Mexico border into Canada. This roadway runs east-west in the vicinity of the Port of Tacoma. Within the study area, I-5 has four general purpose lanes per direction. The posted speed limit is 60 miles per hour (mph).

E 11th Street is a principal arterial which runs in the northeast-southwest direction from south of Alexander Avenue to Marine View Drive. This is a five lane roadway with two lanes per direction and a center two-way left-turn (TWLT) lane. Sidewalks and parking are not provided along E 11th Street. This roadway bridges over the Hylebos Waterway north of Taylor Way. The Hylebos Bridge is currently closed; however, it is planned to be re-opened in 2010. The posted speed limit is 35 mph. This roadway is a designated truck route.

State Route (SR) 509 is a principal arterial which runs in the northeast-southwest direction from downtown Tacoma to north of Taylor Road. It is a four-lane divided highway with turn lanes at intersections and bike lanes on both sides. Sidewalks and parking are not provided along SR 509. The speed limit is 50 mph from Milwaukee Way to Taylor Way and 40 mph hour from Taylor Way north. North of Taylor Way, this roadway becomes **Marine View Drive** which runs along the coast to Slayden Road NE. Marine View Drive is a five lane roadway with two lanes per direction and a TWLT lane. There are sidewalks on both sides of the roadway but no on-street parking. The posted speed limit is 40 mph.

Alexander Avenue is a collector arterial which extends in the northwest-southeast direction from 20th Street E to north of E 11th Street. It is two-lanes with no sidewalks and on-street parking. The speed limit is 40 mph south of Lincoln Avenue and 35 mph north of Lincoln Avenue. North of 11th Street E, this roadway is a designated truck route.

Taylor Way is a minor arterial which extends in the northwest-southeast direction from E 11th Street to SR 509. It is three-lanes south of Lincoln Avenue and five lanes at the SR 509 intersection. The posted speed limit is 40 mph between Lincoln Avenue and SR 509. North of Lincoln Avenue, it is two-lanes and the speed limit is 30 mph. Sidewalks and parking are not provided along Taylor Way. This roadway is a designated truck route.

Lincoln Avenue is a collector arterial which runs in the northeast-southwest direction from Alexander Avenue to north of Taylor Way. It is two-lanes and widens to three-lanes at the Taylor Way intersection. There are no sidewalks or on-street parking. The posted speed limit is 35 mph.

Traffic Volumes

Traffic volume data were collected for the study area to evaluate existing weekday traffic conditions during the peak hour². The analysis focuses on the PM peak hour when the

² Existing traffic volumes are consistent with *BHTRP Draft EIS*.

highest hourly traffic volumes occur and when levels of congestion are typically highest. Intersection turning movement counts were collected at the following study locations:

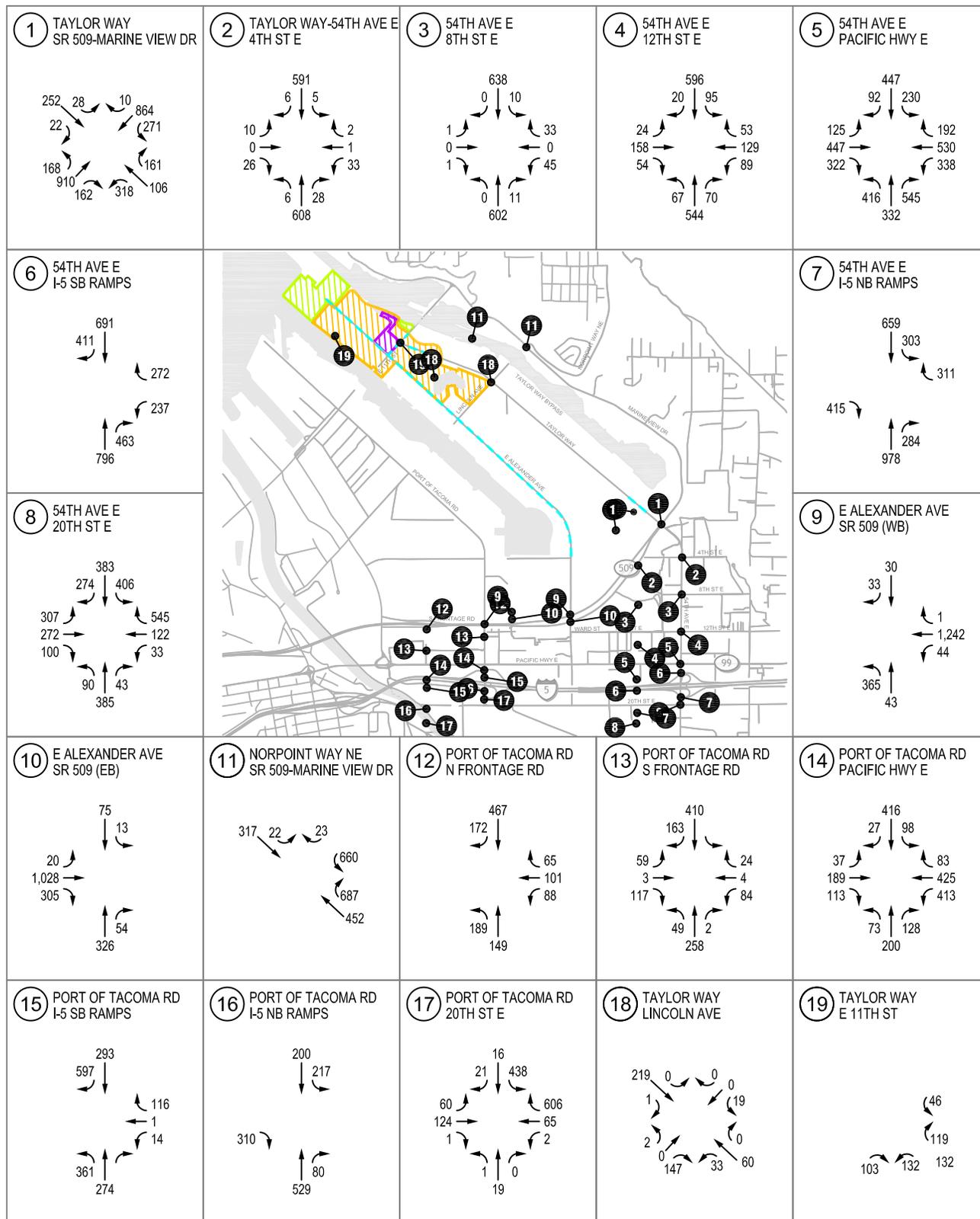
1. Taylor Way/SR 509 – Marine View Drive
2. Taylor Way – 54th Avenue E/4th Street E
3. 54th Avenue E/8th Street E
4. 54th Avenue E/12th Street E
5. 54th Avenue E/Pacific Highway E (SR 99)
6. 54th Avenue E/I-5 SB Ramps
7. 54th Avenue E/I-5 NB Ramps
8. 54th Avenue E/20th Street E
9. Alexander Avenue/North Frontage Road (SR 509)
10. Alexander Avenue/South Frontage Road (SR 509)
11. Norpoint Way NE/Marine View Drive (SR 509)
12. Port of Tacoma Road/North Frontage Road
13. Port of Tacoma Road/South Frontage Road
14. Port of Tacoma Road/Pacific Highway E
15. Port of Tacoma Road/I-5 SB Ramps
16. Port of Tacoma Road/I-5 NB Ramp
17. Port of Tacoma Road/20th Street E
18. Lincoln Avenue/Taylor Way
19. E 11th Street/Taylor Way

Figure 1 shows the location of the study intersections. The PM peak hour generally occurs between 4:15 and 5:15 p.m. within the study area. During the PM peak hour, the highest traffic volumes were found along SR 509 with approximately 2,400 vehicles per hour (vph) between Taylor Way and Alexander Avenue. Fifty-fourth Avenue NE carries approximately 1,200 to 1,400 vph between 4th Street E and I-5. Figure 2 displays the 2008 PM peak-hour turning movement volumes at the study intersections.

In addition to heavy vehicle counts collected as part of the intersection turning movement counts, additional data was obtained to identify travel patterns since truck traffic represents a large portion of the Port of Tacoma's traffic. The Port of Tacoma's *Tideflats Area Truck Volume and Route Study* (Heffron Transportation, Inc. 2007) provides truck counts and travel patterns within the Port. Based on the data collected, trucks represent approximately 8 to 12 percent of the daily traffic within the Port. During the PM peak hour, trucks account for approximately 6 percent of the traffic. This is indicative of an industrial area with higher truck activity than urban roadways where trucks typically account for approximately 2 percent of the traffic.



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Existing (2008) PM Peak Hour Traffic Volumes

FIGURE

NMCR Tacoma Disposal & Reuse



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Intersection Operations

Based on HCM methodology, existing levels of service, delays, and v/c ratios were calculated at the study intersections. Appendix A contains detailed LOS worksheets for existing peak-hour conditions. Table 3 shows the existing intersection operations.

Table 3. Existing (2008) PM Peak Hour LOS Summary

Intersection	Jurisdiction	2008		
		LOS ¹	Delay ²	V/C ³ or WM ⁴
<u>Signalized Intersections</u>				
1. Taylor Way/SR 509 – Marine View Drive	Tacoma	E	65	0.92
3. 54th Avenue E/8th Street E	Fife	A	5	0.45
4. 54th Avenue E/12th Street E	Fife	A	7	0.43
5. 54th Avenue E/Pacific Highway E (SR 99)	Fife	E	59	0.91
6. 54th Avenue E/I-5 SB Ramps	Fife	B	17	0.72
8. 54th Avenue E/20th Street E	Fife	D	43	0.72
9. Alexander Avenue/North Frontage Road (SR 509)	Tacoma	C	28	0.72
10. Alexander Avenue/South Frontage Road (SR 509)	Tacoma	B	17	0.66
11. Norpoint Way NE/Marine View Drive (SR 509)	Tacoma	B	14	0.67
12. Port of Tacoma Road/North Frontage Road	Tacoma	B	13	0.46
13. Port of Tacoma Road/South Frontage Road	Tacoma	B	19	0.39
14. Port of Tacoma Road/Pacific Highway E	Fife	E	63	0.64
15. Port of Tacoma Road/I-5 SB Ramps	Tacoma	B	13	0.55
18. Lincoln Avenue/Taylor Way	Tacoma	B	10	0.29
<u>Unsignalized Intersections</u>				
2. Taylor Way – 54th Avenue E/4th Street E	Fife	D	31	WB
7. 54th Avenue E/I-5 NB Ramps	Fife	F	130	EB
16. Port of Tacoma Road/I-5 NB Ramps	Tacoma	B	11	SBL
17. Port of Tacoma Road/20th Street E	Tacoma	F	>180	EB
19. E 11th Street/Taylor Way	Tacoma	B	10	NA

Notes: SBL = southbound left-turn, WB = westbound, EB = eastbound

1. Level of service, based on 2000 Highway Capacity Manual methodology.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections.
4. Worst movement reported for two-way stop-controlled intersections. NA = not applicable for all-way stop-controlled intersections.

As shown in Table 3, five study intersections are currently operating below the LOS D standard. These intersections include:

- Taylor Way/SR 509 – Marine View Drive operates at LOS E due to high traffic volumes and insufficient left-turn capacity.
- 54th Avenue E/Pacific Highway E (SR 99) operates at LOS E due to high traffic volumes and insufficient capacity.
- Port of Tacoma Road/Pacific Highway E operates at LOS E due to high traffic volumes and insufficient capacity.
- 54th Avenue E/I-5 NB Ramps operates at LOS F due to high traffic volumes and the need for a traffic signal.
- Port of Tacoma Road/20th Avenue E operates at LOS F due to high left and right-turning traffic volumes.

The remaining study intersections are operating at LOS D or better.

Collision Summary

Traffic collision records at the study intersection were obtained from the City of Tacoma and WSDOT³ for 2005-2007. These records represent the most recent three-year period for which complete collision data are available. Collision records at the study intersections are summarized in Table 4.

As shown in the table, all of the signalized intersections have an average of less than 10 collisions per year except the 54th Avenue E/Pacific Highway E (SR 99), 54th Avenue E/I-5 SB Ramps, Alexander Avenue/South Frontage Road (SR 509), and Port of Tacoma Road/I-5 SB Ramps intersections. In addition, all unsignalized intersections have an average of less than five collisions per year except the 54th Avenue E/I-5 NB Ramps intersection.

A majority of the collisions at the 54th Avenue E/Pacific Highway E (SR 99) intersection are due to a failure to grant right-of-way to right-turning traffic. This is likely due to the design of the intersection which provides wider lanes and large radii to accommodate truck traffic. Collisions at the 54th Avenue E/I-5, Port of Tacoma Road/I-5 and Alexander Avenue/South Frontage Road intersections are primarily rear-end. Rear-end collisions are typical of signalized intersection, stop and go traffic, closely spaced intersections.

Table 4. Summary of 2005 – 2007 Collision Records

Location	Number of Reported Collisions ¹			Annual Average
	2005	2006	2007	
1. Taylor Way/SR 509 – Marine View Drive	3	3	0	2.0
2. Taylor Way – 54th Avenue E/4th Street E	0	0	0	0.0
3. 54th Avenue E/8th Street E	0	0	0	0.0
4. 54th Avenue E/12th Street E	0	0	0	0.0
5. 54th Avenue E/Pacific Highway E (SR 99)	25	27	23	25.0
6. 54th Avenue E/I-5 SB Ramps	16	9	11	12.0
7. 54th Avenue E/I-5 NB Ramps	26	26	20	24.0
8. 54th Avenue E/20th Street E	3	3	18	8.0
9. Alexander Avenue/North Frontage Road (SR 509)	0	2	4	2.0
10. Alexander Avenue/South Frontage Road (SR 509)	8	11	13	10.7
11. Norpoint Way NE/Marine View Drive (SR 509)	6	4	3	4.3
12. Port of Tacoma Road/North Frontage Road	1	5	2	2.7
13. Port of Tacoma Road/South Frontage Road	4	1	4	3.0
14. Port of Tacoma Road/Pacific Highway E	1	2	8	3.7
15. Port of Tacoma Road/I-5 SB Ramps	18	15	7	13.3
16. Port of Tacoma Road/I-5 NB Ramps	4	3	1	2.7
17. Port of Tacoma Road/20th Street E	0	1	4	1.7
18. Lincoln Avenue/Taylor Way	1	0	0	0.3

1. Collision records for January 1, 2005 through December 31, 2007 were obtained from City of Tacoma and WSDOT.

Emergency Access

In addition to a review of collision data, safety issues are identified in terms of emergency access and response time to property. Emergency vehicle access to the site is provided via Alexander Avenue. Currently, the primary emergency vehicles access to the Port area and the NMCRC site is by travelling through the Taylor Way/SR 509 – Marine View Drive intersection following Taylor Way to Lincoln Avenue and then heading west to Alexander Avenue. This circuitous route adds travel distance and time to emergency response. There is

³ Per the City of Fife, collision records for Fife intersections were obtained from WSDOT.

a secondary (and more direct) emergency access at the Alexander Avenue/North Frontage Road (SR 509) intersection which is gated.

Non-Motorized

Pedestrian and bicycle facilities within the study area are limited. As discussed previously, bike lanes are provided along SR 509. Many of the roadways have wide shoulders where pedestrians and bicyclist typically travel. There are no planned sidewalks within the study area. The City of Tacoma *Comprehensive Plan* plans bicycles lanes along Alexander Avenue and E 11th Street. However, no funding is identified for this future improvement.

Transit

Transit service to and from the NMCRC site is provided via Route 60. This is the only route that circulates within the Port; the remaining routes travel near the Port along SR 509. Each route is described below.

Route 60 operates between Downtown Tacoma and the Port with stops along Alexander Avenue in the vicinity of the NMCRC site. Service is available on weekdays only during typical commuter hours from approximately 5:00 to 8:00 a.m. from Downtown to the Port and from approximately 3:00 to 6:00 p.m. from the Port to Downtown. Headways are approximately 30 minutes.

Route 61 runs between Downtown Tacoma and north of the Port into Browns Point via SR 509. Service is provided on weekdays only between approximately 6:00 a.m. and 6:00 p.m. with one hour headways.

Route 500 operates between Downtown Tacoma, Fife, and the Federal Way Transit Center via SR 509. Service is available on weekdays between approximately 5:00 and 12:00 a.m. with 30 minute headways. On weekends service is from approximately 7:00 and 12:00 a.m. with one hour headways.

Rail

Tacoma Rail Tideflats Division operates all trains within the study area. Rail facilities within the Port of Tacoma consist of industrial spurs which serve the uses on-site. The Port of Tacoma handles more than two-million train containers per year. All rail crossings are at-grade and in the vicinity of the site all of the crossings are unsignalized except at the Taylor Way/Lincoln Avenue intersection. Trains are operated 24-hours a day and seven days a week. During the day, there are trains that occupy at-grade crossing blocking vehicular traffic and resulting in delays.

Parking

As discussed previously, as part of the roadway descriptions, the majority of the roadways in the vicinity of the site do not have on-street parking. The NMCRC Tacoma site has approximately 130 parking spaces in the front of the building. In addition, there is storage and parking for military equipment and vehicles in the rear of the building.

Chapter 4: Impacts and Alternatives Comparison

This chapter describes future 2013 conditions for the transportation systems within the study area under the No Action, Proposed Action, and Alternative 1 conditions. The future transportation system conditions were established based on forecasts consistent with the Port of Tacoma's *BHTRP Draft EIS*. The No Action Alternative establishes the baseline for system performance against which the Proposed Action and Alternative 1 are compared. For each of the scenarios, a set of transportation facilities were assumed to be in place by 2013 and accounted for in the development of the travel forecasts. Each alternative was evaluated based on a set of performance measures for the main modal components, as described previously.

Alternatives Overview

A total of three alternatives were evaluated including a No Action Alternative. The following presents an overview of each of the Alternatives and the transportation components associated with them.

No Action Alternative

Under the No Action Alternative, the Navy would retain ownership of the NMCRC Tacoma site. The facility would be closed in 2010, and it would remain in caretaker status. Therefore, by 2013 all buildings would be vacant and no traffic would be generated from the site. The remainder of the BHTRP site would be developed as described in the *BHTRP Draft EIS*. Any roadway or rail improvements anticipated to occur within and through the NMCRC Tacoma property, as part of the BHTRP, would be re-routed to avoid the site.

Proposed Action

For the Proposed Action, the Navy would dispose of the 9.03 acre NMCRC Tacoma property, and convey it to the Port of Tacoma for reuse/redevelopment. No additional off-site roadway and rail improvements are assumed beyond those considered as part of the No Action and planned with the BHTRP. The Proposed Action scenario is consistent with the redevelopment described in the *BHTRP Draft EIS*. The BHTRP would relocate the existing TOTE terminal, construct a new YTTI terminal and expand the wharf for the WUT Terminal. The NMCRC Tacoma property is located within the proposed YTTI redevelopment area and also includes portions of the TOTE and road, rail and utility infrastructure to support the marine terminals. The following activities would occur and/or use the site:

- YTTI intermodal rail road
- YTTI main truck gate with all coming to and from the facility would cross the NMCRC site
- Extension of Taylor Road serving the north of the BHTRP including the USAR center, Trident Seafoods, and TOTE
- A portion of the new vessel maintenance area for TOTE

All of the buildings on the NMCRC site would be demolished in order to accommodate the redevelopment.

Alternative 1

Alternative 1 would be consistent with the *BHTRP Draft EIS Alternative 3 – No Action Alternative*. This alternative would not relocate the existing 48-acre TOTE terminal but would include the construction of a new 47-acre container terminal and new 58-acre Break Bulk/Auto Terminal. The rail system would remain the same as existing. The NMCRC Tacoma property is located within the proposed redevelopment area and also includes portions of the TOTE and road, rail and utility infrastructure to support the marine terminals.

Planned and Programmed Improvements

As part of the background conditions for each alternative, the City, Port, and State have planned and programmed transportation improvements that were assumed for this analysis. There are some differences in the transportation improvements included in the No Action, Proposed Action, and Alternative 1 conditions due to the varying levels of redevelopment that would occur at the Port of Tacoma for each alternative. The following describes the roadway improvements assumed as part of the background conditions for each alternative.

Hylebos Bridge

For the No Action, Proposed Action, and Alternative 1, upgrading the existing Hylebos Bridge was included in the 2013 conditions. The bridge provides a connection between E 11th Street and Marine View Drive over the Hylebos Waterway. The proposed improvements are funded and scheduled for completion by 2010. Other improvements in the vicinity of the site such as at the 34th Avenue E/12th Street E intersection and SR 167 are planned but are not fully funded, and therefore, were not assumed as part of this analysis.

BHTRP Transportation Improvements

The No Action and Proposed Action would include transportation improvements proposed as part of the BHTRP. These improvements are proposed as part of the BHTRP to mitigate impacts and alleviate congestion. As part of the BHTRP, the following roadway improvements would be completed for both alternatives (except where noted):

- SR 509/Taylor Way – The northbound and southbound approaches would be expanded to include two left-turn lanes along SR 509. Right-turn lanes would be provided for the northbound, southbound, and eastbound movements.
- 54th Avenue E/I-5 Northbound Ramp – A traffic signal would be installed.
- Taylor Way Widening and Overpass – Portions of this roadway would be reconstructed or abandoned. Reconstructed portions within the BHTRP would include two 14-foot travel lanes, a 12-foot center turn lane and sidewalks on the east side of the roadway. Approximately 880-feet from the SR 509/Taylor Way intersection, a portion of the roadway would be abandoned and a new grade separated Taylor Way would be constructed to the west over the arrival/departure rail tracks and Taylor Way intermodal yard. The new grade separated structure would provide three-lanes with sidewalks.
- Taylor Way Extension – North of Lincoln Avenue a portion of Taylor would be relocated to the east and would tie into 11th Street E east of the existing intersection. As part of the Proposed Action only, at 11th Street E, Taylor Way would extend north (into the NMCRC property) terminating in a cul-de-sac near the existing Trident Seafoods plant and Army Reserve Center. As part of the No Action, the extension of Taylor Way would need to be relocated away from the NMCRC property since the site would remain under Navy ownership. This portion of Taylor Way would consist of two 12-foot lanes with 8-foot shoulders.

- Taylor Way Bypass Route – A new roadway on the east side of the peninsula connecting to the existing Taylor Way approximately 2,500 feet north of the new overpass structure and terminating at Lincoln Avenue would be constructed. This roadway will consist of two 14-foot travel lanes, a 12-foot center turn lane, and sidewalks on the west side. The route would provide an alternate route for vehicular traffic when Taylor Way near Lincoln Avenue is blocked by trains.
- Taylor Way/Lincoln Avenue – This intersection would be closely spaced with the YTTI gate; therefore, this location would be constructed with coordinated traffic signals. In addition, the new configuration would allow vehicular traffic access through the intersection via some of the movements even when portions of the intersection are blocked by trains. Signage from SR 509 would direct drivers to the most appropriate route when the intersection is blocked by a train.

Based on the improvements above, the No Action and Proposed Action would result in one new study intersection: Taylor Way Overpass/Taylor Way. Figure 3 illustrates the BHTRP roadway system.

In addition to roadway improvements, the BHTRP would provide rail improvements. For the Proposed Action, within the NMCRC Tacoma site, these improvements would consist of two tracks running northeast from the Lincoln Avenue/Taylor intersection into the YTTI intermodal road yard which would expand to six tracks within the yard. The six tracks would each be capable of holding half a train or fourteen, 270-foot railcars. The railroad tracks would end at the north side of the YTTI intermodal yard. For the No Action Alternative, these tracks would need to be relocated to avoid the NMCRC site.

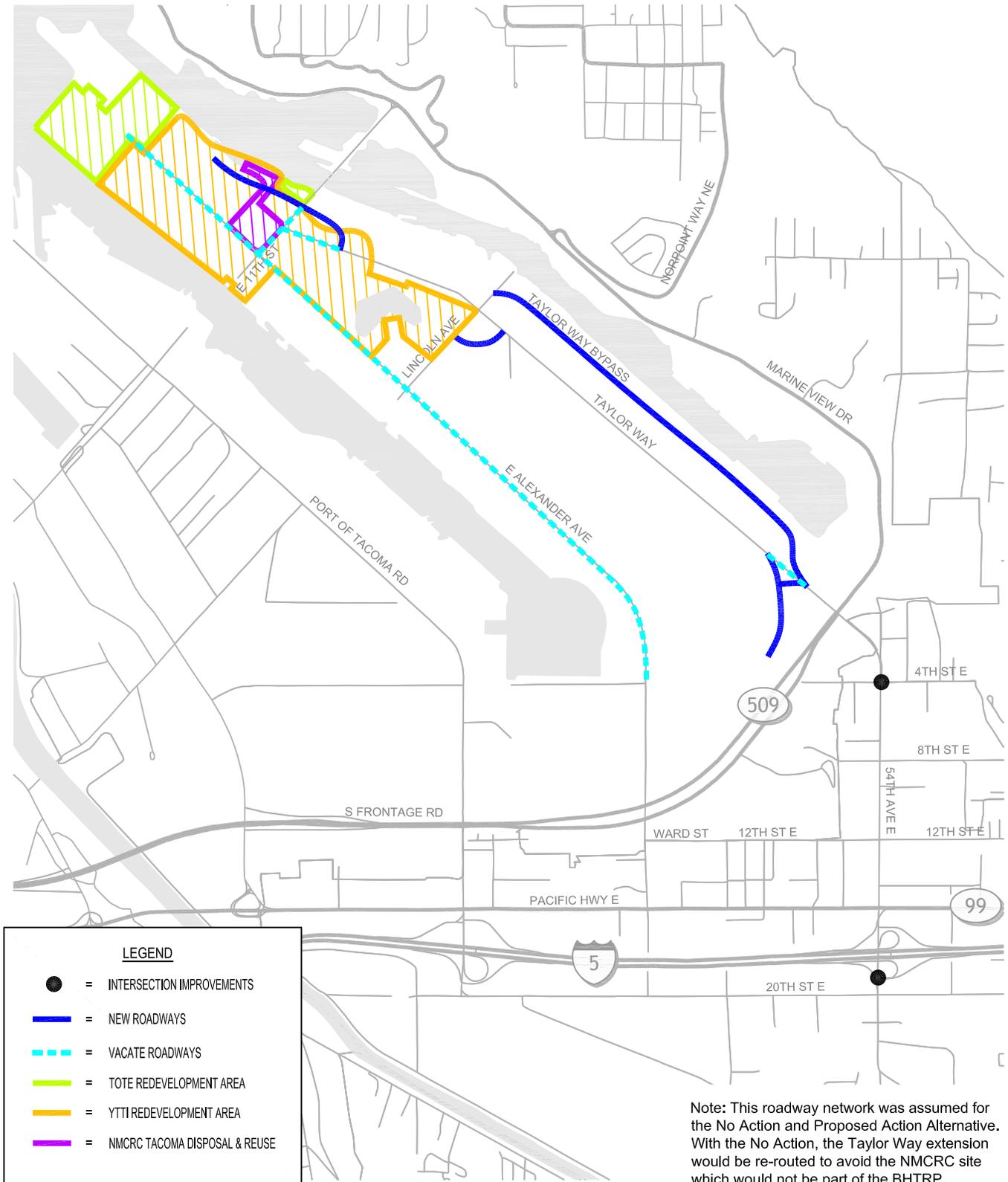
Adopted Master Plan Transportation Improvements

As discussed previously, Alternative 1 would be consistent with continuation of the Port's adopted master plan. As such, planned transportation improvements are slightly different than the Proposed Action and No Action since the BHTRP would not occur. The roadway system would primarily be the same as existing conditions except for the following locations:

- SR 509/Taylor Way – The northbound and southbound approaches would be expanded to include two left-turn lanes along SR 509. Right-turn lanes would be provided for the northbound, southbound, and eastbound movements. (same as Proposed Action).
- 54th Avenue E/I-5 Northbound Ramp – A traffic signal would be installed (same as Proposed Action).
- Taylor Way North of 11th Street E – This roadway would extend north terminating in a cul-de-sac near the existing Trident Seafoods plant and Army Reserve Center. This portion of Taylor Way would consist of two 12-foot lanes with 8-foot shoulders.



NOT TO SCALE



BHTRP Proposed Roadway System

NMCRC Tacoma Disposal & Reuse

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FIGURE

3

Travel Forecasts

The No Action, Proposed Action and Alternative 1 were evaluated for 2013 travel conditions. These conditions assume an increase in travel as a result of growth in the study area. As discussed in Chapter 2 of this report, future (2013) background traffic volumes were determined by applying a two percent per year growth rate to existing traffic volumes consistent with the *BHTRP Draft EIS*.

The Port's BHTRP was considered as part of the background forecast for the No Action and Proposed Action scenarios. Without development on the NMCRC site, the BHTRP would displace approximately 2,500 daily trips with approximately 253 trips occurring during the PM peak hour. In addition, the BHTRP would generate approximately 3,700 total daily trips with approximately 343 trips occurring during the PM peak hour. Accounting for the displaced trips, the net new trip generation for the BHTRP would be approximately 1,200 daily trips with approximately 80 net new trips during the PM peak hour.

The Action Alternative does not include traffic from the proposed BHTRP in the background conditions. Instead, the Action Alternative considers traffic from the continuation of the Port's existing master plan. The existing master plan would displace approximately 1,600 daily trips with approximately 182 trips occurring during the PM peak hour. In addition, the existing master plan would generate approximately 457 daily trips with approximately 18 occurring during the PM peak hour. This does not include traffic generate from the NMCRC site.

Trip Generation

Traffic generated on the NMCRC site for the Proposed Action and Alternative 1 scenarios was determined based on information provided by the Port of Tacoma and is consistent with the *BHTRP Draft EIS*. The No Action Alternative represents closure of the NMCRC, and therefore, no traffic would be generated on-site.

Daily and PM peak hour vehicular trip generation, for trucks and employees for each Action Alternative was determined assuming the NMCRC site represents approximately five percent of the proposed development. Five percent was calculated based on a ratio of the 9.03 acre NMCRC site to the total 168 acre YTTI site. Table 5 provides a summary of the vehicular trip generation for each alternative.

As shown in Table 5, the NMCRC site would generate approximately 120 net new daily trips under the Proposed Action. During the PM peak hour, the NMCRC site would generate less traffic than is currently being experienced. The decrease in trip generation during the PM peak hour is due to the change in use on site. Industrial type uses typically generate higher traffic during off-peak hours when roadways are less congested. Similarly, Alternative 1 would generate less daily and PM peak hour vehicular trips on the NMCRC site than currently generated.

Table 5. NMCRC Site Trip Generation Summary		
	Daily Trips¹	PM Peak Hour Trips¹
<u>Proposed Action</u>		
Total Trips		
Employees	54	10
Trucks	141	8
Displaced Trips	<u>-75</u>	<u>-30</u>
<i>Net New Trips</i>	120	-12
<u>Alternative 1</u>		
Total Trips		
Employees	9	0
Trucks	15	1
Displaced Trips	<u>-75</u>	<u>-30</u>
<i>Net New Trips</i>	-51	-29
1. Trips are based on information from the Port of Tacoma and rates for Port Terminals land use from Institute of Transportation Engineers' <i>Trip Generation</i> , 7 th Edition.		

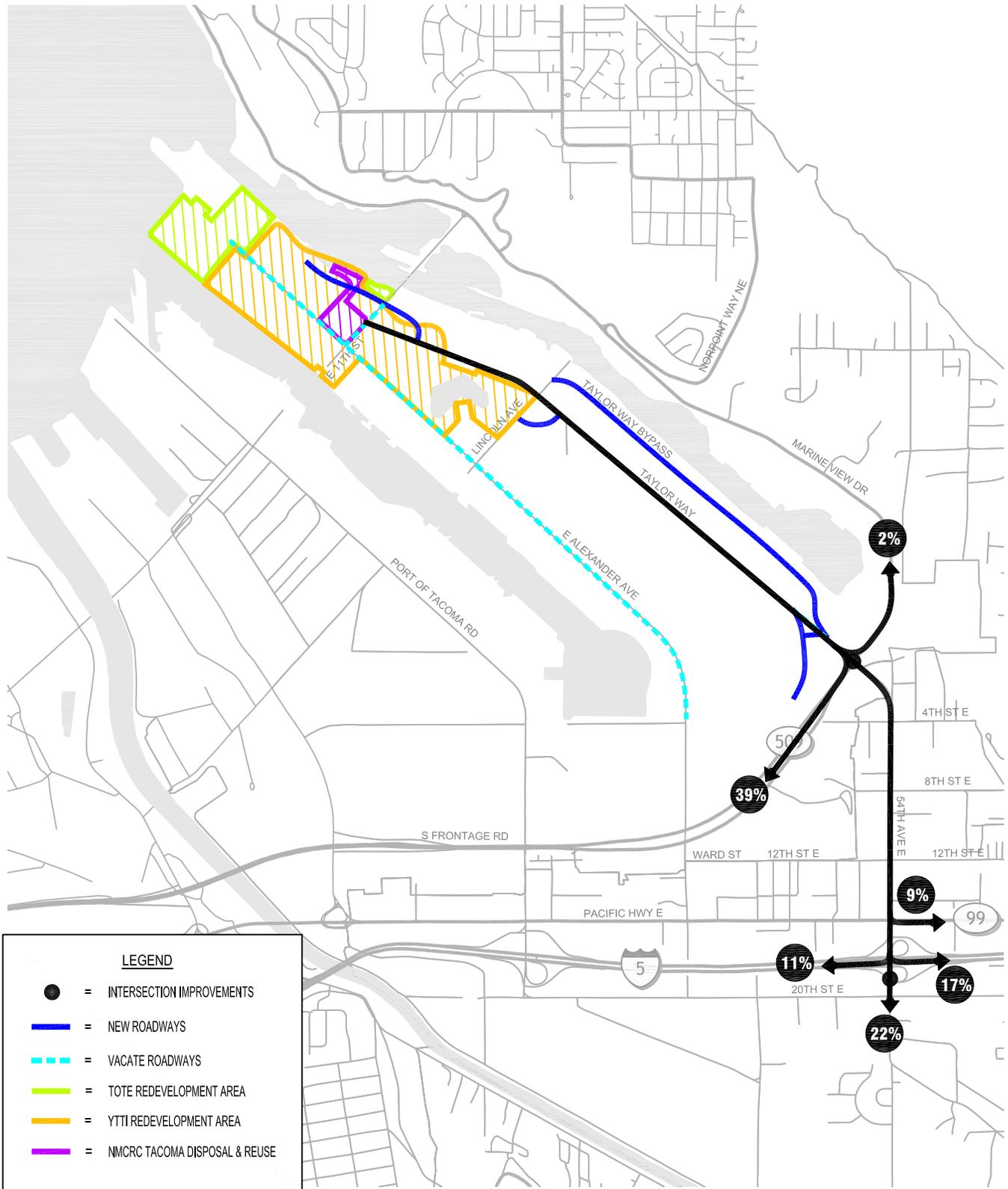
Trip Distribution

The distribution of vehicular traffic was assumed consistent for all Alternatives. The distribution of trucks was based on the Port of Tacoma's *Tideflats Area Truck Volume and Route Study* (Heffron Transportation, Inc. 2007). The distribution of employees was based on commute trip reduction survey data obtained from the City of Tacoma as well as input with the Cities of Tacoma and Fife. This trip distribution is consistent with the *BHTRP Draft EIS*. Figure 4 illustrates the distribution of project trips.

Trucks access the Port via the Taylor Way/SR 509 intersection. It is noted that although the Hylebos Bridge would allow for heavy vehicle access, this analysis does not assume truck access via the bridge since the route is longer than using Taylor Way and most trucks are destined for I-5. As shown in Figure 4, approximately 41 percent of the project traffic would come to and from SR 509, approximately 28 percent would come to and from I-5, approximately 9 percent would come to and from Pacific Highway E, and approximately 22 percent would come to and from 54th Avenue E south of I-5.



NOT TO SCALE



Project Trip Distribution

NMCRC Tacoma Disposal & Reuse

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FIGURE

4

Construction Impacts

The NMCRC Tacoma Disposal and Reuse site would be constructed in conjunction with the development of the entire BHTRP site. Construction impacts for the BHTRP were documented in the *BHTRP Draft EIS*. Traffic associated with construction would include construction employee vehicles and trucks transporting equipment and materials. As discussed in the *BHTRP Draft EIS*, approximately 22,000 total truck trips would be anticipated with the fill importation required for the Port's redevelopment project. This would equate to approximately 260 trucks per day and 32 trucks per hour assuming four months of hauling and eight hour work days. The 9.03 acre NMCRC Tacoma site represents about five percent of the 168 acre YTTI terminal being redeveloped as part of the BHTRP. Five percent of the construction truck traffic would be approximately 13 trucks per day and 2 trucks per hour. This would be less than the total daily and PM peak hour traffic anticipated with the Proposed Action and Alternative 1 scenarios; therefore, transportation impacts due to construction would be expected to be less than impacts with the alternatives.

As part of the BHTRP, construction of the proposed roadways and rail lines may require roadway/lane closures and/or delays to vehicular traffic. For the BHTRP, the Port intends to work with the City of Tacoma to identify potential construction impacts due to these activities and determine the best way to minimize impacts. It is anticipated that as part of mitigating construction impacts for the BHTRP, the contractor would develop a Construction Management Plan identifying truck staging areas, road closures, employee parking, hours of operation, traffic management and other operations related to construction activity.

Operations Impacts

This section discusses the operations for the No Action, Proposed Action, and Alternative 1 for 2013 conditions. Operations are discussed relative to the transportation system including the street system, non-motorized facilities, transit, rail, and parking. These impacts are evaluated using the methodologies described in Chapter 2. The No Action operations are compared with the Action Alternatives to determine if there are any significant operational impacts that would need to be mitigated.

No Action

The No Action Alternative assumes the NMCRC site would be closed and no traffic would be generated. The evaluation of 2013 No Action operations for each mode illustrates how the transportation system would operate if the site was not developed. The No Action 2013 conditions are the baseline against which the 2013 Action Alternatives are measured.

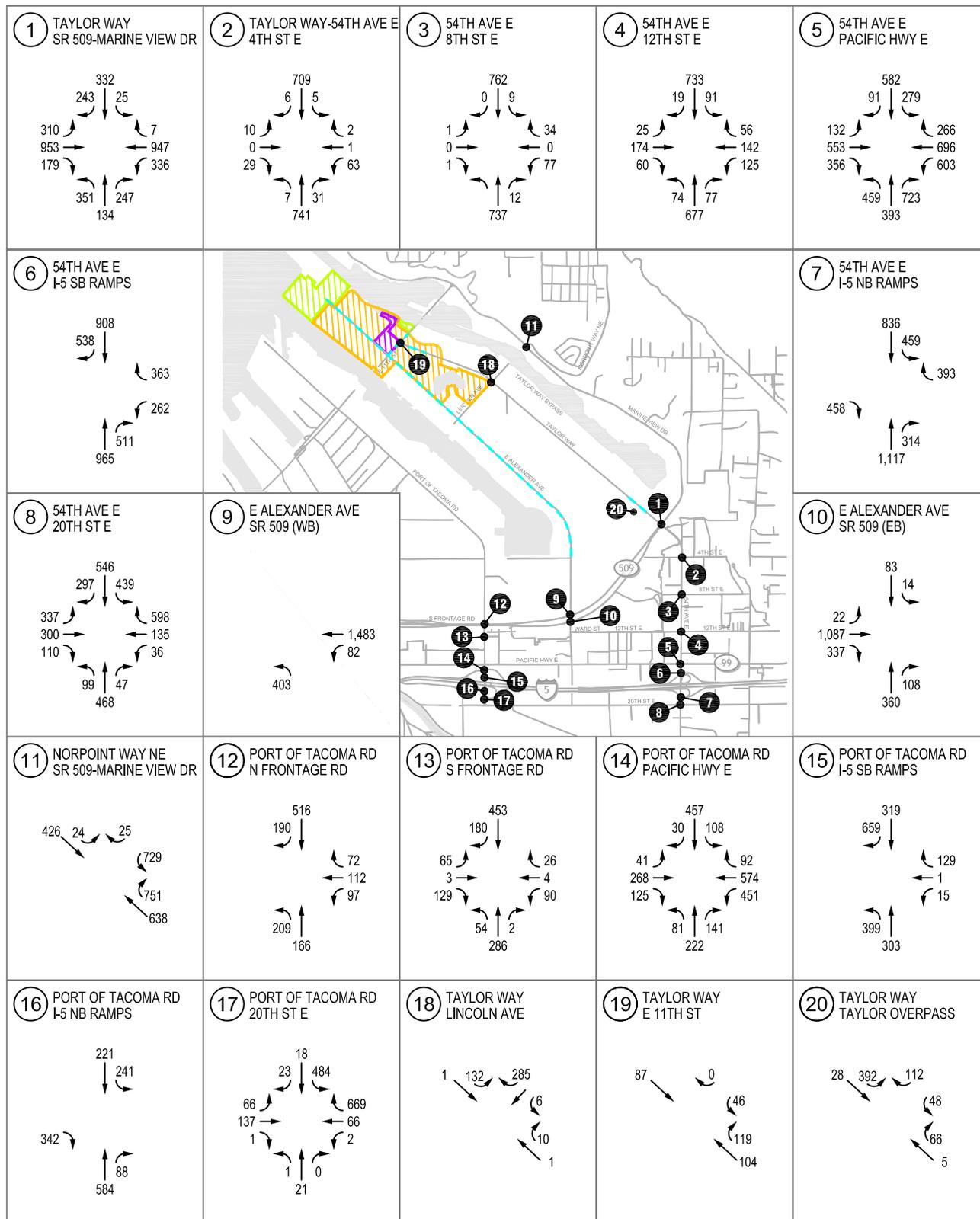
The transportation improvements discussed in this chapter under the Alternatives Overview section were incorporated into the analysis. This primarily includes additional capacity at SR 509/Taylor Way, signalization of 54th Avenue E/I-5 Northbound Ramp intersection, construction of the Taylor Way Bypass, and extension of Taylor Way north into the site.

Street System

The No-Action 2013 PM peak-hour travel forecasts were used to evaluate intersections to gain an understanding of how the street system would operate without development on the NMCRC site. Figure 5 presents traffic volumes for the study intersections under the No Action PM peak hour conditions. As discussed previously, impacts to the street system are measured by determining intersection LOS and safety conditions.



NOT TO SCALE



No Action PM Peak Hour Traffic Volumes

FIGURE

NMCR Tacoma Disposal & Reuse



5

Intersection Operations

Intersection levels of service were calculated for the No Action 2013 conditions. These calculations take into consideration the improvements discussed in the Alternatives Overview and Planned and Programmed Improvements sections. Table 6 summarizes the No Action 2013 intersection operations. Detailed LOS worksheets are provided in Appendix B.

Table 6. No Action (2013) PM Peak Hour LOS Summary

Intersection	Jurisdiction	No Action		
		LOS ¹	Delay ²	V/C ³ or WM ⁴
<u>Signalized Intersections</u>				
1. Taylor Way/SR 509 – Marine View Drive	Tacoma	E	66	0.89
3. 54th Avenue E/8th Street E	Fife	A	7	0.54
4. 54th Avenue E/12th Street E	Fife	A	9	0.53
5. 54th Avenue E/Pacific Highway E (SR 99)	Fife	F	166	1.36
6. 54th Avenue E/I-5 SB Ramps	Fife	B	17	0.81
7. 54th Avenue E/I-5 NB Ramps	Fife	B	15	0.86
8. 54th Avenue E/20th Street E	Fife	D	54	0.87
9. Alexander Avenue/North Frontage Road (SR 509)	Tacoma	C	21	0.78
10. Alexander Avenue/South Frontage Road (SR 509)	Tacoma	C	20	0.73
11. Norpoint Way NE/Marine View Drive (SR 509)	Tacoma	C	22	0.79
12. Port of Tacoma Road/North Frontage Road	Tacoma	B	14	0.49
13. Port of Tacoma Road/South Frontage Road	Tacoma	B	19	0.42
14. Port of Tacoma Road/Pacific Highway E	Fife	F	85	0.75
15. Port of Tacoma Road/I-5 SB Ramps	Tacoma	B	14	0.6
18. Lincoln Avenue/Taylor Way	Tacoma	A	8	0.29
<u>Unsignalized Intersections</u>				
2. Taylor Way – 54th Avenue E/4th Street E	Fife	F	73	WB
17. Port of Tacoma Road/20th Street E	Tacoma	F	>180	EB/WB
16. Port of Tacoma Road/I-5 NB Ramps	Tacoma	B	12	SBL
19. E 11th Street/Taylor Way	Tacoma	A	8	NA
20. Taylor Way/Taylor Way Overpass	Tacoma	C	19	NA

Notes: WB = westbound, EB = eastbound, SBL = southbound left-turn

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

2. Average delay in seconds per vehicle.

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

4. Worst movement reported for two-way stop-controlled intersections. NA = not applicable for all-way stop-controlled intersections.

As shown in Table 3, five study intersections would operate at LOS E or worse under the No Action condition. These intersections include:

- Taylor Way/SR 509 – Marine View Drive
- 54th Avenue E/Pacific Highway E (SR 99)
- Port of Tacoma Road/Pacific Highway E
- Taylor Way – 54th Avenue E/4th Street E
- Port of Tacoma Road/20th Avenue E

The remaining study intersections would operate at LOS D or better.

Emergency Access

Emergency vehicle access to the NMCRC site and properties along Alexander Avenue would be improved with the No Action Alternative. This improvement is due to the addition of the Taylor Way overpass a, grade separate structures, proposed as part of the BHTRP which would eliminate trains blocking the roadway and the opening of the Hylebos Bridge which provides a second and more direct access to the site.

Non-Motorized

The BHTRP would construct sidewalks along Taylor Way and the Taylor Way Bypass route. The addition of sidewalks to roadways providing access to the site would improve pedestrian connectivity to and from the site as well as throughout the Port under the No Action conditions.

Transit

The transit system would be anticipated to be similar to existing conditions under the No Action conditions. It is likely that as ridership increases within Tacoma and the Port of Tacoma area, Pierce Transit would provide additional service to meet the demand.

Rail

As discussed previously, the Port of Tacoma uses a delay ratio to identify issues with rail operations. The BHTRP would provide additional rail lines in the vicinity of the NMCRC site to serve the YTTI and TOTE properties. By 2013, for the No Action conditions, it is anticipated that the delay ratio for rail operations would be approximately 1.34 which is slightly over the Port's guideline. However, based on the *BHTRP Draft EIS*, this delay ratio would not significantly impact rail operations in the Port.

The BHTRP includes construction of the Taylor Way overpass to provide a grade separated crossing. The proposed roadway improvements would provide alternative routes to access the NMCRC site and allow vehicular traffic to bypass trains blocking facilities. However, it is likely that with the increases in rail activity trains blocking the Lincoln Avenue/Taylor Way intersection could increase.

Parking

With the No Action Alternative, the NMCRC site would be vacated; therefore, no parking would be necessary.

Proposed Action and Alternative 1

As discussed previously, the Proposed Action would develop the NMCRC site as part of the BHTRP and the Alternative 1 would provide for a continuation of the Port's existing master plan. The following discusses an evaluation of both Proposed Action and Alternative 1 2013 conditions for each mode. These alternatives are compared to the No Action Alternative to determine potential transportation impacts.

The transportation improvements discussed in this chapter under the Planned and Programmed Improvements section were incorporated into the background conditions for the analysis of Proposed Action and Alternative 1. For the Proposed Action, these primarily include additional capacity at SR 509/Taylor Way, signalization of 54th Avenue E/I-5 Northbound Ramp intersection, construction of the Taylor Way Bypass, and extension of Taylor Way north into the site. For the Alternative 1, transportation improvements include

additional capacity at SR 509/Taylor Way, signalization of 54th Avenue E/I-5 Northbound Ramp intersection, and extension of Taylor Way north into the site.

Street System

The Proposed Action and Alternative 1 2013 PM peak-hour travel forecasts were used to evaluate intersections to gain an understanding of how the street system would operate. Figures 6 and 7 illustrate traffic volumes for the study intersections under the Proposed Action and Alternative 1 PM peak hour conditions. As discussed previously, impacts to the street system are measured by determining intersection LOS and safety conditions.

Intersection Operations

Intersection levels of service were calculated for the Proposed and Alternative 1 2013 conditions and compared to the No Action Alternative. These calculations take into consideration the improvements discussed in the Alternatives Overview and Planned and Programmed Improvements sections. Table 7 provides a comparison of No Action, Proposed Action, and Alternative 1 conditions. Detailed LOS worksheets are provided in Appendices C and D.

As shown in Table 7, the Proposed Action operations would be the same as the No Action Alternative. The following five intersections would continue to operate at LOS E or worse with the addition of traffic from the NMCRC site:

- Taylor Way/SR 509 – Marine View Drive
- 54th Avenue E/Pacific Highway E (SR 99)
- Port of Tacoma Road/Pacific Highway E
- Taylor Way – 54th Avenue E/4th Street E
- Port of Tacoma Road/20th Avenue E

The Proposed Action would not be anticipated to have a significant impact on the study intersections as compared to the No Action Alternative.

The Alternative 1 would improve operations to LOS D at the Taylor Way/SR 509 – Marine View Drive intersection since less traffic would be coming to and from the Port. All other intersections, with the Alternative 1, would have similar operations to the No Action and Proposed Action Alternatives.

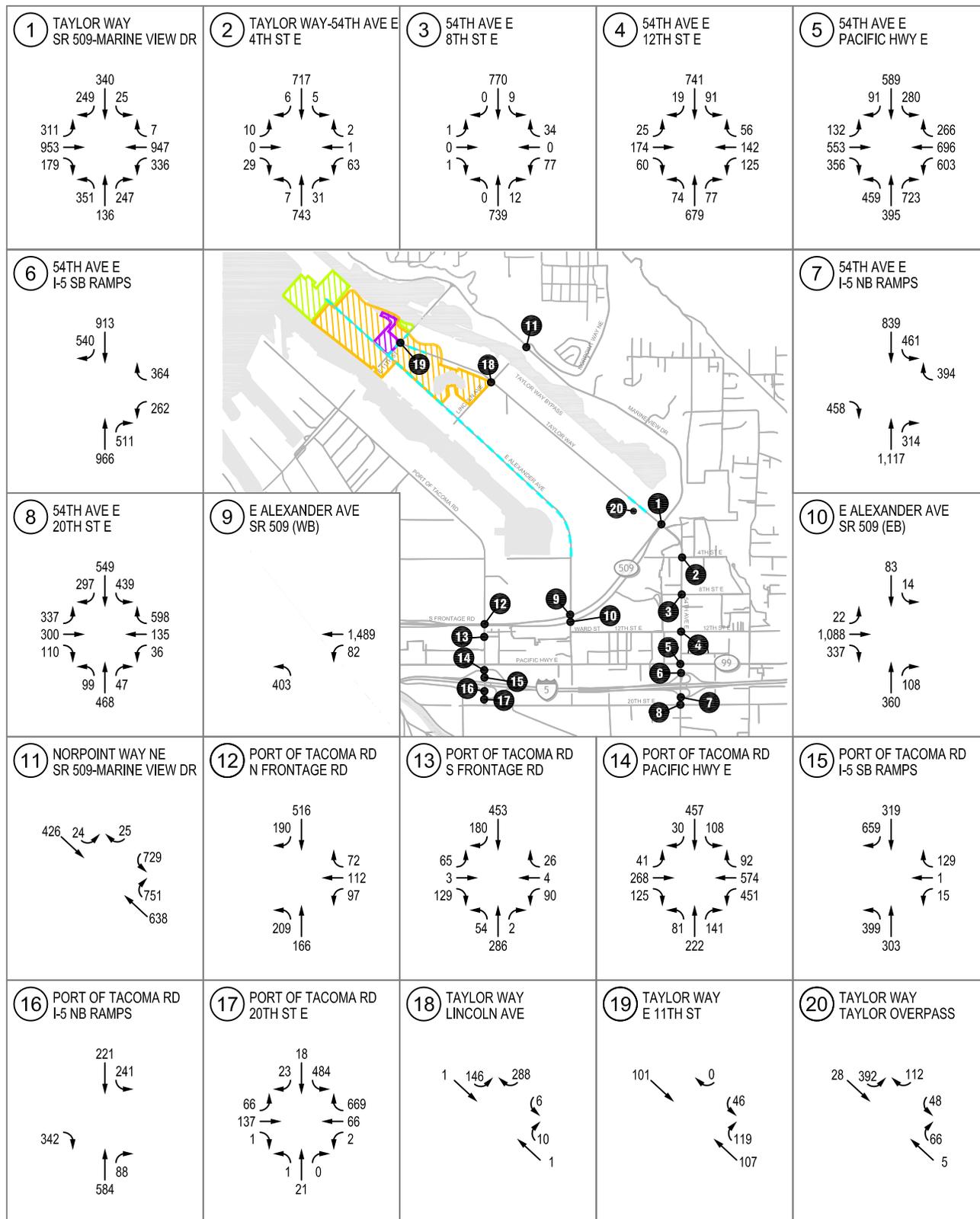
Emergency Access

Similar to the No Action conditions, emergency vehicle access to the NMCRC site and properties along Alexander Avenue would be improved with the Proposed Action. This improvement is due to the addition of the Taylor Way overpass eliminating trains blocking the roadway, proposed as part of the BHTRP, and the opening of the Hylebos Bridge providing a second and more direct access to the site.

Emergency access would not be improved with Alternative 1 due to the closure of Alexander Avenue north of SR 509 according to the Port's existing master plan and no additional access provided except the Hylebos Bridge. The closure of this roadway could add approximately three miles of travel and up to four minutes to emergency response times. This additional response time does not meet the City of Tacoma's fire department level of service standard based on the *BHTRP Draft EIS*.



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Proposed Action PM Peak Hour Traffic Volumes

FIGURE

NMCRC Tacoma Disposal & Reuse

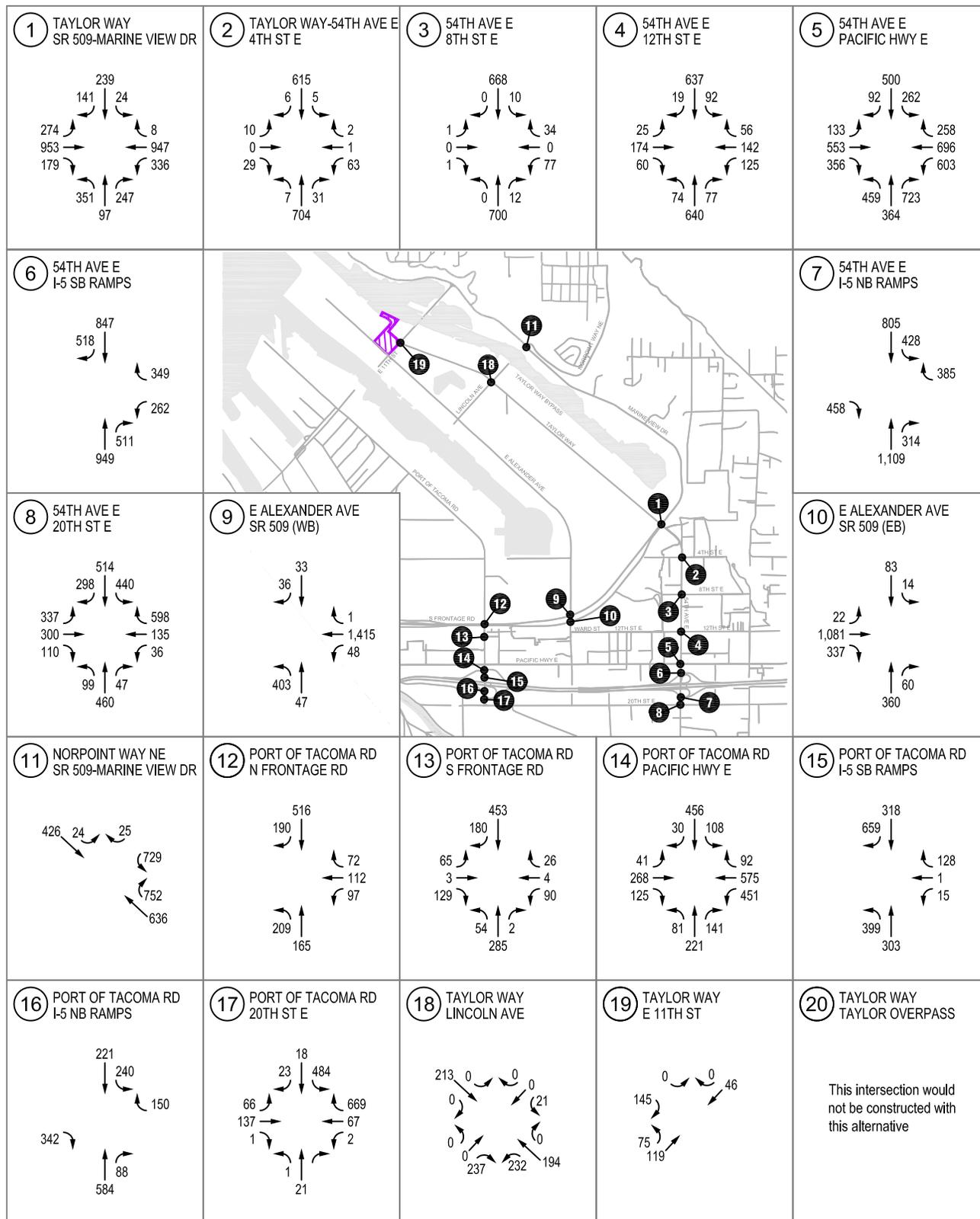
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Alternative 1 PM Peak Hour Traffic Volumes

FIGURE

NMCR Tacoma Disposal & Reuse



7

Non-Motorized

The BHTRP would provide sidewalks along Taylor Way and the Taylor Way Bypass route. Similar to the No Action conditions, the addition of sidewalks to roadways providing access to the site would improve pedestrian connectivity to and from the site as well as throughout the Port for the Proposed Action conditions.

No additional non-motorized facilities would be provided with the Alternative 1. Therefore, no improvements in pedestrian and bicycle connectivity are anticipated.

Transit

The transit system would be similar to existing conditions under the Proposed Action and Alternative 1. It is likely that as ridership increases within Tacoma and the Port of Tacoma area, Pierce Transit would provide additional service to meet the demand.

Rail

Delays to rail operations under Alternative 1 would be within acceptable levels with a delay ratio of 1.25. However, with the Proposed Action, this delay ratio would increase to 1.34, which is higher than the Port's acceptable 1.30 delay ratio. This would be the same as the No Action Alternative. As discussed previously, the Port would not anticipate a significant impact to rail operations with the 1.34 ratio.

For Alternative 1, trains blocking roadways in the study area would increase over the current and No Action conditions due to the increase in rail traffic and the lack of roadway improvements. For the Proposed Action, train activity would also increase; however, the BHTRP proposed roadway improvements would mitigate impacts of trains blocking roadways by providing alternative routes.

Parking

The Proposed Action and Alternative 1 include development on the NMCRC site. It is anticipated that sufficient parking and truck queue storage would be provided to accommodate the activity within the site. No parking or queuing impacts would be expected due to the terminal activities on the site.

Table 7. 2013 No Action, Proposed Action, and Alternative 1 PM Peak Hour Intersection Operations

Intersection	Jurisdiction	No Action			Proposed Action			Alternative 1		
		LOS ¹	Delay ²	V/C ³ or WM ⁴	LOS ¹	Delay ²	V/C ³ or WM ⁴	LOS ¹	Delay ²	V/C ³ or WM ⁴
<u>Signalized Intersections</u>										
1. Taylor Way/SR 509 – Marine View Drive	Tacoma	E	66	0.89	E	67	0.89	D	56	0.84
3. 54th Avenue E/8th Street E	Fife	A	7	0.54	A	7	0.54	A	7	0.52
4. 54th Avenue E/12th Street E	Fife	A	9	0.53	A	9	0.53	A	9	0.49
5. 54th Avenue E/Pacific Highway E (SR 99)	Fife	F	166	1.36	F	167	1.36	F	146	1.27
6. 54th Avenue E/I-5 SB Ramps	Fife	B	17	0.81	B	17	0.82	B	18	0.77
7. 54th Avenue E/I-5 NB Ramps	Fife	B	15	0.86	B	15	0.86	B	14	0.79
8. 54th Avenue E/20th Street E	Fife	D	54	0.87	D	54	0.87	D	52	0.86
9. Alexander Avenue/North Frontage Road (SR 509)	Tacoma	C	21	0.78	C	21	0.78	C	33	0.81
10. Alexander Avenue/South Frontage Road (SR 509)	Tacoma	C	20	0.73	C	20	0.73	B	19	0.71
11. Norpoint Way NE/Marine View Drive (SR 509)	Tacoma	C	22	0.79	C	22	0.79	C	22	0.79
12. Port of Tacoma Road/North Frontage Road	Tacoma	B	14	0.49	B	14	0.49	B	14	0.49
13. Port of Tacoma Road/South Frontage Road	Tacoma	B	19	0.42	B	19	0.42	B	19	0.42
14. Port of Tacoma Road/Pacific Highway E	Fife	F	85	0.75	F	85	0.75	F	85	0.75
15. Port of Tacoma Road/I-5 SB Ramps	Tacoma	B	14	0.6	B	14	0.60	B	14	0.60
18. Lincoln Avenue/Taylor Way	Tacoma	A	8	0.29	A	8	0.31	B	11	0.35
<u>Unsignalized Intersections</u>										
2. Taylor Way – 54th Avenue E/4th Street E	Fife	F	73	WB	F	74	WB	F	55	WB
16. Port of Tacoma Road/I-5 NB Ramps	Tacoma	B	12	SBL	B	12	SBL	B	12	SBL
17. Port of Tacoma Road/20th Street E	Tacoma	F	>180	EB/WB	F	>180	EB/WB	F	>180	EB/WB
19. E 11th Street/Taylor Way	Tacoma	A	8	NA	A	8	NA	A	8.0	NA
20. Taylor Way/Taylor Way Overpass	Tacoma	C	19	NA	C	19	NA	NA	NA	NA

Source: Transpo Group, September 2008

Notes: WB = westbound, EB = eastbound, SBL = southbound left-turn, NA = Not applicable, this intersection does not exist for this scenario.

1. Level of service, based on 2000 *Highway Capacity Manual* methodology.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections.
4. Worst movement reported for two-way stop-controlled intersections. NA = not applicable for all-way stop-controlled intersections.

Mitigation Measures

Based on the analysis presented, there is no construction or operational impacts to mitigate for the Proposed Action and Alternative 1. The Port would provide a construction management plan and transportation system improvements as part of their redevelopment which would improve operations within the study area.

HCM Signalized Intersection Capacity Analysis
1: SR 509 & Taylor Way

NMCRC Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Volume (vph)	168	910	162	271	864	10	318	106	161	28	252	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	1.00
Frt	1.00	0.98		1.00	1.00		1.00	0.91		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1736	3392		1752	3499		1656	3012		1570	3139	1404
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1736	3392		1752	3499		1656	3012		1570	3139	1404
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)	183	989	176	295	939	11	346	115	175	30	274	24
RTOR Reduction (vph)	0	6	0	0	0	0	0	128	0	0	0	18
Lane Group Flow (vph)	183	1159	0	295	950	0	346	162	0	30	274	6
Heavy Vehicles (%)	4%	4%	4%	3%	3%	3%	9%	9%	9%	15%	15%	15%
Turn Type	Prot			Prot			Prot			Prot		custom
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases												6
Actuated Green, G (s)	21.1	60.1		30.0	69.0		30.0	42.7		6.9	19.6	42.7
Effective Green, g (s)	21.1	60.1		30.0	69.0		30.0	42.7		6.9	19.6	42.7
Actuated g/C Ratio	0.13	0.38		0.19	0.43		0.19	0.27		0.04	0.12	0.27
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lane Grp Cap (vph)	229	1277		329	1512		311	805		68	385	375
v/s Ratio Prot	0.11	c0.34		c0.17	0.27		c0.21	0.05		0.02	c0.09	
v/s Ratio Perm												0.00
v/c Ratio	0.80	0.91		0.90	0.63		1.11	0.20		0.44	0.71	0.02
Uniform Delay, d1	67.2	47.2		63.3	35.4		64.8	45.3		74.5	67.3	43.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	17.0	9.5		25.3	0.7		84.8	0.1		3.3	5.7	0.0
Delay (s)	84.2	56.6		88.6	36.1		149.7	45.4		77.8	73.0	43.1
Level of Service	F	E		F	D		F	D		E	E	D
Approach Delay (s)		60.4			48.5			102.1			71.3	
Approach LOS		E			D			F			E	
Intersection Summary												
HCM Average Control Delay	64.7			HCM Level of Service			E					
HCM Volume to Capacity ratio	0.92											
Actuated Cycle Length (s)	159.7			Sum of lost time (s)			20.0					
Intersection Capacity Utilization	88.0%			ICU Level of Service			E					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: 4th St E & Taylor Way

NMCRC Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕	↔	↔	↕	↔	↔	↕	↔	↔	↕	↔
Volume (veh/h)	10	0	26	33	1	2	6	608	28	5	591	6
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
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
Hourly flow rate (vph)	11	0	28	36	1	2	7	661	30	5	642	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None						None					
Median storage (veh)												
Upstream signal (ft)	1317											
pX, platoon unblocked												
vC, conflicting volume	1003	1361	324	1049	1349	346	649				691	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1003	1361	324	1049	1349	346	649				691	
IC, single (s)	7.5	6.5	6.9	7.6	6.6	7.0	4.3				4.3	
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3				2.3	
p0 queue free %	94	100	96	79	99	100	99				99	
cM capacity (veh/h)	195	148	677	171	146	647	893				848	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	39	39	7	441	251	5	428	221				
Volume Left	11	36	7	0	0	5	0	0				
Volume Right	28	2	0	0	30	0	0	7				
cSH	402	177	893	1700	1700	848	1700	1700				
Volume to Capacity	0.10	0.22	0.01	0.26	0.15	0.01	0.25	0.13				
Queue Length 95th (ft)	8	20	1	0	0	0	0	0				
Control Delay (s)	14.9	31.0	9.1	0.0	0.0	9.3	0.0	0.0				
Lane LOS	B	D	A			A						
Approach Delay (s)	14.9	31.0	0.1			0.1						
Approach LOS	B	D										
Intersection Summary												
Average Delay	1.3											
Intersection Capacity Utilization	29.8%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Signalized Intersection Capacity Analysis
3: 8th St E & 54 AVE E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↕		↔	↕	
Volume (vph)	1	0	1	45	0	33	0	602	11	10	638	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frt		0.93			0.94			1.00		1.00	1.00	
Flt Protected		0.98			0.97			1.00		0.95	1.00	
Satd. Flow (prot)		1729			1643			3334		1656	3312	
Flt Permitted		0.80			0.82			1.00		0.95	1.00	
Satd. Flow (perm)		1414			1388			3334		1656	3312	
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)	1	0	1	49	0	36	0	654	12	11	693	0
RTOR Reduction (vph)	0	1	0	0	32	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	53	0	0	665	0	11	693	0
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	8%	8%	8%	9%	9%	9%
Turn Type	Perm		Perm		Prot		Prot					
Protected Phases	8		4		4		1 6		5		2	
Permitted Phases	8		4									
Actuated Green, G (s)	3.9		3.9		15.4		0.7		20.1			
Effective Green, g (s)	3.9		3.9		15.4		0.7		20.1			
Actuated g/C Ratio	0.12		0.12		0.47		0.02		0.61			
Clearance Time (s)	4.0		4.0		5.0		4.0		5.0			
Vehicle Extension (s)	3.0		3.0		3.5		3.0		3.5			
Lane Grp Cap (vph)	167		164		1556		35		2017			
v/s Ratio Prot	0.00		c0.04		c0.20		0.01		c0.21			
v/s Ratio Perm	0.01		0.32		0.43		0.31		0.34			
v/c Ratio	12.8		13.3		5.9		15.9		3.2			
Uniform Delay, d1	1.00		1.00		1.00		1.00		1.00			
Incremental Delay, d2	0.0		1.2		0.2		5.1		0.1			
Delay (s)	12.9		14.5		6.1		21.0		3.3			
Level of Service	B		B		A		C		A			
Approach Delay (s)	12.9		14.5		6.1		3.6		5.5			
Approach LOS	B		B		A		A		A			

Intersection Summary			
HCM Average Control Delay	5.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	33.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: 12th St E & 54 AVE E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↕		↔	↕	
Volume (vph)	24	158	54	89	129	53	67	544	70	95	596	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.5			5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00			1.00		0.95	1.00	0.95
Frt		1.00			0.96			1.00		0.98	1.00	1.00
Flt Protected		0.95			1.00			0.95		1.00	0.95	1.00
Satd. Flow (prot)		1805			1703			1656		3255	1671	3326
Flt Permitted		0.63			1.00			0.61		1.00	0.40	1.00
Satd. Flow (perm)		1203			1102			692		3255	700	3326
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)	26	172	59	97	140	58	73	591	76	103	648	22
RTOR Reduction (vph)	0	25	0	0	30	0	0	13	0	0	3	0
Lane Group Flow (vph)	26	206	0	97	168	0	73	654	0	103	667	0
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	9%	9%	9%	8%	8%	8%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		8		2		2		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	7.8		7.8		7.3		16.7		16.7		16.7	
Effective Green, g (s)	7.8		7.8		7.3		16.7		16.7		16.7	
Actuated g/C Ratio	0.23		0.23		0.22		0.50		0.50		0.50	
Clearance Time (s)	4.0		4.0		4.5		5.0		5.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.5		3.5		3.5	
Lane Grp Cap (vph)	280		425		240		345		1623		349	
v/s Ratio Prot	0.02		c0.11		0.09		0.10		c0.20		0.20	
v/s Ratio Perm	0.09		0.49		0.40		0.45		0.21		0.40	
v/c Ratio	10.1		11.1		11.2		11.4		4.7		5.3	
Uniform Delay, d1	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	0.1		0.9		1.1		0.9		0.4		0.2	
Delay (s)	10.2		12.0		12.3		12.2		5.1		5.5	
Level of Service	B		B		B		B		A		A	
Approach Delay (s)	11.8		12.3		5.4		5.5		5.5			
Approach LOS	B		B		A		A		A			

Intersection Summary			
HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	33.5	Sum of lost time (s)	9.0
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: SR 99 & 54 AVE E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	125	447	322	338	530	192	416	332	545	230	447	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.91		1.00	0.97	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3343	1495	1626	3122		3242	3031		1626	3169	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3343	1495	1626	3122		3242	3031		1626	3169	
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)	136	486	350	367	576	209	452	361	592	250	486	100
RTOR Reduction (vph)	0	0	57	0	32	0	0	252	0	0	15	0
Lane Group Flow (vph)	136	486	293	367	753	0	452	701	0	250	571	0
Heavy Vehicles (%)	8%	8%	8%	11%	11%	11%	8%	8%	8%	11%	11%	11%
Turn Type	Prot	pm+ov	Prot	Split	Split		Split	Split		Split	Split	
Protected Phases	1	6	4	5	2		4	4		3	3	
Permitted Phases			6									
Actuated Green, G (s)	13.0	20.3	44.5	26.5	33.8		24.2	24.2		25.4	25.4	
Effective Green, g (s)	13.0	20.3	44.5	26.5	33.8		24.2	24.2		25.4	25.4	
Actuated g/C Ratio	0.11	0.18	0.39	0.23	0.29		0.21	0.21		0.22	0.22	
Clearance Time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Vehicle Extension (s)	3.0	2.7	3.2	3.0	2.7		3.2	3.2		4.2	4.2	
Lane Grp Cap (vph)	189	590	579	375	918		682	638		359	700	
v/s Ratio Prot	0.08	0.15	0.11	c0.23	c0.24		0.14	c0.23		0.15	c0.18	
v/s Ratio Perm			0.09									
v/c Ratio	0.72	0.82	0.51	0.98	0.82		0.66	1.10		0.70	0.82	
Uniform Delay, d1	49.2	45.6	26.9	44.0	37.8		41.7	45.4		41.2	42.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.80	0.68		1.00	1.00	
Incremental Delay, d2	12.3	9.0	0.6	40.3	5.7		4.6	64.3		6.4	7.8	
Delay (s)	61.6	54.6	27.5	84.3	43.5		38.1	95.0		47.7	50.4	
Level of Service	E	D	C	F	D		D	F		D	D	
Approach Delay (s)		45.8			56.5			76.7			49.6	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM Average Control Delay	59.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: I-5 SB On & 54 AVE E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	0	0	0	237	0	272	0	796	463	0	691	411
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		4.0		4.0		4.0
Lane Util. Factor				1.00		1.00		0.95		1.00		1.00
Frt				1.00		0.85		0.94		1.00		0.85
Flt Protected				0.95		1.00		1.00		1.00		1.00
Satd. Flow (prot)				1671		1495		3280		1776		1509
Flt Permitted				0.95		1.00		1.00		1.00		1.00
Satd. Flow (perm)				1671		1495		3280		1776		1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	258	0	296	0	865	503	0	751	447
RTOR Reduction (vph)	0	0	0	0	0	124	0	118	0	0	0	0
Lane Group Flow (vph)	0	0	0	258	0	172	0	1250	0	0	751	447
Heavy Vehicles (%)		2%	2%	2%	8%	8%	0%	4%	4%	0%	7%	7%
Turn Type				Prot		custom						Free
Protected Phases				3		3 4		6				2 4
Permitted Phases												Free
Actuated Green, G (s)				25.5		48.8		58.2				81.5
Effective Green, g (s)				25.5		48.8		58.2				81.5
Actuated g/C Ratio				0.22		0.42		0.51				0.71
Clearance Time (s)				4.0				4.0				
Vehicle Extension (s)				3.0				3.0				
Lane Grp Cap (vph)				371		634		1660				1259
v/s Ratio Prot				c0.15		0.12		c0.38				c0.42
v/s Ratio Perm												0.30
v/c Ratio				0.70		0.27		0.75				0.60
Uniform Delay, d1				41.2		21.5		22.7				8.5
Progression Factor				1.00		1.00		0.82				0.95
Incremental Delay, d2				5.6		0.2		2.7				0.5
Delay (s)				46.8		21.8		21.2				8.5
Level of Service				D		C		C				A
Approach Delay (s)				0.0		33.4		21.2				5.4
Approach LOS				A		C		C				A

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
7: I-5 EB Off & 54 AVE E

NMCRCTacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↔			↔		↕		↔	↕	
Volume (veh/h)	0	0	415	0	0	311	0	978	284	303	659	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	451	0	0	338	0	1063	309	329	716	0
Pedestrians								1				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								0				
Right turn flare (veh)												
Median type							None			None		
Median storage (veh)												
Upstream signal (ft)								269			871	
pX, platoon unblocked	0.93	0.93	0.87	0.93	0.93	0.88	0.87			0.88		
vC, conflicting volume	2245	2747	717	3044	2592	686	716			1372		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1816	2354	604	2673	2189	371	603			1150		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	7.1	4.1			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	0	0	100	37	100			35		
cM capacity (veh/h)	8	12	387	0	15	534	860			507		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	451	338	709	663	329	716						
Volume Left	0	0	0	0	329	0						
Volume Right	451	338	0	309	0	0						
cSH	387	534	1700	1700	507	1700						
Volume to Capacity	1.16	0.63	0.42	0.39	0.65	0.42						
Queue Length 95th (ft)	439	110	0	0	115	0						
Control Delay (s)	130.2	22.6	0.0	0.0	24.4	0.0						
Lane LOS	F	C			C							
Approach Delay (s)	130.2	22.6	0.0		7.7							
Approach LOS	F	C										
Intersection Summary												
Average Delay			23.2									
Intersection Capacity Utilization			67.2%		ICU Level of Service						C	
Analysis Period (min)			15									

HCM Signalized Intersection Capacity Analysis
8: 20th St E & 54 AVE E

NMCRCTacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	307	272	100	33	122	545	90	385	43	406	383	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	0.91	0.91			1.00	1.00	1.00	0.95		0.91	0.91	
Flt	1.00	0.97			1.00	0.85	1.00	0.98		1.00	0.94	
Flt Protected	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1579	3186			1843	1583	1787	3520		1564	3090	
Flt Permitted	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1579	3186			1843	1583	1787	3520		1564	3090	
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)	334	296	109	36	133	592	98	418	47	441	416	298
RTOR Reduction (vph)	0	22	0	0	0	45	0	8	0	0	83	0
Lane Group Flow (vph)	247	470	0	0	169	547	98	457	0	392	680	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	1%	1%	1%	5%	5%	5%
Turn Type	Split		Split		pm+ov		Split		Split		Split	
Protected Phases	1	1			3	3	2	4	4		2	2
Permitted Phases							3					
Actuated Green, G (s)	22.4	22.4			15.3	57.6	17.0	17.0		42.3	42.3	
Effective Green, g (s)	22.4	22.4			15.3	57.6	17.0	17.0		42.3	42.3	
Actuated g/C Ratio	0.19	0.19			0.13	0.50	0.15	0.15		0.37	0.37	
Clearance Time (s)	4.5	4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.5	3.5			3.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)	308	621			245	855	264	520		575	1137	
v/s Ratio Prot	c0.16	0.15			0.09	c0.24	0.05	c0.13		c0.25	0.22	
v/s Ratio Perm						0.11						
v/c Ratio	0.80	0.76			0.69	0.64	0.37	0.88		0.68	0.60	
Uniform Delay, d1	44.2	43.7			47.6	21.1	44.2	48.0		30.7	29.5	
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00		1.10	1.11	
Incremental Delay, d2	14.3	5.4			7.9	1.6	0.3	15.1		6.2	2.2	
Delay (s)	58.5	49.2			55.4	22.7	44.5	63.1		39.9	35.0	
Level of Service	E	D			E	C	D	E		D	D	
Approach Delay (s)	52.3				29.9		59.9				36.7	
Approach LOS	D				C		E				D	
Intersection Summary												
HCM Average Control Delay			42.7		HCM Level of Service						D	
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			115.0		Sum of lost time (s)		13.5					
Intersection Capacity Utilization			70.1%		ICU Level of Service						C	
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: SR 509 (N Frontage Rd) & Alexander Ave E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗		↖	↗			↖	↗
Volume (vph)	0	0	0	44	1242	1	365	43	0	0	30	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	
Lane Util. Factor				1.00	0.95		1.00	0.95			0.95	
Frt				1.00	1.00		1.00	1.00			0.92	
Flt Protected				0.95	1.00		0.95	1.00			1.00	
Satd. Flow (prot)				1770	3539		1787	3574			2579	
Flt Permitted				0.95	1.00		0.95	1.00			1.00	
Satd. Flow (perm)				1770	3539		1787	3574			2579	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	48	1350	1	397	47	0	0	33	36
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	22	0
Lane Group Flow (vph)	0	0	0	48	1351	0	397	47	0	0	47	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	1%	1%	1%	29%	29%	29%
Turn Type	Perm			Prot			Prot			Prot		
Protected Phases				8			1			6		
Permitted Phases	8									2		
Actuated Green, G (s)	56.7			56.7			30.1			42.9		
Effective Green, g (s)	56.7			56.7			30.1			42.9		
Actuated g/C Ratio	0.52			0.52			0.27			0.39		
Clearance Time (s)	5.0			5.0			5.0			5.0		
Vehicle Extension (s)	2.5			2.5			2.5			2.5		
Lane Grp Cap (vph)	916			1831			491			1399		
v/s Ratio Prot				c0.38			c0.22			0.01		
v/s Ratio Perm	0.03									c0.02		
v/c Ratio	0.05			0.74			0.81			0.03		
Uniform Delay, d1	13.1			20.6			37.1			20.6		
Progression Factor	1.00			1.00			1.00			1.00		
Incremental Delay, d2	0.0			1.5			9.2			0.0		
Delay (s)	13.1			22.1			46.3			20.6		
Level of Service	B			C			D			C		
Approach Delay (s)	0.0			21.8			43.6			48.7		
Approach LOS	A			C			D			D		
Intersection Summary												
HCM Average Control Delay	27.9			HCM Level of Service			C					
HCM Volume to Capacity ratio	0.72											
Actuated Cycle Length (s)	109.6			Sum of lost time (s)			15.0					
Intersection Capacity Utilization	75.4%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
10: SR 509 (S Frontage Rd) & Alexander Ave E

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1028	305	0	0	0	0	326	54	13	75	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0			5.0			5.0	
Lane Util. Factor				1.00	0.95			0.95			1.00	
Frt				1.00	0.97			0.98			1.00	
Flt Protected				0.95	1.00			1.00			0.95	
Satd. Flow (prot)				1736	3352			3498			1805	3610
Flt Permitted				0.95	1.00			1.00			0.95	1.00
Satd. Flow (perm)				1736	3352			3498			1805	3610
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)	22	1117	332	0	0	0	0	354	59	14	82	0
RTOR Reduction (vph)	0	9	0	0	0	0	0	11	0	0	0	0
Lane Group Flow (vph)	22	1440	0	0	0	0	0	402	0	14	82	0
Heavy Vehicles (%)	4%	4%	4%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm			Prot			Prot			Prot		
Protected Phases	4									6		
Permitted Phases	4									5		
Actuated Green, G (s)	58.8			58.8			15.3			1.2		
Effective Green, g (s)	58.8			58.8			15.3			1.2		
Actuated g/C Ratio	0.65			0.65			0.17			0.01		
Clearance Time (s)	5.0			5.0			5.0			5.0		
Vehicle Extension (s)	2.5			2.5			2.5			2.5		
Lane Grp Cap (vph)	1130			2183			593			24		
v/s Ratio Prot				c0.43			c0.11			c0.01		
v/s Ratio Perm	0.01									0.02		
v/c Ratio	0.02			0.66			0.68			0.58		
Uniform Delay, d1	5.6			9.6			35.2			44.3		
Progression Factor	1.00			1.00			1.00			1.00		
Incremental Delay, d2	0.0			0.7			2.8			26.5		
Delay (s)	5.6			10.3			38.0			70.8		
Level of Service	A			B			D			E		
Approach Delay (s)	10.2			0.0			38.0			33.3		
Approach LOS	B			A			D			C		
Intersection Summary												
HCM Average Control Delay	17.1			HCM Level of Service			B					
HCM Volume to Capacity ratio	0.66											
Actuated Cycle Length (s)	90.3			Sum of lost time (s)			15.0					
Intersection Capacity Utilization	75.4%			ICU Level of Service			D					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
11: Norpoint Way & SR 509 (Marine View Drive)

NMCR Tacoma
Existing PM

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↑	↔	↔	↑
Volume (vph)	660	23	452	687	22	317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	4.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3090	1425	1676	1425	1533	1613
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3090	1425	1676	1425	1533	1613
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	717	25	491	747	24	345
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	717	25	491	747	24	345
Heavy Vehicles (%)	2%	2%	2%	2%	6%	6%
Turn Type	Free		Free		Prot	
Protected Phases	8		6		5	
Permitted Phases	Free		Free		6	
Actuated Green, G (s)	27.9	78.2	31.5	78.2	3.8	40.3
Effective Green, g (s)	27.9	78.2	31.5	78.2	3.8	40.3
Actuated g/C Ratio	0.36	1.00	0.40	1.00	0.05	0.52
Clearance Time (s)	5.0		5.0		5.0	
Vehicle Extension (s)	2.5		2.5		2.5	
Lane Grp Cap (vph)	1102	1425	675	1425	74	831
v/s Ratio Prot	c0.23		c0.29		0.02	
v/s Ratio Perm	0.02		c0.52			
v/c Ratio	0.65	0.02	0.73	0.52	0.32	0.42
Uniform Delay, d1	21.1	0.0	19.7	0.0	36.0	11.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.0	3.7	1.4	1.9	0.2
Delay (s)	22.3	0.0	23.4	1.4	37.8	11.9
Level of Service	C	A	C	A	D	B
Approach Delay (s)	21.6		10.1		13.6	
Approach LOS	C		B		B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	78.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: N Frontage Rd & Port of Tacoma Rd

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	0	0	0	88	101	65	189	149	0	0	467	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0	5.0	5.0	5.0			5.0	4.0
Lane Util. Factor				0.95	1.00	1.00	0.95	0.95			0.95	1.00
Frt				1.00	0.85	1.00	1.00	1.00			1.00	0.85
Flt Protected				0.98	1.00	0.95	1.00	1.00			1.00	1.00
Satd. Flow (prot)				3459	1583	1736	3471	3438			1538	1538
Flt Permitted				0.98	1.00	0.95	1.00	1.00			1.00	1.00
Satd. Flow (perm)				3459	1583	1736	3471	3438			1538	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)	0	0	0	96	110	71	205	162	0	0	508	187
RTOR Reduction (vph)	0	0	0	0	0	57	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	206	14	205	162	0	0	508	187
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	4%	4%	4%	5%	5%	5%
Turn Type				Perm			Perm			Prot		
Protected Phases				8			8			1		
Permitted Phases				8			8			6		
Actuated Green, G (s)				10.6			10.6			12.2		
Effective Green, g (s)				10.6			10.6			12.2		
Actuated g/C Ratio				0.20			0.20			0.23		
Clearance Time (s)				5.0			5.0			5.0		
Vehicle Extension (s)				2.5			2.5			2.5		
Lane Grp Cap (vph)				704			322			407		
v/s Ratio Prot				c0.12			0.05			c0.15		
v/s Ratio Perm				0.06			0.01					
v/c Ratio				0.29			0.04			0.50		
Uniform Delay, d1				17.6			16.7			17.3		
Progression Factor				1.00			1.00			1.00		
Incremental Delay, d2				0.2			0.0			0.7		
Delay (s)				17.7			16.7			18.0		
Level of Service				B			B			B		
Approach Delay (s)				0.0			17.5			12.0		
Approach LOS				A			B			B		

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
13: 12th St E & Port of Tacoma Rd

NMCR Tacoma
Existing PM



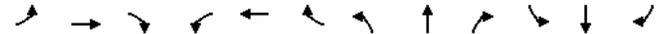
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	↕
Volume (vph)	59	3	117	84	4	24	49	258	2	0	410	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Frt	1.00	0.85	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00
Flt Protected	0.95	1.00	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1778	1583	1710	1770	3535	3505	1568					
Flt Permitted	0.95	1.00	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1778	1583	1710	1770	3535	3505	1568					
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)	64	3	127	91	4	26	53	280	2	0	446	177
RTOR Reduction (vph)	0	0	106	0	5	0	0	0	0	0	0	64
Lane Group Flow (vph)	0	67	21	0	116	0	53	282	0	0	446	113
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	3%	3%	3%
Turn Type	Split	Perm	Split	Prot							custom	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases			4									6
Actuated Green, G (s)	10.5	10.5		11.6			6.1	25.5			14.4	25.5
Effective Green, g (s)	10.5	10.5		11.6			6.1	25.5			14.4	25.5
Actuated g/C Ratio	0.17	0.17		0.19			0.10	0.41			0.23	0.41
Clearance Time (s)	5.0	5.0		5.0			5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5			2.5	2.5			2.5	2.5
Lane Grp Cap (vph)	298	266		317			172	1440			806	639
v/s Ratio Prot	c0.04			c0.07			c0.03	0.08			c0.13	
v/s Ratio Perm		0.01										0.07
v/c Ratio	0.22	0.08		0.37			0.31	0.20			0.55	0.18
Uniform Delay, d1	22.5	22.0		22.3			26.3	11.9			21.3	11.8
Progression Factor	1.00	1.00		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1		0.5			0.7	0.0			0.7	0.1
Delay (s)	22.8	22.1		22.8			27.0	12.0			21.9	11.9
Level of Service	C	C		C			C	B			C	B
Approach Delay (s)	22.3			22.8			14.4				19.1	
Approach LOS	C			C			B				B	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	62.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Pacific HWY & Port of Tacoma Rd

NMCR Tacoma
Existing PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	↕
Volume (vph)	37	189	113	413	425	83	73	200	128	98	416	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	0.95	0.97	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.94	1.00	0.98	1.00	0.94	1.00	0.94	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1687	3184	3335	3354	1583	2981	1492	2956				
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1687	3184	3335	3354	1583	2981	1492	2956				
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)	40	205	123	449	462	90	79	217	139	107	452	29
RTOR Reduction (vph)	0	73	0	0	13	0	0	94	0	0	4	0
Lane Group Flow (vph)	40	255	0	449	539	0	79	262	0	107	477	0
Heavy Vehicles (%)	7%	7%	7%	5%	5%	5%	14%	14%	14%	21%	21%	21%
Turn Type	Prot	Prot	Prot	Prot	Split							
Protected Phases	1	6		5	2		4	7	8	4	7	8
Permitted Phases												
Actuated Green, G (s)	6.8	16.0		12.1	22.3		36.6	36.6			21.5	21.5
Effective Green, g (s)	6.8	16.0		12.1	22.3		32.1	32.1			21.5	21.5
Actuated g/C Ratio	0.06	0.15		0.11	0.21		0.30	0.30			0.20	0.20
Clearance Time (s)	5.0	6.0		6.0	6.0		5.0	5.0			5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.5	3.5			3.5	3.5
Lane Grp Cap (vph)	107	473		375	694		472	888			298	590
v/s Ratio Prot	0.02	0.08		c0.13	c0.16		0.05	c0.09			0.07	c0.16
v/s Ratio Perm												
v/c Ratio	0.37	0.54		1.20	0.78		0.17	0.29			0.36	0.81
Uniform Delay, d1	48.4	42.4		47.8	40.3		27.9	29.1			37.2	41.1
Progression Factor	1.00	1.00		1.00	1.00		0.86	0.86			1.00	1.00
Incremental Delay, d2	2.2	1.2		111.9	5.4		0.1	0.1			0.9	8.2
Delay (s)	50.6	43.6		159.7	45.8		24.0	25.1			38.0	49.4
Level of Service	D	D		F	D		C	C			D	D
Approach Delay (s)		44.4			96.9			24.9				47.3
Approach LOS		D			F			C				D

Intersection Summary			
HCM Average Control Delay	63.5	HCM Level of Service	E
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	107.7	Sum of lost time (s)	21.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: I-5 WB Ramp & Tacoma Rd

NMCRRC Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↕			↕	↕
Volume (vph)	0	0	0	14	1	116	361	274	0	0	293	597
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.5	4.5	4.5	5.0			5.0	4.0
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00
Frt					0.88	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1196	1162	1703	3406			1727	1468
Flt Permitted					0.99	1.00	0.57	1.00			1.00	1.00
Satd. Flow (perm)					1196	1162	1017	3406			1727	1468
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	15	1	126	392	298	0	0	318	649
RTOR Reduction (vph)	0	0	0	0	50	64	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	21	7	392	298	0	0	318	649
Heavy Vehicles (%)	2%	2%	2%	32%	32%	32%	6%	6%	6%	10%	10%	10%
Turn Type				Split	Perm	custom						Free
Protected Phases				8	8	7	4 6 7				3 4 5 6	
Permitted Phases						8	3 4 6					Free
Actuated Green, G (s)					10.1	10.1	65.5	38.0			72.6	107.7
Effective Green, g (s)					10.1	10.1	54.5	38.0			60.6	107.7
Actuated g/C Ratio					0.09	0.09	0.51	0.35			0.56	1.00
Clearance Time (s)					4.5	4.5	4.5					
Vehicle Extension (s)					4.0	4.0	3.0					
Lane Grp Cap (vph)					112	109	585	1202			972	1468
v/s Ratio Prot					0.02		c0.07	0.09			0.18	
v/s Ratio Perm						0.01	c0.27					c0.44
v/c Ratio					0.19	0.06	0.67	0.25			0.33	0.44
Uniform Delay, d1					45.0	44.5	21.4	24.7			12.6	0.0
Progression Factor					1.00	1.00	1.00	1.00			0.04	1.00
Incremental Delay, d2					1.1	0.3	3.0	0.0			0.1	0.3
Delay (s)					46.1	44.8	24.4	24.8			0.6	0.3
Level of Service					D	D	C	C			A	A
Approach Delay (s)		0.0			45.5		24.5			0.4		
Approach LOS		A			D		C			A		
Intersection Summary												
HCM Average Control Delay				13.2								HCM Level of Service
HCM Volume to Capacity ratio				0.55								B
Actuated Cycle Length (s)				107.7			Sum of lost time (s)	13.5				
Intersection Capacity Utilization				55.4%			ICU Level of Service	B				
Analysis Period (min)				15								
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
16: I-5 EB Off & Port of Tacoma Rd

NMCRRC Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								↕			↕	↕
Volume (veh/h)	0	0	0	0	0	0	0	529	80	217	200	0
Sign Control			Stop			Stop		Free			Free	
Grade			0%			0%		0%			0%	
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	575	87	236	217	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1308	1351	217	1308	1308	618	217			662		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1308	1351	217	1308	1308	618	217			662		
IC, single (s)	7.1	6.5	6.3	7.2	6.6	6.3	4.1			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.6	4.1	3.4	2.2			2.3		
p0 queue free %	100	100	100	100	100	100	100			73		
cM capacity (veh/h)	109	110	808	102	110	469	1340			864		
Direction, Lane #								NB 1	SB 1	SB 2		
Volume Total								662	236	217		
Volume Left								0	236	0		
Volume Right								87	0	0		
cSH								1700	864	1700		
Volume to Capacity								0.39	0.27	0.13		
Queue Length 95th (ft)								0	28	0		
Control Delay (s)								0.0	10.7	0.0		
Lane LOS									B			
Approach Delay (s)								0.0	5.6			
Approach LOS												
Intersection Summary												
Average Delay									2.3			
Intersection Capacity Utilization								51.4%		ICU Level of Service	A	
Analysis Period (min)								15				

HCM Unsignalized Intersection Capacity Analysis
17: 20th St & Port of Tacoma Rd

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↔	↔		↔	↔	↔	↔	↔		↔	↔	↔	
Volume (veh/h)	60	124	1	2	65	606	1	19	0	438	16	21	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
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	
Hourly flow rate (vph)	65	135	1	2	71	659	1	21	0	476	17	23	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1039	1004	29	1061	1015	21	40						21
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1039	1004	29	1061	1015	21	40						21
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.2	4.1						4.2
tC, 2 stage (s)													
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2						2.3
p0 queue free %	0	16	100	95	56	37	100						69
cM capacity (veh/h)	38	161	1023	48	162	1048	1550						1533
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2							
Volume Total	65	136	732	22	317	199							
Volume Left	65	0	2	1	317	159							
Volume Right	0	1	659	0	0	23							
cSH	38	162	659	1550	1533	1533							
Volume to Capacity	1.70	0.84	1.11	0.00	0.31	0.31							
Queue Length 95th (ft)	173	142	542	0	33	33							
Control Delay (s)	567.5	88.8	93.0	0.4	8.4	7.2							
Lane LOS	F	F	F	A	A	A							
Approach Delay (s)	244.0		93.0	0.4	8.0								
Approach LOS	F		F										
Intersection Summary													
Average Delay	82.4												
Intersection Capacity Utilization	74.3%			ICU Level of Service			D						
Analysis Period (min)	15												

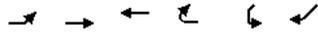
HCM Signalized Intersection Capacity Analysis
18: Lincoln Ave & Taylor Way

NMCR Tacoma
Existing PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	2	0	147	19	0	0	33	60	0	0	219	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0			5.0			5.0		
Lane Util. Factor	1.00	1.00	1.00	1.00			1.00	1.00	1.00			
Flt	1.00	0.85	1.00	1.00			1.00	1.00	1.00			
Flt Protected	0.95	1.00	0.95	0.95			0.95	1.00	1.00			
Satd. Flow (prot)	1805	1509	1805	1357			1226		1652			
Flt Permitted	0.76	1.00	0.76	0.45			1.00		1.00			
Satd. Flow (perm)	1439	1509	1437	642			1226		1652			
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)	2	0	160	21	0	0	36	65	0	0	238	1
RTOR Reduction (vph)	0	0	120	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2	40	21	0	0	36	65	0	0	239	0
Heavy Vehicles (%)	0%	0%	7%	0%	0%	0%	33%	55%	0%	0%	15%	0%
Turn Type	Perm		Perm	Perm	pm+pt			pm+pt				
Protected Phases	4		4	8	8			1	6	5 2		
Permitted Phases	4		4	8	6			2				
Actuated Green, G (s)	10.3		10.3	10.3	21.1			21.1	14.0			
Effective Green, g (s)	10.3		10.3	10.3	21.1			21.1	14.0			
Actuated g/C Ratio	0.25		0.25	0.25	0.51			0.51	0.34			
Clearance Time (s)	5.0		5.0	5.0	5.0			5.0	5.0			
Vehicle Extension (s)	2.5		2.5	2.5	2.5			2.5	2.5			
Lane Grp Cap (vph)	358		375	358	363			625	559			
v/s Ratio Prot					0.01			c0.05	c0.14			
v/s Ratio Perm	0.00		c0.03	0.01	0.05							
v/c Ratio	0.01		0.11	0.06	0.10			0.10	0.43			
Uniform Delay, d1	11.7		12.0	11.9	5.4			5.3	10.6			
Progression Factor	1.00		1.00	1.00	1.00			1.00	1.00			
Incremental Delay, d2	0.0		0.1	0.1	0.1			0.1	0.4			
Delay (s)	11.7		12.1	11.9	5.5			5.3	11.0			
Level of Service	B		B	B	A			A	B			
Approach Delay (s)	12.1		11.9			5.4			11.0			
Approach LOS	B		B			A			B			
Intersection Summary												
HCM Average Control Delay	10.3			HCM Level of Service			B					
HCM Volume to Capacity ratio	0.29											
Actuated Cycle Length (s)	41.4			Sum of lost time (s)			15.0					
Intersection Capacity Utilization	41.5%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
 19: Taylor Way & E 11th Street

NMCRC Tacoma
 Existing PM



Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations	↔	↑	↔		↔	
Sign Control		Stop	Stop		Stop	
Volume (vph)	0	103	132	119	46	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	112	143	129	50	0

Direction, Lane #	EB 1	EB 2	WB 1	SW 1
Volume Total (vph)	0	112	273	50
Volume Left (vph)	0	0	0	50
Volume Right (vph)	0	0	129	0
Hadj (s)	0.00	1.70	0.61	0.20
Departure Headway (s)	4.9	6.6	4.9	5.2
Degree Utilization, x	0.00	0.20	0.37	0.07
Capacity (veh/h)	741	536	714	646
Control Delay (s)	6.7	10.0	10.8	8.6
Approach Delay (s)	10.0		10.8	8.6
Approach LOS	B		B	A

Intersection Summary			
Delay		10.4	
HCM Level of Service		B	
Intersection Capacity Utilization	24.2%		ICU Level of Service A
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
1: SR 509 & Taylor Way

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑	↑↑	↑	↑↑	↑↑		↑	↑↑	↑	↑	↑↑	↑
Volume (vph)	310	953	179	336	947	7	351	134	247	25	332	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3213	3471	1553	3400	3501		1656	2490	1482	1626	2560	1346
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3213	3471	1553	3400	3501		1656	2490	1482	1626	2560	1346
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)	337	1036	195	365	1029	8	382	146	268	27	361	264
RTOR Reduction (vph)	0	0	112	0	0	0	0	0	175	0	0	214
Lane Group Flow (vph)	337	1036	83	365	1037	0	382	146	93	27	361	50
Heavy Vehicles (%)	9%	4%	4%	3%	3%	3%	9%	45%	9%	11%	41%	20%
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4						6			2
Actuated Green, G (s)	21.6	56.9	56.9	22.0	57.3		30.3	55.3	55.3	5.1	30.1	30.1
Effective Green, g (s)	21.6	56.9	56.9	22.0	57.3		30.3	55.3	55.3	5.1	30.1	30.1
Actuated g/C Ratio	0.14	0.36	0.36	0.14	0.36		0.19	0.35	0.35	0.03	0.19	0.19
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	436	1240	555	470	1259		315	864	514	52	484	254
v/s Ratio Prot	0.10	c0.30		c0.11	0.30		c0.23	0.06		0.02	c0.14	
v/s Ratio Perm			0.05					0.06				0.04
v/c Ratio	0.77	0.84	0.15	0.78	0.82		1.21	0.17	0.18	0.52	0.75	0.20
Uniform Delay, d1	66.5	46.9	34.8	66.3	46.4		64.5	36.1	36.2	75.9	61.0	54.4
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	8.0	4.9	0.1	7.6	4.4		121.4	0.1	0.1	6.4	5.9	0.3
Delay (s)	74.5	51.8	34.8	73.9	50.8		185.9	36.1	36.3	82.3	66.8	54.7
Level of Service	E	D	C	E	D		F	D	D	F	E	D
Approach Delay (s)		54.6			56.8			108.1			62.6	
Approach LOS		D			E			F			E	

Intersection Summary			
HCM Average Control Delay	66.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	159.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
2: 4th St E & Taylor Way

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Volume (veh/h)	10	0	29	63	1	2	7	741	31	5	709	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	0	32	68	1	2	8	805	34	5	771	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)								1317				
pX, platoon unblocked												
vC, conflicting volume	1205	1639	389	1265	1626	420	777			839		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1205	1639	389	1265	1626	420	777			839		
IC, single (s)	7.5	6.5	6.9	7.6	6.6	7.0	4.3			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	92	100	95	41	99	100	99			99		
cM capacity (veh/h)	138	100	616	117	99	580	797			742		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	42	72	8	537	302	5	514	263				
Volume Left	11	68	8	0	0	5	0	0				
Volume Right	32	2	0	0	34	0	0	7				
cSH	327	120	797	1700	1700	742	1700	1700				
Volume to Capacity	0.13	0.60	0.01	0.32	0.18	0.01	0.30	0.15				
Queue Length 95th (ft)	11	75	1	0	0	1	0	0				
Control Delay (s)	17.7	72.5	9.6	0.0	0.0	9.9	0.0	0.0				
Lane LOS	C	F	A			A						
Approach Delay (s)	17.7	72.5	0.1			0.1						
Approach LOS	C	F										

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
3: 8th St E & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↕		↔	↕	
Volume (vph)	1	0	1	77	0	34	0	737	12	9	762	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0			5.0			4.0		
Lane Util. Factor	1.00			1.00			0.95			1.00		
Frt	0.93			0.96			1.00			1.00		
Flt Protected	0.98			0.97			1.00			0.95		
Satd. Flow (prot)	1729			1661			3162			1656		
Flt Permitted	0.86			0.79			1.00			0.95		
Satd. Flow (perm)	1529			1361			3162			1656		
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)	1	0	1	84	0	37	0	801	13	10	828	0
RTOR Reduction (vph)	0	1	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	99	0	0	813	0	10	828	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	14%	8%	9%	21%	0%
Turn Type	Perm		Perm		Prot		Prot		Perm		Perm	
Protected Phases	8		4		4		1		6		5	
Permitted Phases	8		4		4		1		6		5	
Actuated Green, G (s)	7.0		7.0		20.4		0.8		25.2		0	
Effective Green, g (s)	7.0		7.0		20.4		0.8		25.2		0	
Actuated g/C Ratio	0.17		0.17		0.50		0.02		0.61		0	
Clearance Time (s)	4.0		4.0		5.0		4.0		5.0		0	
Vehicle Extension (s)	3.0		3.0		3.5		3.0		3.5		0	
Lane Grp Cap (vph)	260		231		1566		32		1825		0	
v/s Ratio Prot	0.00		c0.07		c0.26		0.01		c0.28		0	
v/s Ratio Perm	0.00		0.43		0.52		0.31		0.45		0	
v/c Ratio	14.2		15.3		7.1		19.9		4.3		0	
Uniform Delay, d1	1.00		1.00		1.00		1.00		1.00		0	
Incremental Delay, d2	0.0		1.3		0.3		5.5		0.2		0	
Delay (s)	14.2		16.6		7.4		25.5		4.5		0	
Level of Service	B		B		A		C		A		0	
Approach Delay (s)	14.2		16.6		7.4		4.8		8.1		0	
Approach LOS	B		B		A		A		A		0	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	41.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	37.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: 12th St E & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↕		↔	↕	
Volume (vph)	25	174	60	125	142	56	74	677	77	91	733	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.5			5.0			5.0		
Lane Util. Factor	1.00			1.00			1.00			0.95		
Frt	1.00			0.96			1.00			0.98		
Flt Protected	0.95			1.00			0.95			1.00		
Satd. Flow (prot)	1805			1827			1703			1716		
Flt Permitted	0.62			1.00			0.56			1.00		
Satd. Flow (perm)	1185			1827			1009			1716		
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)	27	189	65	136	154	61	80	736	84	99	797	21
RTOR Reduction (vph)	0	22	0	0	26	0	0	11	0	0	3	0
Lane Group Flow (vph)	27	232	0	136	189	0	80	809	0	99	815	0
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	9%	16%	9%	8%	21%	8%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		8		2		2		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	12.3		12.3		11.8		11.8		20.0		20.0	
Effective Green, g (s)	12.3		12.3		11.8		11.8		20.0		20.0	
Actuated g/C Ratio	0.30		0.30		0.29		0.29		0.48		0.48	
Clearance Time (s)	4.0		4.0		4.5		4.5		5.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.5		3.5	
Lane Grp Cap (vph)	353		544		288		490		265		1493	
v/s Ratio Prot	0.02		0.13		c0.13		0.11		0.15		0.18	
v/s Ratio Perm	0.08		0.43		0.47		0.39		0.30		0.54	
v/c Ratio	10.4		11.7		12.2		11.8		6.4		7.4	
Uniform Delay, d1	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	0.1		0.5		1.2		0.5		0.8		0.4	
Delay (s)	10.5		12.2		13.4		12.4		7.2		7.9	
Level of Service	B		B		B		B		A		A	
Approach Delay (s)	12.0		12.8		7.8		8.1		8.1		8.1	
Approach LOS	B		B		A		A		A		A	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	41.3	Sum of lost time (s)	9.5
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: SR 99 & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	132	553	356	603	696	266	459	393	723	279	582	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.90		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3343	1495	1626	3117		3242	2932		1530	2914	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3343	1495	1626	3117		3242	2932		1530	2914	
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)	143	601	387	655	757	289	499	427	786	303	633	99
RTOR Reduction (vph)	0	0	13	0	34	0	0	289	0	0	11	0
Lane Group Flow (vph)	143	601	374	655	1012	0	499	924	0	303	721	0
Heavy Vehicles (%)	8%	8%	8%	11%	11%	11%	8%	17%	8%	18%	23%	11%
Turn Type	Prot	pm+ov	Prot	Split	Split		Split	Split		Split	Split	
Protected Phases	1	6	4	5	2		4	4		3	3	
Permitted Phases			6									
Actuated Green, G (s)	13.2	22.3	44.6	26.5	35.6		22.3	22.3		25.3	25.3	
Effective Green, g (s)	13.2	22.3	44.6	26.5	35.6		22.3	22.3		25.3	25.3	
Actuated g/C Ratio	0.11	0.19	0.39	0.23	0.31		0.19	0.19		0.22	0.22	
Clearance Time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Vehicle Extension (s)	3.0	2.7	3.2	3.0	2.7		3.2	3.2		4.2	4.2	
Lane Grp Cap (vph)	192	648	580	375	965		629	569		337	641	
v/s Ratio Prot	0.09	0.18	0.12	c0.40	c0.32		0.15	c0.32		0.20	c0.25	
v/s Ratio Perm			0.12									
v/c Ratio	0.74	0.93	0.64	1.75	1.05		0.79	1.62		0.90	1.12	
Uniform Delay, d1	49.3	45.6	28.7	44.2	39.7		44.2	46.4		43.6	44.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.89	0.79		1.00	1.00	
Incremental Delay, d2	14.5	19.4	2.3	346.9	42.6		8.2	287.0		25.9	75.1	
Delay (s)	63.8	65.0	31.0	391.1	82.3		47.3	323.6		69.5	120.0	
Level of Service	E	E	C	F	F		D	F		E	F	
Approach Delay (s)		53.2			201.2			243.1			105.2	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	166.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	113.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: I-5 SB On & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	0	0	0	262	0	363	0	965	511	0	908	538
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		4.0		4.0		4.0
Lane Util. Factor				1.00		1.00		0.95		1.00		1.00
Frt				1.00		0.85		0.95		1.00		0.85
Flt Protected				0.95		1.00		1.00		1.00		1.00
Satd. Flow (prot)				1671		1442		3250		1681		1455
Flt Permitted				0.95		1.00		1.00		1.00		1.00
Satd. Flow (perm)				1671		1442		3250		1681		1455
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	285	0	395	0	1049	555	0	987	585
RTOR Reduction (vph)	0	0	0	0	0	105	0	73	0	0	0	0
Lane Group Flow (vph)	0	0	0	285	0	290	0	1531	0	0	987	585
Heavy Vehicles (%)	0%	0%	0%	8%	0%	12%	0%	6%	4%	0%	13%	11%
Turn Type				Prot		custom						Free
Protected Phases				3		3	4	6			2	4
Permitted Phases												Free
Actuated Green, G (s)				23.3		34.3		72.7			83.7	115.0
Effective Green, g (s)				23.3		34.3		72.7			83.7	115.0
Actuated g/C Ratio				0.20		0.30		0.63			0.73	1.00
Clearance Time (s)				4.0				4.0				
Vehicle Extension (s)				3.0				3.0				
Lane Grp Cap (vph)				339		430		2055			1223	1455
v/s Ratio Prot				c0.17		0.20		0.47			c0.59	
v/s Ratio Perm												0.40
v/c Ratio				0.84		0.67		0.75			0.81	0.40
Uniform Delay, d1				44.1		35.4		14.7			10.3	0.0
Progression Factor				1.00		1.00		0.88			0.98	1.00
Incremental Delay, d2				16.9		4.1		1.7			0.4	0.1
Delay (s)				60.9		39.6		14.6			10.5	0.1
Level of Service				E		D		B			B	A
Approach Delay (s)				0.0		48.5		14.6			6.6	
Approach LOS				A		D		B			A	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: I-5 EB Off & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↖			↖		↕		↖	↗	↗
Volume (vph)	0	0	458	0	0	393	0	1117	314	459	836	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0			4.0		4.0		4.0	4.0	
Lane Util. Factor			1.00			1.00		0.95		1.00	1.00	
Flpb, ped/bikes			0.99			1.00		1.00		1.00	1.00	
Frt			1.00			1.00		1.00		1.00	1.00	
Flt Protected			0.86			0.86		0.97		1.00	1.00	
Satd. Flow (prot)			1607			1467		3364		1583	1743	
Flt Permitted			1.00			1.00		1.00		0.09	1.00	
Satd. Flow (perm)			1607			1467		3364		156	1743	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	498	0	0	427	0	1214	341	499	909	0
RTOR Reduction (vph)	0	0	0	0	0	41	0	19	0	0	0	0
Lane Group Flow (vph)	0	0	498	0	0	386	0	1536	0	499	909	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	1%	0%	0%	12%	0%	4%	3%	14%	9%	0%
Turn Type			Free			custom				pm+pt		
Protected Phases							2			1	6	
Permitted Phases			Free			1				6		
Actuated Green, G (s)			115.0			35.6		71.4		111.0	115.0	
Effective Green, g (s)			115.0			35.6		71.4		111.0	115.0	
Actuated g/C Ratio			1.00			0.31		0.62		0.97	1.00	
Clearance Time (s)						4.0		4.0		4.0	4.0	
Vehicle Extension (s)						3.0		3.0		3.0	3.0	
Lane Grp Cap (vph)			1607			454		2089		592	1743	
v/s Ratio Prot								0.46		0.26	0.52	
v/s Ratio Perm			0.31			c0.26				c0.55		
v/c Ratio			0.31			0.85		0.74		0.84	0.52	
Uniform Delay, d1			0.0			37.2		15.2		19.0	0.0	
Progression Factor			1.00			1.00		0.87		1.03	1.00	
Incremental Delay, d2			0.5			14.2		1.2		7.8	0.8	
Delay (s)			0.5			51.4		14.5		27.3	0.8	
Level of Service			A			D		B		C	A	
Approach Delay (s)		0.5			51.4			14.5			10.2	
Approach LOS		A			D			B			B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
8: 20th St E & 54 AVE E

NMCRRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↖			↖		↕		↖	↗	↗
Volume (vph)	337	300	110	36	135	598	99	468	47	439	546	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	0.91	0.91			1.00	1.00	1.00	0.95		0.91	0.91	
Frt	1.00	0.97			1.00	0.85	1.00	0.99		1.00	0.95	
Flt Protected	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1579	3186			1843	1583	1787	3463		1564	3049	
Flt Permitted	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1579	3186			1843	1583	1787	3463		1564	3049	
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)	366	326	120	39	147	650	108	509	51	477	593	323
RTOR Reduction (vph)	0	22	0	0	0	36	0	7	0	0	50	0
Lane Group Flow (vph)	271	519	0	0	186	614	108	553	0	429	914	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	1%	3%	1%	5%	9%	5%
Turn Type	Split			Split	pm+ov	Split				Split		
Protected Phases	1	1		3	3	2	4	4		2	2	
Permitted Phases						3						
Actuated Green, G (s)	23.1	23.1				11.0	56.4	17.5	17.5	45.4	45.4	
Effective Green, g (s)	23.1	23.1				11.0	56.4	17.5	17.5	45.4	45.4	
Actuated g/C Ratio	0.20	0.20				0.10	0.49	0.15	0.15	0.39	0.39	
Clearance Time (s)	4.5	4.5				4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.5	3.5				3.0	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	317	640				176	838	272	527	617	1204	
v/s Ratio Prot	c0.17	0.16				c0.10	c0.29	0.06	c0.16	0.27	0.30	
v/s Ratio Perm							0.10					
v/c Ratio	0.85	0.81				1.06	0.73	0.40	1.05	0.70	0.76	
Uniform Delay, d1	44.3	43.9				52.0	23.3	44.0	48.8	29.0	30.1	
Progression Factor	1.00	1.00				1.00	1.00	1.00	1.00	1.06	1.06	
Incremental Delay, d2	20.0	7.9				83.7	3.3	0.3	52.9	5.8	4.1	
Delay (s)	64.3	51.8				135.7	26.7	44.3	101.6	36.5	36.0	
Level of Service	E	D				F	C	D	F	D	D	
Approach Delay (s)		56.0				50.9		92.4			36.1	
Approach LOS		E				D		F			D	

Intersection Summary			
HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: SR 509 (N Frontage Rd) & Alexander Ave E

NMCRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↔		↔	↔			↔	↔
Volume (vph)	0	0	0	82	1483	0	403	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0				5.0	5.0
Lane Util. Factor				1.00	0.95		1.00					
Frt				1.00	1.00		1.00					
Flt Protected				0.95	1.00		0.95					
Satd. Flow (prot)				1770	3539		1787					
Flt Permitted				0.95	1.00		0.95					
Satd. Flow (perm)				1770	3539		1787					
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	89	1612	0	438	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	89	1612	0	438	0	0	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%	1%	0%	0%	0%	0%	0%
Turn Type				Perm			Prot					
Protected Phases					8		1	6			2	
Permitted Phases				8								
Actuated Green, G (s)				60.0	60.0		30.0					
Effective Green, g (s)				60.0	60.0		30.0					
Actuated g/C Ratio				0.60	0.60		0.30					
Clearance Time (s)				5.0	5.0		5.0					
Vehicle Extension (s)				2.5	2.5		2.5					
Lane Grp Cap (vph)				1062	2123		536					
v/s Ratio Prot					c0.46		c0.25					
v/s Ratio Perm				0.05								
v/c Ratio				0.08	0.76		0.82					
Uniform Delay, d1				8.4	14.7		32.5					
Progression Factor				1.00	1.00		1.00					
Incremental Delay, d2				0.0	1.5		9.2					
Delay (s)				8.4	16.2		41.6					
Level of Service				A	B		D					
Approach Delay (s)		0.0			15.8			41.6			0.0	
Approach LOS		A			B			D			A	
Intersection Summary												
HCM Average Control Delay				21.1			HCM Level of Service				C	
HCM Volume to Capacity ratio				0.78								
Actuated Cycle Length (s)				100.0			Sum of lost time (s)		10.0			
Intersection Capacity Utilization				84.2%			ICU Level of Service				E	
Analysis Period (min)				15								

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: SR 509 (S Frontage Rd) & Alexander Ave E

NMCRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔						↔	↔	↔	↔	↔
Volume (vph)	22	1087	337	0	0	0	0	360	108	14	83	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0						5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95						0.95		1.00	0.95	
Frt	1.00	0.96						0.97		1.00	1.00	
Flt Protected	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (prot)	1736	3300						3451		1805	3610	
Flt Permitted	0.95	1.00						1.00		0.95	1.00	
Satd. Flow (perm)	1736	3300						3451		1805	3610	
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)	24	1182	366	0	0	0	0	391	117	15	90	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	24	1538	0	0	0	0	0	486	0	15	90	0
Heavy Vehicles (%)	4%	6%	4%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type				Perm							Prot	
Protected Phases					4			6			5	2
Permitted Phases				4								
Actuated Green, G (s)		60.5	60.5					18.1		1.2	24.3	
Effective Green, g (s)		60.5	60.5					18.1		1.2	24.3	
Actuated g/C Ratio		0.64	0.64					0.19		0.01	0.26	
Clearance Time (s)		5.0	5.0					5.0		5.0	5.0	
Vehicle Extension (s)		2.5	2.5					2.5		2.5	2.5	
Lane Grp Cap (vph)		1108	2106					659		23	925	
v/s Ratio Prot								c0.14		c0.01	0.02	
v/s Ratio Perm		0.01										
v/c Ratio		0.02	0.73					0.74		0.65	0.10	
Uniform Delay, d1		6.3	11.6					36.1		46.6	26.9	
Progression Factor		1.00	1.00					1.00		1.00	1.00	
Incremental Delay, d2		0.0	1.3					4.1		46.4	0.0	
Delay (s)		6.3	12.9					40.2		93.0	26.9	
Level of Service		A	B					D		F	C	
Approach Delay (s)		12.8				0.0		40.2			36.4	
Approach LOS		B				A		D			D	
Intersection Summary												
HCM Average Control Delay								20.3			HCM Level of Service	C
HCM Volume to Capacity ratio								0.73				
Actuated Cycle Length (s)								94.8			Sum of lost time (s)	15.0
Intersection Capacity Utilization								84.2%			ICU Level of Service	E
Analysis Period (min)								15				

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Norpoint Way & SR 509 (Marine View Drive)

NMCRC Tacoma
No Action PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑↑	↑	↑	↑	↑	↑
Volume (vph)	729	25	638	751	24	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	4.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3090	1425	1676	1425	1533	1613
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3090	1425	1676	1425	1533	1613
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	792	27	693	816	26	463
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	792	27	693	816	26	463
Heavy Vehicles (%)	2%	2%	2%	2%	6%	6%
Turn Type	Free		Free		Prot	
Protected Phases	8		6		5	2
Permitted Phases	Free		Free		6	
Actuated Green, G (s)	34.0	114.7	61.1	114.7	4.6	70.7
Effective Green, g (s)	34.0	114.7	61.1	114.7	4.6	70.7
Actuated g/C Ratio	0.30	1.00	0.53	1.00	0.04	0.62
Clearance Time (s)	5.0		5.0		5.0	5.0
Vehicle Extension (s)	2.5		2.5		2.5	2.5
Lane Grp Cap (vph)	916	1425	893	1425	61	994
v/s Ratio Prot	c0.26		c0.41		0.02	0.29
v/s Ratio Perm		0.02		c0.57		
v/c Ratio	0.86	0.02	0.78	0.57	0.43	0.47
Uniform Delay, d1	38.2	0.0	21.3	0.0	53.8	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.0	4.1	1.7	3.5	0.3
Delay (s)	46.6	0.0	25.5	1.7	57.2	12.1
Level of Service	D	A	C	A	E	B
Approach Delay (s)	45.1		12.6		14.5	
Approach LOS	D		B		B	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	114.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: N Frontage Rd & Port of Tacoma Rd

NMCRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑	↑	↑↑			↑↑	↑	
Volume (vph)	0	0	0	97	112	72	209	166	0	0	516	190	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					5.0	5.0	5.0	5.0			5.0	4.0	
Lane Util. Factor					0.95	1.00	1.00	0.95			0.95	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.98	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					3459	1583	1736	3438			3438	1538	
Flt Permitted					0.98	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					3459	1583	1736	3438			3438	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)	0	0	0	105	122	78	227	180	0	0	561	207	
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	227	15	227	180	0	0	561	207	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	4%	5%	0%	0%	5%	5%	
Turn Type				Perm		Perm		Prot					
Protected Phases				8		8		1		6		2	
Permitted Phases				8		8							
Actuated Green, G (s)				11.0		11.0		13.6		34.8		16.2	
Effective Green, g (s)				11.0		11.0		13.6		34.8		16.2	
Actuated g/C Ratio				0.20		0.20		0.24		0.62		0.29	
Clearance Time (s)				5.0		5.0		5.0		5.0		5.0	
Vehicle Extension (s)				2.5		2.5		2.5		2.5		2.5	
Lane Grp Cap (vph)				682		312		423		2144		998	
v/s Ratio Prot								c0.13		0.05		c0.16	
v/s Ratio Perm				0.07		0.01							
v/c Ratio				0.33		0.05		0.54		0.08		0.56	
Uniform Delay, d1				19.2		18.2		18.4		4.2		16.8	
Progression Factor				1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2				0.2		0.0		1.0		0.0		0.6	
Delay (s)				19.5		18.2		19.4		4.2		17.4	
Level of Service				B		B		B		A		B	
Approach Delay (s)				0.0		19.1		12.7				12.7	
Approach LOS				A		B		B					

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
13: 12th St E & Port of Tacoma Rd

NMCRCTacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↗			↖	↗
Volume (vph)	65	3	129	90	4	26	54	286	2	0	453	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0		5.0			5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Frt	1.00	0.85	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	1.00
Flt Protected	0.95	1.00	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1777	1583	1709	1770	3536	3505	1568					
Flt Permitted	0.95	1.00	0.96	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1777	1583	1709	1770	3536	3505	1568					
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)	71	3	140	98	4	28	59	311	2	0	492	196
RTOR Reduction (vph)	0	0	117	0	5	0	0	0	0	0	0	63
Lane Group Flow (vph)	0	74	23	0	125	0	59	313	0	0	492	133
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	0%	3%	3%
Turn Type	Split	Perm	Split	Prot							custom	
Protected Phases	4	4	3	3	1	6					2	
Permitted Phases		4										6
Actuated Green, G (s)	10.8	10.8		12.2	6.5	27.5					16.0	27.5
Effective Green, g (s)	10.8	10.8		12.2	6.5	27.5					16.0	27.5
Actuated g/C Ratio	0.16	0.16		0.19	0.10	0.42					0.24	0.42
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0					5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5	2.5	2.5					2.5	2.5
Lane Grp Cap (vph)	293	261		318	176	1485					856	658
v/s Ratio Prot	c0.04			c0.07	c0.03	0.09					c0.14	
v/s Ratio Perm		0.01										0.08
v/c Ratio	0.25	0.09		0.39	0.34	0.21					0.57	0.20
Uniform Delay, d1	23.8	23.2		23.4	27.5	12.1					21.8	12.0
Progression Factor	1.00	1.00		1.00	1.00	1.00					1.00	1.00
Incremental Delay, d2	0.3	0.1		0.6	0.8	0.1					0.8	0.1
Delay (s)	24.2	23.3		24.0	28.3	12.1					22.5	12.2
Level of Service	C	C		C	C	B					C	B
Approach Delay (s)	23.6			24.0		14.7					19.6	
Approach LOS	C			C		B					B	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	65.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Pacific HWY & Port of Tacoma Rd

NMCRCTacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗	↖	↗		↖	↗			↖	↗
Volume (vph)	41	268	125	451	574	92	81	222	141	108	457	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	6.0		6.0	6.0		5.0			5.0	5.0
Lane Util. Factor	1.00	0.95	0.97	0.95	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Frt	1.00	0.95	1.00	0.98	1.00	0.94	1.00	0.94	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1687	3213	3335	3367	1583	2982	1492	2956				
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1687	3213	3335	3367	1583	2982	1492	2956				
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)	45	291	136	490	624	100	88	241	153	117	497	33
RTOR Reduction (vph)	0	43	0	0	10	0	0	92	0	0	4	0
Lane Group Flow (vph)	45	384	0	490	714	0	88	302	0	117	526	0
Heavy Vehicles (%)	7%	7%	7%	5%	5%	5%	14%	14%	14%	21%	21%	21%
Turn Type	Prot	Prot	Prot	Split	Split							
Protected Phases	1	6	5	2	4	7	8	4	7	8	3	3
Permitted Phases												
Actuated Green, G (s)	6.8	21.0	12.0	27.2	38.3	38.3					22.1	22.1
Effective Green, g (s)	6.8	21.0	12.0	27.2	33.8	33.8					22.1	22.1
Actuated g/C Ratio	0.06	0.18	0.10	0.24	0.29	0.29					0.19	0.19
Clearance Time (s)	5.0	6.0	6.0	6.0							5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0							3.5	3.5
Lane Grp Cap (vph)	100	587	348	797	466	877					287	569
v/s Ratio Prot	0.03	0.12	c0.15	c0.21	0.06	c0.10					0.08	c0.18
v/s Ratio Perm												
v/c Ratio	0.45	0.65	1.41	0.90	0.19	0.34					0.41	0.92
Uniform Delay, d1	52.2	43.6	51.4	42.5	30.3	31.8					40.7	45.6
Progression Factor	1.00	1.00	1.00	1.00	0.88	0.88					1.00	1.00
Incremental Delay, d2	3.2	2.6	200.0	12.6	0.1	0.1					1.1	21.2
Delay (s)	55.4	46.2	251.5	55.1	26.7	28.0					41.8	66.7
Level of Service	E	D	F	E	C	C					D	E
Approach Delay (s)		47.1		134.4		27.7						62.2
Approach LOS		D		F		C						E

Intersection Summary			
HCM Average Control Delay	84.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	21.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: I-5 WB Ramp & Tacoma Rd

NMCRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	0	0	0	15	1	129	399	303	1	0	319	659	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.5	4.5	4.5	5.0			5.0	4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00	
Frt					0.88	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1187	1154	1703	3404			1727	1468	
Flt Permitted					0.99	1.00	0.55	1.00			1.00	1.00	
Satd. Flow (perm)					1187	1154	991	3404			1727	1468	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	16	1	140	434	329	1	0	347	716	
RTOR Reduction (vph)	0	0	0	0	58	70	0	0	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	22	7	434	330	0	0	347	716	
Heavy Vehicles (%)	0%	0%	0%	32%	32%	33%	6%	6%	6%	0%	10%	10%	
Turn Type				Split		Perm	custom					Free	
Protected Phases				8		8		7		4	5	6	
Permitted Phases						8		3		4	6	Free	
Actuated Green, G (s)					10.0	10.0		72.9		44.8		78.1	114.9
Effective Green, g (s)					10.0	10.0		61.9		44.8		66.1	114.9
Actuated g/C Ratio					0.09	0.09		0.54		0.39		0.58	1.00
Clearance Time (s)					4.5	4.5		4.5					
Vehicle Extension (s)					4.0	4.0		3.0					
Lane Grp Cap (vph)					103	100		613		1327		994	1468
v/s Ratio Prot					0.02			c0.08		0.10		0.20	
v/s Ratio Perm						0.01		c0.30				c0.49	
v/c Ratio					0.22	0.07		0.71		0.25		0.35	0.49
Uniform Delay, d1					48.8	48.2		21.8		23.7		13.0	0.0
Progression Factor					1.00	1.00		1.00		1.00		0.04	1.00
Incremental Delay, d2					1.5	0.4		3.7		0.0		0.0	0.1
Delay (s)					50.3	48.6		25.5		23.7		0.5	0.1
Level of Service					D	D		C		C		A	A
Approach Delay (s)		0.0				49.4			24.7			0.2	
Approach LOS		A				D			C			A	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
16: I-5 EB Off & Port of Tacoma Rd

NMCRC Tacoma
No Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	0	0	0	0	584	88	241	221	0
Sign Control			Stop			Stop		Free			Free	
Grade			0%			0%		0%			0%	
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	635	96	262	240	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1447	1495	240	1447	1447	683	240			730		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1447	1495	240	1447	1447	683	240			730		
IC, single (s)	7.1	6.5	6.3	7.1	6.5	6.3	4.1			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	100	100	100	100			68		
cM capacity (veh/h)	83	84	784	83	90	431	1338			813		

Direction, Lane #	NB 1	SB 1	SB 2
Volume Total	730	262	240
Volume Left	0	262	0
Volume Right	96	0	0
cSH	1700	813	1700
Volume to Capacity	0.43	0.32	0.14
Queue Length 95th (ft)	0	35	0
Control Delay (s)	0.0	11.5	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.0	
Approach LOS			

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
17: 20th St & Port of Tacoma Rd

NMCRC Tacoma
No Action PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↔	↔		↔	↔			↔		↔	↔		
Volume (veh/h)	66	137	1	2	66	669	1	21	0	484	18	23	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
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	
Hourly flow rate (vph)	72	149	1	2	72	727	1	23	0	526	20	25	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1145	1109	32	1172	1122	23	45						23
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1145	1109	32	1172	1122	23	45						23
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.2	4.1						4.2
tC, 2 stage (s)													
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2						2.3
p0 queue free %	0	0	100	0	46	30	100						66
cM capacity (veh/h)	23	133	1019	0	133	1045	1545						1530
Direction, Lane #													
	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2							
Volume Total	72	150	801	24	351	220							
Volume Left	72	0	2	1	351	175							
Volume Right	0	1	727	0	0	25							
cSH	23	134	0	1545	1530	1530							
Volume to Capacity	3.18	1.12	Err	0.00	0.34	0.34							
Queue Length 95th (ft)	Err	215	Err	0	39	39							
Control Delay (s)	Err	179.2	Err	0.3	8.6	7.5							
Lane LOS	F	F	F	A	A	A							
Approach Delay (s)	3356.2		Err		0.3		8.1						
Approach LOS	F		F										
Intersection Summary													
Average Delay	Err												
Intersection Capacity Utilization	80.6%			ICU Level of Service			D						
Analysis Period (min)	15												

HCM Signalized Intersection Capacity Analysis
18: Lincoln Ave & Taylor Way

NMCRC Tacoma
No Action PM Peak Hour



Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔
Volume (vph)	6	285	132	1	1	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.88	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1245	1114	1280	950	1210	
Flt Permitted	0.67	1.00	0.75	1.00	1.00	
Satd. Flow (perm)	872	1114	1010	950	1210	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	310	143	1	1	11
RTOR Reduction (vph)	0	237	0	0	6	0
Lane Group Flow (vph)	7	73	143	1	6	0
Heavy Vehicles (%)	45%	45%	41%	100%	0%	41%
Turn Type	custom		Perm			
Protected Phases			6		2	
Permitted Phases	8	8	6			
Actuated Green, G (s)	6.4	6.4	12.8	12.8	12.8	
Effective Green, g (s)	6.4	6.4	12.8	12.8	12.8	
Actuated g/C Ratio	0.24	0.24	0.47	0.47	0.47	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	205	262	475	447	569	
v/s Ratio Prot			0.00		0.01	
v/s Ratio Perm	0.01	c0.07	c0.14			
v/c Ratio	0.03	0.28	0.30	0.00	0.01	
Uniform Delay, d1	8.0	8.5	4.4	3.8	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	0.6	0.4	0.0	0.0	
Delay (s)	8.1	9.1	4.8	3.8	3.8	
Level of Service	A	A	A	A	A	
Approach Delay (s)	9.1		4.8		3.8	
Approach LOS	A		A		A	
Intersection Summary						
HCM Average Control Delay	7.6		HCM Level of Service		A	
HCM Volume to Capacity ratio	0.29					
Actuated Cycle Length (s)	27.2		Sum of lost time (s)		8.0	
Intersection Capacity Utilization	27.6%		ICU Level of Service		A	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
19: E 11th Street & Taylor Way

NMCRC Tacoma
No Action PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↑	↔	↔	↑
Sign Control	Stop		Stop			Stop
Volume (vph)	46	0	104	119	0	87
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	50	0	113	129	0	95
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total (vph)	50	113	129	0	95	
Volume Left (vph)	50	0	0	0	0	
Volume Right (vph)	0	0	129	0	0	
Hadj (s)	0.20	0.76	-0.70	0.00	0.70	
Departure Headway (s)	4.9	5.5	4.0	4.8	5.5	
Degree Utilization, x	0.07	0.17	0.14	0.00	0.15	
Capacity (veh/h)	685	643	876	746	636	
Control Delay (s)	8.2	8.4	6.5	6.6	8.3	
Approach Delay (s)	8.2	7.4		8.3		
Approach LOS	A	A		A		
Intersection Summary						
Delay						7.7
HCM Level of Service						A
Intersection Capacity Utilization	15.5%		ICU Level of Service		A	
Analysis Period (min)						15

HCM Unsignalized Intersection Capacity Analysis
20: Taylor Overpass & Taylor Way

NMCRC Tacoma
No Action PM Peak Hour

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Stop			Stop	Stop	
Volume (vph)	48	112	392	28	5	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	122	426	30	5	72
Direction, Lane #	WB 1	WB 2	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	52	122	426	30	5	72
Volume Left (vph)	52	0	426	0	0	0
Volume Right (vph)	0	122	0	0	0	72
Hadj (s)	2.20	0.06	1.20	1.70	1.70	1.00
Departure Headway (s)	8.3	6.2	6.4	6.9	7.4	6.7
Degree Utilization, x	0.12	0.21	0.76	0.06	0.01	0.13
Capacity (veh/h)	410	545	554	506	465	515
Control Delay (s)	11.2	9.6	25.7	9.2	9.3	9.5
Approach Delay (s)	10.1		24.6		9.5	
Approach LOS	B		C		A	
Intersection Summary						
Delay						19.4
HCM Level of Service						C
Intersection Capacity Utilization	38.4%		ICU Level of Service		A	
Analysis Period (min)						15

HCM Signalized Intersection Capacity Analysis
1: SR 509 & Taylor Way

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑	↑↑	↑	↑↑	↑↑		↑	↑↑	↑	↑↑	↑↑	↑
Volume (vph)	311	953	179	336	947	7	351	136	247	25	340	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3213	3471	1553	3400	3501		1656	2490	1482	1626	2560	1346
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3213	3471	1553	3400	3501		1656	2490	1482	1626	2560	1346
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)	338	1036	195	365	1029	8	382	148	268	27	370	271
RTOR Reduction (vph)	0	0	113	0	0	0	0	0	174	0	0	219
Lane Group Flow (vph)	338	1036	82	365	1037	0	382	148	94	27	370	52
Heavy Vehicles (%)	9%	4%	4%	3%	3%	3%	9%	45%	9%	11%	41%	20%
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4					6				2
Actuated Green, G (s)	21.7	57.1	57.1	22.1	57.5		30.3	56.0	56.0	5.1	30.8	30.8
Effective Green, g (s)	21.7	57.1	57.1	22.1	57.5		30.3	56.0	56.0	5.1	30.8	30.8
Actuated g/C Ratio	0.14	0.36	0.36	0.14	0.36		0.19	0.35	0.35	0.03	0.19	0.19
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	435	1236	553	469	1256		313	870	518	52	492	259
v/s Ratio Prot	0.11	c0.30		c0.11	0.30		c0.23	0.06		0.02	c0.14	
v/s Ratio Perm			0.05					0.06				0.04
v/c Ratio	0.78	0.84	0.15	0.78	0.83		1.22	0.17	0.18	0.52	0.75	0.20
Uniform Delay, d1	67.0	47.4	35.1	66.7	46.8		65.0	36.1	36.2	76.4	61.1	54.4
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	8.2	5.0	0.1	7.7	4.5		124.6	0.1	0.1	6.4	6.1	0.3
Delay (s)	75.1	52.4	35.2	74.4	51.3		189.6	36.1	36.3	82.8	67.2	54.7
Level of Service	E	D	D	E	D		F	D	D	F	E	D
Approach Delay (s)		55.2			57.3			109.6			62.8	
Approach LOS		E			E			F			E	
Intersection Summary												
HCM Average Control Delay			66.8	HCM Level of Service				E				
HCM Volume to Capacity ratio			0.89									
Actuated Cycle Length (s)			160.3	Sum of lost time (s)				20.0				
Intersection Capacity Utilization			81.4%	ICU Level of Service				D				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
2: 4th St E & Taylor Way

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔		↔	↔		↔	↔		
Volume (veh/h)	10	0	29	63	1	2	7	743	31	5	717	6	
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
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	
Hourly flow rate (vph)	11	0	32	68	1	2	8	808	34	5	779	7	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type							None						
Median storage (veh)													
Upstream signal (ft)	1317												
pX, platoon unblocked													
vC, conflicting volume	1215	1650	393	1272	1636	421	786			841			
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1215	1650	393	1272	1636	421	786			841			
IC, single (s)	7.5	6.5	6.9	7.6	6.6	7.0	4.3			4.3			
IC, 2 stage (s)													
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3			
p0 queue free %	92	100	95	41	99	100	99			99			
cM capacity (veh/h)	136	98	612	116	97	579	791			741			
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3					
Volume Total	42	72	8	538	303	5	520	266					
Volume Left	11	68	8	0	0	5	0	0					
Volume Right	32	2	0	0	34	0	0	7					
cSH	322	118	791	1700	1700	741	1700	1700					
Volume to Capacity	0.13	0.61	0.01	0.32	0.18	0.01	0.31	0.16					
Queue Length 95th (ft)	11	76	1	0	0	1	0	0					
Control Delay (s)	17.8	74.1	9.6	0.0	0.0	9.9	0.0	0.0					
Lane LOS	C	F	A			A							
Approach Delay (s)	17.8	74.1	0.1			0.1							
Approach LOS	C	F											
Intersection Summary													
Average Delay			3.5										
Intersection Capacity Utilization			38.5%	ICU Level of Service				A					
Analysis Period (min)			15										

HCM Signalized Intersection Capacity Analysis
3: 8th St E & 54 AVE E

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	1	0	1	77	0	34	0	739	12	9	770	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0		5.0		4.0		5.0	
Lane Util. Factor	1.00		1.00		0.95		1.00		0.95		1.00	
Frt	0.93		0.96		1.00		1.00		1.00		1.00	
Flt Protected	0.98		0.97		1.00		0.95		1.00		1.00	
Satd. Flow (prot)	1729		1661		3162		1656		2983		2983	
Flt Permitted	0.86		0.79		1.00		0.95		1.00		1.00	
Satd. Flow (perm)	1529		1361		3162		1656		2983		2983	
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)	1	0	1	84	0	37	0	803	13	10	837	0
RTOR Reduction (vph)	0	1	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	99	0	0	815	0	10	837	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	14%	8%	9%	21%	0%
Turn Type	Perm		Perm		Prot		Prot		Perm		Perm	
Protected Phases	8		4		4		1 6		5		2	
Permitted Phases	8		4		4		1 6		5		2	
Actuated Green, G (s)	7.0		7.0		20.6		0.8		25.4		25.4	
Effective Green, g (s)	7.0		7.0		20.6		0.8		25.4		25.4	
Actuated g/C Ratio	0.17		0.17		0.50		0.02		0.61		0.61	
Clearance Time (s)	4.0		4.0		5.0		4.0		5.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.5		3.0		3.5		3.5	
Lane Grp Cap (vph)	259		230		1573		32		1830		1830	
v/s Ratio Prot	0.00		c0.07		c0.26		0.01		c0.28		c0.28	
v/s Ratio Perm	0.00		0.43		0.52		0.31		0.46		0.46	
v/c Ratio	0.00		0.43		0.52		0.31		0.46		0.46	
Uniform Delay, d1	14.3		15.4		7.0		20.0		4.3		4.3	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	0.0		1.3		0.3		5.5		0.2		0.2	
Delay (s)	14.3		16.7		7.4		25.6		4.5		4.5	
Level of Service	B		B		A		C		A		A	
Approach Delay (s)	14.3		16.7		7.4		4.8		8.1		8.1	
Approach LOS	B		B		A		A		A		A	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	41.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: 12th St E & 54 AVE E

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔		↔	↔		↔	↔	
Volume (vph)	25	174	60	125	142	56	74	679	77	91	741	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.5		5.0		5.0		5.0	
Lane Util. Factor	1.00		1.00		1.00		1.00		0.95		1.00	
Frt	1.00		0.96		1.00		1.00		0.98		1.00	
Flt Protected	0.95		1.00		0.95		1.00		0.95		1.00	
Satd. Flow (prot)	1805		1827		1703		1716		1656		3083	
Flt Permitted	0.62		1.00		0.56		1.00		0.31		1.00	
Satd. Flow (perm)	1185		1827		1007		1716		541		3083	
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)	27	189	65	136	154	61	80	738	84	99	805	21
RTOR Reduction (vph)	0	22	0	0	26	0	0	11	0	0	3	0
Lane Group Flow (vph)	27	232	0	136	189	0	80	811	0	99	823	0
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	9%	16%	9%	8%	21%	8%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		8		2		2		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	12.3		12.3		11.8		11.8		20.1		20.1	
Effective Green, g (s)	12.3		12.3		11.8		11.8		20.1		20.1	
Actuated g/C Ratio	0.30		0.30		0.29		0.29		0.49		0.49	
Clearance Time (s)	4.0		4.0		4.5		4.5		5.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.5		3.5	
Lane Grp Cap (vph)	352		543		287		489		263		1497	
v/s Ratio Prot	0.02		0.13		c0.14		0.11		0.15		0.18	
v/s Ratio Perm	0.02		0.13		c0.14		0.11		0.15		0.18	
v/c Ratio	0.08		0.43		0.47		0.39		0.30		0.54	
Uniform Delay, d1	10.5		11.7		12.2		11.9		6.4		7.4	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	0.1		0.5		1.2		0.5		0.8		0.4	
Delay (s)	10.6		12.3		13.5		12.4		7.2		7.9	
Level of Service	B		B		B		B		A		A	
Approach Delay (s)	12.1		12.1		12.8		12.8		7.8		8.1	
Approach LOS	B		B		B		B		A		A	

Intersection Summary			
HCM Average Control Delay	9.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	41.4	Sum of lost time (s)	9.5
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: SR 99 & 54 AVE E

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	132	553	356	603	696	266	459	395	723	280	589	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.90		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3343	1495	1626	3117		3242	2932		1530	2914	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3343	1495	1626	3117		3242	2932		1530	2914	
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)	143	601	387	655	757	289	499	429	786	304	640	99
RTOR Reduction (vph)	0	0	13	0	34	0	0	289	0	0	11	0
Lane Group Flow (vph)	143	601	374	655	1012	0	499	926	0	304	728	0
Heavy Vehicles (%)	8%	8%	8%	11%	11%	11%	8%	17%	8%	18%	23%	11%
Turn Type	Prot	pm+ov	Prot	Split	Split		Split	Split		Split	Split	
Protected Phases	1	6	4	5	2		4	4		3	3	
Permitted Phases			6									
Actuated Green, G (s)	13.2	22.3	44.6	26.5	35.6		22.3	22.3		25.3	25.3	
Effective Green, g (s)	13.2	22.3	44.6	26.5	35.6		22.3	22.3		25.3	25.3	
Actuated g/C Ratio	0.11	0.19	0.39	0.23	0.31		0.19	0.19		0.22	0.22	
Clearance Time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Vehicle Extension (s)	3.0	2.7	3.2	3.0	2.7		3.2	3.2		4.2	4.2	
Lane Grp Cap (vph)	192	648	580	375	965		629	569		337	641	
v/s Ratio Prot	0.09	0.18	0.12	c0.40	c0.32		0.15	c0.32		0.20	c0.25	
v/s Ratio Perm			0.12									
v/c Ratio	0.74	0.93	0.64	1.75	1.05		0.79	1.63		0.90	1.14	
Uniform Delay, d1	49.3	45.6	28.7	44.2	39.7		44.2	46.4		43.6	44.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.89	0.79		1.00	1.00	
Incremental Delay, d2	14.5	19.4	2.3	346.9	42.6		8.2	288.5		26.6	79.2	
Delay (s)	63.8	65.0	31.0	391.1	82.3		47.3	325.2		70.3	124.1	
Level of Service	E	E	C	F	F		D	F		E	F	
Approach Delay (s)		53.2			201.2			244.3			108.4	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	167.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.36		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	13.9
Intersection Capacity Utilization	113.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: I-5 SB On & 54 AVE E

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	0	0	0	262	0	364	0	966	511	0	913	540
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		4.0			4.0	4.0
Lane Util. Factor				1.00		1.00		0.95			1.00	1.00
Frt				1.00		0.85		0.95			1.00	0.85
Flt Protected				0.95		1.00		1.00			1.00	1.00
Satd. Flow (prot)				1671		1442		3250			1681	1455
Flt Permitted				0.95		1.00		1.00			1.00	1.00
Satd. Flow (perm)				1671		1442		3250			1681	1455
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	285	0	396	0	1050	555	0	992	587
RTOR Reduction (vph)	0	0	0	0	0	105	0	72	0	0	0	0
Lane Group Flow (vph)	0	0	0	285	0	291	0	1533	0	0	992	587
Heavy Vehicles (%)	0%	0%	0%	8%	0%	12%	0%	6%	4%	0%	13%	11%
Turn Type				Prot		custom						Free
Protected Phases				3		3	4	6			2	4
Permitted Phases												Free
Actuated Green, G (s)				23.3		34.3		72.7			83.7	115.0
Effective Green, g (s)				23.3		34.3		72.7			83.7	115.0
Actuated g/C Ratio				0.20		0.30		0.63			0.73	1.00
Clearance Time (s)				4.0				4.0				
Vehicle Extension (s)				3.0				3.0				
Lane Grp Cap (vph)				339		430		2055			1223	1455
v/s Ratio Prot				c0.17		0.20		0.47			c0.59	
v/s Ratio Perm												0.40
v/c Ratio				0.84		0.68		0.75			0.81	0.40
Uniform Delay, d1				44.1		35.5		14.7			10.4	0.0
Progression Factor				1.00		1.00		0.88			0.98	1.00
Incremental Delay, d2				16.9		4.2		1.7			0.4	0.1
Delay (s)				60.9		39.6		14.7			10.6	0.1
Level of Service				E		D		B			B	A
Approach Delay (s)				0.0		48.6		14.7			6.7	
Approach LOS				A		D		B			A	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

7: I-5 EB Off & 54 AVE E

NMCRRC Tacoma

Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↖			↖		↕		↖	↖	↖
Volume (vph)	0	0	458	0	0	394	0	1117	314	461	839	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0			4.0		4.0		4.0	4.0	
Lane Util. Factor			1.00			1.00		0.95		1.00	1.00	
Flpb, ped/bikes			0.99			1.00		1.00		1.00	1.00	
Flpb, ped/bikes			1.00			1.00		1.00		1.00	1.00	
Frt			0.86			0.86		0.97		1.00	1.00	
Flt Protected			1.00			1.00		1.00		0.95	1.00	
Satd. Flow (prot)			1607			1467		3364		1583	1743	
Flt Permitted			1.00			1.00		1.00		0.09	1.00	
Satd. Flow (perm)			1607			1467		3364		156	1743	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	498	0	0	428	0	1214	341	501	912	0
RTOR Reduction (vph)	0	0	0	0	0	41	0	19	0	0	0	0
Lane Group Flow (vph)	0	0	498	0	0	387	0	1536	0	501	912	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	1%	0%	0%	12%	0%	4%	3%	14%	9%	0%
Turn Type			Free			custom				pm+pt		
Protected Phases							2			1	6	
Permitted Phases			Free				1			6		
Actuated Green, G (s)			115.0			35.7	71.3	111.0	115.0			
Effective Green, g (s)			115.0			35.7	71.3	111.0	115.0			
Actuated g/C Ratio			1.00			0.31	0.62	0.97	1.00			
Clearance Time (s)			4.0			4.0	4.0	4.0	4.0			
Vehicle Extension (s)			3.0			3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)			1607			455	2086	594	1743			
v/s Ratio Prot							0.46	0.26	0.52			
v/s Ratio Perm			0.31			c0.26		c0.55				
v/c Ratio			0.31			0.85	0.74	0.84	0.52			
Uniform Delay, d1			0.0			37.2	15.3	19.0	0.0			
Progression Factor			1.00			1.00	0.87	1.03	1.00			
Incremental Delay, d2			0.5			14.2	1.2	7.8	0.8			
Delay (s)			0.5			51.4	14.6	27.3	0.8			
Level of Service			A			D	B	C	A			
Approach Delay (s)		0.5			51.4		14.6		10.2			
Approach LOS		A			D		B		B			

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

8: 20th St E & 54 AVE E

NMCRRC Tacoma

Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↖	↖			↖	↖	↖		↖	↖	↖
Volume (vph)	337	300	110	36	135	598	99	468	47	439	549	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	0.91	0.91			1.00	1.00	1.00	0.95		0.91	0.91	
Frt	1.00	0.97			1.00	0.85	1.00	0.99		1.00	0.95	
Flt Protected	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1579	3186			1843	1583	1787	3463		1564	3049	
Flt Permitted	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1579	3186			1843	1583	1787	3463		1564	3049	
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)	366	326	120	39	147	650	108	509	51	477	597	323
RTOR Reduction (vph)	0	22	0	0	0	36	0	7	0	0	50	0
Lane Group Flow (vph)	271	519	0	0	186	614	108	553	0	429	918	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	1%	3%	1%	5%	9%	5%
Turn Type	Split			Split	pm+ov	Split				Split		
Protected Phases	1	1		3	3	2	4	4		2	2	
Permitted Phases						3						
Actuated Green, G (s)	23.1	23.1				11.0	56.4	17.5	17.5	45.4	45.4	
Effective Green, g (s)	23.1	23.1				11.0	56.4	17.5	17.5	45.4	45.4	
Actuated g/C Ratio	0.20	0.20				0.10	0.49	0.15	0.15	0.39	0.39	
Clearance Time (s)	4.5	4.5				4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.5	3.5				3.0	2.0	2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)	317	640				176	838	272	527	617	1204	
v/s Ratio Prot	c0.17	0.16				c0.10	c0.29	0.06	c0.16	0.27	0.30	
v/s Ratio Perm							0.10					
v/c Ratio	0.85	0.81				1.06	0.73	0.40	1.05	0.70	0.76	
Uniform Delay, d1	44.3	43.9				52.0	23.3	44.0	48.8	29.0	30.1	
Progression Factor	1.00	1.00				1.00	1.00	1.00	1.00	1.06	1.06	
Incremental Delay, d2	20.0	7.9				83.7	3.3	0.3	52.9	5.8	4.2	
Delay (s)	64.3	51.8				135.7	26.7	44.3	101.6	36.4	36.1	
Level of Service	E	D				F	C	D	F	D	D	
Approach Delay (s)		56.0				50.9		92.4			36.2	
Approach LOS		E				D		F			D	

Intersection Summary			
HCM Average Control Delay	53.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: SR 509 (N Frontage Rd) & Alexander Ave E

NMCR Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗		↖	↗			↖	↗
Volume (vph)	0	0	0	82	1489	0	403	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0				5.0	5.0
Lane Util. Factor				1.00	0.95		1.00				1.00	1.00
Frt				1.00	1.00		1.00				1.00	1.00
Flt Protected				0.95	1.00		0.95				0.95	1.00
Satd. Flow (prot)				1770	3539		1787				3451	3610
Flt Permitted				0.95	1.00		0.95				1.00	1.00
Satd. Flow (perm)				1770	3539		1787				3451	3610
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	89	1618	0	438	0	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	89	1618	0	438	0	0	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%	1%	0%	0%	0%	0%	0%
Turn Type				Perm			Prot					
Protected Phases					8		1	6			2	
Permitted Phases				8								
Actuated Green, G (s)				60.0	60.0		30.0					
Effective Green, g (s)				60.0	60.0		30.0					
Actuated g/C Ratio				0.60	0.60		0.30					
Clearance Time (s)				5.0	5.0		5.0					
Vehicle Extension (s)				2.5	2.5		2.5					
Lane Grp Cap (vph)				1062	2123		536					
v/s Ratio Prot					c0.46		c0.25					
v/s Ratio Perm				0.05								
v/c Ratio				0.08	0.76		0.82					
Uniform Delay, d1				8.4	14.7		32.5					
Progression Factor				1.00	1.00		1.00					
Incremental Delay, d2				0.0	1.6		9.2					
Delay (s)				8.4	16.3		41.6					
Level of Service				A	B		D					
Approach Delay (s)		0.0			15.9			41.6			0.0	
Approach LOS		A			B			D			A	
Intersection Summary												
HCM Average Control Delay				21.2			HCM Level of Service				C	
HCM Volume to Capacity ratio				0.78								
Actuated Cycle Length (s)				100.0			Sum of lost time (s)		10.0			
Intersection Capacity Utilization				84.3%			ICU Level of Service		E			
Analysis Period (min)				15								

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: SR 509 (S Frontage Rd) & Alexander Ave E

NMCR Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											↖	↗
Volume (vph)	22	1088	337	0	0	0	0	360	108	14	83	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0			5.0			5.0	5.0
Lane Util. Factor				1.00	0.95			0.95			1.00	0.95
Frt				1.00	0.96			0.97			1.00	1.00
Flt Protected				0.95	1.00			1.00			0.95	1.00
Satd. Flow (prot)				1736	3300			3451			1805	3610
Flt Permitted				0.95	1.00			1.00			0.95	1.00
Satd. Flow (perm)				1736	3300			3451			1805	3610
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)	24	1183	366	0	0	0	0	391	117	15	90	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	22	0	0	0	0
Lane Group Flow (vph)	24	1539	0	0	0	0	0	486	0	15	90	0
Heavy Vehicles (%)	4%	6%	4%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type				Perm							Prot	
Protected Phases					4			6			5	2
Permitted Phases				4								
Actuated Green, G (s)				60.5	60.5			18.1			1.2	24.3
Effective Green, g (s)				60.5	60.5			18.1			1.2	24.3
Actuated g/C Ratio				0.64	0.64			0.19			0.01	0.26
Clearance Time (s)				5.0	5.0			5.0			5.0	5.0
Vehicle Extension (s)				2.5	2.5			2.5			2.5	2.5
Lane Grp Cap (vph)				1108	2106			659			23	925
v/s Ratio Prot					c0.47			c0.14			c0.01	0.02
v/s Ratio Perm				0.01								
v/c Ratio				0.02	0.73			0.74			0.65	0.10
Uniform Delay, d1				6.3	11.6			36.1			46.6	26.9
Progression Factor				1.00	1.00			1.00			1.00	1.00
Incremental Delay, d2				0.0	1.3			4.1			46.4	0.0
Delay (s)				6.3	12.9			40.2			93.0	26.9
Level of Service				A	B			D			F	C
Approach Delay (s)					12.8			0.0			40.2	36.4
Approach LOS					B			A			D	D
Intersection Summary												
HCM Average Control Delay					20.3			HCM Level of Service			C	
HCM Volume to Capacity ratio					0.73							
Actuated Cycle Length (s)					94.8			Sum of lost time (s)		15.0		
Intersection Capacity Utilization					84.3%			ICU Level of Service		E		
Analysis Period (min)					15							

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Norpoint Way & SR 509 (Marine View Drive)

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↑	↔	↔	↑
Volume (vph)	729	25	638	751	24	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	4.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3090	1425	1676	1425	1533	1613
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3090	1425	1676	1425	1533	1613
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	792	27	693	816	26	463
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	792	27	693	816	26	463
Heavy Vehicles (%)	2%	2%	2%	2%	6%	6%
Turn Type	Free		Free		Prot	
Protected Phases	8		6		5	
Permitted Phases	Free		Free		6	
Actuated Green, G (s)	34.0	114.7	61.1	114.7	4.6	70.7
Effective Green, g (s)	34.0	114.7	61.1	114.7	4.6	70.7
Actuated g/C Ratio	0.30	1.00	0.53	1.00	0.04	0.62
Clearance Time (s)	5.0		5.0		5.0	
Vehicle Extension (s)	2.5		2.5		2.5	
Lane Grp Cap (vph)	916	1425	893	1425	61	994
v/s Ratio Prot	c0.26		c0.41		0.02	
v/s Ratio Perm	0.02		c0.57		0.02	
v/c Ratio	0.86	0.02	0.78	0.57	0.43	0.47
Uniform Delay, d1	38.2	0.0	21.3	0.0	53.8	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.0	4.1	1.7	3.5	0.3
Delay (s)	46.6	0.0	25.5	1.7	57.2	12.1
Level of Service	D	A	C	A	E	B
Approach Delay (s)	45.1		12.6		14.5	
Approach LOS	D		B		B	

Intersection Summary			
HCM Average Control Delay	22.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	114.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: N Frontage Rd & Port of Tacoma Rd

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations				↔	↔	↔	↔	↔	↔	↔	↔	↔	
Volume (vph)	0	0	0	97	112	72	209	166	0	0	516	190	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)				5.0	5.0	5.0	5.0	5.0			5.0	4.0	
Lane Util. Factor				0.95	1.00	1.00	0.95	0.95			0.95	1.00	
Frt				1.00	0.85	1.00	1.00	1.00			1.00	0.85	
Flt Protected				0.98	1.00	0.95	1.00	1.00			1.00	1.00	
Satd. Flow (prot)				3459	1583	1736	3438	3438			3438	1538	
Flt Permitted				0.98	1.00	0.95	1.00	1.00			1.00	1.00	
Satd. Flow (perm)				3459	1583	1736	3438	3438			3438	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)	0	0	0	105	122	78	227	180	0	0	561	207	
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	227	15	227	180	0	0	561	207	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	4%	5%	0%	0%	5%	5%	
Turn Type				Perm		Perm		Prot		Free			
Protected Phases				8		8		1		6		2	
Permitted Phases				8		8				Free			
Actuated Green, G (s)				11.0		11.0		13.6		34.8		16.2	
Effective Green, g (s)				11.0		11.0		13.6		34.8		16.2	
Actuated g/C Ratio				0.20		0.20		0.24		0.62		0.29	
Clearance Time (s)				5.0		5.0		5.0		5.0		5.0	
Vehicle Extension (s)				2.5		2.5		2.5		2.5		2.5	
Lane Grp Cap (vph)				682		312		423		2144		998	
v/s Ratio Prot				c0.13		0.05				c0.16			
v/s Ratio Perm				0.07		0.01				0.13			
v/c Ratio				0.33		0.05		0.54		0.08		0.56	
Uniform Delay, d1				19.2		18.2		18.4		4.2		16.8	
Progression Factor				1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2				0.2		0.0		1.0		0.0		0.6	
Delay (s)				19.5		18.2		19.4		4.2		17.4	
Level of Service				B		B		B		A		B	
Approach Delay (s)				0.0		19.1		12.7		12.7			
Approach LOS				A		B		B		B			

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
13: 12th St E & Port of Tacoma Rd

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	↕
Volume (vph)	65	3	129	90	4	26	54	286	2	0	453	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Frt	1.00	0.85	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.85
Flt Protected	0.95	1.00		0.96	0.95	1.00	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	1777	1583		1709	1770	3536	1770	3536		3505	1568	1568
Flt Permitted	0.95	1.00		0.96	0.95	1.00	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	1777	1583		1709	1770	3536	1770	3536		3505	1568	1568
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)	71	3	140	98	4	28	59	311	2	0	492	196
RTOR Reduction (vph)	0	0	117	0	5	0	0	0	0	0	0	63
Lane Group Flow (vph)	0	74	23	0	125	0	59	313	0	0	492	133
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	0%	3%	3%
Turn Type	Split	Perm	Split	Prot							custom	
Protected Phases	4	4		3	3		1	6			2	
Permitted Phases			4									6
Actuated Green, G (s)	10.8	10.8		12.2			6.5	27.5			16.0	27.5
Effective Green, g (s)	10.8	10.8		12.2			6.5	27.5			16.0	27.5
Actuated g/C Ratio	0.16	0.16		0.19			0.10	0.42			0.24	0.42
Clearance Time (s)	5.0	5.0		5.0			5.0	5.0			5.0	5.0
Vehicle Extension (s)	2.5	2.5		2.5			2.5	2.5			2.5	2.5
Lane Grp Cap (vph)	293	261		318			176	1485			856	658
v/s Ratio Prot	c0.04			c0.07			c0.03	0.09			c0.14	
v/s Ratio Perm		0.01										0.08
v/c Ratio	0.25	0.09		0.39			0.34	0.21			0.57	0.20
Uniform Delay, d1	23.8	23.2		23.4			27.5	12.1			21.8	12.0
Progression Factor	1.00	1.00		1.00			1.00	1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1		0.6			0.8	0.1			0.8	0.1
Delay (s)	24.2	23.3		24.0			28.3	12.1			22.5	12.2
Level of Service	C	C		C			C	B			C	B
Approach Delay (s)	23.6			24.0			14.7				19.6	
Approach LOS	C			C			B				B	

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	65.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Pacific HWY & Port of Tacoma Rd

NMCRRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕	↕	↕		↕	↕		↕	↕	↕
Volume (vph)	41	268	125	451	574	92	81	222	141	108	457	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	6.0		6.0		5.0	5.0			5.0	5.0
Lane Util. Factor	1.00	0.95	0.97	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.95	1.00	0.98	1.00	0.94	1.00	0.94	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00		0.95	1.00	0.95	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1687	3213		3335	3367	1583	2982	2982		1492	2956	2956
Flt Permitted	0.95	1.00		0.95	1.00	0.95	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1687	3213		3335	3367	1583	2982	2982		1492	2956	2956
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)	45	291	136	490	624	100	88	241	153	117	497	33
RTOR Reduction (vph)	0	43	0	0	10	0	0	92	0	0	4	0
Lane Group Flow (vph)	45	384	0	490	714	0	88	302	0	117	526	0
Heavy Vehicles (%)	7%	7%	7%	5%	5%	5%	14%	14%	14%	21%	21%	21%
Turn Type	Prot	Prot	Prot	Split	Split							
Protected Phases	1	6		5	2		4	7	8	4	7	8
Permitted Phases										3	3	
Actuated Green, G (s)	6.8	21.0		12.0	27.2		38.3	38.3		22.1	22.1	
Effective Green, g (s)	6.8	21.0		12.0	27.2		33.8	33.8		22.1	22.1	
Actuated g/C Ratio	0.06	0.18		0.10	0.24		0.29	0.29		0.19	0.19	
Clearance Time (s)	5.0	6.0		6.0	6.0					5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0					3.5	3.5	
Lane Grp Cap (vph)	100	587		348	797		466	877		287	569	
v/s Ratio Prot	0.03	0.12		c0.15	c0.21		0.06	c0.10		0.08	c0.18	
v/s Ratio Perm												
v/c Ratio	0.45	0.65		1.41	0.90		0.19	0.34		0.41	0.92	
Uniform Delay, d1	52.2	43.6		51.4	42.5		30.3	31.8		40.7	45.6	
Progression Factor	1.00	1.00		1.00	1.00		0.88	0.88		1.00	1.00	
Incremental Delay, d2	3.2	2.6		200.0	12.6		0.1	0.1		1.1	21.2	
Delay (s)	55.4	46.2		251.5	55.1		26.7	28.0		41.8	66.7	
Level of Service	E	D		F	E		C	C		D	E	
Approach Delay (s)		47.1			134.4			27.7			62.2	
Approach LOS		D			F			C			E	

Intersection Summary			
HCM Average Control Delay	84.9	HCM Level of Service	F
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	21.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: I-5 WB Ramp & Tacoma Rd

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↕			↕	↕
Volume (vph)	0	0	0	15	1	129	399	303	1	0	319	659
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.5	4.5	4.5	5.0			5.0	4.0
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00
Frt					0.88	0.85	1.00	1.00			1.00	0.85
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)					1187	1154	1703	3404			1727	1468
Flt Permitted					0.99	1.00	0.55	1.00			1.00	1.00
Satd. Flow (perm)					1187	1154	991	3404			1727	1468
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	16	1	140	434	329	1	0	347	716
RTOR Reduction (vph)	0	0	0	0	58	70	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	22	7	434	330	0	0	347	716
Heavy Vehicles (%)	0%	0%	0%	32%	32%	33%	6%	6%	6%	0%	10%	10%
Turn Type				Split	Perm	custom						Free
Protected Phases				8	8	7	4 6 7			3 4 5 6		
Permitted Phases						8	3 4 6					Free
Actuated Green, G (s)					10.0	10.0	72.9	44.8			78.1	114.9
Effective Green, g (s)					10.0	10.0	61.9	44.8			66.1	114.9
Actuated g/C Ratio					0.09	0.09	0.54	0.39			0.58	1.00
Clearance Time (s)					4.5	4.5	4.5					
Vehicle Extension (s)					4.0	4.0	3.0					
Lane Grp Cap (vph)					103	100	613	1327			994	1468
v/s Ratio Prot					0.02		c0.08	0.10			0.20	
v/s Ratio Perm						0.01	c0.30					c0.49
v/c Ratio					0.22	0.07	0.71	0.25			0.35	0.49
Uniform Delay, d1					48.8	48.2	21.8	23.7			13.0	0.0
Progression Factor					1.00	1.00	1.00	1.00			0.04	1.00
Incremental Delay, d2					1.5	0.4	3.7	0.0			0.0	0.1
Delay (s)					50.3	48.6	25.5	23.7			0.5	0.1
Level of Service					D	D	C	C			A	A
Approach Delay (s)		0.0			49.4			24.7			0.2	
Approach LOS		A			D			C			A	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
16: I-5 EB Off & Port of Tacoma Rd

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations								↕			↕	↕
Volume (veh/h)	0	0	0	0	0	0	0	584	88	241	221	0
Sign Control			Stop			Stop		Free			Free	
Grade			0%			0%		0%			0%	
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	635	96	262	240	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1447	1495	240	1447	1447	683	240			730		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1447	1495	240	1447	1447	683	240			730		
IC, single (s)	7.1	6.5	6.3	7.1	6.5	6.3	4.1			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	100	100	100	100			68		
cM capacity (veh/h)	83	84	784	83	90	431	1338			813		

Direction, Lane #	NB 1	SB 1	SB 2
Volume Total	730	262	240
Volume Left	0	262	0
Volume Right	96	0	0
cSH	1700	813	1700
Volume to Capacity	0.43	0.32	0.14
Queue Length 95th (ft)	0	35	0
Control Delay (s)	0.0	11.5	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.0	
Approach LOS			

Intersection Summary			
Average Delay		2.4	
Intersection Capacity Utilization		56.1%	ICU Level of Service B
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
17: 20th St & Port of Tacoma Rd

NMCRC Tacoma
Proposed Action PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↔	↔		↔	↔	↔		↔		↔	↔		
Volume (veh/h)	66	137	1	2	66	669	1	21	0	484	18	23	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
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	
Hourly flow rate (vph)	72	149	1	2	72	727	1	23	0	526	20	25	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1145	1109	32	1172	1122	23	45						23
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1145	1109	32	1172	1122	23	45						23
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.2	4.1						4.2
tC, 2 stage (s)													
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2						2.3
p0 queue free %	0	0	100	0	46	30	100						66
cM capacity (veh/h)	23	133	1019	0	133	1045	1545						1530
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2							
Volume Total	72	150	801	24	351	220							
Volume Left	72	0	2	1	351	175							
Volume Right	0	1	727	0	0	25							
cSH	23	134	0	1545	1530	1530							
Volume to Capacity	3.18	1.12	Err	0.00	0.34	0.34							
Queue Length 95th (ft)	Err	215	Err	0	39	39							
Control Delay (s)	Err	179.2	Err	0.3	8.6	7.5							
Lane LOS	F	F	F	A	A	A							
Approach Delay (s)	3356.2		Err		0.3		8.1						
Approach LOS	F		F										
Intersection Summary													
Average Delay			Err										
Intersection Capacity Utilization			80.6%		ICU Level of Service		D						
Analysis Period (min)			15										

HCM Signalized Intersection Capacity Analysis
18: Lincoln Ave & Taylor Way

NMCRC Tacoma
Proposed Action PM Peak Hour



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔		↔	↔
Volume (vph)	6	288	1	10	146	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Flt	1.00	0.85	0.88	1.00	1.00	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1245	1114	1210	1280	950	
Flt Permitted	0.95	1.00	1.00	0.75	1.00	
Satd. Flow (perm)	1245	1114	1210	1010	950	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	7	313	1	11	159	1
RTOR Reduction (vph)	0	240	6	0	0	0
Lane Group Flow (vph)	7	73	6	0	159	1
Heavy Vehicles (%)	45%	45%	0%	41%	41%	100%
Turn Type	custom			Perm		
Protected Phases				2	6	
Permitted Phases	8	8	6			
Actuated Green, G (s)	6.5	6.5	13.2	13.2	13.2	13.2
Effective Green, g (s)	6.5	6.5	13.2	13.2	13.2	13.2
Actuated g/C Ratio	0.23	0.23	0.48	0.48	0.48	0.48
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	292	261	577	481	453	
v/s Ratio Prot				0.01	0.00	
v/s Ratio Perm	0.01	c0.07	c0.16			
v/c Ratio	0.02	0.28	0.01	0.33	0.00	
Uniform Delay, d1	8.2	8.7	3.8	4.5	3.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	0.6	0.0	0.4	0.0	
Delay (s)	8.2	9.3	3.8	4.9	3.8	
Level of Service	A	A	A	A	A	
Approach Delay (s)	9.3		3.8		4.9	
Approach LOS	A		A		A	
Intersection Summary						
HCM Average Control Delay			7.7		HCM Level of Service	
HCM Volume to Capacity ratio			0.31			
Actuated Cycle Length (s)			27.7		Sum of lost time (s)	
Intersection Capacity Utilization			27.8%		ICU Level of Service	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
19: E 11th Street & Taylor Way

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘		↕	↗	↘	↕
Sign Control	Stop		Stop			Stop
Volume (vph)	46	0	107	119	0	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	50	0	116	129	0	110
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total (vph)	50	116	129	0	110	
Volume Left (vph)	50	0	0	0	0	
Volume Right (vph)	0	0	129	0	0	
Hadj (s)	0.20	0.77	-0.70	0.00	0.70	
Departure Headway (s)	4.9	5.5	4.0	4.8	5.5	
Degree Utilization, x	0.07	0.18	0.14	0.00	0.17	
Capacity (veh/h)	676	642	872	745	636	
Control Delay (s)	8.3	8.5	6.5	6.6	8.4	
Approach Delay (s)	8.3	7.4		8.4		
Approach LOS	A	A		A		
Intersection Summary						
Delay						7.8
HCM Level of Service						A
Intersection Capacity Utilization	15.6%					ICU Level of Service A
Analysis Period (min)						15

HCM Unsignalized Intersection Capacity Analysis
20: Taylor Overpass & Lincoln Ave Bypass

NMCRC Tacoma
Proposed Action PM Peak Hour

Movement	WBL	WBR	SEL	SET	NWT	NWR
Lane Configurations	↘	↗	↘	↗	↕	↗
Sign Control	Stop			Stop	Stop	
Volume (vph)	48	112	392	28	5	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	122	426	30	5	72
Direction, Lane #	WB 1	WB 2	SE 1	SE 2	NW 1	NW 2
Volume Total (vph)	52	122	426	30	5	72
Volume Left (vph)	52	0	426	0	0	0
Volume Right (vph)	0	122	0	0	0	72
Hadj (s)	2.20	0.06	1.20	1.70	1.70	1.00
Departure Headway (s)	8.3	6.2	6.4	6.9	7.4	6.7
Degree Utilization, x	0.12	0.21	0.76	0.06	0.01	0.13
Capacity (veh/h)	410	545	554	506	465	515
Control Delay (s)	11.2	9.6	25.7	9.2	9.3	9.5
Approach Delay (s)	10.1		24.6		9.5	
Approach LOS	B		C		A	
Intersection Summary						
Delay						19.4
HCM Level of Service						C
Intersection Capacity Utilization	38.4%					ICU Level of Service A
Analysis Period (min)						15

HCM Signalized Intersection Capacity Analysis
1: SR 509 & Taylor Way

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔		↔	↔	↔	↔	↔	↔
Volume (vph)	274	953	179	336	947	8	351	97	247	24	239	141
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3335	3471	1553	3400	3500		1656	3167	1482	1612	3112	1442
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3335	3471	1553	3400	3500		1656	3167	1482	1612	3112	1442
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)	298	1036	195	365	1029	9	382	105	268	26	260	153
RTOR Reduction (vph)	0	0	109	0	0	0	0	0	185	0	0	132
Lane Group Flow (vph)	298	1036	86	365	1038	0	382	105	83	26	260	21
Heavy Vehicles (%)	5%	4%	4%	3%	3%	3%	9%	14%	9%	12%	16%	12%
Turn Type	Prot		Perm	Prot			Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4						6			2
Actuated Green, G (s)	18.1	54.5	54.5	20.6	57.0		30.2	45.0	45.0	4.9	19.7	19.7
Effective Green, g (s)	18.1	54.5	54.5	20.6	57.0		30.2	45.0	45.0	4.9	19.7	19.7
Actuated g/C Ratio	0.12	0.38	0.38	0.14	0.39		0.21	0.31	0.31	0.03	0.14	0.14
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	2.5	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	2.5
Lane Grp Cap (vph)	416	1305	584	483	1376		345	983	460	54	423	196
v/s Ratio Prot	0.09	c0.30		c0.11	0.30		c0.23	0.03		0.02	c0.08	
v/s Ratio Perm			0.06					0.06				0.01
v/c Ratio	0.72	0.79	0.15	0.76	0.75		1.11	0.11	0.18	0.48	0.61	0.11
Uniform Delay, d1	61.0	40.3	29.9	59.8	38.0		57.4	35.7	36.5	68.8	59.1	54.9
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	5.4	3.3	0.1	6.3	2.3		80.5	0.0	0.1	4.9	2.3	0.2
Delay (s)	66.4	43.6	30.0	66.1	40.2		137.9	35.7	36.7	73.7	61.3	55.1
Level of Service	E	D	C	E	D		F	D	D	E	E	E
Approach Delay (s)		46.3			47.0			87.8			59.9	
Approach LOS		D			D			F			E	

Intersection Summary		
HCM Average Control Delay	55.6	HCM Level of Service E
HCM Volume to Capacity ratio	0.84	
Actuated Cycle Length (s)	145.0	Sum of lost time (s) 20.0
Intersection Capacity Utilization	80.4%	ICU Level of Service D
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis
2: 4th St E & Taylor Way

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔		↔	↔	↔
Volume (veh/h)	10	0	29	63	1	2	7	704	31	5	615	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	0	32	68	1	2	8	765	34	5	668	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None				None	
Median storage (veh)												
Upstream signal (ft)								1317				
pX, platoon unblocked												
vC, conflicting volume	1083	1497	338	1174	1483	399	675			799		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1083	1497	338	1174	1483	399	675			799		
IC, single (s)	7.5	6.5	6.9	7.6	6.6	7.0	4.3			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.3			2.3		
p0 queue free %	94	100	95	50	99	100	99			99		
cM capacity (veh/h)	170	122	664	137	121	597	873			770		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	42	72	8	510	289	5	446	229
Volume Left	11	68	8	0	0	5	0	0
Volume Right	32	2	0	0	34	0	0	7
cSH	381	140	873	1700	1700	770	1700	1700
Volume to Capacity	0.11	0.51	0.01	0.30	0.17	0.01	0.26	0.13
Queue Length 95th (ft)	9	61	1	0	0	1	0	0
Control Delay (s)	15.6	54.8	9.2	0.0	0.0	9.7	0.0	0.0
Lane LOS	C	F	A			A		
Approach Delay (s)	15.6	54.8	0.1			0.1		
Approach LOS	C	F						

Intersection Summary		
Average Delay	2.9	
Intersection Capacity Utilization	37.4%	ICU Level of Service A
Analysis Period (min)	15	

HCM Signalized Intersection Capacity Analysis
3: 8th St E & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Volume (vph)	1	0	1	77	0	34	0	700	12	10	668	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00			0.95		1.00	0.95	
Frt		0.93			0.96			1.00		1.00	1.00	
Flt Protected		0.98			0.97			1.00		0.95	1.00	
Satd. Flow (prot)		1729			1661			3304		1656	3282	
Flt Permitted		0.86			0.79			1.00		0.95	1.00	
Satd. Flow (perm)		1527			1361			3304		1656	3282	
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)	1	0	1	84	0	37	0	761	13	11	726	0
RTOR Reduction (vph)	0	1	0	0	22	0	0	1	0	0	0	0
Lane Group Flow (vph)	0	1	0	0	99	0	0	773	0	11	726	0
Heavy Vehicles (%)	0%	0%	0%	6%	0%	6%	0%	9%	8%	9%	10%	0%
Turn Type	Perm		Perm		Prot		Prot					
Protected Phases	8		4		1		6		5		2	
Permitted Phases	8		4		1		6		5		2	
Actuated Green, G (s)	6.9		6.9		17.5		0.8		22.3		0	
Effective Green, g (s)	6.9		6.9		17.5		0.8		22.3		0	
Actuated g/C Ratio	0.18		0.18		0.46		0.02		0.58		0	
Clearance Time (s)	4.0		4.0		5.0		4.0		5.0		0	
Vehicle Extension (s)	3.0		3.0		3.5		3.0		3.5		0	
Lane Grp Cap (vph)	276		246		1514		35		1916		0	
v/s Ratio Prot	0.00		c0.07		c0.23		0.01		c0.22		0	
v/s Ratio Perm	0.00		0.40		0.51		0.31		0.38		0	
v/c Ratio	0.00		0.40		0.51		0.31		0.38		0	
Uniform Delay, d1	12.8		13.8		7.3		18.4		4.2		0	
Progression Factor	1.00		1.00		1.00		1.00		1.00		0	
Incremental Delay, d2	0.0		1.1		0.3		5.1		0.1		0	
Delay (s)	12.8		14.9		7.7		23.5		4.4		0	
Level of Service	B		B		A		C		A		0	
Approach Delay (s)	12.8		14.9		7.7		4.7		7.5		0	
Approach LOS	B		B		A		A		A		0	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	38.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: 12th St E & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔		↔	↔	
Volume (vph)	25	174	60	125	142	56	74	640	77	92	637	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.5			5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00			1.00		0.95	1.00	
Frt		1.00			0.96			1.00		0.98	1.00	
Flt Protected		0.95			1.00			0.95		1.00	0.95	
Satd. Flow (prot)		1805			1703			1656		3232	1671	
Flt Permitted		0.62			1.00			0.37		1.00	0.33	
Satd. Flow (perm)		1185			1032			643		3232	585	
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)	27	189	65	136	154	61	80	696	84	100	692	21
RTOR Reduction (vph)	0	22	0	0	25	0	0	13	0	0	3	0
Lane Group Flow (vph)	27	232	0	136	190	0	80	767	0	100	710	0
Heavy Vehicles (%)	0%	0%	0%	6%	6%	6%	9%	10%	9%	8%	9%	8%
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		8		2		2		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	12.1		12.1		11.6		11.6		18.4		18.4	
Effective Green, g (s)	12.1		12.1		11.6		11.6		18.4		18.4	
Actuated g/C Ratio	0.31		0.31		0.29		0.29		0.47		0.47	
Clearance Time (s)	4.0		4.0		4.5		4.5		5.0		5.0	
Vehicle Extension (s)	3.0		3.0		3.0		3.0		3.5		3.5	
Lane Grp Cap (vph)	363		560		303		504		300		1506	
v/s Ratio Prot	0.02		0.13		c0.13		0.11		c0.24		0.22	
v/s Ratio Perm	0.02		0.41		0.45		0.38		0.27		0.51	
v/c Ratio	0.07		0.41		0.45		0.38		0.27		0.51	
Uniform Delay, d1	9.7		10.9		11.3		11.1		6.4		7.4	
Progression Factor	1.00		1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2	0.1		0.5		1.1		0.5		0.6		0.3	
Delay (s)	9.8		11.4		12.4		11.5		7.0		7.7	
Level of Service	A		B		B		B		A		A	
Approach Delay (s)	11.2		11.9		7.6		7.6		7.6		7.5	
Approach LOS	B		B		B		B		A		A	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	39.5	Sum of lost time (s)	9.5
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: SR 99 & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	133	553	356	603	696	258	459	364	723	262	500	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.90		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3343	1495	1626	3121		3242	3009		1612	3152	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1671	3343	1495	1626	3121		3242	3009		1612	3152	
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)	145	601	387	655	757	280	499	396	786	285	543	100
RTOR Reduction (vph)	0	0	20	0	32	0	0	311	0	0	13	0
Lane Group Flow (vph)	145	601	367	655	1005	0	499	871	0	285	630	0
Heavy Vehicles (%)	8%	8%	8%	11%	11%	11%	8%	8%	8%	12%	12%	11%
Turn Type	Prot	pm+ov	Prot	Split	Split		Split	Split		Split	Split	
Protected Phases	1	6	4	5	2		4	4		3	3	
Permitted Phases			6									
Actuated Green, G (s)	13.3	22.3	44.6	26.5	35.5		22.3	22.3		25.3	25.3	
Effective Green, g (s)	13.3	22.3	44.6	26.5	35.5		22.3	22.3		25.3	25.3	
Actuated g/C Ratio	0.12	0.19	0.39	0.23	0.31		0.19	0.19		0.22	0.22	
Clearance Time (s)	4.5	4.7	4.7	4.5	4.7		4.7	4.7		4.7	4.7	
Vehicle Extension (s)	3.0	2.7	3.2	3.0	2.7		3.2	3.2		4.2	4.2	
Lane Grp Cap (vph)	193	648	580	375	963		629	583		355	693	
v/s Ratio Prot	0.09	0.18	0.12	c0.40	c0.32		0.15	c0.29		0.18	c0.20	
v/s Ratio Perm			0.12									
v/c Ratio	0.75	0.93	0.63	1.75	1.04		0.79	1.49		0.80	0.91	
Uniform Delay, d1	49.2	45.6	28.6	44.2	39.8		44.2	46.4		42.5	43.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.87	0.76		1.00	1.00	
Incremental Delay, d2	15.1	19.4	2.1	346.9	40.9		8.4	229.7		13.2	16.1	
Delay (s)	64.4	65.0	30.7	391.1	80.6		47.0	265.1		55.7	59.8	
Level of Service	E	E	C	F	F		D	F		E	E	
Approach Delay (s)		53.2			200.8			200.3			58.6	
Approach LOS		D			F			F			E	
Intersection Summary												
HCM Average Control Delay		145.6										
HCM Volume to Capacity ratio		1.27										
Actuated Cycle Length (s)		115.0			Sum of lost time (s)		13.9					
Intersection Capacity Utilization		112.1%			ICU Level of Service		H					
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: I-5 SB On & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (vph)	0	0	0	262	0	349	0	949	511	0	847	518
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.0		4.0		4.0			4.0	4.0
Lane Util. Factor				1.00		1.00		0.95			1.00	1.00
Frpb, ped/bikes				1.00		1.00		1.00			1.00	1.00
Flpb, ped/bikes				1.00		1.00		1.00			1.00	1.00
Frt				1.00		0.85		0.95			1.00	0.85
Flt Protected				0.95		1.00		1.00			1.00	1.00
Satd. Flow (prot)				1671		1495		3289			1776	1509
Flt Permitted				0.95		1.00		1.00			1.00	1.00
Satd. Flow (perm)				1671		1495		3289			1776	1509
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	285	0	379	0	1032	555	0	921	563
RTOR Reduction (vph)	0	0	0	0	0	106	0	79	0	0	0	0
Lane Group Flow (vph)	0	0	0	285	0	273	0	1508	0	0	921	563
Confl. Peds. (#/hr)				8		8		8			8	8
Heavy Vehicles (%)	0%	0%	0%	8%	0%	8%	0%	4%	4%	0%	7%	7%
Turn Type				Prot		custom						Free
Protected Phases				3		3.4		6			2.4	
Permitted Phases												Free
Actuated Green, G (s)				24.3		36.5		70.5			82.7	115.0
Effective Green, g (s)				24.3		36.5		70.5			82.7	115.0
Actuated g/C Ratio				0.21		0.32		0.61			0.72	1.00
Clearance Time (s)				4.0		4.0		4.0			4.0	4.0
Vehicle Extension (s)				3.0		3.0		3.0			3.0	3.0
Lane Grp Cap (vph)				353		475		2016			1277	1509
v/s Ratio Prot				c0.17		0.18		c0.46			c0.52	
v/s Ratio Perm												0.37
v/c Ratio				0.81		0.58		0.75			0.72	0.37
Uniform Delay, d1				43.1		32.8		15.9			9.4	0.0
Progression Factor				1.00		1.00		1.06			1.00	1.00
Incremental Delay, d2				12.7		1.7		1.8			0.2	0.1
Delay (s)				55.8		34.5		18.6			9.6	0.1
Level of Service				E		C		B			A	A
Approach Delay (s)		0.0				43.6		18.6			6.0	
Approach LOS		A				D		B			A	
Intersection Summary												
HCM Average Control Delay		18.0									B	
HCM Volume to Capacity ratio		0.77										
Actuated Cycle Length (s)		115.0				Sum of lost time (s)		12.0				
Intersection Capacity Utilization		71.7%				ICU Level of Service		C				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: I-5 EB Off & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↖			↖		↕		↖	↖	↖
Volume (vph)	0	0	458	0	0	385	0	1109	314	428	805	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0			4.0		4.0		4.0	4.0	
Lane Util. Factor			1.00			1.00		0.95		1.00	1.00	
Flpb, ped/bikes			0.99			1.00		1.00		1.00	1.00	
Flpb, ped/bikes			1.00			1.00		1.00		1.00	1.00	
Frt			0.86			0.86		0.97		1.00	1.00	
Flt Protected			1.00			1.00		1.00		0.95	1.00	
Satd. Flow (prot)			1607			1508		3389		1671	1776	
Flt Permitted			1.00			1.00		1.00		0.10	1.00	
Satd. Flow (perm)			1607			1508		3389		174	1776	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	498	0	0	418	0	1205	341	465	875	0
RTOR Reduction (vph)	0	0	0	0	0	42	0	19	0	0	0	0
Lane Group Flow (vph)	0	0	498	0	0	376	0	1527	0	465	875	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	1%	0%	0%	9%	0%	3%	3%	8%	7%	0%
Turn Type			Free			custom				pm+pt		
Protected Phases								2		1		6
Permitted Phases			Free					1		6		
Actuated Green, G (s)			115.0			34.2		72.8		111.0		115.0
Effective Green, g (s)			115.0			34.2		72.8		111.0		115.0
Actuated g/C Ratio			1.00			0.30		0.63		0.97		1.00
Clearance Time (s)						4.0		4.0		4.0		4.0
Vehicle Extension (s)						3.0		3.0		3.0		3.0
Lane Grp Cap (vph)			1607			448		2145		613		1776
v/s Ratio Prot								0.45		0.23		0.49
v/s Ratio Perm			0.31			c0.25				c0.51		
v/c Ratio			0.31			0.84		0.71		0.76		0.49
Uniform Delay, d1			0.0			37.8		14.1		17.0		0.0
Progression Factor			1.00			1.00		0.83		1.05		1.00
Incremental Delay, d2			0.5			12.9		1.1		4.3		0.8
Delay (s)			0.5			50.8		12.8		22.0		0.8
Level of Service			A			D		B		C		A
Approach Delay (s)		0.5			50.8			12.8				8.2
Approach LOS		A			D			B				A
Intersection Summary												
HCM Average Control Delay			13.7									B
HCM Volume to Capacity ratio			0.79									
Actuated Cycle Length (s)			115.0							8.0		
Intersection Capacity Utilization			71.2%									C
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
8: 20th St E & 54 AVE E

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↖			↖		↕		↖	↖	↖
Volume (vph)	337	300	110	36	135	598	99	460	47	440	514	298
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5			4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	0.91	0.91			1.00	1.00	1.00	0.95		0.91	0.91	
Frt	1.00	0.97			1.00	0.85	1.00	0.99		1.00	0.95	
Flt Protected	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1579	3186			1843	1583	1805	3525		1564	3113	
Flt Permitted	0.95	0.99			0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1579	3186			1843	1583	1805	3525		1564	3113	
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)	366	326	120	39	147	650	108	500	51	478	559	324
RTOR Reduction (vph)	0	22	0	0	0	36	0	7	0	0	56	0
Lane Group Flow (vph)	271	519	0	0	186	614	108	544	0	430	875	0
Heavy Vehicles (%)	4%	4%	4%	2%	2%	2%	0%	1%	1%	5%	5%	5%
Turn Type			Split		Split	pm+ov	Split			Split		
Protected Phases		1	1		3	3	2	4	4		2	2
Permitted Phases							3					
Actuated Green, G (s)		23.1	23.1				11.8	56.4	17.5	17.5	44.6	44.6
Effective Green, g (s)		23.1	23.1				11.8	56.4	17.5	17.5	44.6	44.6
Actuated g/C Ratio		0.20	0.20				0.10	0.49	0.15	0.15	0.39	0.39
Clearance Time (s)		4.5	4.5				4.5	4.5	4.5	4.5	4.5	4.5
Vehicle Extension (s)		3.5	3.5				3.0	2.0	2.0	2.0	2.0	2.0
Lane Grp Cap (vph)		317	640				189	838	275	536	607	1207
v/s Ratio Prot		c0.17	0.16				c0.10	c0.28	0.06	c0.15	0.27	0.28
v/s Ratio Perm								0.10				
v/c Ratio		0.85	0.81				0.98	0.73	0.39	1.02	0.71	0.72
Uniform Delay, d1		44.3	43.9				51.5	23.3	44.0	48.8	29.7	30.0
Progression Factor		1.00	1.00				1.00	1.00	1.00	1.00	1.09	1.10
Incremental Delay, d2		20.0	7.9				60.4	3.3	0.3	42.8	6.3	3.5
Delay (s)		64.3	51.8				111.9	26.7	44.3	91.5	38.9	36.4
Level of Service		E	D				F	C	D	F	D	D
Approach Delay (s)			56.0					45.6		83.8		37.2
Approach LOS			E					D		F		D
Intersection Summary												
HCM Average Control Delay			51.6									D
HCM Volume to Capacity ratio			0.86									
Actuated Cycle Length (s)			115.0							18.0		
Intersection Capacity Utilization			77.1%									D
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
9: SR 509 (N Frontage Rd) & Alexander Ave E

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↔	↔	↔	↔			↔	↔
Volume (vph)	0	0	0	48	1415	1	403	47	0	0	33	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0		5.0	5.0			5.0	5.0
Lane Util. Factor				1.00	0.95		1.00	0.95			1.00	1.00
Frt				1.00	1.00		1.00	1.00			1.00	0.85
Flt Protected				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (prot)				1770	3539		1787	3610			1900	1615
Flt Permitted				0.95	1.00		0.95	1.00			1.00	1.00
Satd. Flow (perm)				1770	3539		1787	3610			1900	1615
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	52	1538	1	438	51	0	0	36	39
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	15
Lane Group Flow (vph)	0	0	0	52	1539	0	438	51	0	0	36	24
Heavy Vehicles (%)	0%	0%	0%	2%	2%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Perm			Prot				Perm				
Protected Phases				8		1	6			2		2
Permitted Phases	8									2		
Actuated Green, G (s)	60.2			60.2		30.1	42.9			7.8		7.8
Effective Green, g (s)	60.2			60.2		30.1	42.9			7.8		7.8
Actuated g/C Ratio	0.53			0.53		0.27	0.38			0.07		0.07
Clearance Time (s)	5.0			5.0		5.0	5.0			5.0		5.0
Vehicle Extension (s)	2.5			2.5		2.5	2.5			2.5		2.5
Lane Grp Cap (vph)	942			1884		476	1369			131		111
v/s Ratio Prot				c0.43		c0.25	0.01			c0.02		
v/s Ratio Perm	0.03									0.01		
v/c Ratio	0.06			0.82		0.92	0.04			0.27		0.22
Uniform Delay, d1	12.7			21.9		40.3	22.1			50.0		49.8
Progression Factor	1.00			1.00		1.00	1.00			1.00		1.00
Incremental Delay, d2	0.0			2.8		23.1	0.0			0.8		0.7
Delay (s)	12.8			24.7		63.5	22.1			50.8		50.5
Level of Service	B			C		E	C			D		D
Approach Delay (s)	0.0			24.3		59.1	50.6					
Approach LOS	A			C		E	D					

Intersection Summary			
HCM Average Control Delay	33.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	113.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: SR 509 (S Frontage Rd) & Alexander Ave E

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↔	↔	↔	↔	↔			↔	↔
Volume (vph)	22	1081	337	0	0	0	0	360	60	14	83	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				5.0	5.0			5.0			5.0	5.0
Lane Util. Factor				1.00	0.95			0.95			1.00	0.95
Frt				1.00	0.96			0.98			1.00	1.00
Flt Protected				0.95	1.00			1.00			0.95	1.00
Satd. Flow (prot)				1736	3347			3498			1805	3610
Flt Permitted				0.95	1.00			1.00			0.95	1.00
Satd. Flow (perm)				1736	3347			3498			1805	3610
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)	24	1175	366	0	0	0	0	391	65	15	90	0
RTOR Reduction (vph)	0	10	0	0	0	0	0	11	0	0	0	0
Lane Group Flow (vph)	24	1531	0	0	0	0	0	445	0	15	90	0
Heavy Vehicles (%)	4%	4%	4%	0%	0%	0%	0%	1%	1%	0%	0%	0%
Turn Type	Perm			Prot				Perm				
Protected Phases				4		6	5			2		
Permitted Phases	4									2		
Actuated Green, G (s)	60.5			60.5		16.5	1.2			22.7		
Effective Green, g (s)	60.5			60.5		16.5	1.2			22.7		
Actuated g/C Ratio	0.65			0.65		0.18	0.01			0.24		
Clearance Time (s)	5.0			5.0		5.0	5.0			5.0		5.0
Vehicle Extension (s)	2.5			2.5		2.5	2.5			2.5		2.5
Lane Grp Cap (vph)	1127			2173		619	23			879		
v/s Ratio Prot				c0.46		c0.13	c0.01			0.02		
v/s Ratio Perm	0.01									0.01		
v/c Ratio	0.02			0.70		0.72	0.65			0.10		
Uniform Delay, d1	5.8			10.6		36.2	45.8			27.3		
Progression Factor	1.00			1.00		1.00	1.00			1.00		1.00
Incremental Delay, d2	0.0			1.0		3.7	46.4			0.0		
Delay (s)	5.8			11.6		39.9	92.2			27.4		
Level of Service	A			B		D	F			C		
Approach Delay (s)	11.5			0.0		39.9	36.6					
Approach LOS	B			A		D	D					

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	93.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
11: Norpoint Way & SR 509 (Marine View Drive)

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↑↑	↑	↑	↑	↑	↑
Volume (vph)	729	25	636	752	24	426
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	5.0	4.0	5.0	5.0
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3090	1425	1676	1425	1533	1613
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3090	1425	1676	1425	1533	1613
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	792	27	691	817	26	463
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	792	27	691	817	26	463
Heavy Vehicles (%)	2%	2%	2%	2%	6%	6%
Turn Type	Free		Free		Prot	
Protected Phases	8		6		5	
Permitted Phases	Free		Free		6	
Actuated Green, G (s)	34.0	114.7	61.1	114.7	4.6	70.7
Effective Green, g (s)	34.0	114.7	61.1	114.7	4.6	70.7
Actuated g/C Ratio	0.30	1.00	0.53	1.00	0.04	0.62
Clearance Time (s)	5.0		5.0		5.0	
Vehicle Extension (s)	2.5		2.5		2.5	
Lane Grp Cap (vph)	916	1425	893	1425	61	994
v/s Ratio Prot	c0.26		c0.41		0.02	
v/s Ratio Perm	0.02		c0.57			
v/c Ratio	0.86	0.02	0.77	0.57	0.43	0.47
Uniform Delay, d1	38.2	0.0	21.3	0.0	53.8	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.5	0.0	4.1	1.7	3.5	0.3
Delay (s)	46.6	0.0	25.4	1.7	57.2	12.1
Level of Service	D	A	C	A	E	B
Approach Delay (s)	45.1		12.5		14.5	
Approach LOS	D		B		B	

Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	114.7	Sum of lost time (s)	10.0
Intersection Capacity Utilization	68.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: N Frontage Rd & Port of Tacoma Rd

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations					↑↑	↑	↑	↑↑			↑↑	↑	
Volume (vph)	0	0	0	97	112	72	209	165	0	0	516	190	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					5.0	5.0	5.0	5.0			5.0	4.0	
Lane Util. Factor					0.95	1.00	1.00	0.95			0.95	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.98	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					3459	1583	1736	3471			3438	1538	
Flt Permitted					0.98	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					3459	1583	1736	3471			3438	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)	0	0	0	105	122	78	227	179	0	0	561	207	
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	227	15	227	179	0	0	561	207	
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	4%	4%	0%	0%	5%	5%	
Turn Type				Perm		Perm		Prot		Free			
Protected Phases				8		8		1		6		2	
Permitted Phases				8		8				Free			
Actuated Green, G (s)				11.0		11.0		13.6		34.8		16.2	
Effective Green, g (s)				11.0		11.0		13.6		34.8		16.2	
Actuated g/C Ratio				0.20		0.20		0.24		0.62		0.29	
Clearance Time (s)				5.0		5.0		5.0		5.0		5.0	
Vehicle Extension (s)				2.5		2.5		2.5		2.5		2.5	
Lane Grp Cap (vph)				682		312		423		2165		998	
v/s Ratio Prot								c0.13		0.05		c0.16	
v/s Ratio Perm				0.07		0.01							
v/c Ratio				0.33		0.05		0.54		0.08		0.56	
Uniform Delay, d1				19.2		18.2		18.4		4.2		16.8	
Progression Factor				1.00		1.00		1.00		1.00		1.00	
Incremental Delay, d2				0.2		0.0		1.0		0.0		0.6	
Delay (s)				19.5		18.2		19.4		4.2		17.4	
Level of Service				B		B		B		A		B	
Approach Delay (s)				0.0		19.1		12.7				12.7	
Approach LOS				A		B		B		B			

Intersection Summary			
HCM Average Control Delay	14.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
13: 12th St E & Port of Tacoma Rd

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↑		↔		↑	↑		↑	↑	↑
Volume (vph)	65	3	129	90	4	26	54	285	2	0	453	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		5.0	5.0			5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Frt	1.00	0.85	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.85
Flt Protected	0.95	1.00		0.96	0.95	1.00	0.95	1.00		1.00	1.00	1.00
Satd. Flow (prot)	1777	1583		1709	1770	3536	1770	3536		3505	1568	1568
Flt Permitted	0.95	1.00		0.96	0.95	1.00	0.95	1.00		1.00	1.00	1.00
Satd. Flow (perm)	1777	1583		1709	1770	3536	1770	3536		3505	1568	1568
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)	71	3	140	98	4	28	59	310	2	0	492	196
RTOR Reduction (vph)	0	0	117	0	5	0	0	0	0	0	0	63
Lane Group Flow (vph)	0	74	23	0	125	0	59	312	0	0	492	133
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	2%	2%	2%	0%	3%	3%
Turn Type	Split	Perm	Split	Perm	Prot	Perm	Perm	custom				
Protected Phases	4	4		3	3		1	6		2		6
Permitted Phases			4						2			
Actuated Green, G (s)	10.8	10.8		12.2			6.5	27.5		16.0		27.5
Effective Green, g (s)	10.8	10.8		12.2			6.5	27.5		16.0		27.5
Actuated g/C Ratio	0.16	0.16		0.19			0.10	0.42		0.24		0.42
Clearance Time (s)	5.0	5.0		5.0			5.0	5.0		5.0		5.0
Vehicle Extension (s)	2.5	2.5		2.5			2.5	2.5		2.5		2.5
Lane Grp Cap (vph)	293	261		318			176	1485		856		658
v/s Ratio Prot	c0.04			c0.07			c0.03	0.09		c0.14		
v/s Ratio Perm		0.01										0.08
v/c Ratio	0.25	0.09		0.39			0.34	0.21		0.57		0.20
Uniform Delay, d1	23.8	23.2		23.4			27.5	12.1		21.8		12.0
Progression Factor	1.00	1.00		1.00			1.00	1.00		1.00		1.00
Incremental Delay, d2	0.3	0.1		0.6			0.8	0.1		0.8		0.1
Delay (s)	24.2	23.3		24.0			28.3	12.1		22.5		12.2
Level of Service	C	C		C			C	B		C		B
Approach Delay (s)	23.6			24.0			14.7			19.6		
Approach LOS	C			C			B			B		

Intersection Summary			
HCM Average Control Delay	19.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	65.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
14: Pacific HWY & Port of Tacoma Rd

NMCRRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↑		↔		↑	↑		↑	↑	↑
Volume (vph)	41	268	125	451	575	92	81	221	141	108	456	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	6.0		6.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95	0.97	0.95	0.95	1.00	0.95	0.95	1.00	0.95	1.00	0.95
Frt	1.00	0.95	1.00	0.98	1.00	0.94	1.00	0.94	1.00	0.99	1.00	0.99
Flt Protected	0.95	1.00		0.95	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1687	3213		3335	3367	1583	2982	2982		1492	2956	2956
Flt Permitted	0.95	1.00		0.95	1.00	0.95	1.00	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1687	3213		3335	3367	1583	2982	2982		1492	2956	2956
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)	45	291	136	490	625	100	88	240	153	117	496	33
RTOR Reduction (vph)	0	43	0	0	10	0	0	93	0	0	4	0
Lane Group Flow (vph)	45	384	0	490	715	0	88	300	0	117	525	0
Heavy Vehicles (%)	7%	7%	7%	5%	5%	5%	14%	14%	14%	21%	21%	21%
Turn Type	Prot	Prot	Prot	Split	Split	Split	Split	Split		Split	Split	
Protected Phases	1	6		5	2		4	7	8	4	7	8
Permitted Phases												
Actuated Green, G (s)	6.8	21.1		12.0	27.3		38.2	38.2		22.1	22.1	
Effective Green, g (s)	6.8	21.1		12.0	27.3		33.7	33.7		22.1	22.1	
Actuated g/C Ratio	0.06	0.18		0.10	0.24		0.29	0.29		0.19	0.19	
Clearance Time (s)	5.0	6.0		6.0	6.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.5	3.5		3.5	3.5	
Lane Grp Cap (vph)	100	590		348	800		464	875		287	569	
v/s Ratio Prot	0.03	0.12		c0.15	c0.21		0.06	c0.10		0.08	c0.18	
v/s Ratio Perm												
v/c Ratio	0.45	0.65		1.41	0.89		0.19	0.34		0.41	0.92	
Uniform Delay, d1	52.2	43.5		51.4	42.4		30.4	31.9		40.7	45.6	
Progression Factor	1.00	1.00		1.00	1.00		0.88	0.87		1.00	1.00	
Incremental Delay, d2	3.2	2.6		200.0	12.4		0.1	0.1		1.1	20.9	
Delay (s)	55.4	46.0		251.5	54.8		26.8	27.9		41.8	66.5	
Level of Service	E	D		F	D		C	C		D	E	
Approach Delay (s)		46.9			134.1			27.7			62.0	
Approach LOS		D			F			C			E	

Intersection Summary			
HCM Average Control Delay	84.8	HCM Level of Service	F
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	21.0
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
15: I-5 WB Ramp & Tacoma Rd

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	0	0	0	15	1	128	399	303	1	0	318	659	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.5	4.5	4.5	5.0			5.0	4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			1.00	1.00	
Frt					0.88	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.99	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1194	1162	1703	3404			1727	1468	
Flt Permitted					0.99	1.00	0.55	1.00			1.00	1.00	
Satd. Flow (perm)					1194	1162	992	3404			1727	1468	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	0	0	16	1	139	434	329	1	0	346	716	
RTOR Reduction (vph)	0	0	0	0	58	69	0	0	0	0	0	0	
Lane Group Flow (vph)	0	0	0	0	22	7	434	330	0	0	346	716	
Heavy Vehicles (%)	0%	0%	0%	32%	32%	32%	6%	6%	6%	0%	10%	10%	
Turn Type				Split		Perm	custom					Free	
Protected Phases				8		8		7		4	5	6	
Permitted Phases						8		3		4	6	Free	
Actuated Green, G (s)					10.0	10.0		72.9		44.8		78.2	114.9
Effective Green, g (s)					10.0	10.0		61.9		44.8		66.2	114.9
Actuated g/C Ratio					0.09	0.09		0.54		0.39		0.58	1.00
Clearance Time (s)					4.5	4.5		4.5					
Vehicle Extension (s)					4.0	4.0		3.0					
Lane Grp Cap (vph)					104	101		613		1327		995	1468
v/s Ratio Prot					0.02			c0.08		0.10		0.20	
v/s Ratio Perm						0.01		c0.30				c0.49	
v/c Ratio					0.22	0.07		0.71		0.25		0.35	0.49
Uniform Delay, d1					48.8	48.2		21.7		23.7		12.9	0.0
Progression Factor					1.00	1.00		1.00		1.00		0.04	1.00
Incremental Delay, d2					1.4	0.4		3.7		0.0		0.0	0.1
Delay (s)					50.2	48.5		25.5		23.7		0.5	0.1
Level of Service					D	D		C		C		A	A
Approach Delay (s)		0.0				49.4			24.7			0.2	
Approach LOS		A				D			C			A	

Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	114.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
16: I-5 EB Off & Port of Tacoma Rd

NMCRC Tacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	0	0	0	0	584	88	240	221	0
Sign Control			Stop			Stop		Free			Free	
Grade			0%			0%		0%			0%	
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
Hourly flow rate (vph)	0	0	0	0	0	0	0	635	96	261	240	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1445	1492	240	1445	1445	683	240			730		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1445	1492	240	1445	1445	683	240			730		
IC, single (s)	7.1	6.5	6.3	7.1	6.5	6.3	4.1			4.3		
IC, 2 stage (s)												
tF (s)	3.5	4.0	3.4	3.5	4.0	3.4	2.2			2.3		
p0 queue free %	100	100	100	100	100	100	100			68		
cM capacity (veh/h)	83	85	784	83	90	431	1338			813		

Direction, Lane #	NB 1	SB 1	SB 2
Volume Total	730	261	240
Volume Left	0	261	0
Volume Right	96	0	0
cSH	1700	813	1700
Volume to Capacity	0.43	0.32	0.14
Queue Length 95th (ft)	0	35	0
Control Delay (s)	0.0	11.5	0.0
Lane LOS		B	
Approach Delay (s)	0.0	6.0	
Approach LOS			

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
17: 20th St & Port of Tacoma Rd

NMCRCTacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	66	137	1	2	67	669	1	21	0	484	18	23	
Sign Control	Stop			Stop			Free			Free			
Grade	0%												
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	
Hourly flow rate (vph)	72	149	1	2	73	727	1	23	0	526	20	25	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None						None						
Median storage (veh)													
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	1146	1109	32	1172	1122	23	45						23
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1146	1109	32	1172	1122	23	45						23
tC, single (s)	7.2	6.6	6.3	7.2	6.6	6.2	4.1						4.2
tC, 2 stage (s)													
tF (s)	3.6	4.1	3.4	3.5	4.0	3.3	2.2						2.3
p0 queue free %	0	0	100	0	45	30	100						66
cM capacity (veh/h)	22	133	1019	0	133	1045	1545						1530
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1	SB 2							
Volume Total	72	150	802	24	351	220							
Volume Left	72	0	2	1	351	175							
Volume Right	0	1	727	0	0	25							
cSH	22	134	0	1545	1530	1530							
Volume to Capacity	3.22	1.12	Err	0.00	0.34	0.34							
Queue Length 95th (ft)	Err	215	Err	0	39	39							
Control Delay (s)	Err	179.2	Err	0.3	8.6	7.5							
Lane LOS	F	F	F	A	A	A							
Approach Delay (s)	3356.2	Err		0.3	8.1								
Approach LOS	F	F											
Intersection Summary													
Average Delay	Err												
Intersection Capacity Utilization	80.6%			ICU Level of Service			D						
Analysis Period (min)	15												

HCM Signalized Intersection Capacity Analysis
18: Lincoln Ave & Taylor Way

NMCRCTacoma
Alternative 1 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	237	21	0	0	232	194	0	0	213	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0			5.0			5.0		
Lane Util. Factor	1.00		1.00		1.00		1.00		1.00			
Flt	0.85		1.00		1.00		1.00		1.00			
Flt Protected	1.00		0.95		0.95		1.00		1.00			
Satd. Flow (prot)	1509		1805		1583		1667		1652			
Flt Permitted	1.00		0.76		0.44		1.00		1.00			
Satd. Flow (perm)	1509		1439		737		1667		1652			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	258	23	0	0	252	211	0	0	232	0
RTOR Reduction (vph)	0	0	202	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	56	23	0	0	252	211	0	0	232	0
Heavy Vehicles (%)	0%	0%	7%	0%	0%	0%	14%	14%	0%	0%	15%	0%
Turn Type	Perm		Perm		Perm		pm+pt		pm+pt			
Protected Phases	4		4		8		1		6		5	
Permitted Phases	4		8		8		6		2			
Actuated Green, G (s)	10.1		10.1		26.7		26.7		12.9			
Effective Green, g (s)	10.1		10.1		26.7		26.7		12.9			
Actuated g/C Ratio	0.22		0.22		0.57		0.57		0.28			
Clearance Time (s)	5.0		5.0		5.0		5.0		5.0			
Vehicle Extension (s)	2.5		2.5		2.5		2.5		2.5			
Lane Grp Cap (vph)	326		311		580		951		455			
v/s Ratio Prot	c0.04		0.02		c0.08		0.13		0.14			
v/s Ratio Perm	0.17		0.07		0.43		0.22		0.51			
v/c Ratio	14.9		14.6		5.5		4.9		14.3			
Uniform Delay, d1	1.00		1.00		1.00		1.00		1.00			
Progression Factor	0.2		0.1		0.4		0.1		0.7			
Incremental Delay, d2	15.1		14.7		5.9		5.0		14.9			
Delay (s)	15.1		14.7		5.9		5.0		14.9			
Level of Service	B		B		A		A		B			
Approach Delay (s)	15.1		14.7		5.5		5.0		14.9			
Approach LOS	B		B		A		A					
Intersection Summary												
HCM Average Control Delay	10.5			HCM Level of Service			B					
HCM Volume to Capacity ratio	0.35											
Actuated Cycle Length (s)	46.8			Sum of lost time (s)			10.0					
Intersection Capacity Utilization	46.7%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
 19: Taylor Way & E 11th Street

NMCRC Tacoma
 Alternative 1 PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↗	↗		↖	↗
Sign Control		Stop	Stop		Stop	
Volume (vph)	75	119	46	0	0	145
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	82	129	50	0	0	158
Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2	
Volume Total (vph)	82	129	50	0	158	
Volume Left (vph)	82	0	0	0	0	
Volume Right (vph)	0	0	0	0	158	
Hadj (s)	0.74	0.00	0.00	0.00	-0.44	
Departure Headway (s)	5.7	5.0	5.0	5.2	4.7	
Degree Utilization, x	0.13	0.18	0.07	0.00	0.21	
Capacity (veh/h)	605	702	688	685	726	
Control Delay (s)	8.3	7.8	8.3	7.0	7.7	
Approach Delay (s)	8.0		8.3	7.7		
Approach LOS	A		A	A		
Intersection Summary						
Delay			8.0			
HCM Level of Service			A			
Intersection Capacity Utilization			19.0%		ICU Level of Service A	
Analysis Period (min)			15			