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TECHNICAL REPORT

Tesoro Savage Vancouver Energy Distribution Terminal Transportation Impact Analysis

Date:	August 22, 2013	Project #: 13574.0
To:	Helen Devery, Berger ABAM	
From:	Brian J. Dunn P.E., Chris Brehmer, P.E., and Anais Malinge	

This report documents the results of the transportation impact analysis (TIA) prepared by Kittelson & Associates, Inc. (KAI) for the proposed Tesoro Savage Vancouver Energy Distribution Terminal in Vancouver, Washington. The proposed development site is located along the south side of Lower River Road (SR 501), within the Port of Vancouver.

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EXECUTIVE SUMMARY

Tesoro Savage Petroleum Terminal LLC (the Applicant) is proposing to construct a facility to receive petroleum by rail, store it on site, and ship it via the Columbia River to various users/refiners on the West Coast. The proposed facility involves three separate Port property areas; Terminal 5, Parcel 1A, and Berths 13 and 14 along the Columbia River. These areas are all zoned appropriately for the

proposed industrial use and are currently used for marine cargo laydown, temporary storage of scrap metal and a marine lay berth.

The proposed development will begin operations in 2015 and reach peak operations by 2020. At that time, the proposed facility will be handling a maximum of 360,000 barrels of petroleum per day, an average of 4 unit trains per day, and is expected to reach peak employment of 110 workers.

Traffic associated with the proposed site development will primarily access the Port's Terminal 5 area via Lower River Road (SR 501) west, Old Lower River Road south, and the Old Alcoa Facility Access Road to the east. From this road, access driveways will be established to separate parking lots adjacent to the facility's administrative and support buildings (Facility Area 200), just north of the loop track.

A site vicinity map is shown in Figure 1 with the proposed site plan shown in Figure 2.

Study Findings and Recommendations

This study concludes that acceptable levels of traffic operations and safety can be maintained at the study intersections with the build-out of the proposed development. Key study findings and recommendations are as follows:

Findings

- All study intersections currently operate acceptably during the weekday a.m. and p.m. peak hours and are projected to continue to do so in 2020 and 2025 with site development.
- A review of historical crash data identified no safety-related mitigation needs at the study intersections.
- Intersection sight distance is adequate at all study intersections.
- The proposed development is estimated to generate 332 average daily trips, 48 weekday a.m. peak hour trips (40 in, 8 out), and 46 weekday p.m. peak hour trips (10 in, 36 out).

Recommendations

- The applicant should work with the Port of Vancouver and City of Vancouver to post a 25 MPH speed limit on Old Lower River Road south of SR 501, where no posted speed sign exists.
- The applicant should work with the Port and WSDOT to post a YIELD sign to control the channelized northbound right-turn maneuver from Old Lower River Road onto SR 501.
- The applicant should work with the Port and City of Vancouver to reconfigure traffic control devices at the Old Lower River Road/Old Alcoa Facility Access Road intersection.

- The applicant should work with the Port to add texturing/coloring treatments to the striped crosswalk on the private access approach to Lower River Road (SR 501), between the Far West Steel operation and the proposed Storage Tank area.
- The applicant should properly locate and maintain any new landscaping, signage, and/or above-ground utilities installed along the site frontage and internal roadways to ensure that adequate sight distance continues to be available.

LEGEND

● - STUDY INTERSECTIONS

SITE VICINITY MAP
VANCOUVER, WA

FIGURE
1

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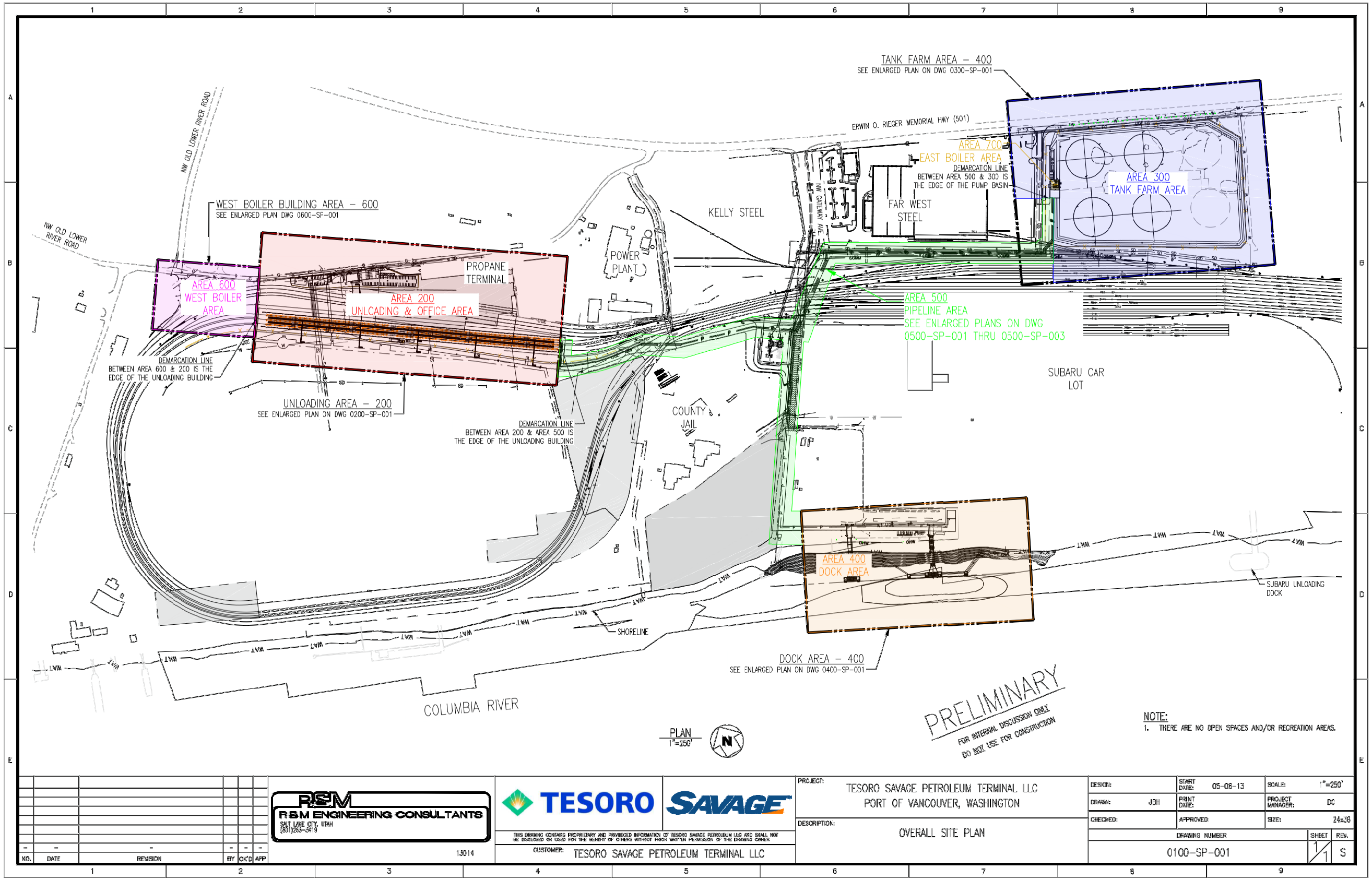

SITE PLAN PROVIDED AUGUST 2013 BY BERGERABAM

PROPOSED SITE PLAN
VANCOUVER, WA

FIGURE **2**

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Additional details on the analysis, pertinent findings and recommendations are documented in the remaining sections of this report.

SCOPE OF REPORT

This transportation impact analysis determines the transportation-related impacts associated with the proposed site development. The study intersections and overall study area for this project were determined based on a review of existing travel patterns, the traffic impact analysis requirements pursuant to Vancouver Municipal Code (VMC) Sections 11.80.130 and 11.80.080, the City's *Traffic Study Guidelines*, the City of Vancouver's Concurrency Ordinance (VMC 11.70), and direction provided by City of Vancouver staff through the project scoping process.

Transportation Concurrency Corridors and Study Intersections

The study site is located within Transportation Analysis Zone (TAZ) #38. In accordance with Vancouver's Transportation Concurrency ordinance, this report summarizes the number of weekday p.m. peak hour site-generated trips impacting each of the City's adopted concurrency corridors. Site-generated trips within the City were tracked to the following City-modeled concurrency corridors:

- Fourth Plain Boulevard (Port of Vancouver to I-5)
- Mill Plain Boulevard (Fourth Plain Boulevard to I-5)

Analysis Periods

Weekday morning (6:00 - 9:00 a.m.) and evening (4:00 - 6:00 p.m.) peak hour traffic conditions were modeled at the study intersections.

Study Intersections

Per the VMC and City staff direction, operational analysis was prepared at the following study intersections:

- Old Lower River Road/Lower River Road (SR 501)
- Gateway Avenue/Lower River Road (SR 501)
- Fourth Plain Boulevard/Mill Plain Boulevard (SR 501)
- Old Lower River Road/ Old Alcoa Facility Access Road

Report Format

The remaining sections of this report address the following transportation issues:

- Existing site conditions, surrounding land uses, and transportation system conditions within the site vicinity;
- Vehicle crash histories at study intersections;
- In-process developments, anticipated regional traffic growth trends, and planned transportation improvements in the study area;
- Future year 2020 and 2025 background traffic conditions at all study intersections during the weekday a.m. and p.m. peak hours;
- Trip generation and distribution estimates for the proposed site development;
- Future year 2020 and 2025 total traffic conditions at the study intersections with full build-out of the site during the weekday a.m. and p.m. peak hours;
- Vehicle queuing and sight distance at key study intersections;
- On-site access and circulation;
- Access spacing;
- Transportation concurrency corridor trip assignment;
- Analysis of construction traffic impacts; and,
- Potential traffic mitigation measures.

Conclusions and recommendations are provided following the analysis and documentation herein.

INTERSECTION ANALYSIS METHODOLOGY

All level-of-service (LOS) and volume-to-capacity (v/c) ratio analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 1). *A description of level of service, how it is measured, the criteria by which it is determined, and generally acceptable ranges of level of service are presented in Appendix "A".*

The peak 15-minute flow rate was used in the evaluation of all intersection operations to ensure that this study was based on a reasonable worst-case scenario. For this reason, the operations analyses reflect conditions that are only likely to occur for 15 minutes out of each average weekday a.m. and p.m. peak hour. Traffic conditions during all other weekday hours will likely operate under better conditions than those described in this report.

For the intersections operations analyses, *Synchro Version 8.0* software was used to analyze the study intersections along SR 501. Due to the unique traffic control characteristics of the Old Lower River Road/Old Alcoa Facility Access Road intersection, a separate software program, *SIDRA Version 5.1* was used to properly model the delay associated with stop-controlled and free-flow movements.

Intersection Operating Standards

VMC Section 11.80.130B requires signalized intersections under City jurisdiction to maintain LOS "E" and a v/c ratio less than 0.95. Unsignalized intersections must maintain a v/c ratio less than 0.95 for the critical movement and/or approach.

SR 501, which overlaps Lower River Road and then Mill Plain Boulevard to the southeast, is under the jurisdiction of the Washington State Department of Transportation (WSDOT). Therefore, intersections along SR 501 are subject to WSDOT's traffic operation standards, which require LOS "D" or better.

EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and current operational and geometric characteristics of roadways within the study area. This section creates a basis for comparison to future conditions. The study site was visited and inventoried in July 2013. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic conditions, and transportation facilities in the study area.

Site Conditions and Adjacent Land Uses

The proposed development site is located in three separate Port of Vancouver properties: a portion of Terminal 5, all of Parcel 1A, and Berths 13 and 14 along the Columbia River. At Terminal 5, two additional railroad loop tracks will be added inside the current loop tracks (constructed in 2010) to unload petroleum from incoming rail cars (see Areas 200 and 600 on site plan). Parcel 1A, just east of the Farwest Steel operation, is currently used for marine cargo laydown and temporary storage of steel scrap and will be the location of a series of holding tanks (a.k.a. Product Storage Tanks) designed to temporarily store petroleum (see Area 300 on site plan). Lastly, Berths 13 and 14 along the Columbia River, just south of the Subaru of America lot, will be used to transfer petroleum onto barges and ships (see Area 400 on site plan).

Recent completion of the loop track at Terminal 5 is part of ongoing efforts by the Port to complete the West Vancouver Freight Access project. Construction efforts are currently underway to complete a new grade-separated crossing for Gateway Avenue to pass over the adjacent rail line. These improvements will provide access to Terminal 5 properties south of the rail line, including the Clark County Corrections Jail Work Center and Subaru of America Lot along Harborside Drive. Terminal 5 is also the location of the future BHP Billiton Bulk Potash Handling Facility; preliminary construction has begun and the facility is expected to be completed in in mid-2015.

There are a variety of other marine and industrial businesses in the vicinity of the Tesoro Savage Vancouver Energy Distribution Terminal site. Other nearby industrial businesses include Subaru of America, Kelly Steel, Tri-Star, FarWest Steel Corporation, West Van Materials Recovery Center, and Tidewater. There is also a propane terminal (operated by Keyera) and a gas fired turbine power plant

(operated by Clark County Public Utilities) located at the east end of the Old Alcoa Facility Access Road, which is a private roadway. The Clark County Jail Work Center is located west of Gateway Avenue and the Subaru facility.

Adjacent Roadway Facilities

Table 1 summarizes key characteristics of the local study area roadways.

Table 1: Existing Transportation Facilities and Roadway Designations

Roadway	Classification	Cross-Section	Speed Limit	Side-walks?	Bicycle Lanes?	Median?	On-Street Parking?
Fourth Plain Boulevard	Principal Arterial	3-5 lane	35 mph	Partial	Yes	TWLTL[1]	No
Mill Plain Boulevard (SR 501)	Principal Arterial (State Highway Route)	5-lane	35 mph	Yes	Yes	Raised	No
Lower River Road (SR 501)[2]	Principal Arterial (State Highway Route)	2-5 lane[3]	45-50[4] mph	No[5]	No[6]	No	No
Gateway Avenue	Local Public Street	2-lane	Not Posted	Partial (east side)	No	No	Yes
Old Lower River Road	Local Public Street	2-lane	Not Posted	No	No	No	No
Old Alcoa Facility Access Road	Private Street	2-lane	15 mph	No	No	No	No

[1] Two-Way Left-Turn Lane with exclusive turn lanes at major street intersections.
[2] Lower River Road (SR 501) is both a City-designated Principal Arterial and State designated Highway Route from Fourth Plain Boulevard to the City Limits, and then only a State Highway Route west of Gateway Avenue.
[3] Cross-section changes from 5 lanes east of 26th Avenue to 2 lanes west of 26th Avenue, with left-turn lanes at major intersections.
[4] Posted speed changes from 45 MPH east of Centennial Industrial Park to 50 MPH west of Centennial Industrial Park.
[5] There is a new two-way multiuse trail along the south side of Lower River Road (SR 501) extending from Gateway Avenue east along the Far West Steel property as well as the proposed Tesoro Savage Petroleum Terminal site frontage for the Tank Farm Area.
[6] Although not formally designated as bike lanes, there is fog line striping and sufficient paved shoulder on both sides of SR 501 for bicycle travel.

SR 501

State Route (SR) 501 is operated and maintained by WSDOT. West of I-5, this highway leads west out of the downtown Vancouver area along Mill Plain Boulevard and then along Lower River Road west of the Fourth Plain Boulevard/Mill Plain Boulevard intersection. As Mill Plain Boulevard, the highway has 5 lanes of travel and urban design features including a landscaped median, bicycle lanes and sidewalks. West of the Fourth Plain Boulevard intersection, the highway becomes more rural in nature, where it reduces down to 2 travel lanes with left-turn lanes provided at major intersections. The highway generally has wide paved shoulders and fog line striping for bicycle travel and there is a multi-use path at intermittent locations along the south side of the road.

Gateway Avenue

Gateway Avenue is the main entrance to Terminal 5 at the Port of Vancouver. The roadway is a private road with two travel lanes, partial sidewalks and on-street parking is allowed.

Old Lower River Road

Old Lower River Road extends south from Lower River Road (SR 501) and then west to provide access to local industrial businesses before it circles back to SR 501 to the northwest. It is a public local road with two lanes of travel, no sidewalks or bicycle lanes, and no on-street parking.

Old Alcoa Access Facility Road

The Old Alcoa Access Facility Road extends east from where Old Lower River Road turns southbound-to-westbound. This private road has two travel lanes, a posted speed of 15 MPH and no sidewalks. It leads east to the Keyera propane facility and a gate that prevents further travel east.

Bicycle and Pedestrian Facilities

Sidewalks and bicycle lanes are installed along Mill Plain Boulevard and Fourth Plain Boulevard. While there are no designated bicycle lanes along Lower River Road (SR 501), a two-way multiuse path was recently installed along the south side of SR 501 starting at Gateway Avenue and proceeding east along the FarWest Steel property frontage. This path also extends along the site frontage of the Tank Farm area of the Tesoro Savage project and includes a striped crosswalk and signage at the private access to SR 501 between the FarWest Steel and the proposed Storage Tank area.

No continuous sidewalks or bicycle lanes are installed on the local streets that lead directly to the site, namely Gateway Avenue and Old Lower River Road.

Transit Facilities

The nearest fixed-route public transit service to the site is provided at the Mill Plain Boulevard/Fourth Plain Boulevard intersection, and provided by C-Tran (Reference 2). The intersection is roughly 0.75 miles east of the easternmost portion of the site. *Route #25* serves the intersection and provides service between 39th Street/Fruit Valley Road, downtown Vancouver, and the 99th Street Transit Center. Service is provided on weekdays at approximately 35-minute headways and on weekends at approximately 50-minute headways. *Route #25* travels on Fruit Valley Road, Fourth Plain Boulevard, and Mill Plain Boulevard.

The Port of Vancouver is in the process of developing a multi-modal path along Lower River Road (SR 501) to the bus service line at the Mill Plain/Fourth Plain intersection.

Crash Analysis

A five-year crash history of all study intersections (data reported from January 2008 through December 2012) was obtained from WSDOT in an effort to identify potential safety issues. Key crash variables (e.g., type, severity, etc.) were reviewed at each intersection to assess whether any crash patterns might be identifiable.

Table 2 presents a summary of the 5-year crash history at the study intersections in terms of crashes by type, severity, and per million entering vehicles (MEV). The City's *Traffic Study Guidelines* identify a crash rate greater than or equal to 1.0 crashes/MEV as a threshold that determines the need for additional evaluation and potential mitigation.

Table 2: 2008-2012 Crash Data Summary

Intersection	# of Crashes	Crash Type				Crash Severity		Crashes per MEV[2]
		Rear -End	Side-swipe	Angle	Overturned Vehicle	PDO[1]	Injury	
Old Lower River Rd/Lower River Rd (SR 501)	1	-	1	-	-	-	1	0.35
Gateway Ave/Lower River Road (SR 501)	1	-	-	-	1	1	-	0.25
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	4	-	2	1	1	3	1	0.33
Old Lower River Rd/Old Alcoa Facility Access Rd	0	-	-	-	-	-	-	0.00
Lower River Road/Private Driveway (FarWest Steel)[3]	0	-	-	-	-	-	-	0.00

[1] PDO: Property Damage Only
[2] MEV: Million Entering Vehicles
[3] The private drive intersection with Lower River Road (SR 501) between the Far West Steel property and the proposed Tesoro Savage Tank Farm area was established in the last two years and no crash data was available for this intersection. Given the limited use of this road, its recent construction in accordance with City design standards and sufficient intersection sight distance (as observed and noted in the previous section of this report), there are no apparent traffic safety issues at this location.

As shown in the previous table, the study intersections have a crash rate of less than one crash per million entering vehicles. Based on the crash review, and in accordance with City requirements for thresholds exceeding 1.0 crashes/MEV, no apparent safety hazards or safety-based mitigation measures were identified. *Appendix "B" contains the crash data used for the crash analysis.*

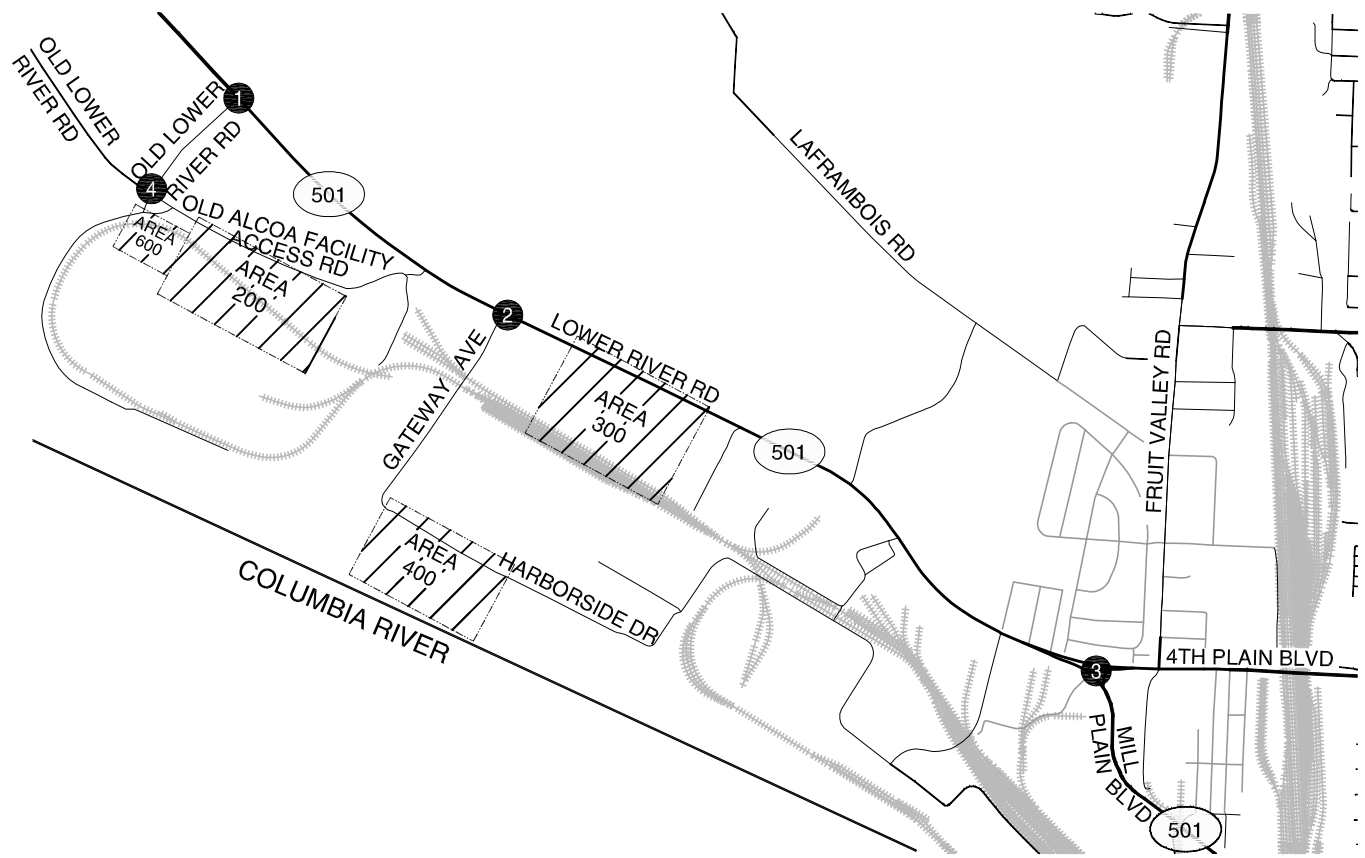
Existing Lane Configurations and Traffic Control Devices

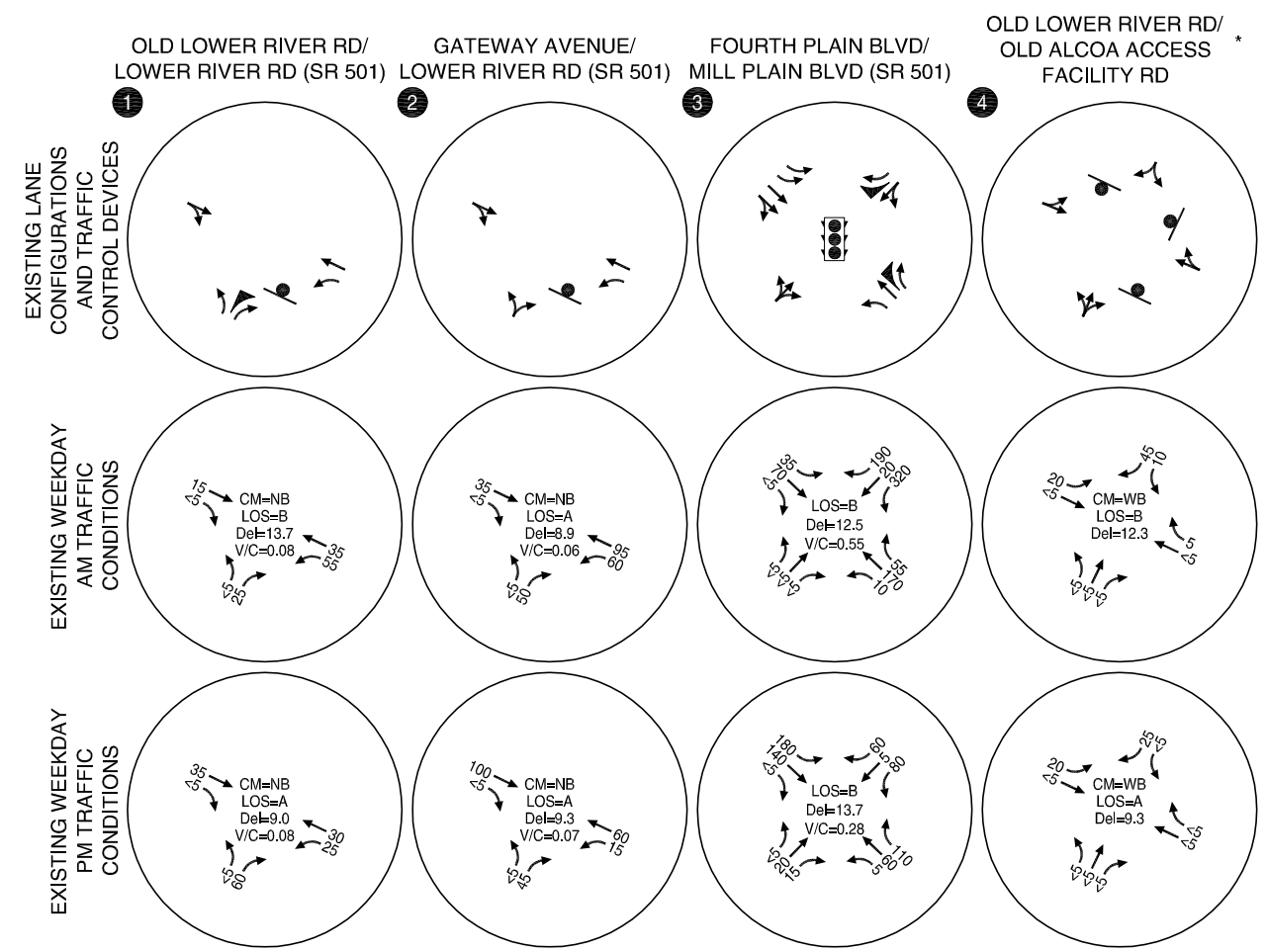
Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections. Each of the intersections is also described below.

Fourth Plain Boulevard/Mill Plain Boulevard (SR 501)

This four-legged intersection is signalized and operates with protected left-turn phasing on the mainline approaches of Mill Plain Boulevard and permitted left-turn phasing on the Fourth Plain and St. Francis Lane approaches. The traffic signal is isolated, and therefore, not coordinated with other signals along Mill Plain Boulevard. Crosswalks with pedestrian signal control are installed on the southwest and southeast intersection approaches. Pedestrians are not accommodated on the other two approaches. The westbound approach on Fourth Plain Boulevard has a free right turn lane that merges with northbound-to-westbound Mill Plain Boulevard traffic at speed.

(NO SCALE)





LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
STOP SIGN
TRAFFIC SIGNAL

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* Southbound approach has "Right Turn Permitted Without Stopping" Sign

EXISTING TRAFFIC CONDITIONS
WEEKDAY AM & PM PEAK HOURS
VANCOUVER, WA

FIGURE 3

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Gateway Avenue/Lower River Road (SR 501)

This T-shaped intersection operates with stop-control on the minor street approach of Gateway Avenue. An exclusive left-turn lane is provided for movements off the highway.

Old Lower River Road /Lower River Road (SR 501)

This T-shaped intersection operates with stop-control on the minor street approach of Old Lower River Road; however, the northbound right-turn movement from Old Lower River Road is channelized with no posted traffic control. That impact analysis conservatively assumes the northbound right-turn movement is stop-controlled for delay calculation purposes, even though drivers may only yield before merging with mainstream traffic.

Old Lower River Road /Old Alcoa Facility Access Road

This four-legged intersection is intersected by the public portion of Old Lower River Road (north and west legs only), the private portion of the Old Alcoa Facility Access Road (east leg), and an outbound-only driveway coming from the rail loop track and "perimeter road" at Terminal 5. Traffic control is as follows:

- Southbound approach: stop-controlled with a "Right Turn Permitted Without Stopping" sign
- Northbound approach: stop controlled
- Eastbound approach: uncontrolled
- Westbound approach: stop-controlled

The traffic control configuration allows the current primary southbound-to-westbound and eastbound-to-northbound movements on the public section of Old Lower River Road to occur freely while stopping all other movements.

Existing Traffic Conditions

Traffic counts were obtained at the study intersections on mid-week days in May 2013 during the weekday morning (6:00 – 9:00 a.m.) and afternoon (4:00 – 6:00 p.m.) peak periods. The counts were compiled and reviewed to identify the peak hour periods for the street system, which occurred from 7:00 – 8:00 a.m. and 4:00 – 5:00 p.m.

As shown in Figure 3 and in Table 3, all study intersections currently operate within acceptable operations thresholds during the weekday a.m. and p.m. peak hours.

Table 3: Existing Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.08	LOS "D"	Yes
	PM	A	0.08		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.06	LOS "D"	Yes
	PM	A	0.07		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.55	LOS "D"	Yes
	PM	B	0.28		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	B	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	A	NA		Yes

Appendix "C" contains the traffic count data sheets used in this study and Appendix "D" contains the operational analysis worksheets prepared for the existing conditions weekday a.m. and p.m. peak hour analysis periods.

BASELINE TRAFFIC CONDITIONS

The baseline traffic conditions analysis estimates operating conditions for the year 2020, when the proposed Tesoro Savage Vancouver Energy Distribution Terminal is expected to operate at full capacity and at full employment. Also, a baseline future forecast for the year 2025 was prepared, per the City's TIA requirements, to identify how the study area's transportation system will operate five years after completion of the proposed development.

This baseline analysis includes general traffic growth in the region, vehicle trips generated by in-process developments in the site's vicinity, but does not include traffic from the proposed development. It also accounts for planned transportation improvement projects not associated with the proposed site development.

Planned Roadway Improvements

As noted earlier in this report the Port of Vancouver is completing several street improvement projects to improve access to Terminal 5 and other areas of the Port. The Port has constructed a "perimeter road" around the outside of the loop track connecting Old Lower River Road with Harborside Drive and a new grade-separated structure for Gateway Avenue to convey the roadway over the railroad tracks. Access to Berths 13 and 14 along the Columbia River will also be established. These improvements will help reduce internal site traffic use of Lower River Road (SR 501) traveling between site areas. No other funded street improvements were identified in the study area.

Build-Out Year 2020 Baseline Traffic Conditions

A 1.5-percent linear annual growth rate was applied to existing year 2013 peak hour traffic volumes over a 7-year period to develop year 2020 baseline traffic volumes for the weekday a.m. and p.m. peak hours. This growth rate was applied to major traffic movements at the study intersections along SR 501 intersections, but not at minor connections related to Port properties such as Gateway Avenue and Old Lower River Road.

One in-process development was identified and included in the 2020 baseline traffic volumes; the Terminal 5 Bulk Potash Handling Facility. The approved Bulk Potash Handling Facility development is to be located west of the proposed site. The vehicle trips generated from this in-process development were assigned to the study intersections based on the trip generation and assignment contained in the *Bulk Potash Handling Facility Transportation Impact Analysis* (Reference 3).

Figures 4 and 5 and Table 4 illustrate the build-out year 2020 baseline traffic conditions for the respective weekday a.m. and p.m. peak hour periods. As shown, the study intersections are forecast to continue to operate acceptably under these scenarios during the weekday a.m. and p.m. peak hours.

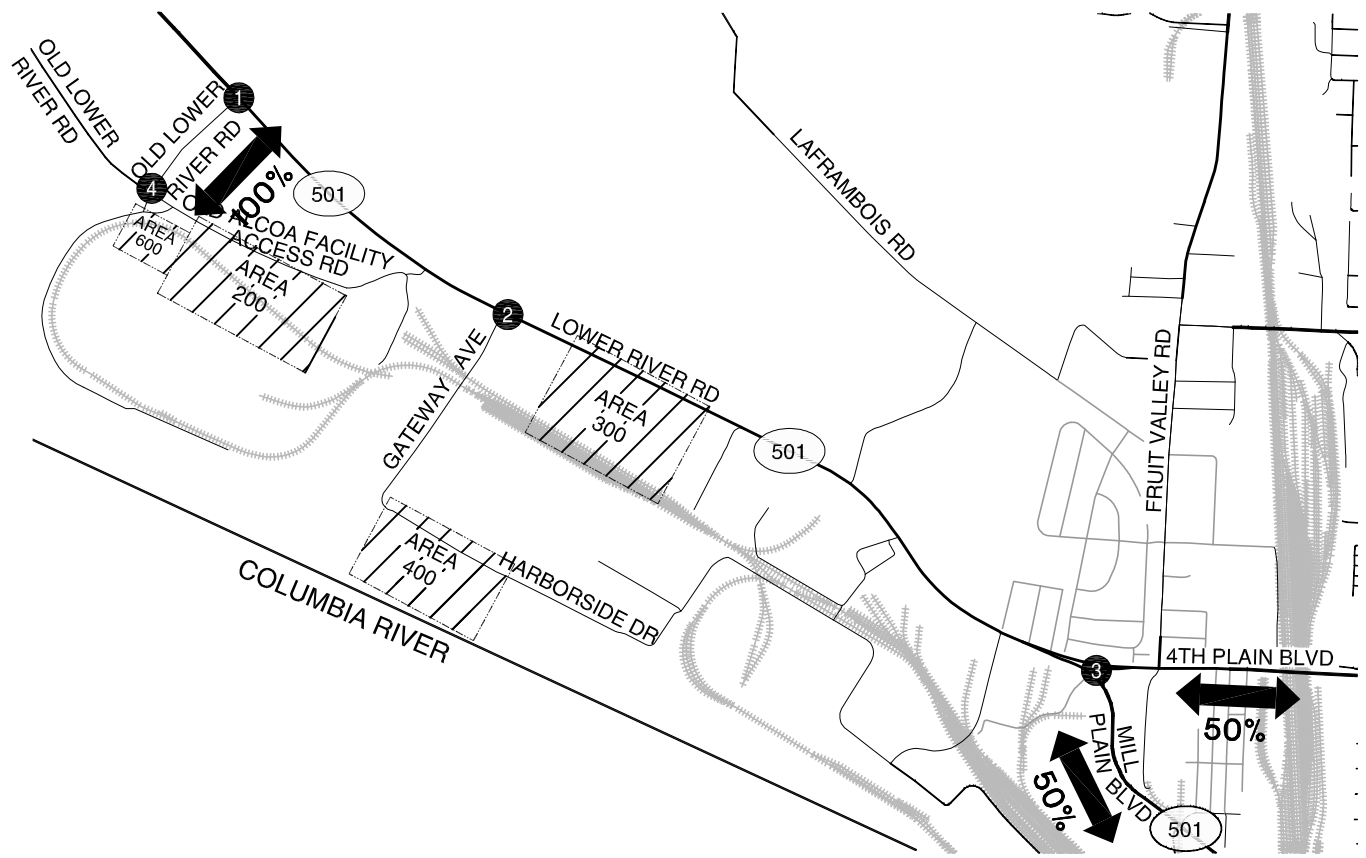
Table 4: Build-Out Year 2020 Baseline Traffic Conditions Summary

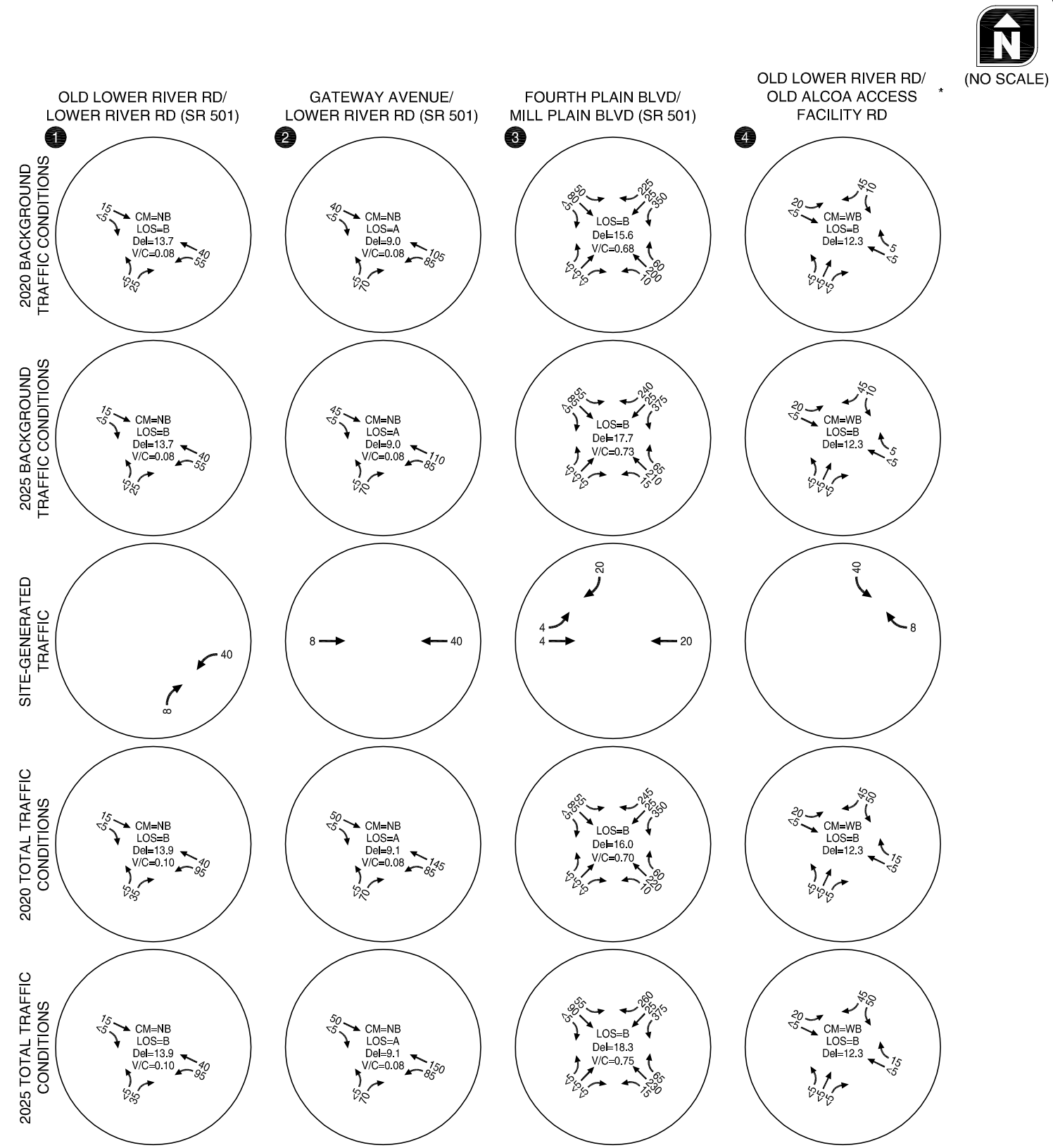
Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.08	LOS "D"	Yes
	PM	A	0.08		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.08	LOS "D"	Yes
	PM	A	0.07		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.68	LOS "D"	Yes
	PM	B	0.34		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	B	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	A	NA		Yes

Appendix "E" includes in-process development trips. Appendix "F" contains the 2020 baseline traffic conditions operational analysis worksheets prepared for the a.m. and p.m. peak hour periods.

Forecast Year 2025 Baseline Traffic Conditions

Year 2020 baseline traffic volumes were further increased by a 1.5 percent linear annual growth rate to develop year 2025 baseline traffic volumes. Consistent with the 2020 analysis, the growth rate was applied to major traffic movements of study intersections along SR 501. No additional in-process developments or planned roadway improvements were identified at the study intersections for the 2025 forecast year.





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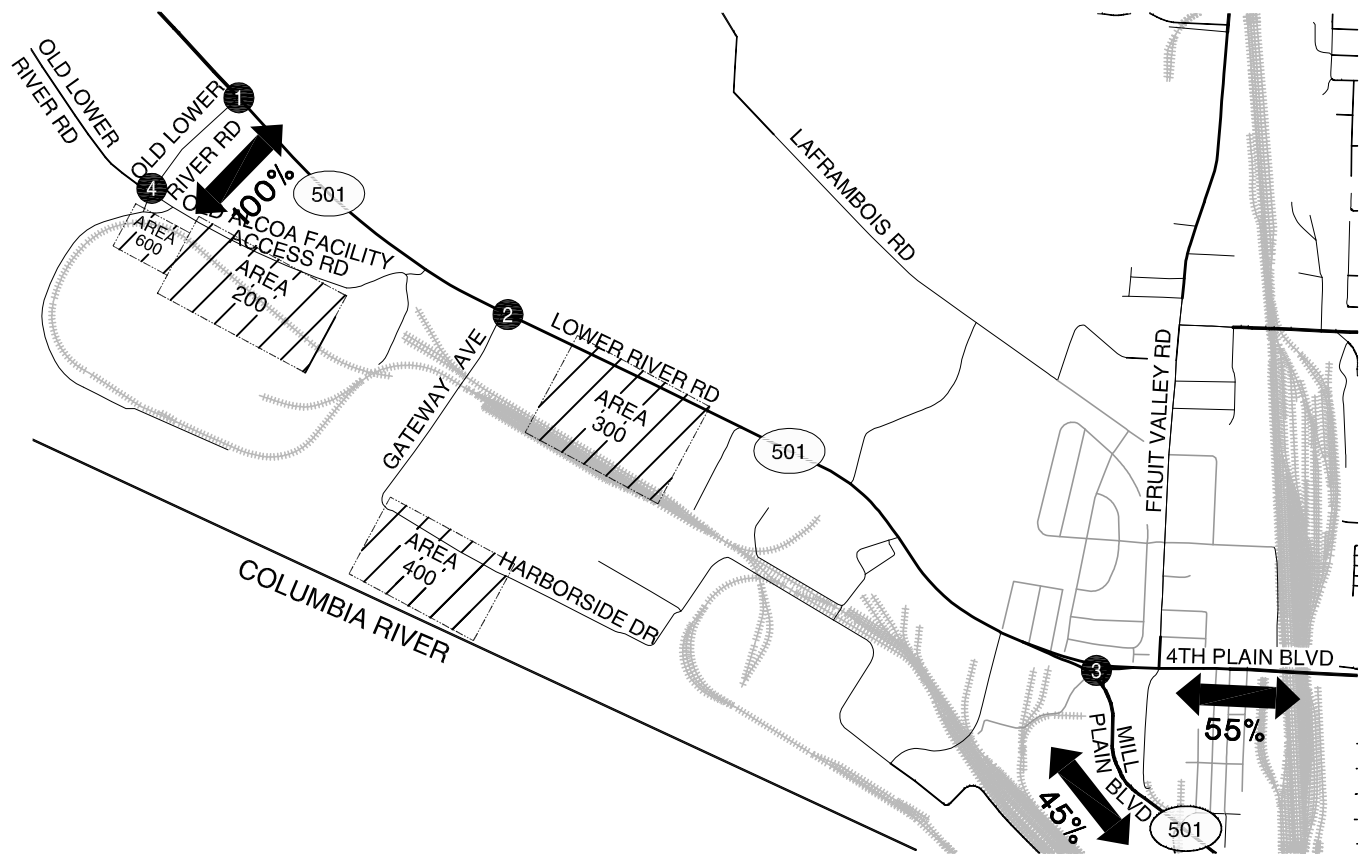
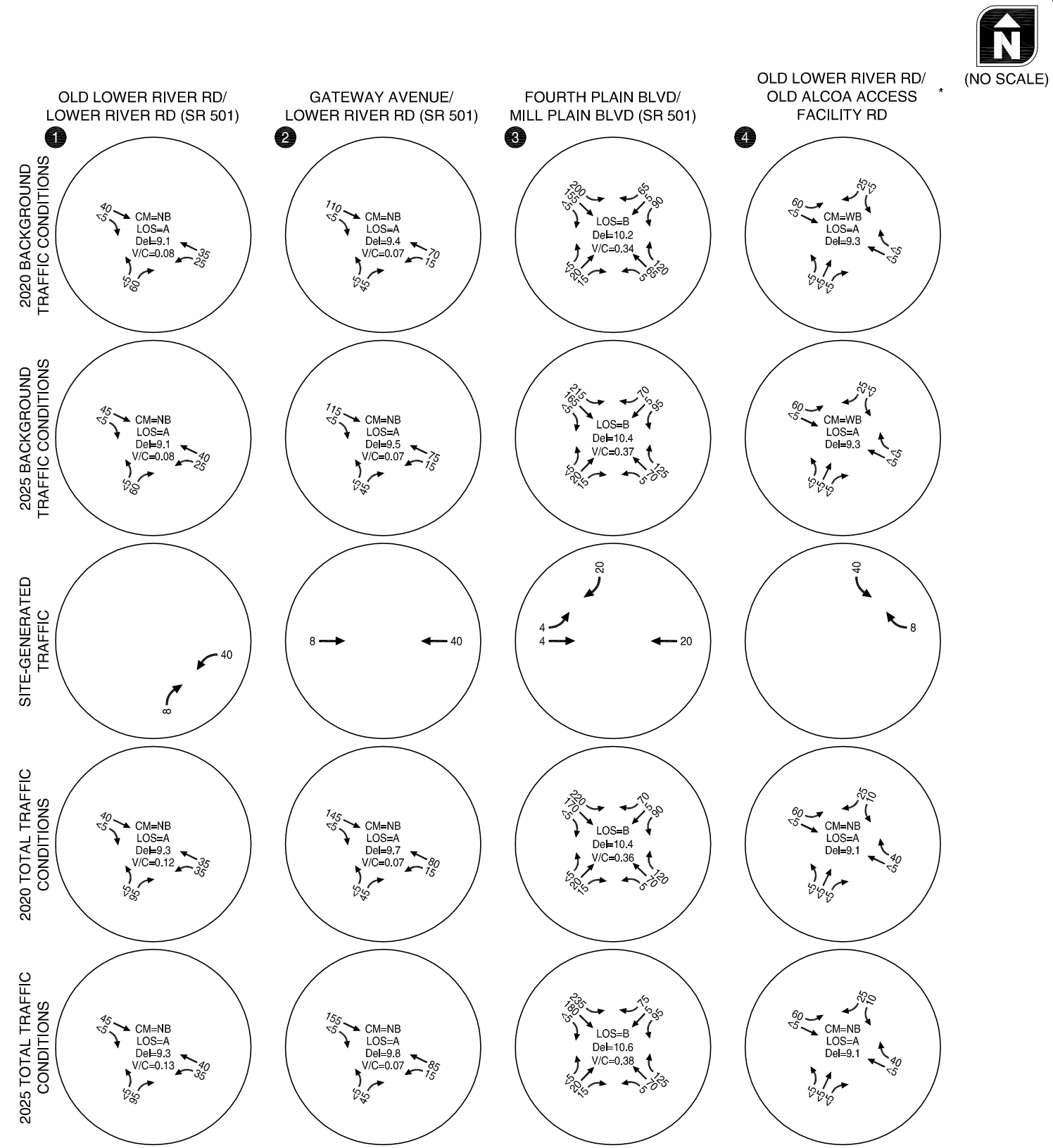
* Southbound approach has "Right Turn Permitted Without Stopping" Sign

FUTURE TRAFFIC CONDITIONS
WEEKDAY AM PEAK HOUR
VANCOUVER, WA

FIGURE 4





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* Southbound approach has "Right Turn Permitted Without Stopping" Sign

FUTURE TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
VANCOUVER, WA

FIGURE **5**

As shown in Figures 4 and 5 and in Table 5, all study intersections are forecast to continue to operate acceptably in the year 2025 during the weekday a.m. and p.m. peak hours.

Table 5: Forecast Year 2025 Baseline Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.08	LOS "D"	Yes
	PM	A	0.08		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.08	LOS "D"	Yes
	PM	A	0.07		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.73	LOS "D"	Yes
	PM	B	0.37		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	B	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	A	NA		Yes

Appendix "G" contains the 2025 baseline traffic conditions operational analysis worksheets prepared for the a.m. and p.m. peak hour periods

TOTAL TRAFFIC CONDITIONS

This report section presents the proposed development plan, its anticipated trip generation, trip distribution and assignment, the operational impacts of site trips on the study intersections, and required trip assignment to the City of Vancouver's concurrency corridors.

Proposed Development Plan

Tesoro Savage Petroleum Terminal LLC (the applicant) is proposing to construct a facility to receive petroleum by rail, store it on site, and ship it via the Columbia River to various users/refiners on the West Coast. The development proposal, known as the Tesoro Savage Vancouver Energy Distribution Terminal, is to begin operations in 2015 and reach peak operations (full staffing) by the year 2020. At that time, the proposed facility will be processing a maximum of 360,000 barrels of petroleum per day, an average of 4 unit trains per day, and reach peak employment of 110 workers. Descriptions of the facility processing areas comprising the site are described in the following sections.

Terminal 5

The portion of Terminal 5 associated with this project is located along the south side of the Old Alcoa Facility Access Road. It involves Area 600 (West Boiler Area) and Area 200 (Uloading & Office Area) as shown in the site plan. In this area, the applicant is proposing to construct new loop track lines within the existing loop track along with a structure used to unload petroleum delivered by unit trains. A boiler/steam plant and a series of small office buildings will be built north of the loop track

and along the south side of the Old Alcoa Facility Access Road. The buildings will be used by facility employees to park their personal vehicles during the workday, begin and end their workday, and to conduct normal business operations.

Vehicular access to this portion of Terminal 5 will occur from Lower River Road (SR 501) via the public access to Old Lower River Road, and then the Old Alcoa Facility Access Road.

Parcel 1A

Parcel 1A is located along the south side of Lower River Road (SR 501) just east of the FarWest Steel Corporation site. A series of storage tanks will be built as shown in the site plan (Area 300 – Storage) for temporary storage of petroleum. Parking at the storage tank are will be limited to a few stalls and will be used for occasional routine maintenance; no peak hour "commute" trips to this area are anticipated. Vehicular access to the storage tank area will be provided via SR 501 and the existing private drive located along the east side of FarWest Steel Corporation.

Berths 13 and 14

Berths 13 and 14 to the Columbia River are located southeast of Terminal 5 and just south of the Subaru America car lot. These berths, as shown in the site plan (Area 400 -Marine Terminal) will be used to pump petroleum onto barges or ships.

Vehicular access to the berths will be provided by a new connection to Harborside Drive and Gateway Avenue as part of a Port project. Like the storage tank area, vehicle parking at the berths will be limited to a few stalls and no peak hour "commute" trips to this area are anticipated.

Site Trip Generation

Trip generation estimates of daily and weekday a.m. and p.m. peak hour vehicle trip ends for the proposed development were calculated using the standard reference manual, *Trip Generation, 9th Edition*, published by the Institute of Transportation Engineers (Reference 4). ITE trip rates for land use code 110 (Light Industrial) were used as the basis for estimating vehicle trips. These rates, using permanent employees as the independent variable, are based on empirical observations at other similar industrial developments.

Table 6 shows the estimated trip generation for the proposed industrial use.

Table 6: Trip Generation Estimate

Land Use	ITE Code	Size	Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
				Total	In	Out	Total	In	Out
Light Industrial	110	110 employees	332	48	40	8	46	10	36

Truck Traffic

Because the primary function of the proposed facility is to transfer petroleum from rail cars onto nearby barges, post-construction operations of the proposed development are not expected to generate tractor-trailer trucks trips on the external street network on typical days. Instead, typical delivery and service vehicle trips are expected. A separate discussion of contractor trips and construction-related truck trips is provided later in this report.

Site Trip Distribution and Assignment

The estimated vehicle trip distribution pattern was based on a review of the existing weekday a.m. and p.m. traffic counts at the Lower River Road (SR 501)/Old Lower River Road intersection, (where all external trips are expected to enter and exit the site) as well as the existing patterns observed at the Mill Plain Boulevard (SR 501)/Fourth Plain Boulevard intersection.

As shown in Figures 4 and 5, all weekday a.m. and p.m. peak hour site trips were assigned to points east along SR 501, reflecting the location of the Port of Vancouver and major destinations to the east such as the downtown area of Vancouver and I-5.

Build-Out Year 2020 Total Traffic Conditions

The year build-out year 2020 total traffic analysis identifies how the study area's transportation system will operate with the proposed development complete and operating at full capacity and full employment. This analysis includes general regional traffic growth, traffic generated due to in-process developments and the vehicle trips generated from the proposed development.

Figures 4 and 5 and Table 7 also illustrate the year 2020 total traffic conditions. As shown, all study intersections are forecast to continue to operate adequately during the weekday a.m. and p.m. peak hours.

Table 7: Build-Out Year 2020 Total Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.10	LOS "D"	Yes
	PM	A	0.12		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.08	LOS "D"	Yes
	PM	A	0.07		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.70	LOS "D"	Yes
	PM	B	0.36		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	B	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	A	NA		Yes

Appendix "H" contains the 2020 with project traffic conditions operational analysis worksheets.

Forecast Year 2025 Total Traffic Conditions

The forecast year 2025 total traffic analysis identifies how the study area's transportation system will operate five years after the proposed development reaches its peak capacity and full employment. Figures 4 and 5 and Table 8 illustrate the future year 2025 total traffic conditions and show that the study intersections are forecast to continue to operate acceptably during the weekday a.m. and p.m. peak hours.

Table 8: Forecast Year 2025 Total Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.10	LOS "D"	Yes
	PM	A	0.13		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.08	LOS "D"	Yes
	PM	A	0.07		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.75	LOS "D"	Yes
	PM	B	0.38		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	B	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	A	NA		Yes

Appendix "I" contains the 2025 total traffic condition operational analysis worksheets prepared for the a.m. and p.m. peak hour periods.

Vehicle Queuing Analysis

Vehicle queuing analyses were using the *SimTraffic* software for the study intersections along Lower River Road (SR 501) and using the *SIDRA* software for the Old Lower River Road/Old Alcoa Facility Access Road intersection. Tables 9 and 10 show the forecast 95th percentile vehicle queues for the year 2020 and 2025 weekday a.m. and p.m. peak hour conditions, both without and with the development project. One vehicle was assumed to occupy 25 feet of space for this analysis. *Appendix "J" includes the queuing analysis worksheets.*

Table 9: Forecast 95th Percentile Vehicle Queues, Weekday a.m. Peak Hour

Intersection	Approach	Movement	95th Percentile Queue (feet)				Storage Length Available (feet)
			2020 Baseline	2020 Total	2025 Baseline	2025 Total	
Old Lower River Rd/ Lower River Rd (SR 501)	Westbound	Left	<25	25	<25	<25	750
	Northbound	Left	<25	<25	25	<25	125
		Channelized Right	75	75	75	75	250
Gateway Ave/ Lower River Rd (SR 501)	Westbound	Left	<25	25	<25	25	200
	Northbound	Left/Right	75	75	75	75	200
Old Lower River Rd/ Old Alcoa Facility Access Rd	Westbound	Through/Right	<25	<25	<25	<25	175
	Northbound	Left/Through/Right	<25	<25	<25	<25	150
	Southbound	Left	<25	25	<25	25	>500

Table 10: Forecast 95th Percentile Vehicle Queues, Weekday p.m. Peak Hour

Intersection	Approach	Movement	95th Percentile Queue (feet)				Storage Length Available (feet)
			2020 Baseline	2020 With Project	2025 Baseline	2025 With Project	
Old Lower River Rd/ Lower River Rd (SR 501)	Westbound	Left	<25	<25	<25	<25	750
	Northbound	Left	50	50	25	50	125
		Channelized Right	75	75	75	75	250
Gateway Ave/ Lower River Rd (SR 501)	Westbound	Left	<25	<25	<25	<25	200
	Northbound	Left/Right	50	50	50	75	200
Old Lower River Rd/ Old Alcoa Facility Access Rd	Westbound	Through/Right	<25	<25	<25	<25	175
	Northbound	Left/Through/Right	<25	<25	<25	<25	150
	Southbound	Left	<25	<25	<25	<25	>500

As shown in the previous two tables, the forecast queues can be accommodated within the available storage at the identified study intersections, during both the a.m. and p.m. peak periods.

INTERSECTION SIGHT DISTANCE

Per VMC Section 11.80.140, public and private streets must comply with the sight distance standards specified in *A Policy on Geometric Design of Highways and Streets standards* (AASHTO, Reference 5). To address this requirement, the proposed development plan was reviewed to ensure that drivers associated with the site development (normal traffic & construction traffic) have adequate intersection sight distance at key intersections in the site vicinity. Table 11 shows the results of the sight distance analysis for stop-controlled movements at key intersections. As shown in the following table, all locations currently have adequate intersection sight distance.

Table 11: Intersection Sight Distance Analysis Results

Intersection	Approach	Available Sight Distance (Feet)[1]	Minimum AASHTO Standard (Feet)[2]	Is Sight Distance Adequate?
Lower River Road (SR 501)/ Old Lower River Road	Northbound	>1,000 WB & EB	555 feet	Yes
Lower River Road (SR 501)/ Gateway Avenue	Northbound	>1,000 WB & EB	555 feet	Yes
Lower River Road (SR 501)/ Private Access -FarWest Steel [3]	Northbound	>1,000 WB & EB	555 feet	Yes
Old Lower River Road/ Old Alcoa Facility Access Road	Northbound Southbound Westbound	650 WB, >1,000 NB 550 WB 650 WB	280 WB, 610 NB 280 WB 280 WB	Yes Yes Yes

[1] Distances shown reflect approaching free-flow traffic movements only.

[2] Minimum AASHTO distances shown reflect posted speed of roadway, which is 50 MPH along Lower River Road (SR 501). Where posted speed is not provided (i.e. Old Lower River Road) and no other data is available, the Basic Rule speed of 55 MPH was assumed. An 85th percentile speed of 24 MPH was recorded along Old Lower River Road, west of the Old Alcoa Facility Access Road.

[3] This intersection was included in the sight distance analysis to ensure adequate sight distance for vehicles potentially related to the proposed site development.

It should be noted that the private drive access along the east side of the FarWest Steel property and its connection with Lower River Road (SR 501) was included in the sight distance analysis, given this connection has the potential to be used by site traffic. Additionally, there is no posted speed limit on Old Lower River Road, south of SR 501. Therefore, the 55 MPH Basic Rule speed was assumed to apply to free-flowing traffic approaching from Old Lower River Road, except west of the Old Alcoa Facility Access Road intersection, where a speed survey conducted along Old Lower River Road indicated an 85th percentile travel speed of 24 MPH . *Appendix "K" contains the results of this speed survey.*

ON-SITE ACCESS AND TRAFFIC CIRCULATION

On-site access and traffic circulation was evaluated based on the proposed site plan. As stated in the trip generation section of this report, most, if not all, site trips will travel to/from the administrative and support buildings on the Terminal 5 property (Area 200- Unloading and Office). Traffic will access this location using Lower River Road (SR 501) and Old Lower River Road. After making a left-turn onto the Old Alcoa Facility Access Road, site traffic will have the option of using one of several new driveways to separate parking lots next to the administrative buildings.

Any site trips associated with the storage tank area on Parcel 1A (Area 300 – Storage) to the northeast will use Lower River Road (SR 501) to access the private access drive east of FarWest Steel. Any trips associated with the petroleum loading operation at Berths 13 and 14 along the Columbia River will use a new driveway connection to Harborside Drive, which will connect with Gateway Avenue and the internal ring road around the loop track which leads to Old Lower River Road and the administrative buildings on the Terminal 5 property.

ACCESS SPACING

The proposed development relies on taking access to public and private street connections that are already established and in conformance with City of Vancouver access spacing requirements, per VMC Section 11.080.110.

CONSTRUCTION TRAFFIC IMPACTS

The proposed Tesoro Savage Vancouver Energy Distribution Terminal will generate traffic during facility construction. To account for the traffic-related impacts, construction worker and truck delivery traffic have been estimated and analyzed.

Construction Year 2014 Baseline Traffic Conditions

Construction of the proposed development is estimated to occur over a 9-month period in 2014. An annual growth rate of 1.5 percent, consistent with build-out and forecast year growth, was applied to

major traffic movements at the study intersections along SR 501 intersections, but not at minor connections related to Port properties such as Gateway Avenue and Old Lower River Road. In addition to background traffic growth, the construction traffic associated with the BHP Billiton site was accounted for as in-process traffic. As per the Terminal 5 Transportation Management Plan, 177 daily construction workers and 64 daily truck deliveries are estimated during a majority of BHP Billiton site construction (KAI, Reference 6). The associated freight access plan was referenced to determine site access and circulation patterns for these workers and trucks during the a.m. and p.m. peak hours. The resulting construction year 2014 a.m. and p.m. peak hour background traffic volumes and operations results are presented in Table 12 Figures 6 and 7, respectively. As shown, the study intersections operate acceptably in both the a.m. and p.m. peak hours.

Appendix "L" includes the in-process trip generation and freight route from the Terminal 5 TMP.

Table 12: Construction Year 2014 Baseline Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.09	LOS "D"	Yes
	PM	B	0.31		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.06	LOS "D"	Yes
	PM	B	0.09		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.65	LOS "D"	Yes
	PM	B	0.32		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	C	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	B	NA		Yes

Site Construction Trip Generation

During the 9-month construction period, the proposed development site will generate construction worker and truck delivery traffic. Tesoro Savage estimates a total of 125 daily construction workers and 83 daily, round trip truck deliveries.

Table 13 shows the estimated trips generated due to construction of the proposed development.

Table 13: Estimated Construction Trip Generation

Trip Type	Size	Daily Trips	Weekday AM Peak Hour Trips			Weekday PM Peak Hour Trips		
			Total	In	Out	Total	In	Out
Construction Workers	125 employees	250	125	125	0	125	0	125
Truck Deliveries	83 deliveries	166	16	8	8	16	8	8
Net New Trip Generation		**416**	**141**	**133**	**8**	**141**	**8**	**133**

The 125 construction workers were assumed to arrive during the a.m. peak period and depart during the p.m. peak period. The 83 roundtrip truck deliveries were distributed across the 10-hour daily construction schedule; as such, an estimated 16 total truck deliveries were assumed during both the a.m. and p.m. peak periods (8 in, 8 out), respectively.

Site Construction Trip Distribution and Assignment

Based on trip distribution pattern estimates by Tesoro Savage, all construction worker traffic will use the Old Lower River Road entrance from Lower River Road (SR 501). Tesoro Savage also estimates that 11% of trucks will use Old Lower River Road entrance from Lower River Road (SR 501), 3% will use Gateway Avenue, and 86% will use the private access drive east of FarWest Steel.

Construction Year 2014 Total Traffic Conditions

The impact of construction site generated trips on intersection operations are shown in Table 14 as well as Figures 6 and 7 for the a.m. and p.m. peak periods, respectively. As shown, the study intersections operate acceptably in both the a.m. and p.m. peak hours.

Table 14: Construction Year 2014 Total Traffic Conditions Summary

Intersection	Peak Hour	LOS	V/C	Standard	Meets Standard?
Old Lower River Rd/Lower River Rd (SR 501)	AM	B	0.10	LOS "D"	Yes
	PM	B	0.32		Yes
Gateway Ave/Lower River Rd (SR 501)	AM	A	0.06	LOS "D"	Yes
	PM	B	0.35		Yes
Fourth Plain Blvd/Mill Plain Blvd (SR 501)	AM	B	0.70	LOS "D"	Yes
	PM	B	0.37		Yes
Old Lower River Rd/Old Alcoa Facility Access Rd	AM	C	NA	LOS "E" & V/C ≤ 0.95	Yes
	PM	B	NA		Yes

Appendix "M" contains the construction year 2014 traffic conditions operational analysis worksheets.

Construction Truck Traffic

As stated previously, there will be up to an estimated 83 round-trip truck deliveries (83 in, 83 out) occurring on weekdays at the site over the course of the 9-month construction schedule. These trips will generally occur within the construction staging period between 7:00 a.m. and 8:00 p.m. During peak traffic periods on the adjacent major street network, only 16 trucks (8 in, 8 out) are estimated to occur during the a.m. and p.m. peak hours, respectively.

All construction truck deliveries are projected to travel to and from I-5, and the two designated truck routes intended to be used by drivers are Mill Plain Boulevard and Fourth Plain Boulevard. On

occasion, when traffic congestion occurs along I-5, truck drivers may use the designated truck route along Fruit Valley Road via either 39th Street or 78th Street. However, the magnitude of truck trips is anticipated to be small, given the low peak hour truck trip projections and presence of other truck route options. The Applicant will make best efforts to require construction truck drivers to route their deliveries via Mill Plain Boulevard and Fourth Plain Boulevard.

It should also be emphasized, again, that the primary function of the proposed facility is to transfer petroleum from rail cars onto nearby barges. Therefore, post-construction operations of the proposed development are not expected to generate any significant truck traffic on the external street network save for typical delivery and service vehicles.

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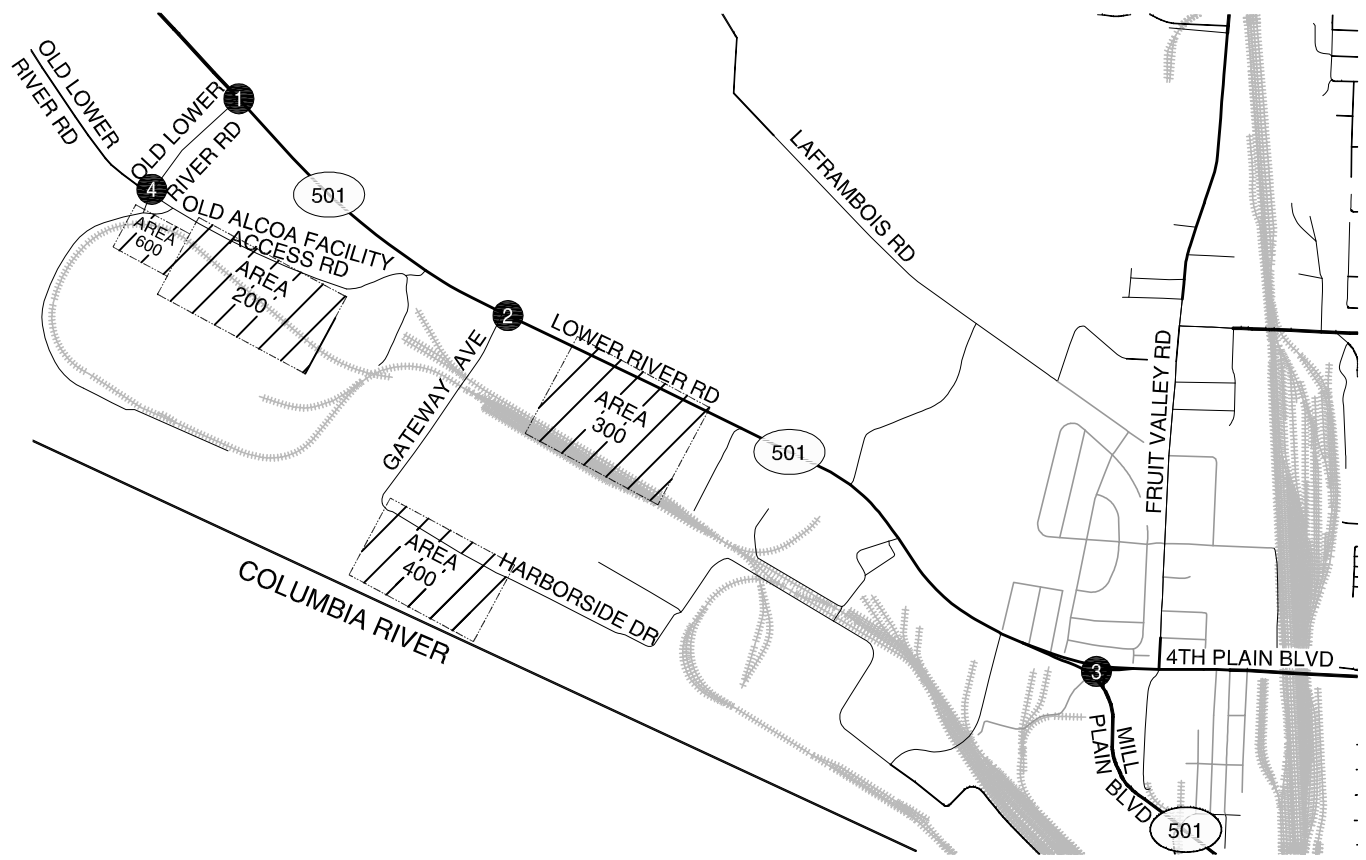

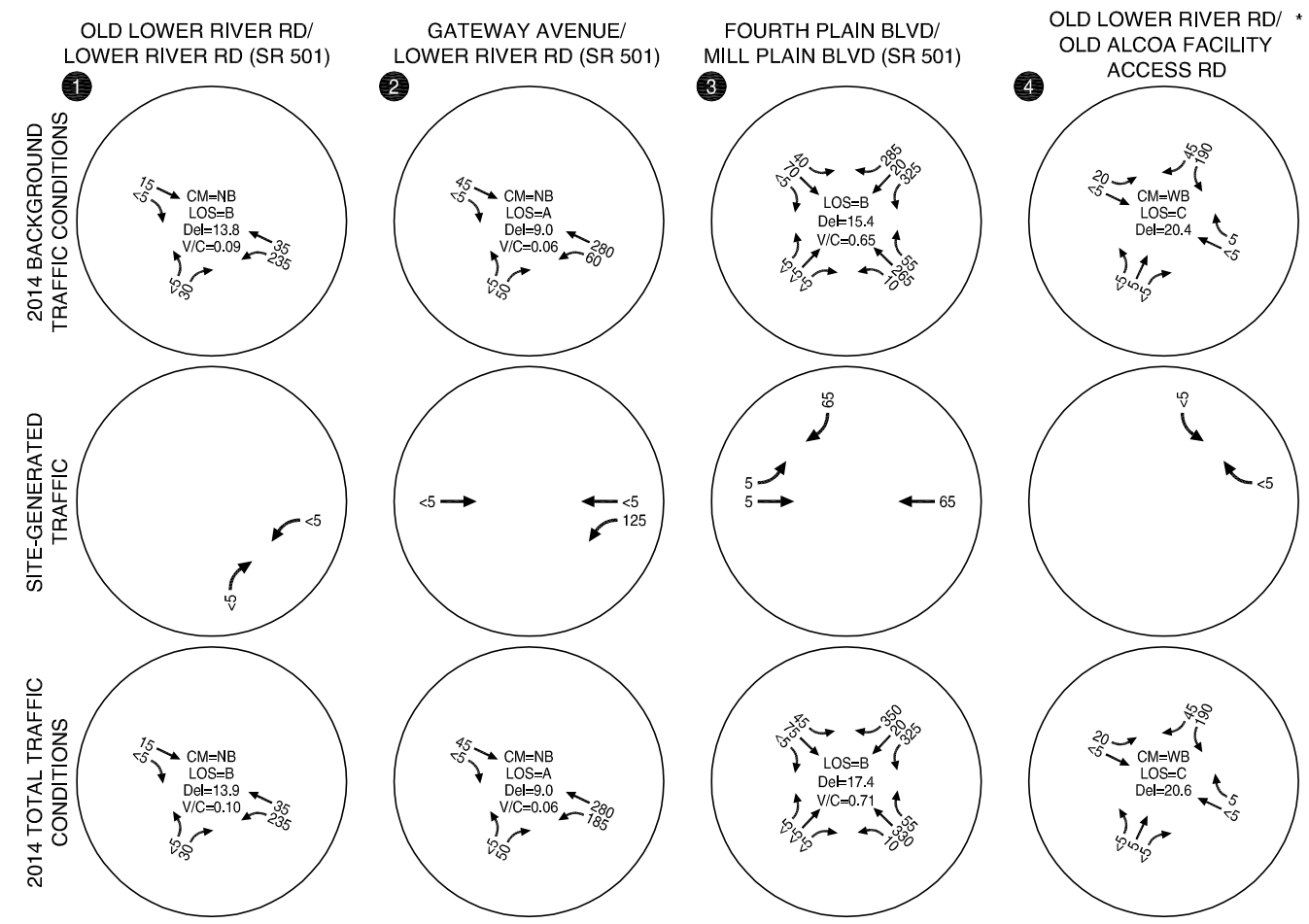

LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

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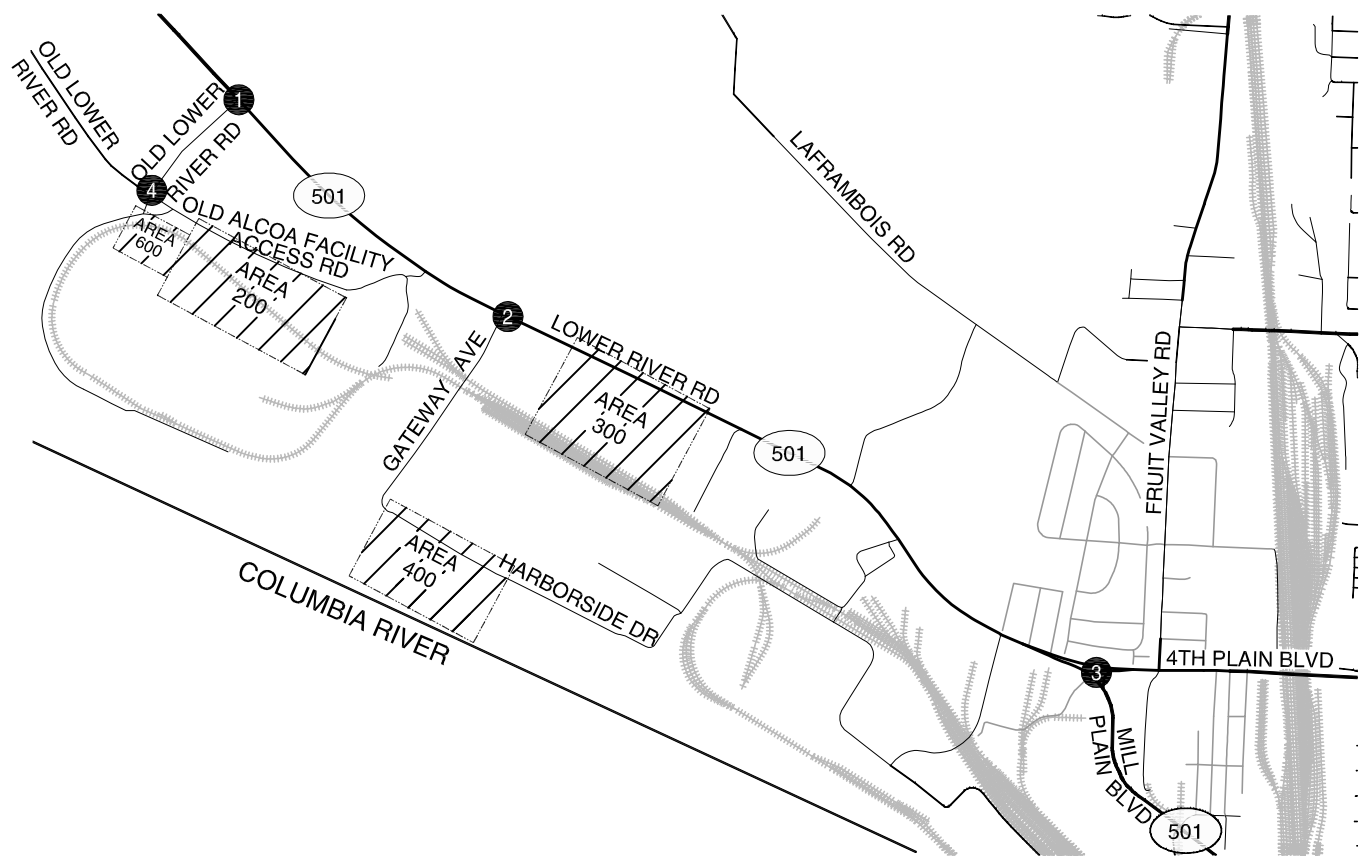
* Southbound approach has "Right Turn Permitted Without Stopping" Sign

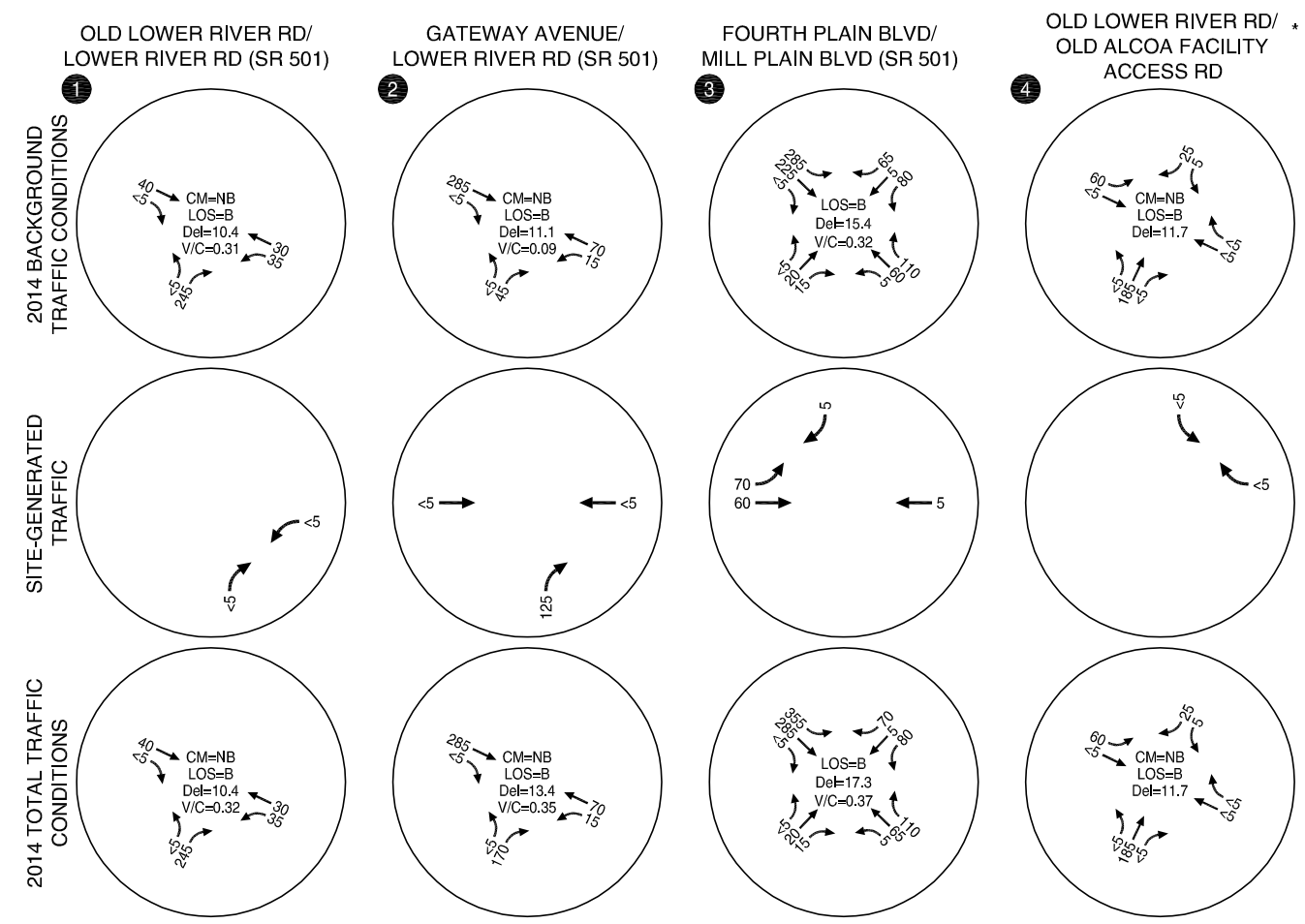
CONSTRUCTION YEAR 2014 TRAFFIC
WEEKDAY AM PEAK HOUR
VANCOUVER, WA

FIGURE 6

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING

(NO SCALE)





LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALIZED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

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* Southbound approach has "Right Turn Permitted Without Stopping" Sign

CONSTRUCTION YEAR 2014 TRAFFIC
WEEKDAY PM PEAK HOUR
VANCOUVER, WA

FIGURE 7

INTERSECTION TRAFFIC CONTROL CHANGES

While the operational analyses documented in this report found adequate capacity is available at the study intersections, four traffic control changes and/or enhancements are recommended as described below[1].

- The applicant should work with the Port of Vancouver and City of Vancouver to post a 25 MPH speed limit on Old Lower River Road south of SR 501, where no posted speed sign exists.
- Based on a review of turn movement patterns, intersection configuration, and the Manual on Uniform Traffic Control Devices (MUTCD, Reference 7), the applicant should work with the Port and WSDOT to post a YIELD sign to control the channelized northbound right-turn maneuver from Old Lower River Road onto SR 501. A YIELD sign is appropriate given that northbound right-turn drivers have sufficient sight distance to make a decision to enter and merge with the highway traffic stream, and the ability to enter the highway without stopping reduces the time and distance drivers need to fully merge into the through lane, benefiting both side street and highway traffic.
- The applicant should work with the Port and City of Vancouver to reconfigure traffic control devices at the Old Lower River Road/Old Alcoa Facility Access Road intersection.
- The applicant should work with the Port to add texturing/coloring treatments to the striped crosswalk on the private access approach to Lower River Road (SR 501), between the Far West Steel operation and the proposed Storage Tank area. This treatment is intended to enhance the safety of bicyclists and pedestrians using this crosswalk as part of the adjacent multi-use path.

CONCURRENCY CORRIDOR TRIP ASSIGNMENT

As part of the transportation impact analysis, the number of trips assigned to the City of Vancouver's Transportation concurrency corridors has been evaluated. The two corridors impacted by the development are Mill Plain Boulevard (Fourth Plain Boulevard to I-5) and Fourth Plain Boulevard (Mill Plain Boulevard to I-5).

Table 15 summarizes the total number of weekday p.m. peak hour trips entering each of the City's adopted concurrency corridors. Assigned trips were recorded counting trips only once along each of the specified sections.

[1] Regardless of site development, the changes below could also be implemented by the Port of Vancouver in advance of site development, subject to local agency and Port approval.

Table 15: Concurrency Corridor Weekday PM Peak Hour Trip Assignment

Corridor Name	Corridor Limit	PM Peak Hour Trips to Corridor
Mill Plain Blvd.	Fourth Plain to I-5	20
	I-5 to Andresen	0
	Andresen to I-205	0
	I-205 to 136th Ave.	0
	136th Ave. to 164th Ave.	0
	164th Ave. to 192nd Ave.	0
St. Johns / Ft. Van Way	Mill Plain to 63rd St.	0
Fourth Plain Blvd.	Mill Plain to I-5	26
	I-5 to Andresen	0
	Andresen to I-205	0
	I-205 to 162nd Ave.	0
Andresen Road	Mill Plain to SR500	0
	SR500 to 78th St.	0
112th Avenue	Mill Plain to 28th St.	0
	28th St. to 51st St.	0
164th/162nd Avenue	SR14 to SE 1st St.	0
	SE 1st St. to Fourth Plain	0
Burton Road / 28th Street	18th St. to 112th Ave.	0
	112th Ave. to 138th Ave.	0
	138th Ave. to 162nd Ave.	0
18th Street	112th Ave. to 138th Ave.	0
	138th Ave. to 164th Ave.	0
136th/137th Avenue	Mill Plain to 28th St.	0
	28th St. to Fourth Plain	0
192nd Avenue	SR14 to NE 18th St.	0

FINDINGS AND RECOMMENDATIONS

Based on the results of the transportation impact analysis, the proposed Tesoro Savage Vancouver Energy Distribution Terminal can be developed while maintaining acceptable levels of service and safety on the surrounding transportation system. The analysis developed the following findings and recommendations.

Findings

- All study intersections currently operate acceptably during the weekday a.m. and p.m. peak hours and are projected to do so in 2020 and 2025 with site development.

- A review of historical crash data identified no safety-related mitigation needs at the study intersections.
- Intersection sight distance is adequate at all study intersections.
- The proposed development is estimated to generate 332 additional daily trips, 48 weekday a.m. peak hour trips (40 in, 8 out), and 46 weekday p.m. peak hour trips (10 in, 36 out).

Recommendations

- The applicant should work with the Port of Vancouver and City of Vancouver to post a 25 MPH speed limit on Old Lower River Road south of SR 501, where no posted speed sign exists.
- The applicant should work with the Port and WSDOT to post a YIELD sign to control the channelized northbound right-turn maneuver from Old Lower River Road onto SR 501.
- The applicant should work with the Port and City of Vancouver to reconfigure traffic control devices at the Old Lower River Road/Old Alcoa Facility Access Road intersection.
- The applicant should work with the Port to add texturing/coloring treatments to the striped crosswalk on the private access approach to Lower River Road (SR 501), between the Far West Steel operation and the proposed Storage Tank area.
- Any new landscaping, signage, and/or above-ground utilities installed along the site frontage and internal roadways should be properly located and maintained to ensure that adequate sight distance continues to be available.

We trust this report adequately addresses the traffic impacts and associated with the proposed Tesoro Savage Vancouver Energy Distribution Terminal. Please contact us if you have any questions or comments regarding the contents of this report or the analyses performed.

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APPENDICES

A. Level-of-Service Descriptions

B. Crash Data

C. Traffic Count Data

D. 2013 Existing Traffic Conditions Level-of-Service Worksheets

E. In-Process Development

F. Build-Out Year 2020 Baseline Traffic Conditions Level-of-Service Worksheets

G. Forecast Year 2025 Baseline Traffic Conditions Level-of-Service Worksheets

H. Build-Out Year 2020 Total Traffic Conditions Level-of-Service Worksheets

I. Forecast Year 2025 Total Traffic Conditions Level-of-Service Worksheets

J. 95th Percentile Queuing Analysis Worksheets

K. Speed Survey Results for Old Lower River Road

L. Construction In-Process Development

M. Construction Year 2014 Traffic Conditions Level-of-Service Worksheets

Appendix A Description of Level-of-Service Methods and Criteria

Level of Service Concept

Level of service (LOS) is a concept developed by traffic engineers to gauge the overall quality of the travel experience through an intersection or roadway segment as it is perceived by the traveler. Six categories are used to denote the various levels of service, which range from A to F.

Signalized Intersections

At signalized intersections, level of service is defined by a single performance measure: average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Table A1 provides a qualitative description of each LOS category as it applies to signalized intersections, and Table A2 identifies the average control delay threshold point used as the boundary for each LOS category. LOS thresholds for the specific reviewing jurisdiction(s) are described in the body of the report.

Table A1
Level of Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values, even when the volume/capacity ratio is significantly below 1.0.

Table A2
Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Unsignalized Intersections

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The *2000 Highway Capacity Manual* provides models for estimating average control delay at both TWSC and AWSC intersections. Table A3 provides a qualitative description of each LOS category as it applies to unsignalized intersections, and Table A4 identifies the average control delay threshold point used as the boundary for each LOS category. LOS thresholds for the specific reviewing jurisdiction(s) are described in the body of the report.

Table A3
Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation with very little time spent waiting for an acceptable gap. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the average control delay an inconvenience, but acceptable gaps are still very easy to find. • Occasionally there is more than one vehicle in queue.
C	• Average control delay becomes noticeable to most drivers, even though acceptable gaps are found on a regular basis. • It is not uncommon for an arriving driver to find a standing queue of at least one additional vehicle.
D	• Average control delay is long enough to be an irritation to most drivers. Average control delay is long because acceptable gaps are hard to find, because there is a standing queue of vehicles already waiting when the driver arrives, or both.
E	• Drivers find the length of the average control delay approaching intolerable levels. • Average control delay is long because acceptable gaps are hard to find, because there is a standing queue of vehicles already waiting when the driver arrives, or both. • There may or may not be substantial excess capacity remaining at the intersection when this condition is encountered.
F	• Most drivers encountering this condition consider the length of the average control delay to be too long. • Average control delay is long because acceptable gaps are hard to find, because there is a standing queue of vehicles already waiting when the driver arrives, or both. • There may or may not be substantial excess capacity remaining at the intersection when this condition is encountered.

Table A4
Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

It should be noted that the level of service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, the control delay threshold for any given level of service has been set to be less for an unsignalized intersection than for a signalized intersection. **While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections.** No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of unsignalized intersections, it is important to consider other measures of effectiveness (MOE's) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions.

Appendix B Crash Data

Reported collisions that occurred on State Route 501 (mp 1.69 to 4.12) from the Mill Plain/4th Plain intersection to NW Old Lower River Rd as well as (See Cover letter).....2008 - 2012

UNDER 23 UNITED STATES CODE - SECTION 409, THIS DATA CANNOT BE USED IN DISCOVERY OR AS EVIDENCE AT TRIAL IN ANY ACTION FOR DAMAGES AGAINST THE WSDOT, OR ANY JURISDICTION INVOLVED IN THE DATA

JURISDICTION	PRIMARY TRAFFICWAY	MILE POST	BLOCK NUMBER	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	Mi or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDAL	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	MV DRIVER CONT CIRC 1 (UNIT 2)	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDCYCLIST ACTION (UNIT 2)	PEDCYCLIST CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways - 2010 forward)
City Street	NW LOWER RIVER RD		6800		800	F	W	NW ERWIN D RIEGER HWY	3241661	07/12/09	7:57 PM	Possible Injury	1	0	1		Not at Intersection and Not Related	Raining	Wet	Daylight	Vehicle overturned	Motorcycle	Going Straight Ahead	Under Influence of Alcohol	Under Influence of Drugs	West	East								
City Street	FRUIT VALLEY RD				75	F	N	W FOURTH PLAIN BLVD	3319581	07/08/10	5:12 PM	No Injury	0	0	2		At Driveway	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Motorcycle	Going Straight Ahead	None	South	North			Lane of Primary Trafficway
City Street	NW LOWER RVR RD				0.25	M	W	W MILL PLAIN BLVD	2998371	11/01/08	11:02 AM	No Injury	0	0	2		At Driveway	Raining	Wet	Daylight	One car entering driveway access	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle	Driver Distractions Outside Vehicle	East	South	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	None	West	East			
City Street	FRUIT VALLEY RD			4 PLAIN BLVD					C700870	03/04/08	7:30 AM	No Injury	0	0	2		At Intersection and Related	Overcast	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead			North	South	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped at Signal or Stop Sign		North	Vehicle Stopped			
City Street	FRUIT VALLEY RD			FOURTH PLAIN BLVD					C708538	05/18/08	4:05 PM	Possible Injury	1	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped at Signal or Stop Sign			South	Vehicle Stopped	Not Stated	Going Straight Ahead		South	North			
City Street	W 4 PLAIN BLVD			FRUIT VALLEY RD					2815573	04/07/09	10:04 AM	Unknown	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Right Turn	Improper Turn	Driver Distractions Outside Vehicle	North	West	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	None	West	Vehicle Stopped			
City Street	W FOURTH PLAIN BLVD		2000	NW FRUIT VALLEY RD					3432316	08/30/11	9:50 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights On	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Disregard Stop and Go Light		West	East	Passenger Car	Making Left Turn	None	South	West			Lane of Primary Trafficway
City Street	FRUIT VALLEY RD			W FOURTH PLAIN BLVD					3241765	12/11/09	4:05 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Follow Too Closely		North	South	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped at Signal or Stop Sign	None	North	Vehicle Stopped			
City Street	NW FRUIT VALLEY RD		2600	W FOURTH PLAIN BLVD					3432569	09/03/11	11:26 PM	No Injury	0	0	1		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights On	Street Light Pole or Base	Passenger Car	Making Left Turn	Under Influence of Alcohol	Exceeding Reas. Safe Speed	West	North								Past the Outside Shoulder of Primary Trafficway
City Street	NW FRUIT VALLEY RD		2600	W FOURTH PLAIN BLVD					3432701	06/05/11	8:15 PM	No Injury	0	0	2		At Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - both going straight - sideswipe	Passenger Car	Going Straight Ahead	Over Center Line		South	North	Passenger Car	Going Straight Ahead	None	North	South			Lane of Primary Trafficway
State Route	S01	2.03							3319664	06/26/10	12:37 PM	Evident Injury	1	0	1		At Intersection and Not Related	Unknown	Dry	Daylight	Vehicle overturned	Motorcycle	Going Straight Ahead	None		South	North								Lane 1 Increasing Milepost
State Route	S01	2.03							2998685	08/12/08	12:09 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		Northeast	Southeast	Passenger Car	Going Straight Ahead	None	Southwest	Northeast			Lane 2 Decreasing Milepost
State Route	S01	2.03							3227378	06/15/10	11:36 AM	No Injury	0	0	2		At Intersection and Not Related	Clear or Partly Cloudy	Wet	Daylight	From same direction - both going straight - both moving - sideswipe	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other		North	South	Bus or Motor Stage	Going Straight Ahead	None	North	South			Lane 1 Decreasing Milepost
State Route	S01	2.03							2814245	10/05/10	12:04 AM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Same direction - both turning left - both moving - sideswipe	Not Stated	Making Left Turn	Improper Turn		West	North	Truck Tractor & Semi-Trailer	Making Left Turn	None	West	North			Intersecting Road Increasing Milepost
State Route	S01	2.14							3322720	04/30/11	7:07 PM	Possible Injury	2	0	3		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - both moving - rear-end	Motorcycle	Going Straight Ahead	Follow Too Closely		West	East	Pickup,Panel Truck or Vanette under 10,000 lb	Changing Lanes	Inattention	West	East			Lane 2 Decreasing Milepost
State Route	S01	2.14							E203234	10/30/12	1:02 PM	Possible Injury	1	0	2		Driveway Related but Not at Driveway	Raining	Wet	Daylight	From same direction - both going straight - both moving - rear-end	Passenger Car	Going Straight Ahead	Follow Too Closely		East	West	Pickup,Panel Truck or Vanette under 10,000 lb	Slowing	None	East	West			Lane 1 Increasing Milepost
State Route	S01	2.32							2998961	05/09/08	4:33 PM	Possible Injury	3	0	2		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Unknown Driver Distraction		Northwest	Southeast	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	None	Northwest	Vehicle Stopped			Lane 1 Decreasing Milepost
State Route	S01	2.36							3241092	11/05/09	5:09 PM	Possible Injury	1	0	1	1	At Driveway	Clear or Partly Cloudy	Dry	Daylight	Vehicle - Pedalcyclist	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Fail to Yield Row to Pedestrian		Southeast	Southwest						Riding with Traffic	None	Right Shoulder Decreasing Milepost
State Route	S01	2.39							2813749	03/21/09	5:22 AM	Possible Injury	1	0	1		Not at Intersection and Not Related	Raining	Wet	Dark-Street Lights On	Roadway Ditch	Passenger Car	Going Straight Ahead	Apparently Asleep		Southeast	Northwest								Past Right Shoulder Increasing Milepost
State Route	S01	2.45							E091902	02/13/11	8:47 PM	No Injury	0	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Wet	Dark-Street Lights On	Tree or Stump (stationary)	Passenger Car	Going Straight Ahead	Apparently Ill	Over Center Line	Southeast	Northwest								Past Right Shoulder Decreasing Milepost
State Route	S01	2.50							2815057	05/04/08	1:01 AM	Serious Injury	3	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Other Objects	Passenger Car	Going Straight Ahead	Exceeding Reas. Safe Speed		Northwest	Southeast								Past Right Shoulder Decreasing Milepost
State Route	S01	2.51							2993460	02/05/08	3:12 PM	Evident Injury	1	0	1		Driveway Related but Not at Driveway	Raining	Wet	Daylight	Vehicle overturned	Truck (Flatbed,Van,etc)	Going Straight Ahead	Inattention		Southeast	Northwest								Past Right Shoulder Increasing Milepost
State Route	S01	2.53							3598429	08/14/12	8:05 PM	Evident Injury	1	0	2		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - both moving - head-on	Motorcycle	Going Straight Ahead	Exceeding Reas. Safe Speed	Over Center Line	West	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	None	East	West			Lane 1 Increasing Milepost
State Route	S01	2.63							3319469	04/17/11	1:17 AM	Serious Injury	4	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Vehicle overturned	Passenger Car	Going Straight Ahead	Exceeding Stated Speed Limit		Northwest	Southeast								Past Right Shoulder Decreasing Milepost
State Route	S01	2.65							3432519	09/28/11	5:40 AM	Evident Injury	1	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Wet	Dark-No Street Lights	Over Embankment - No Guardrail Present	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Unknown Driver Distraction		Southeast	Northwest								Past Right Shoulder Increasing Milepost
State Route	S01	3.41							3613647	11/04/12	7:32 AM	No Injury	0	0	1		Not at Intersection and Not Related	Overcast	Wet	Unknown	Over Embankment - No Guardrail Present	Passenger Car	Going Straight Ahead	Other		Southeast	Northwest								Past Right Shoulder Increasing Milepost
State Route	S01	3.44							3322175	05/29/10	5:46 PM	Possible Injury	1	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Tree or Stump (stationary)	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other		Southeast	Northwest								Past Right Shoulder Increasing Milepost
State Route	S01	4.10							2998687	08/20/08	10:29 AM	Possible Injury	2	0	2		At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		Southeast	Southwest	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	None	Northwest	Southeast			Lane 1 Decreasing Milepost

Collision not at study intersection

Prepared by: WSDOT/STCDO/CDA8/MB
6/24/13

*As of 1/1/2009 citizen reports are no longer being captured (Report # begins with "C")

ACCIDENT ANALYSIS

Project Name:	Tesoro/Savage Petroleum Terminal
Project Number:	13574
Analyst:	AXM
Date:	07/03/2013
Filename:	C:\Users\amalinge\AppData\Local\Microsoft\Window

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

INTERSECTION ANALYSIS

Intersection:	NW Old Lower River Rd/SR 501		Mile Post	
Vehicles Entering Intersection =		1,570		
Number of Accidents =		1		
Time Period =		5		
Accident Rate =		1	1,000,000	**0.35** *Accidents / mev*
	1,570	365	5	
Intersection:	NW Gateway Ave/SR 501		Mile Post	
Vehicles Entering Intersection =		2,190		
Number of Accidents =		1		
Time Period =		5		
Accident Rate =		1	1,000,000	**0.25** *Accidents / mev*
	2,190	365	5	
Intersection:	W Fourth Plain Blvd/W Mill Plain Blvd		Mile Post	
Vehicles Entering Intersection =		6,670		
Number of Accidents =		4		
Time Period =		5		
Accident Rate =		4	1,000,000	**0.33** *Accidents / mev*
	6,670	365	5	
Intersection:	NW Old Lower River Rd/NW Old Lowe		Mile Post	
Vehicles Entering Intersection =		780		
Number of Accidents =		0		
Time Period =		5		
Accident Rate =		0	1,000,000	**0.00** *Accidents / mev*
	780	365	5	

Appendix C Traffic Count Data

Type of peak hour being reported: User-Defined

Method for determining peak hour: Total Entering Volume

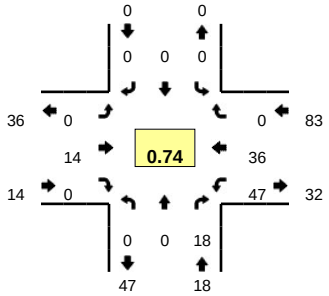
LOCATION: NW Old Lower River Rd (North) -- SR 501

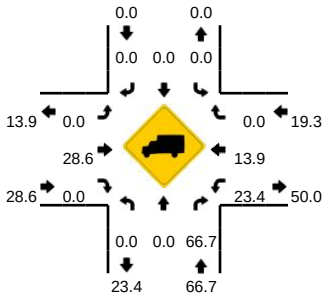
CITY/STATE: Vancouver, WA

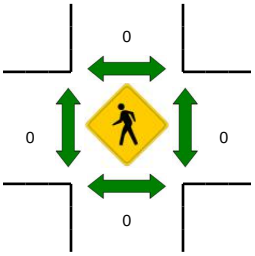
QC JOB #: 10972018

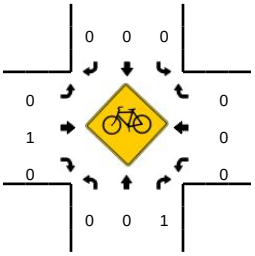
DATE: Thu, May 30 2013

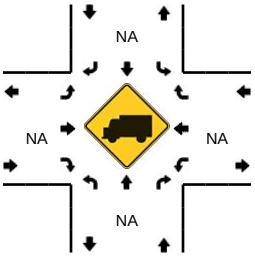
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

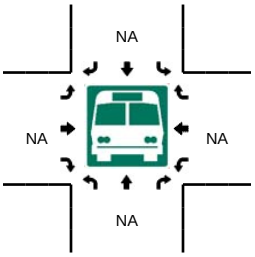












5-Min Count Period Beginning At	NW Old Lower River Rd (North) (Northbound)				NW Old Lower River Rd (North) (Southbound)				SR 501 (Eastbound)				SR 501 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	2	0	0	0	0	0	0	1	0	0	5	0	0	0	8	
6:35 AM	0	0	6	0	0	0	0	0	0	2	0	0	5	1	0	0	14	
6:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	14	3	0	0	17	
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	9	
6:50 AM	0	0	2	0	0	0	0	0	0	0	0	0	5	0	0	0	7	
6:55 AM	0	0	2	0	0	0	0	0	0	0	0	0	3	2	0	0	7	93
7:00 AM	0	0	1	0	0	0	0	0	0	4	0	0	3	3	0	0	11	100
7:05 AM	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	5	101
7:10 AM	0	0	1	0	0	0	0	0	0	0	0	0	2	2	0	0	5	103
7:15 AM	0	0	1	0	0	0	0	0	0	2	0	0	2	6	0	0	11	103
7:20 AM	0	0	1	0	0	0	0	0	0	0	0	0	4	1	0	0	6	103
7:25 AM	0	0	2	0	0	0	0	0	0	0	0	0	9	0	0	0	11	111
7:30 AM	0	0	1	0	0	0	0	0	0	0	0	0	2	3	0	0	6	109
7:35 AM	0	0	3	0	0	0	0	0	0	2	0	0	6	1	0	0	12	107
7:40 AM	0	0	1	0	0	0	0	0	0	1	0	0	6	1	0	0	9	99
7:45 AM	0	0	2	0	0	0	0	0	0	1	0	0	5	5	0	0	13	103
7:50 AM	0	0	2	0	0	0	0	0	0	1	0	0	4	8	0	0	15	111
7:55 AM	0	0	3	0	0	0	0	0	0	2	0	0	0	6	0	0	11	115
8:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	3	3	0	0	7	111
8:05 AM	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	5	111
8:10 AM	0	0	2	0	0	0	0	0	0	2	0	0	2	2	0	0	8	114
8:15 AM	0	0	1	0	0	0	0	0	0	1	0	0	5	4	0	0	11	114
8:20 AM	0	0	3	0	0	0	0	0	0	1	0	0	6	3	0	0	13	121
8:25 AM	0	0	1	0	0	0	0	0	0	1	0	0	4	3	0	0	9	119

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	28	0	0	0	0	0	0	16	0	0	36	76	0	0	156
Heavy Trucks	0	0	16		0	0	0		0	4	0		4	12	0		36
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:34 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

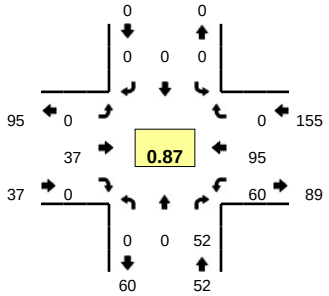
Type of peak hour being reported: User-Defined

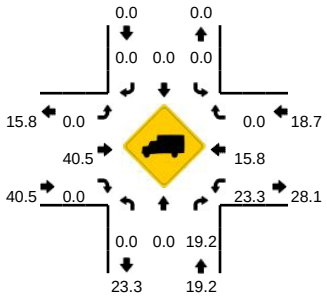
Method for determining peak hour: Total Entering Volume

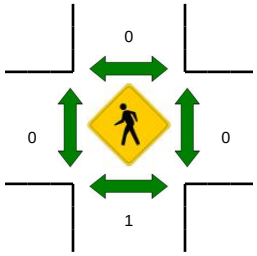
LOCATION: NW Gateway Ave -- SR 501
CITY/STATE: Vancouver, WA

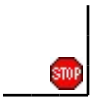
QC JOB #: 10972007
DATE: Thu, May 30 2013

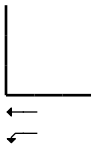
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:10 AM -- 7:25 AM

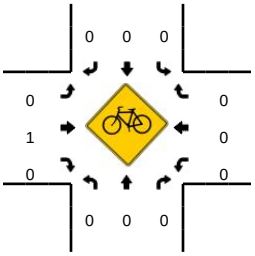


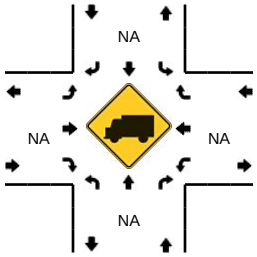


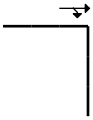


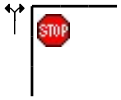


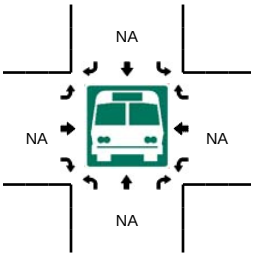












5-Min Count Period Beginning At	NW Gateway Ave (Northbound)				NW Gateway Ave (Southbound)				SR 501 (Eastbound)				SR 501 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	1	0	0	0	0	0	0	3	0	0	13	4	0	0	21	203
6:35 AM	0	0	1	0	0	0	0	0	0	6	0	0	18	8	0	0	33	224
6:40 AM	0	0	2	0	0	0	0	0	0	3	0	0	16	19	0	0	40	254
6:45 AM	0	0	1	0	0	0	0	0	0	0	0	0	12	9	0	0	22	261
6:50 AM	0	0	2	0	0	0	0	0	0	1	0	0	12	5	0	0	20	268
6:55 AM	0	0	3	0	0	0	0	0	0	1	0	0	4	5	0	0	13	270
7:00 AM	0	0	5	0	0	0	0	0	0	7	0	0	3	5	0	0	20	277
7:05 AM	0	0	3	0	0	0	0	0	0	1	0	0	1	5	0	0	10	271
7:10 AM	0	0	13	0	0	0	0	0	0	1	0	0	5	5	0	0	24	281
7:15 AM	0	0	8	0	0	0	0	0	0	3	0	0	5	11	0	0	27	280
7:20 AM	0	0	7	0	0	0	0	0	0	0	0	0	4	8	0	0	19	266
7:25 AM	0	0	2	0	0	0	0	0	0	4	0	0	8	5	0	0	19	268
7:30 AM	0	0	3	0	0	0	0	0	0	2	0	0	5	6	0	0	16	263
7:35 AM	0	0	0	0	0	0	0	0	0	3	0	0	9	8	0	0	20	250
7:40 AM	0	0	4	0	0	0	0	0	0	2	0	0	10	7	0	0	23	233
7:45 AM	0	0	4	0	0	0	0	0	0	4	0	0	3	11	0	0	22	233
7:50 AM	0	0	1	0	0	0	0	0	0	5	0	0	3	14	0	0	23	236
7:55 AM	0	0	2	0	0	0	0	0	0	5	0	0	4	10	0	0	21	244
8:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	5	5	0	0	11	235
8:05 AM	0	0	2	0	0	0	0	0	0	1	0	0	3	8	0	0	14	239
8:10 AM	0	0	2	0	0	0	0	0	0	2	1	0	1	5	0	0	11	226
8:15 AM	0	0	3	0	0	0	0	0	0	2	0	0	2	9	0	0	16	215
8:20 AM	0	0	1	0	0	0	0	0	0	4	0	0	1	7	0	0	13	209
8:25 AM	0	0	1	0	0	0	0	0	0	3	0	0	5	8	0	0	17	207

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	112	0	0	0	0	0	0	16	0	0	56	96	0	0	280
Heavy Trucks	0	0	12		0	0	0		0	8	0		12	16	0		48
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:34 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

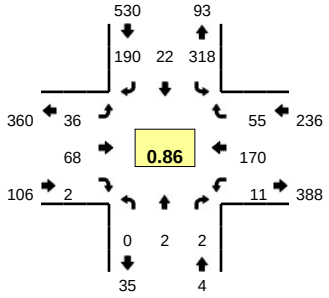
Type of peak hour being reported: User-Defined

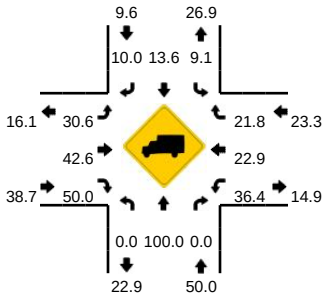
Method for determining peak hour: Total Entering Volume

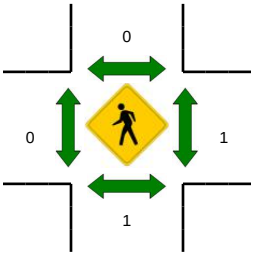
LOCATION: W Mill Plain Blvd -- 4th Plain Rd
CITY/STATE: Vancouver, WA

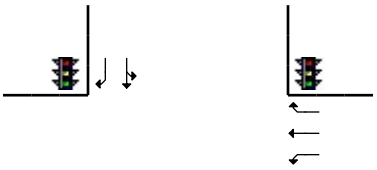
QC JOB #: 10972003
DATE: Thu, May 30 2013

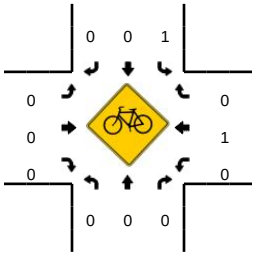
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

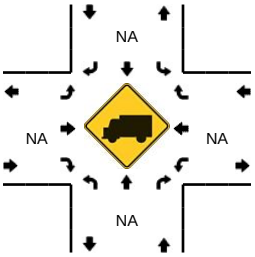


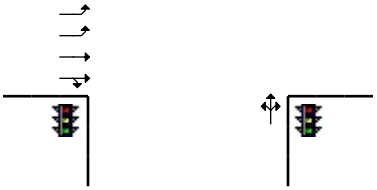


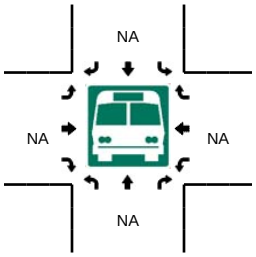












5-Min Count Period Beginning At	W Mill Plain Blvd (Northbound)				W Mill Plain Blvd (Southbound)				4th Plain Rd (Eastbound)				4th Plain Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	0	0	17	1	22	0	3	2	0	0	0	14	0	0	59	
6:35 AM	0	0	1	0	16	0	35	0	3	10	0	0	1	11	2	0	79	
6:40 AM	0	0	1	0	14	0	29	0	5	4	0	0	1	7	4	0	65	
6:45 AM	0	0	0	0	24	2	27	0	2	2	0	0	0	7	3	0	67	
6:50 AM	0	0	0	0	21	0	24	0	3	3	0	0	1	9	5	0	66	
6:55 AM	0	0	0	0	14	1	20	0	0	3	0	0	2	7	6	0	53	647
7:00 AM	0	0	0	0	24	0	8	0	2	11	0	0	1	10	2	0	58	671
7:05 AM	0	0	0	0	21	3	13	0	5	2	0	0	2	10	3	0	59	696
7:10 AM	0	0	0	0	22	5	10	0	3	4	0	0	1	5	8	0	58	720
7:15 AM	0	1	0	0	27	6	21	0	4	7	0	0	1	13	2	0	82	746
7:20 AM	0	0	0	0	21	0	18	0	1	3	0	0	2	14	5	0	64	761
7:25 AM	0	0	0	0	23	4	19	0	3	9	0	0	1	12	9	0	80	790
7:30 AM	0	0	1	0	24	2	21	0	3	6	1	0	0	20	3	0	81	812
7:35 AM	0	0	0	0	27	0	11	0	0	3	0	0	0	14	4	0	59	792
7:40 AM	0	0	0	0	18	0	25	0	4	6	1	0	1	19	6	0	80	807
7:45 AM	0	1	0	0	36	0	20	0	3	9	0	0	0	25	4	0	98	838
7:50 AM	0	0	1	0	32	2	16	0	5	2	0	0	2	11	5	0	76	848
7:55 AM	0	0	0	0	43	0	8	0	3	6	0	0	0	17	4	0	81	876
8:00 AM	0	0	0	0	20	0	10	0	4	4	0	0	1	4	3	0	46	864
8:05 AM	0	0	0	0	15	1	9	0	5	3	0	0	0	5	2	0	40	845
8:10 AM	0	0	0	0	8	0	14	0	3	6	0	0	0	6	2	0	39	826
8:15 AM	0	0	1	0	12	0	12	0	3	10	0	0	0	6	1	0	45	789
8:20 AM	0	0	0	0	13	1	12	0	2	6	0	0	0	8	7	0	49	774
8:25 AM	0	0	1	0	10	0	4	0	4	7	0	0	0	13	0	0	39	733

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	4	4	0	444	8	176	0	44	68	0	0	8	212	52	0	1020
Heavy Trucks	0	4	0		32	4	28		24	32	0		4	44	20		192
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:34 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

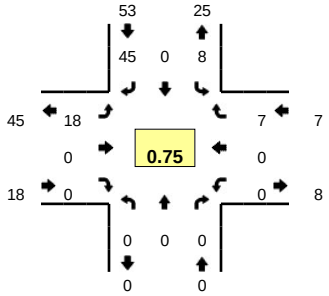
Type of peak hour being reported: User-Defined

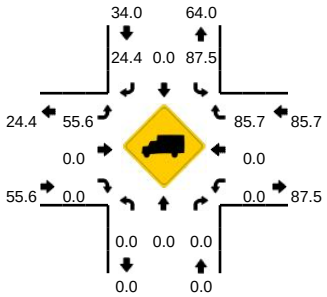
Method for determining peak hour: Total Entering Volume

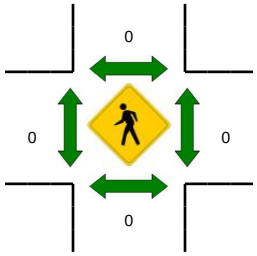
LOCATION: NW Old Lower River Rd -- NW Old Lower River Rd
CITY/STATE: Vancouver, WA

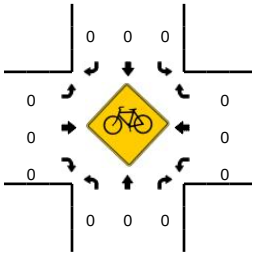
QC JOB #: 10972013
DATE: Thu, Jun 27 2013

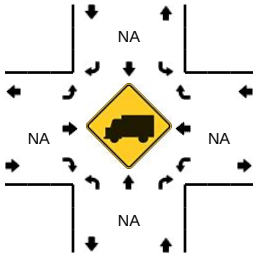
Peak-Hour: 7:00 AM -- 8:00 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

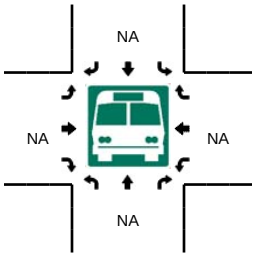












5-Min Count Period Beginning At	NW Old Lower River Rd (Northbound)				NW Old Lower River Rd (Southbound)				NW Old Lower River Rd (Eastbound)				NW Old Lower River Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:30 AM	0	0	0	0	1	0	9	0	3	0	0	0	0	0	0	0	13	
6:35 AM	0	0	0	0	0	0	9	0	1	0	0	0	0	0	0	0	10	
6:40 AM	0	0	0	0	0	0	5	0	4	0	0	0	0	0	0	0	9	
6:45 AM	0	0	0	0	0	0	12	0	3	0	0	0	0	0	0	0	15	
6:50 AM	0	0	0	0	1	0	7	0	1	0	0	0	0	0	0	0	9	
6:55 AM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	84
7:00 AM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	84
7:05 AM	0	0	0	0	0	0	3	0	2	0	0	0	0	0	0	0	5	86
7:10 AM	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3	87
7:15 AM	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	89
7:20 AM	0	0	0	0	2	0	2	0	1	0	0	0	0	0	0	0	5	87
7:25 AM	0	0	0	0	0	0	7	0	2	0	0	0	0	0	2	0	11	90
7:30 AM	0	0	0	0	0	0	4	0	3	0	0	0	0	0	0	0	7	84
7:35 AM	0	0	0	0	1	0	3	0	2	0	0	0	0	0	0	0	6	80
7:40 AM	0	0	0	0	2	0	1	0	3	0	0	0	0	0	2	0	8	79
7:45 AM	0	0	0	0	0	0	4	0	1	0	0	0	0	0	1	0	6	70
7:50 AM	0	0	0	0	1	0	4	0	2	0	0	0	0	0	0	0	7	68
7:55 AM	0	0	0	0	1	0	8	0	2	0	0	0	0	0	2	0	13	78
8:00 AM	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3	78
8:05 AM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2	75
8:10 AM	0	0	0	0	1	0	1	0	2	0	0	0	0	0	2	0	6	78
8:15 AM	0	0	0	0	1	0	6	0	2	0	0	0	0	0	0	0	9	83
8:20 AM	0	0	0	0	0	0	3	0	3	0	0	0	0	0	1	0	7	85
8:25 AM	0	0	0	0	1	0	3	0	2	0	0	0	0	0	0	0	6	80

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	8	0	64	0	20	0	0	0	0	0	12	0	104
Heavy Trucks	0	0	0		8	0	8		8	0	0		0	0	12		36
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:34 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

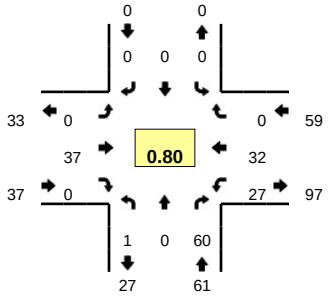
Type of peak hour being reported: User-Defined

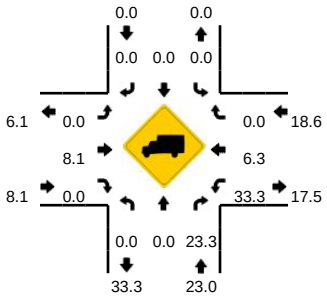
Method for determining peak hour: Total Entering Volume

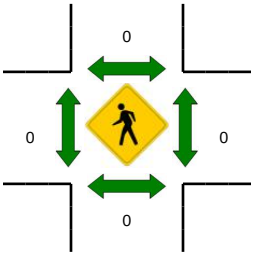
LOCATION: NW Old Lower River Rd (North) -- SR 501
CITY/STATE: Vancouver, WA

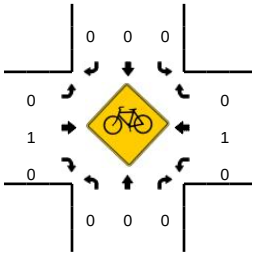
QC JOB #: 10972012
DATE: Thu, May 30 2013

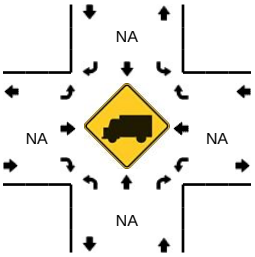
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:10 PM -- 4:25 PM

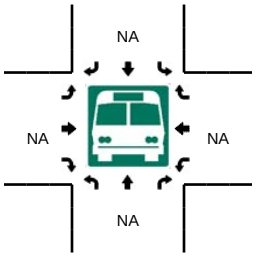












5-Min Count Period Beginning At	NW Old Lower River Rd (North) (Northbound)				NW Old Lower River Rd (North) (Southbound)				SR 501 (Eastbound)				SR 501 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	8	0	0	0	0	0	0	1	0	0	4	1	0	0	14	
4:05 PM	0	0	5	0	0	0	0	0	0	4	0	0	1	4	0	0	14	
4:10 PM	0	0	6	0	0	0	0	0	0	7	0	0	3	3	0	0	19	
4:15 PM	0	0	5	0	0	0	0	0	0	2	0	0	3	3	0	0	13	
4:20 PM	0	0	8	0	0	0	0	0	0	1	0	0	3	5	0	0	17	
4:25 PM	0	0	3	0	0	0	0	0	0	1	0	0	3	4	0	0	11	
4:30 PM	1	0	4	0	0	0	0	0	0	4	0	0	2	2	0	0	13	
4:35 PM	0	0	9	0	0	0	0	0	0	6	0	0	1	2	0	0	18	
4:40 PM	0	0	3	0	0	0	0	0	0	4	0	0	1	0	0	0	8	
4:45 PM	0	0	5	0	0	0	0	0	0	1	0	0	6	3	0	0	15	
4:50 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	
4:55 PM	0	0	4	0	0	0	0	0	0	3	0	0	0	5	0	0	12	157
5:00 PM	0	0	5	0	0	0	0	0	0	8	0	0	1	3	0	0	17	160
5:05 PM	0	0	2	0	0	0	0	0	0	3	0	0	3	4	0	0	12	158
5:10 PM	2	0	9	0	0	0	0	0	0	2	0	0	3	1	0	0	17	156
5:15 PM	0	0	2	0	0	0	0	0	0	4	0	0	0	1	0	0	7	150
5:20 PM	0	0	2	0	0	0	0	0	0	3	0	0	0	2	0	0	7	140
5:25 PM	0	0	2	0	0	0	0	0	0	1	0	0	0	2	0	0	5	134
5:30 PM	0	0	4	0	0	0	0	0	0	1	0	0	1	2	0	0	8	129
5:35 PM	0	0	5	0	0	0	0	0	0	3	0	0	0	2	0	0	10	121
5:40 PM	0	0	1	0	0	0	0	0	0	2	0	0	2	4	0	0	9	122
5:45 PM	0	0	1	0	0	0	0	0	0	5	0	0	0	3	0	0	9	116
5:50 PM	0	0	1	0	0	0	0	0	0	3	0	0	1	5	0	0	10	123
5:55 PM	0	0	4	0	0	0	0	0	0	1	0	0	0	1	0	0	6	117

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	76	0	0	0	0	0	0	40	0	0	36	44	0	0	196
Heavy Trucks	0	0	12		0	0	0		0	4	0		20	4	0		40
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:58 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

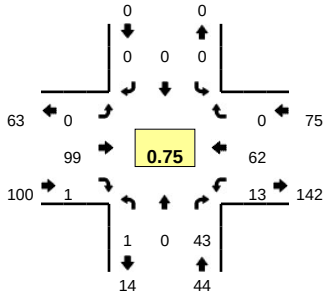
Type of peak hour being reported: User-Defined

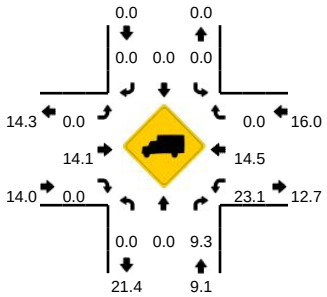
Method for determining peak hour: Total Entering Volume

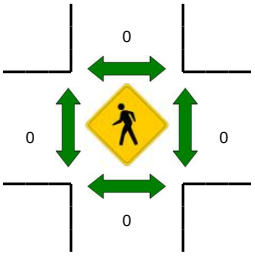
LOCATION: NW Gateway Ave -- SR 501
CITY/STATE: Vancouver, WA

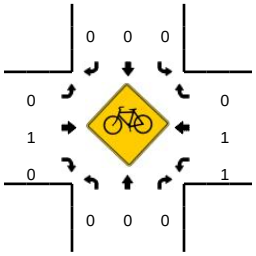
QC JOB #: 10972008
DATE: Thu, May 30 2013

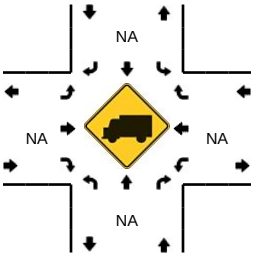
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:00 PM -- 4:15 PM

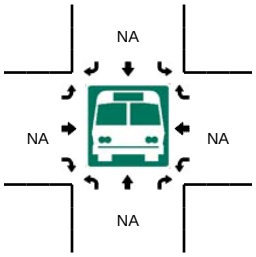












5-Min Count Period Beginning At	NW Gateway Ave (Northbound)				NW Gateway Ave (Southbound)				SR 501 (Eastbound)				SR 501 (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	11	0	0	0	0	0	0	8	0	0	0	7	0	0	26	
4:05 PM	0	0	2	0	0	0	0	0	0	9	0	0	3	8	0	0	22	
4:10 PM	0	0	7	0	0	0	0	0	0	12	0	0	3	3	0	0	25	
4:15 PM	0	0	4	0	0	0	0	0	0	7	0	0	0	9	0	0	20	
4:20 PM	0	0	4	0	0	0	0	0	0	10	0	0	2	6	0	0	22	
4:25 PM	0	0	2	0	0	0	0	0	0	5	0	0	0	6	0	0	13	
4:30 PM	1	0	4	0	0	0	0	0	0	8	0	0	2	3	0	0	18	
4:35 PM	0	0	5	0	0	0	0	0	0	14	0	0	1	3	0	0	23	
4:40 PM	0	0	1	0	0	0	0	0	0	9	0	0	1	5	0	0	16	
4:45 PM	0	0	0	0	0	0	0	0	0	7	1	0	0	7	0	0	15	
4:50 PM	0	0	3	0	0	0	0	0	0	4	0	0	0	3	0	0	10	
4:55 PM	0	0	0	0	0	0	0	0	0	6	0	0	1	2	0	0	9	219
5:00 PM	0	0	4	0	0	0	0	0	0	14	0	1	0	4	0	0	23	216
5:05 PM	0	0	5	0	0	0	0	0	0	5	0	0	2	8	0	1	21	215
5:10 PM	0	0	6	0	0	0	0	0	0	8	0	0	0	3	0	0	17	207
5:15 PM	0	0	3	0	0	0	0	0	0	10	0	0	1	1	0	0	15	202
5:20 PM	0	0	4	0	0	0	0	0	0	6	0	0	1	2	0	0	13	193
5:25 PM	0	0	3	0	0	0	0	0	0	3	0	0	4	2	0	0	12	192
5:30 PM	0	0	6	0	0	0	0	0	0	4	0	0	2	3	0	0	15	189
5:35 PM	0	0	3	0	0	0	0	0	0	9	0	0	0	3	0	0	15	181
5:40 PM	0	0	3	0	0	0	0	0	0	3	0	0	1	9	0	0	16	181
5:45 PM	0	0	6	0	0	0	0	0	0	6	0	0	1	3	0	0	16	182
5:50 PM	0	0	1	0	0	0	0	0	0	2	0	0	1	4	0	0	8	180
5:55 PM	0	0	1	0	0	0	0	0	0	7	0	0	0	1	0	1	10	181

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	80	0	0	0	0	0	0	116	0	0	24	72	0	0	292
Heavy Trucks	0	0	12		0	0	0		0	20	0		4	16	0		52
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:58 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

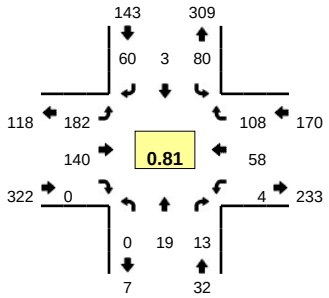
Type of peak hour being reported: User-Defined

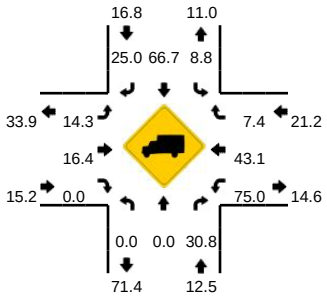
Method for determining peak hour: Total Entering Volume

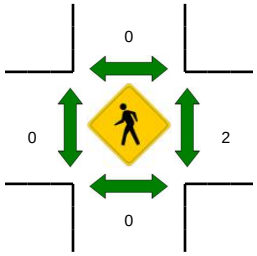
LOCATION: W Mill Plain Blvd -- 4th Plain Rd
CITY/STATE: Vancouver, WA

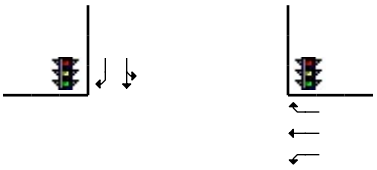
QC JOB #: 10972004
DATE: Thu, May 30 2013

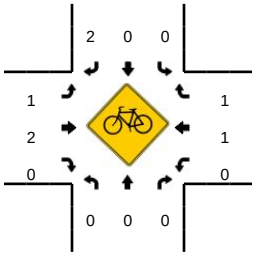
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

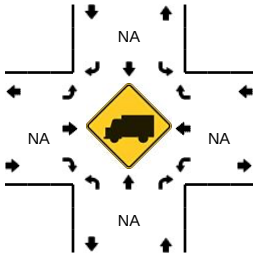


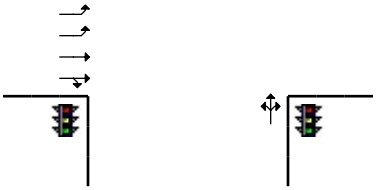


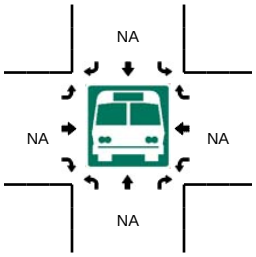












5-Min Count Period Beginning At	W Mill Plain Blvd (Northbound)				W Mill Plain Blvd (Southbound)				4th Plain Rd (Eastbound)				4th Plain Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	4	2	0	2	1	6	0	16	17	0	0	0	7	7	0	62	
4:05 PM	0	9	2	0	7	1	5	0	12	12	0	0	1	7	9	0	65	
4:10 PM	0	1	1	0	8	1	4	0	11	15	0	0	0	5	9	0	55	
4:15 PM	0	1	3	0	3	0	7	0	12	9	0	0	0	6	10	0	51	
4:20 PM	0	0	0	0	7	0	2	0	8	13	0	0	0	7	11	0	48	
4:25 PM	0	0	0	0	6	0	4	0	13	6	0	0	1	5	11	0	46	
4:30 PM	0	2	1	0	4	0	8	0	24	17	0	0	0	2	5	0	63	
4:35 PM	0	0	3	0	8	0	7	0	30	27	0	0	0	5	10	0	90	
4:40 PM	0	0	0	0	7	0	7	0	16	9	0	0	1	2	10	0	52	
4:45 PM	0	0	1	0	9	0	3	0	13	4	0	0	1	5	6	0	42	
4:50 PM	0	0	0	0	4	0	4	0	15	9	0	0	0	4	14	0	50	
4:55 PM	0	2	0	0	15	0	3	0	12	2	0	0	0	3	6	0	43	667
5:00 PM	0	1	2	0	6	0	4	0	20	8	0	0	0	4	9	0	54	659
5:05 PM	0	1	1	0	7	1	10	0	21	16	0	0	0	1	18	0	76	670
5:10 PM	0	1	0	0	4	0	3	0	17	16	0	0	0	0	22	0	63	678
5:15 PM	0	2	0	0	6	0	3	0	15	10	0	0	0	1	18	0	55	682
5:20 PM	0	0	0	0	5	0	4	0	10	6	0	0	0	1	11	0	37	671
5:25 PM	0	0	0	0	10	0	3	0	15	7	0	0	0	3	15	0	53	678
5:30 PM	0	0	0	0	1	0	5	0	5	5	0	0	0	3	8	0	27	642
5:35 PM	0	0	1	0	11	0	4	0	13	8	0	0	0	2	10	0	49	601
5:40 PM	0	0	1	0	2	0	2	0	8	6	0	0	0	5	5	0	29	578
5:45 PM	0	0	3	0	3	0	3	0	9	7	0	0	0	4	7	0	36	572
5:50 PM	0	1	0	0	2	0	1	0	1	4	0	0	0	3	6	0	18	540
5:55 PM	0	0	0	0	2	0	2	0	4	4	0	0	0	5	4	0	21	518

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	8	16	0	76	0	88	0	280	212	0	0	4	36	100	0	820
Heavy Trucks	0	0	8		16	0	20		32	16	0		4	20	16		132
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:58 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

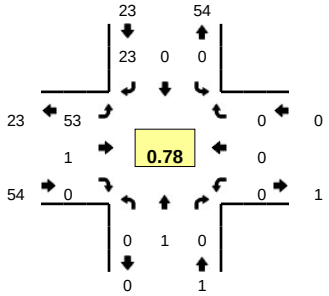
Type of peak hour being reported: User-Defined

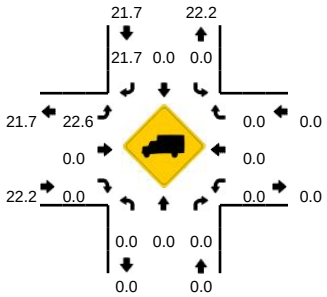
Method for determining peak hour: Total Entering Volume

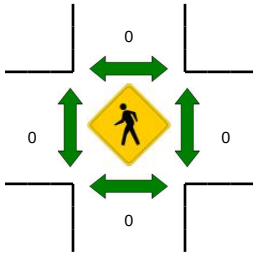
LOCATION: NW Old Lower River Rd -- NW Old Lower River Rd
CITY/STATE: Vancouver, WA

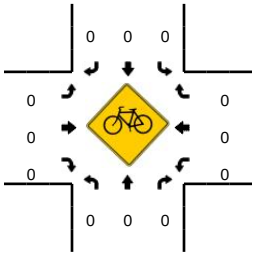
QC JOB #: 10972014
DATE: Thu, Jun 27 2013

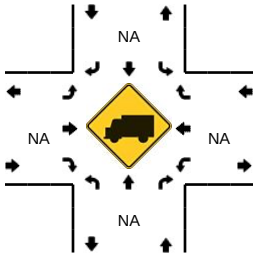
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

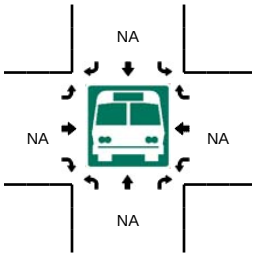












5-Min Count Period Beginning At	NW Old Lower River Rd (Northbound)				NW Old Lower River Rd (Southbound)				NW Old Lower River Rd (Eastbound)				NW Old Lower River Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	0	9	
4:05 PM	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	
4:10 PM	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3	
4:15 PM	0	0	0	0	0	0	5	0	5	0	0	0	0	0	0	0	10	
4:20 PM	0	0	0	0	0	0	4	0	3	0	0	0	0	0	0	0	7	
4:25 PM	0	0	0	0	0	0	4	0	3	0	0	0	0	0	0	0	7	
4:30 PM	0	1	0	0	0	0	3	0	7	0	0	0	0	0	0	0	11	
4:35 PM	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	6	
4:40 PM	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	5	
4:45 PM	0	0	0	0	0	0	2	0	5	1	0	0	0	0	0	0	8	
4:50 PM	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	5	
4:55 PM	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3	78
5:00 PM	0	0	0	0	0	0	2	0	4	0	0	0	0	0	0	0	6	75
5:05 PM	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3	74
5:10 PM	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	75
5:15 PM	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	68
5:20 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	62
5:25 PM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	57
5:30 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	47
5:35 PM	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	6	47
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
5:45 PM	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	36
5:50 PM	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	4	35
5:55 PM	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3	35

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	4	0	0	0	0	44	0	52	0	0	0	0	0	0	0	100
Heavy Trucks	0	0	0		0	0	8		4	0	0		0	0	0		12
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/2/2013 8:58 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix D 2013 Existing Traffic Conditions Level-of-Service WorksheetsCrash Data

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	14	0	53	36	0	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	19	0	72	49	0	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			19		211	19
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			19		211	19
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			95		100	96
cM capacity (veh/h)			1471		744	899

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	19	72	49	34
Volume Left	0	72	0	0
Volume Right	0	0	0	34
cSH	1700	1471	1700	449
Volume to Capacity	0.01	0.05	0.03	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.6	0.0	13.7
Lane LOS		A		B
Approach Delay (s)	0.0	4.5		13.7
Approach LOS				B

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	37	0	60	95	0	52
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	43	0	69	109	0	60
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)						
pX, platoon unblocked						
vC, conflicting volume			44		291	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			44		291	44
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			95		100	94
cM capacity (veh/h)			1439		670	980

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	43	69	109	60
Volume Left	0	69	0	0
Volume Right	0	0	0	60
cSH	1700	1439	1700	980
Volume to Capacity	0.03	0.05	0.06	0.06
Queue Length 95th (ft)	0	4	0	5
Control Delay (s)	0.0	7.6	0.0	8.9
Lane LOS		A		A
Approach Delay (s)	0.0	3.0		8.9
Approach LOS				A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	68	2	11	170	55	0	2	2	318	22	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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2511		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2511		1327	1545	1308		1174			1281	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	42	79	2	13	198	64	0	2	2	370	26	221
RTOR Reduction (vph)	0	1	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	42	80	0	13	198	64	0	3	0	0	396	221
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	5.3	31.4		1.4	27.5	72.1		24.3			24.3	72.1
Effective Green, g (s)	5.3	31.4		1.4	27.5	72.1		24.3			24.3	72.1
Actuated g/C Ratio	0.07	0.44		0.02	0.38	1.00		0.34			0.34	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.5		1.0	1.0			2.0			2.0	
Lane Grp Cap (vph)	196	1094		26	589	1308		396			432	1468
v/s Ratio Prot	0.02	0.03		0.01	c0.13			0.00				
v/s Ratio Perm						0.05					c0.31	c0.15
v/c Ratio	0.21	0.07		0.50	0.34	0.05		0.01			0.92	0.15
Uniform Delay, d1	31.4	11.9		35.0	15.8	0.0		15.9			22.9	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.1		5.4	1.5	0.1		0.0			23.6	0.2
Delay (s)	31.6	12.0		40.4	17.4	0.1		15.9			46.5	0.2
Level of Service	C	B		D	B	A		B			D	A
Approach Delay (s)		18.7			14.4			15.9			29.9	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	24.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	72.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	56.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: EXAM

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.91	17.8
18X	R	9	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.86	17.8
Approach		11	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	11	88.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.84	18.9
16X	R	60	24.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.63	18.9
Approach		71	33.7	0.066	8.6	LOS A	0.8	24.4	0.36	0.66	18.9
North West: NW Old Lower River Rc											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	1.07	18.6
2X	T	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.95	18.6
Approach		4	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.99	18.6
All Vehicles		111	42.1	0.066	7.0	NA	0.8	24.4	0.25	0.67	19.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	37	0	27	32	1	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	46	0	34	40	1	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			46		154	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			46		154	46
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			98		100	92
cM capacity (veh/h)			1384		822	967

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	46	34	40	76
Volume Left	0	34	0	1
Volume Right	0	0	0	75
cSH	1700	1384	1700	983
Volume to Capacity	0.03	0.02	0.02	0.08
Queue Length 95th (ft)	0	2	0	6
Control Delay (s)	0.0	7.7	0.0	9.0
Lane LOS		A		A
Approach Delay (s)	0.0	3.5		9.0
Approach LOS				A

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	99	1	13	62	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	132	1	17	83	1	57
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			133		250	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			133		250	133
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			99		100	94
cM capacity (veh/h)			1332		733	898

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	133	17	83	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1332	1700	894
Volume to Capacity	0.08	0.01	0.05	0.07
Queue Length 95th (ft)	0	1	0	5
Control Delay (s)	0.0	7.7	0.0	9.3
Lane LOS		A		A
Approach Delay (s)	0.0	1.3		9.3
Approach LOS				A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	182	140	0	4	58	108	0	19	13	80	3	60
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1584			1627	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.71	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1584			1204	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	225	173	0	5	72	133	0	23	16	99	4	74
RTOR Reduction (vph)	0	0	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	225	173	0	5	72	133	0	26	0	0	103	74
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	10.8	38.9		1.2	29.3	65.7		10.6			10.6	65.7
Effective Green, g (s)	10.8	38.9		1.2	29.3	65.7		10.6			10.6	65.7
Actuated g/C Ratio	0.16	0.59		0.02	0.45	1.00		0.16			0.16	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.5		1.0	1.0			2.0			2.0	
Lane Grp Cap (vph)	505	1843		19	593	1491		256			194	1292
v/s Ratio Prot	c0.07	0.06		0.00	c0.05			0.02				
v/s Ratio Perm						0.09					c0.09	0.06
v/c Ratio	0.45	0.09		0.26	0.12	0.09		0.10			0.53	0.06
Uniform Delay, d1	24.8	5.8		31.8	10.7	0.0		23.5			25.3	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.1		2.7	0.4	0.1		0.1			1.4	0.1
Delay (s)	25.0	5.9		34.5	11.1	0.1		23.5			26.7	0.1
Level of Service	C	A		C	B	A		C			C	A
Approach Delay (s)		16.7			4.7			23.5			15.6	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: EXPM

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.85	18.7
18X	R	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.83	18.6
Approach		3	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.84	18.6
North East: NW Old Lower River Rd											
1X	L	1	0.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.86	19.2
16X	R	36	22.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.67	19.1
Approach		37	21.2	0.027	7.7	LOS A	0.2	6.1	0.33	0.68	19.1
North West: NW Old Lower River Rd											
7X	L	80	23.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		81	22.6	0.054	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	1.07	18.5
2X	T	1	0.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.95	18.5
Approach		4	2.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.99	18.5
All Vehicles		125	21.1	0.054	2.8	NA	0.2	6.1	0.10	0.61	21.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Appendix E In-Process Development

Table 8. Terminal 5 Project-Related Trips

Category of Trip	Units	Daily Trips	Total Trip Ends [b] AM Peak Trips In	AM Peak Trips Out	AM Peak Trips Total	PM Peak Trips In	PM Peak Trips Out	PM Peak Trips Total
Day Shift Employees and Visitors [a]								
Operations	*12*	*24*	*12*	*0*	*12*	*0*	*0*	*0*
Maintenance	*12*	*24*	*12*	*0*	*12*	*0*	*0*	*0*
Site Administration & Service Providers	*16*	*32*	*0*	*0*	*0*	*0*	*16*	*16*
	40	80	24	0	24	0	16	16
Night Shift [c]								
Operations & Maintenance	12	24	0	0	0	0	0	0
Trucks [d]	1	2	0	0	0	0	0	0
TOTAL TRIP ENDS		**106**	**24**	**0**	**24**	**0**	**16**	**16**

[a] All operations and maintenance workers anticipated to arrive between 7 and 8 AM, while site administration and service providers to arrive between 8 and 9 AM. Maintenance anticipated to leave between 4 and 5 PM, and operations to depart either before 4 PM or after 6 PM.
[b] Assumes a "typical" day when a ship is in port.
[c] Night shift is anticipated to be either a single or double shift with approximately 3 to 12 persons at any given time. Table assumes a maximum of 12.
[d] For site-related deliveries such as fuel. Cargo will arrive by rail and depart by ship. Arrival/departure assumed to occur out of peak hours.

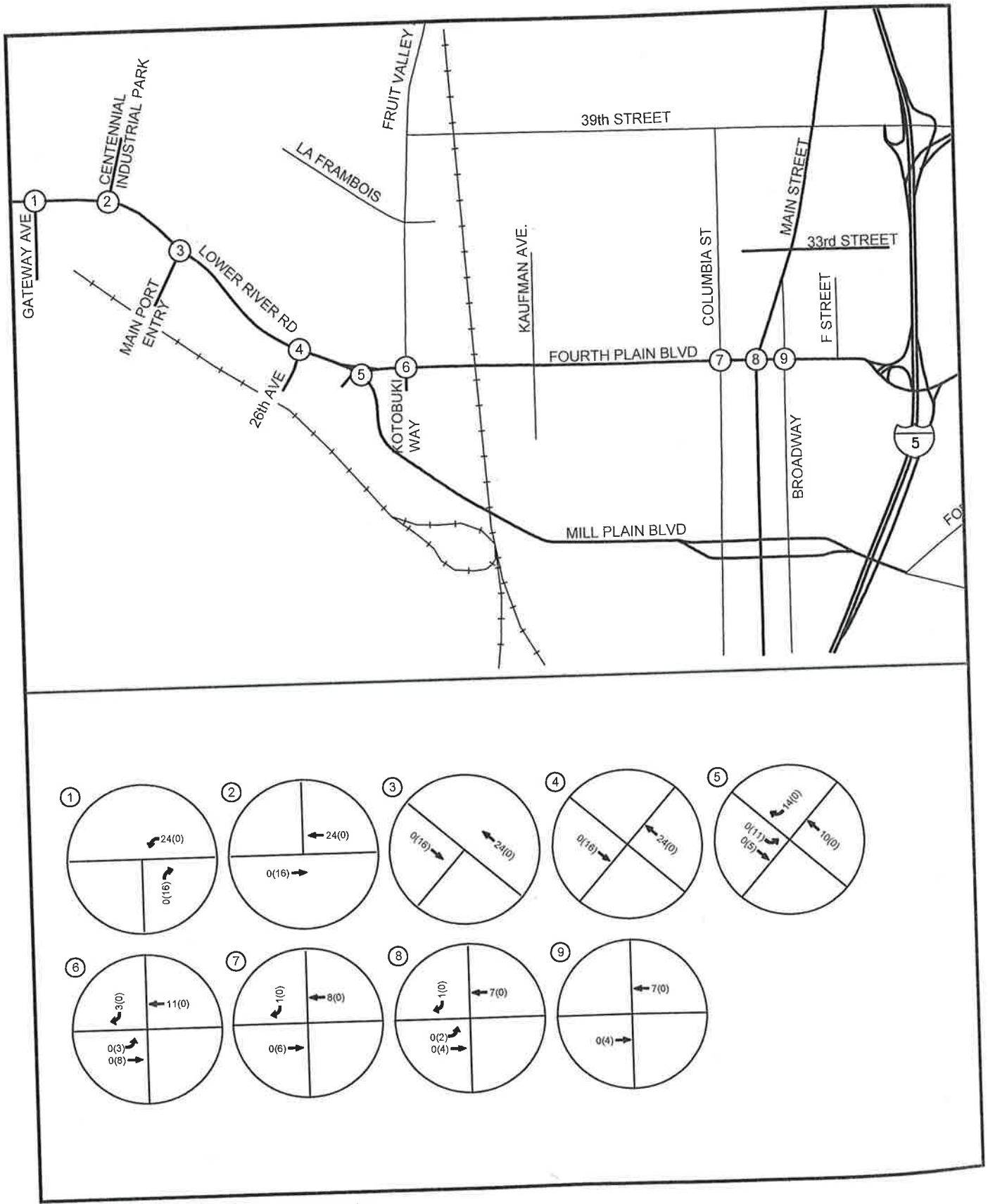
Fourth Plain Boulevard and Mill Plain Boulevard currently serve as the primary routes between Terminal 5 and destinations beyond the study area. The Fruit Valley Road corridor also attracts some project-related traffic, primarily related to employees and visitors accessing the site. For inbound project traffic, an average of 43 percent is expected to use Fourth Plain Boulevard, 42 percent is expected to use Mill Plain Boulevard, and about 14 percent would use Fruit Valley Road. For outbound traffic, about 50 percent is anticipated to use Fourth Plain Boulevard, 32 percent to use Mill Plain Boulevard and 18 percent to use Fruit Valley Road. Much of the inbound and outbound project traffic using Fourth Plain and Mill Plain Boulevards would travel to/from I-5, with some auto traffic diffusing onto other streets in the study area to accommodate multiple home-to-work trips. Trip distribution assumptions for autos used in the analysis of potential Terminal 5 traffic impacts are illustrated in Figure 6.

It is anticipated that inbound and outbound truck trips generated by the Terminal 5 operations will be primarily focused on travel between the project site and I-5. Between these points, truck traffic is expected to primarily use the Mill Plain and Fourth Plain Boulevard corridors. Truck trip distribution percentages were roughly split between the corridors, with 60 percent using Mill Plain Boulevard (the designated state highway and primary access route to the south) and 40 percent using Fourth Plain Boulevard (the primary access route to the north).

4.4 TRAFFIC VOLUMES WITH TERMINAL 5 OPERATIONS

The trip distribution patterns described above were used to assign trips associated with Terminal 5 operations onto the surrounding street network. These trips are illustrated in Figure 7.

Of project-related AM peak hour inbound trips, 11 would be made via Fourth Plain Boulevard, 10 via Mill Plain Boulevard, and 3 via Fruit Valley Road. No AM peak hour outbound trips are expected.



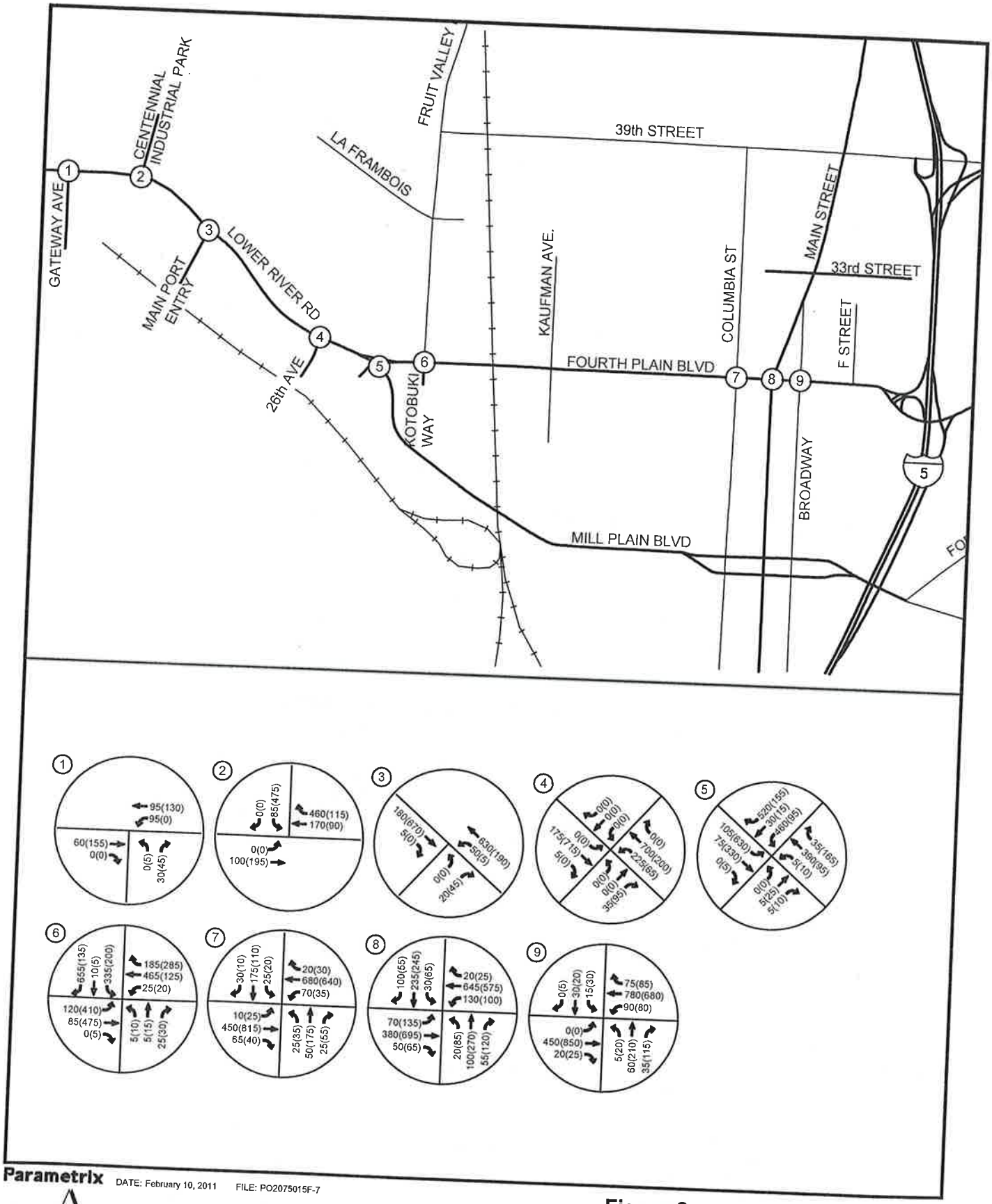
Parametrix DATE: February 10, 2011 FILE: PO2075015F-6

N

LEGEND

XXX (XXX) TURNING MOVEMENT BY DIRECTION OF TRAFFIC - AM (PM)

Figure 7
Terminal 5 AM (PM) Peak Hour Turning Movements
TERMINAL 5



Parametrix DATE: February 10, 2011 FILE: PO2075015F-7

N

LEGEND

XXX (XXX) TURNING MOVEMENT BY DIRECTION OF TRAFFIC - AM (PM)

Figure 8
2020 AM (PM) Peak Hour Turning Movements with Baseline, Parcel 8, and Terminal 5
TERMINAL 5

Appendix F Build-Out Year 2020 Baseline Traffic Conditions Level-of-Service Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	15	0	53	40	0	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	20	0	72	54	0	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			20		218	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			20		218	20
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			95		100	96
cM capacity (veh/h)			1470		737	897

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	20	72	54	34
Volume Left	0	72	0	0
Volume Right	0	0	0	34
cSH	1700	1470	1700	449
Volume to Capacity	0.01	0.05	0.03	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.6	0.0	13.7
Lane LOS		A		B
Approach Delay (s)	0.0	4.3		13.7
Approach LOS				B

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	41	0	84	105	0	68
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	47	0	97	121	0	78
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)						
pX, platoon unblocked						
vC, conflicting volume			48		362	48
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			48		362	48
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			93		100	92
cM capacity (veh/h)			1433		597	974

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	47	97	121	78
Volume Left	0	97	0	0
Volume Right	0	0	0	78
cSH	1700	1433	1700	974
Volume to Capacity	0.03	0.07	0.07	0.08
Queue Length 95th (ft)	0	5	0	7
Control Delay (s)	0.0	7.7	0.0	9.0
Lane LOS		A		A
Approach Delay (s)	0.0	3.4		9.0
Approach LOS				A

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	80	0	12	198	61	0	2	2	351	24	224
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1280	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	59	93	0	14	230	71	0	2	2	408	28	260
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	59	93	0	14	230	71	0	3	0	0	436	260
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.2	18.7		1.2	15.7	61.6		26.7			26.7	61.6
Effective Green, g (s)	4.2	18.7		1.2	15.7	61.6		26.7			26.7	61.6
Actuated g/C Ratio	0.07	0.30		0.02	0.25	1.00		0.43			0.43	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	182	766		26	394	1308		509			555	1468
v/s Ratio Prot	c0.02	0.04		0.01	c0.15			0.00				
v/s Ratio Perm						0.05					c0.34	c0.18
v/c Ratio	0.32	0.12		0.54	0.58	0.05		0.01			0.79	0.18
Uniform Delay, d1	27.3	15.5		29.9	20.1	0.0		9.9			15.0	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.4	0.0		10.3	1.4	0.1		0.0			6.7	0.3
Delay (s)	27.7	15.5		40.2	21.5	0.1		9.9			21.7	0.3
Level of Service	C	B		D	C	A		A			C	A
Approach Delay (s)		20.3			17.5			9.9			13.7	
Approach LOS		C			B			A			B	

Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKAM_2020

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.91	17.8
18X	R	9	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.86	17.8
Approach		11	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	11	88.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.84	18.9
16X	R	60	24.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.63	18.9
Approach		71	33.7	0.066	8.6	LOS A	0.8	24.4	0.36	0.66	18.9
North West: NW Old Lower River Rd											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	1.07	18.6
2X	T	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.95	18.6
Approach		4	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.99	18.6
All Vehicles		111	42.1	0.066	7.0	NA	0.8	24.4	0.25	0.67	19.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	41	0	27	35	1	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	51	0	34	44	1	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			51		162	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			51		162	51
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			98		100	92
cM capacity (veh/h)			1378		813	960

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	51	34	44	76
Volume Left	0	34	0	1
Volume Right	0	0	0	75
cSH	1700	1378	1700	976
Volume to Capacity	0.03	0.02	0.03	0.08
Queue Length 95th (ft)	0	2	0	6
Control Delay (s)	0.0	7.7	0.0	9.1
Lane LOS		A		A
Approach Delay (s)	0.0	3.3		9.1
Approach LOS				A

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	109	1	13	69	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	145	1	17	92	1	57
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			147		273	146
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			147		273	146
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			99		100	94
cM capacity (veh/h)			1316		712	883

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	147	17	92	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1316	1700	878
Volume to Capacity	0.09	0.01	0.05	0.07
Queue Length 95th (ft)	0	1	0	5
Control Delay (s)	0.0	7.8	0.0	9.4
Lane LOS		A		A
Approach Delay (s)	0.0	1.2		9.4
Approach LOS				A

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	201	155	0	4	64	119	0	21	14	88	3	66
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.95			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1594			1631	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.70	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1594			1200	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	248	191	0	5	79	147	0	26	17	109	4	81
RTOR Reduction (vph)	0	0	0	0	0	0	0	14	0	0	0	0
Lane Group Flow (vph)	248	191	0	5	79	147	0	29	0	0	113	81
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	9.3	22.1		1.0	13.8	47.0		8.9			8.9	47.0
Effective Green, g (s)	9.3	22.1		1.0	13.8	47.0		8.9			8.9	47.0
Actuated g/C Ratio	0.20	0.47		0.02	0.29	1.00		0.19			0.19	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	608	1463		22	390	1491		302			227	1292
v/s Ratio Prot	c0.08	0.06		0.00	c0.06			0.02				
v/s Ratio Perm						0.10					c0.09	0.06
v/c Ratio	0.41	0.13		0.23	0.20	0.10		0.10			0.50	0.06
Uniform Delay, d1	16.4	7.0		22.6	12.5	0.0		15.7			17.0	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.0		1.9	0.1	0.1		0.1			0.6	0.1
Delay (s)	16.6	7.0		24.5	12.6	0.1		15.8			17.7	0.1
Level of Service	B	A		C	B	A		B			B	A
Approach Delay (s)		12.4			4.9			15.8			10.3	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	47.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKPM_2020

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.85	18.7
18X	R	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.83	18.6
Approach		3	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.84	18.6
North East: NW Old Lower River Rd											
1X	L	1	0.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.86	19.2
16X	R	36	22.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.67	19.1
Approach		37	21.2	0.027	7.7	LOS A	0.2	6.1	0.33	0.68	19.1
North West: NW Old Lower River Rd											
7X	L	80	23.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		81	22.6	0.054	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	1.07	18.5
2X	T	1	0.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.95	18.5
Approach		4	2.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.99	18.5
All Vehicles		125	21.1	0.054	2.8	NA	0.2	6.1	0.10	0.61	21.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Appendix G Forecast Year 2025 Baseline Traffic Conditions Level-of-Service Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	17	0	53	42	0	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	23	0	72	57	0	34
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			23		223	23
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			23		223	23
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			95		100	96
cM capacity (veh/h)			1466		732	894

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	23	72	57	34
Volume Left	0	72	0	0
Volume Right	0	0	0	34
cSH	1700	1466	1700	447
Volume to Capacity	0.01	0.05	0.03	0.08
Queue Length 95th (ft)	0	4	0	6
Control Delay (s)	0.0	7.6	0.0	13.7
Lane LOS		A		B
Approach Delay (s)	0.0	4.2		13.7
Approach LOS				B

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	44	0	84	112	0	68
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	51	0	97	129	0	78
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)						
pX, platoon unblocked						
vC, conflicting volume			52		373	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			52		373	52
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			93		100	92
cM capacity (veh/h)			1429		588	969

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	51	97	129	78
Volume Left	0	97	0	0
Volume Right	0	0	0	78
cSH	1700	1429	1700	969
Volume to Capacity	0.03	0.07	0.08	0.08
Queue Length 95th (ft)	0	5	0	7
Control Delay (s)	0.0	7.7	0.0	9.0
Lane LOS		A		A
Approach Delay (s)	0.0	3.3		9.0
Approach LOS				A

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	85	0	13	211	65	0	2	2	375	26	238
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1281	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	62	99	0	15	245	76	0	2	2	436	30	277
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	62	99	0	15	245	76	0	3	0	0	466	277
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.2	19.1		1.2	16.1	62.0		26.7			26.7	62.0
Effective Green, g (s)	4.2	19.1		1.2	16.1	62.0		26.7			26.7	62.0
Actuated g/C Ratio	0.07	0.31		0.02	0.26	1.00		0.43			0.43	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	181	778		26	401	1308		506			552	1468
v/s Ratio Prot	c0.02	0.04		0.01	c0.16			0.00				
v/s Ratio Perm						0.06					c0.36	c0.19
v/c Ratio	0.34	0.13		0.58	0.61	0.06		0.01			0.84	0.19
Uniform Delay, d1	27.6	15.4		30.1	20.2	0.0		10.1			15.8	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.4	0.0		17.8	1.9	0.1		0.0			10.9	0.3
Delay (s)	28.0	15.5		47.9	22.1	0.1		10.1			26.7	0.3
Level of Service	C	B		D	C	A		B			C	A
Approach Delay (s)		20.3			18.3			10.1			16.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	62.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKAM_2025

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.91	17.8
18X	R	9	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.86	17.8
Approach		11	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	11	88.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.84	18.9
16X	R	60	24.0	0.066	8.6	LOS A	0.8	24.4	0.36	0.63	18.9
Approach		71	33.7	0.066	8.6	LOS A	0.8	24.4	0.36	0.66	18.9
North West: NW Old Lower River Rd											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	1.07	18.6
2X	T	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.95	18.6
Approach		4	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.99	18.6
All Vehicles		111	42.1	0.066	7.0	NA	0.8	24.4	0.25	0.67	19.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	44	0	27	38	1	60
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	55	0	34	48	1	75
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			55		170	55
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			55		170	55
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			98		100	92
cM capacity (veh/h)			1373		805	956

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	55	34	48	76
Volume Left	0	34	0	1
Volume Right	0	0	0	75
cSH	1700	1373	1700	972
Volume to Capacity	0.03	0.02	0.03	0.08
Queue Length 95th (ft)	0	2	0	6
Control Delay (s)	0.0	7.7	0.0	9.1
Lane LOS		A		A
Approach Delay (s)	0.0	3.2		9.1
Approach LOS				A

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	117	1	13	73	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	156	1	17	97	1	57
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			157		289	157
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			157		289	157
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			99		100	93
cM capacity (veh/h)			1304		697	871

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	157	17	97	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1304	1700	866
Volume to Capacity	0.09	0.01	0.06	0.07
Queue Length 95th (ft)	0	1	0	5
Control Delay (s)	0.0	7.8	0.0	9.5
Lane LOS		A		A
Approach Delay (s)	0.0	1.2		9.5
Approach LOS				A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	215	165	0	5	68	127	0	22	15	94	4	71
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1582			1626	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.70	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1582			1195	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	265	204	0	6	84	157	0	27	19	116	5	88
RTOR Reduction (vph)	0	0	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	265	204	0	6	84	157	0	31	0	0	121	88
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	9.5	22.5		1.0	14.0	47.5		9.0			9.0	47.5
Effective Green, g (s)	9.5	22.5		1.0	14.0	47.5		9.0			9.0	47.5
Actuated g/C Ratio	0.20	0.47		0.02	0.29	1.00		0.19			0.19	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	614	1474		22	392	1491		300			226	1292
v/s Ratio Prot	c0.09	0.07		0.01	c0.06			0.02				
v/s Ratio Perm						0.11					c0.10	0.07
v/c Ratio	0.43	0.14		0.27	0.21	0.11		0.10			0.54	0.07
Uniform Delay, d1	16.6	7.0		22.9	12.6	0.0		15.9			17.4	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.0		2.4	0.1	0.1		0.1			1.2	0.1
Delay (s)	16.8	7.1		25.3	12.7	0.1		16.0			18.6	0.1
Level of Service	B	A		C	B	A		B			B	A
Approach Delay (s)		12.6			5.0			16.0			10.8	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKPM_2025

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.85	18.7
18X	R	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.83	18.6
Approach		3	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.84	18.6
North East: NW Old Lower River Rd											
1X	L	1	0.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.86	19.2
16X	R	36	22.0	0.027	7.7	LOS A	0.2	6.1	0.33	0.67	19.1
Approach		37	21.2	0.027	7.7	LOS A	0.2	6.1	0.33	0.68	19.1
North West: NW Old Lower River Rd											
7X	L	80	23.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.054	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		81	22.6	0.054	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	1.07	18.5
2X	T	1	0.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.95	18.5
Approach		4	2.0	0.005	9.1	LOS A	0.0	0.5	0.01	0.99	18.5
All Vehicles		125	21.1	0.054	2.8	NA	0.2	6.1	0.10	0.61	21.3

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Appendix H Build-Out Year 2020 Total Traffic Conditions Level-of-Service Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	15	0	93	40	0	33
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	20	0	126	54	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			20		326	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			20		326	20
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			91		100	95
cM capacity (veh/h)			1470		615	897

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	20	126	54	45
Volume Left	0	126	0	0
Volume Right	0	0	0	45
cSH	1700	1470	1700	449
Volume to Capacity	0.01	0.09	0.03	0.10
Queue Length 95th (ft)	0	7	0	8
Control Delay (s)	0.0	7.7	0.0	13.9
Lane LOS		A		B
Approach Delay (s)	0.0	5.4		13.9
Approach LOS				B

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	49	0	84	145	0	68
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	56	0	97	167	0	78
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)						
pX, platoon unblocked						
vC, conflicting volume			57		417	57
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			57		417	57
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			93		100	92
cM capacity (veh/h)			1422		555	962

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	56	97	167	78
Volume Left	0	97	0	0
Volume Right	0	0	0	78
cSH	1700	1422	1700	962
Volume to Capacity	0.03	0.07	0.10	0.08
Queue Length 95th (ft)	0	5	0	7
Control Delay (s)	0.0	7.7	0.0	9.1
Lane LOS		A		A
Approach Delay (s)	0.0	2.8		9.1
Approach LOS				A

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	84	0	12	218	61	0	2	2	351	24	244
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1280	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	64	98	0	14	253	71	0	2	2	408	28	284
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	64	98	0	14	253	71	0	3	0	0	436	284
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.2	19.3		1.2	16.3	62.2		26.7			26.7	62.2
Effective Green, g (s)	4.2	19.3		1.2	16.3	62.2		26.7			26.7	62.2
Actuated g/C Ratio	0.07	0.31		0.02	0.26	1.00		0.43			0.43	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	180	783		26	405	1308		504			549	1468
v/s Ratio Prot	c0.02	0.04		0.01	c0.16			0.00				
v/s Ratio Perm						0.05					c0.34	c0.19
v/c Ratio	0.36	0.13		0.54	0.62	0.05		0.01			0.79	0.19
Uniform Delay, d1	27.7	15.4		30.2	20.3	0.0		10.2			15.4	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.4	0.0		10.3	2.2	0.1		0.0			7.3	0.3
Delay (s)	28.1	15.4		40.5	22.4	0.1		10.2			22.6	0.3
Level of Service	C	B		D	C	A		B			C	A
Approach Delay (s)		20.4			18.5			10.2			13.8	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	62.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTAM_2020

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.92	17.8
18X	R	20	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.86	17.8
Approach		21	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	64	88.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.84	18.1
16X	R	60	24.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.59	18.1
Approach		124	57.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.72	18.1
North West: NW Old Lower River Rd											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	1.07	18.6
2X	T	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.95	18.6
Approach		4	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.99	18.6
All Vehicles		175	58.8	0.183	9.9	NA	1.6	58.6	0.31	0.72	18.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	41	0	37	35	1	96
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	51	0	46	44	1	120
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			51		188	51
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			51		188	51
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			97		100	88
cM capacity (veh/h)			1378		779	960

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	51	46	44	121
Volume Left	0	46	0	1
Volume Right	0	0	0	120
cSH	1700	1378	1700	970
Volume to Capacity	0.03	0.03	0.03	0.12
Queue Length 95th (ft)	0	3	0	11
Control Delay (s)	0.0	7.7	0.0	9.3
Lane LOS		A		A
Approach Delay (s)	0.0	4.0		9.3
Approach LOS				A

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	145	1	13	79	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	193	1	17	105	1	57
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			195		334	194
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			195		334	194
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			99		100	93
cM capacity (veh/h)			1262		656	830

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	195	17	105	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1262	1700	825
Volume to Capacity	0.11	0.01	0.06	0.07
Queue Length 95th (ft)	0	1	0	6
Control Delay (s)	0.0	7.9	0.0	9.7
Lane LOS		A		A
Approach Delay (s)	0.0	1.1		9.7
Approach LOS				A

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	221	171	0	4	68	119	0	21	14	88	3	72
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.95			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1594			1631	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.70	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1594			1200	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	273	211	0	5	84	147	0	26	17	109	4	89
RTOR Reduction (vph)	0	0	0	0	0	0	0	14	0	0	0	0
Lane Group Flow (vph)	273	211	0	5	84	147	0	29	0	0	113	89
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	9.6	22.6		1.0	14.0	47.5		8.9			8.9	47.5
Effective Green, g (s)	9.6	22.6		1.0	14.0	47.5		8.9			8.9	47.5
Actuated g/C Ratio	0.20	0.48		0.02	0.29	1.00		0.19			0.19	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	621	1481		22	392	1491		299			225	1292
v/s Ratio Prot	c0.09	0.07		0.00	c0.06			0.02				
v/s Ratio Perm						0.10					c0.09	0.07
v/c Ratio	0.44	0.14		0.23	0.21	0.10		0.10			0.50	0.07
Uniform Delay, d1	16.6	7.0		22.9	12.6	0.0		16.0			17.3	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.0		1.9	0.1	0.1		0.1			0.6	0.1
Delay (s)	16.8	7.0		24.8	12.7	0.1		16.0			18.0	0.1
Level of Service	B	A		C	B	A		B			B	A
Approach Delay (s)		12.5			5.1			16.0			10.1	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTPM_2020

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.88	18.8
18X	R	46	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.85	18.7
Approach		47	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.85	18.7
North East: NW Old Lower River Rd											
1X	L	13	0.0	0.040	8.2	LOS A	0.3	7.8	0.34	0.86	19.0
16X	R	35	22.0	0.040	8.2	LOS A	0.3	7.8	0.34	0.65	19.0
Approach		47	16.1	0.040	8.2	LOS A	0.3	7.8	0.34	0.70	19.0
North West: NW Old Lower River Rd											
7X	L	77	23.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		78	22.6	0.052	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.004	9.1	LOS A	0.0	0.5	0.01	1.07	18.5
2X	T	1	0.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.95	18.5
Approach		4	2.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.99	18.5
All Vehicles		177	14.3	0.052	4.8	NA	0.3	7.8	0.17	0.69	20.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Appendix I Forecast Year 2025 Total Traffic Conditions Level-of-Service Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	17	0	93	42	0	33
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	23	0	126	57	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			23		331	23
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			23		331	23
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			91		100	95
cM capacity (veh/h)			1466		611	894

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	23	126	57	45
Volume Left	0	126	0	0
Volume Right	0	0	0	45
cSH	1700	1466	1700	447
Volume to Capacity	0.01	0.09	0.03	0.10
Queue Length 95th (ft)	0	7	0	8
Control Delay (s)	0.0	7.7	0.0	13.9
Lane LOS		A		B
Approach Delay (s)	0.0	5.3		13.9
Approach LOS				B

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	52	0	84	152	0	68
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	60	0	97	175	0	78
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)						
pX, platoon unblocked						
vC, conflicting volume			61		429	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			61		429	61
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			93		100	92
cM capacity (veh/h)			1417		547	958

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	60	97	175	78
Volume Left	0	97	0	0
Volume Right	0	0	0	78
cSH	1700	1417	1700	958
Volume to Capacity	0.04	0.07	0.10	0.08
Queue Length 95th (ft)	0	5	0	7
Control Delay (s)	0.0	7.7	0.0	9.1
Lane LOS		A		A
Approach Delay (s)	0.0	2.7		9.1
Approach LOS				A

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	22.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	89	0	13	231	65	0	2	2	375	26	258
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1281	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	66	103	0	15	269	76	0	2	2	436	30	300
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	66	103	0	15	269	76	0	3	0	0	466	300
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.2	19.8		1.2	16.8	62.7		26.7			26.7	62.7
Effective Green, g (s)	4.2	19.8		1.2	16.8	62.7		26.7			26.7	62.7
Actuated g/C Ratio	0.07	0.32		0.02	0.27	1.00		0.43			0.43	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	179	797		25	414	1308		500			545	1468
v/s Ratio Prot	c0.02	0.04		0.01	c0.17			0.00				
v/s Ratio Perm						0.06					c0.36	c0.20
v/c Ratio	0.37	0.13		0.60	0.65	0.06		0.01			0.86	0.20
Uniform Delay, d1	28.0	15.3		30.5	20.3	0.0		10.4			16.3	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.5	0.0		23.2	2.6	0.1		0.0			12.0	0.3
Delay (s)	28.5	15.3		53.7	23.0	0.1		10.4			28.3	0.3
Level of Service	C	B		D	C	A		B			C	A
Approach Delay (s)		20.5			19.4			10.4			17.3	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	18.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	62.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTAM_2025

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.92	17.8
18X	R	20	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.86	17.8
Approach		21	86.0	0.041	12.3	LOS B	0.2	8.2	0.23	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	64	88.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.84	18.1
16X	R	60	24.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.59	18.1
Approach		124	57.0	0.183	11.5	LOS B	1.6	58.6	0.39	0.72	18.1
North West: NW Old Lower River Rd											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	1.07	18.6
2X	T	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.95	18.6
Approach		4	3.0	0.004	8.9	LOS A	0.0	0.5	0.01	0.99	18.6
All Vehicles		175	58.8	0.183	9.9	NA	1.6	58.6	0.31	0.72	18.6

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	44	0	37	38	1	96
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	55	0	46	48	1	120
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			55		195	55
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			55		195	55
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			97		100	87
cM capacity (veh/h)			1373		771	956

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	55	46	48	121
Volume Left	0	46	0	1
Volume Right	0	0	0	120
cSH	1700	1373	1700	966
Volume to Capacity	0.03	0.03	0.03	0.13
Queue Length 95th (ft)	0	3	0	11
Control Delay (s)	0.0	7.7	0.0	9.3
Lane LOS		A		A
Approach Delay (s)	0.0	3.8		9.3
Approach LOS				A

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	18.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	153	1	13	83	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	204	1	17	111	1	57
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			205		350	205
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			205		350	205
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			99		100	93
cM capacity (veh/h)			1250		642	819

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	205	17	111	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1250	1700	813
Volume to Capacity	0.12	0.01	0.07	0.07
Queue Length 95th (ft)	0	1	0	6
Control Delay (s)	0.0	7.9	0.0	9.8
Lane LOS		A		A
Approach Delay (s)	0.0	1.1		9.8
Approach LOS				A

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	181	0	5	72	127	0	22	15	94	4	76
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1582			1626	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.70	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1582			1195	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	290	223	0	6	89	157	0	27	19	116	5	94
RTOR Reduction (vph)	0	0	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	290	223	0	6	89	157	0	31	0	0	121	94
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	9.8	23.0		1.0	14.2	48.0		9.0			9.0	48.0
Effective Green, g (s)	9.8	23.0		1.0	14.2	48.0		9.0			9.0	48.0
Actuated g/C Ratio	0.20	0.48		0.02	0.30	1.00		0.19			0.19	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	627	1491		21	393	1491		297			224	1292
v/s Ratio Prot	c0.09	0.07		0.01	c0.07			0.02				
v/s Ratio Perm						0.11					c0.10	0.07
v/c Ratio	0.46	0.15		0.29	0.23	0.11		0.10			0.54	0.07
Uniform Delay, d1	16.8	7.0		23.1	12.8	0.0		16.2			17.6	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.2	0.0		2.7	0.1	0.1		0.1			1.4	0.1
Delay (s)	17.0	7.0		25.9	12.9	0.1		16.2			19.1	0.1
Level of Service	B	A		C	B	A		B			B	A
Approach Delay (s)		12.7			5.2			16.2			10.8	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTPM_2025

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.88	18.8
18X	R	46	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.85	18.7
Approach		47	0.0	0.050	9.0	LOS A	0.2	6.0	0.27	0.85	18.7
North East: NW Old Lower River Rd											
1X	L	13	0.0	0.040	8.2	LOS A	0.3	7.8	0.34	0.86	19.0
16X	R	35	22.0	0.040	8.2	LOS A	0.3	7.8	0.34	0.65	19.0
Approach		47	16.1	0.040	8.2	LOS A	0.3	7.8	0.34	0.70	19.0
North West: NW Old Lower River Rd											
7X	L	77	23.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		78	22.6	0.052	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.004	9.1	LOS A	0.0	0.5	0.01	1.07	18.5
2X	T	1	0.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.96	18.6
12X	R	1	3.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.95	18.5
Approach		4	2.0	0.004	9.1	LOS A	0.0	0.5	0.01	0.99	18.5
All Vehicles		177	14.3	0.052	4.8	NA	0.3	7.8	0.17	0.69	20.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used. Geometric Delay not included.

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Appendix J 95th Percentile Queuing Analysis Worksheets

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	22	19	75
Average Queue (ft)	1	1	30
95th Queue (ft)	8	14	86
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	39	80
Average Queue (ft)	4	37
95th Queue (ft)	22	69
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	23	61	44	76	77	260	29	312	70
Average Queue (ft)	2	17	6	24	12	94	3	163	10
95th Queue (ft)	14	47	25	65	43	202	17	266	48
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)						0			
Queuing Penalty (veh)						0			

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	32	103	76
Average Queue (ft)	2	6	25
95th Queue (ft)	13	46	80
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	15	64
Average Queue (ft)	1	27
95th Queue (ft)	8	56
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	109	140	48	78	55	131	74	149	24
Average Queue (ft)	17	43	5	22	9	34	22	49	1
95th Queue (ft)	64	95	26	60	40	91	55	105	14
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)	0	0							
Queuing Penalty (veh)	0	0							

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	20	69	75
Average Queue (ft)	1	2	27
95th Queue (ft)	8	30	83
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	39	77
Average Queue (ft)	3	36
95th Queue (ft)	21	67
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	48	69	44	91	71	308	42	478	182
Average Queue (ft)	3	17	7	26	14	115	5	206	24
95th Queue (ft)	22	46	28	69	48	240	26	371	149
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)						1			
Queuing Penalty (veh)						0			

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	30	48	75
Average Queue (ft)	2	3	29
95th Queue (ft)	15	31	85
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	66
Average Queue (ft)	1	28
95th Queue (ft)	13	55
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	86	100	40	76	66	111	81	171	30
Average Queue (ft)	20	46	6	25	8	37	25	59	1
95th Queue (ft)	59	91	24	62	40	88	59	123	15
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	31	27	76
Average Queue (ft)	3	1	32
95th Queue (ft)	25	19	89
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	49	79
Average Queue (ft)	7	39
95th Queue (ft)	31	70
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	24	70	58	82	69	260	47	295	90
Average Queue (ft)	2	18	7	28	14	105	4	164	15
95th Queue (ft)	12	51	33	68	49	199	23	263	61
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)						0			
Queuing Penalty (veh)						0			

Intersection: 1: SR 501 & NW Old Lower River Rd (North)

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	36	63	76
Average Queue (ft)	3	4	30
95th Queue (ft)	22	37	87
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	31	62
Average Queue (ft)	2	27
95th Queue (ft)	14	57
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: 4th Plain Rd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	84	100	45	75	62	90	75	140	41
Average Queue (ft)	19	46	6	24	10	33	25	50	2
95th Queue (ft)	56	86	25	61	42	77	59	107	21
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	44	19	76
Average Queue (ft)	3	1	34
95th Queue (ft)	24	14	91
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			1
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (ft)	8	50	82
Average Queue (ft)	0	6	39
95th Queue (ft)	6	27	72
Link Distance (ft)	848		657
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		180	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	34	92	46	108	62	344	46	358	104
Average Queue (ft)	4	20	7	30	11	129	5	191	16
95th Queue (ft)	22	59	30	74	42	270	26	314	64
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)						3			
Queuing Penalty (veh)						0			

Intersection: 1: SR 501 & NW Old Lower River Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	41	71	75
Average Queue (ft)	3	4	27
95th Queue (ft)	21	37	83
Link Distance (ft)		717	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	750		50
Storage Blk Time (%)			0
Queuing Penalty (veh)			0

Intersection: 2: SR 501 & NW Gateway Ave

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	37	70
Average Queue (ft)	3	29
95th Queue (ft)	19	59
Link Distance (ft)		657
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	180	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: W 4th Plain Blvd & W Mill Plain Blvd

Movement	EB	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	L	T	TR	L	T	LTR	LT	R
Maximum Queue (ft)	108	124	40	91	77	118	87	170	65
Average Queue (ft)	23	53	5	29	12	35	29	57	3
95th Queue (ft)	74	103	23	70	52	89	70	119	27
Link Distance (ft)			686	686		689	533	756	756
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	225	225			250				
Storage Blk Time (%)									
Queuing Penalty (veh)									

Appendix K Speed Survey Results for Old Lower River Road

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: WB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	Mon	Tue 16-Jul-13	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		1				1			1	
1:00 AM		1				1			1	
2:00 AM		1				1			1	
3:00 AM		19				19			19	
4:00 AM		9				9			9	
5:00 AM		18				18			18	
6:00 AM		**76**				**76**			**76**	
7:00 AM		48				48			48	
8:00 AM		37				37			37	
9:00 AM		44				44			44	
10:00 AM		47				47			47	
11:00 AM		48				48			48	
12:00 PM		52				52			52	
1:00 PM		54				54			54	
2:00 PM		**62**				**62**			**62**	
3:00 PM		44				44			44	
4:00 PM		28				28			28	
5:00 PM		10				10			10	
6:00 PM		7				7			7	
7:00 PM		2				2			2	
8:00 PM		1				1			1	
9:00 PM		9				9			9	
10:00 PM		5				5			5	
11:00 PM		3				3			3	
Day Total		626				626			626	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		6:00 AM 76				6:00 AM 76			6:00 AM 76	
PM Peak Volume		2:00 PM 62				2:00 PM 62			2:00 PM 62	

Comments: See aerial map for correct location of tubes

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB
DATE: Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	2	2	1	1	0	0	0	0	0	0	0	0	0	0	6	16-25	3
1:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-10	0
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1-10	0
3:00 AM	2	1	2	2	0	0	0	0	0	0	0	0	0	0	7	21-30	4
4:00 AM	2	2	1	0	0	0	0	0	0	0	0	0	0	0	5	16-25	3
5:00 AM	2	0	1	0	0	0	0	0	0	0	0	0	0	0	3	8-17	1
6:00 AM	7	2	8	**4**	0	0	0	0	0	0	0	0	0	0	21	21-30	12
7:00 AM	6	11	16	1	0	0	0	0	0	0	0	0	0	0	34	16-25	27
8:00 AM	1	10	14	2	**1**	0	0	0	0	0	0	0	0	0	28	16-25	23
9:00 AM	7	7	18	3	0	0	0	0	0	0	0	0	0	0	35	16-25	25
10:00 AM	**10**	13	**22**	1	0	0	0	0	0	0	0	0	0	0	46	16-25	35
11:00 AM	9	**23**	22	2	0	0	0	0	0	0	0	0	0	0	**56**	16-25	45
12:00 PM	11	**27**	25	0	**2**	0	0	0	0	0	0	0	0	0	65	16-25	52
1:00 PM	3	19	21	4	0	0	0	0	0	0	0	0	0	0	47	16-25	40
2:00 PM	**12**	19	32	5	1	0	0	0	0	0	0	0	0	0	69	16-25	51
3:00 PM	10	15	**57**	**10**	1	0	0	0	0	0	0	0	0	0	**93**	16-25	72
4:00 PM	10	10	34	8	0	0	0	0	0	0	0	0	0	0	62	18-27	43
5:00 PM	0	5	22	4	1	0	0	0	0	0	0	0	0	0	32	20-29	26
6:00 PM	0	2	8	4	0	0	0	0	0	0	0	0	0	0	14	21-30	12
7:00 PM	1	0	5	0	0	0	0	0	0	0	0	0	0	0	6	16-25	5
8:00 PM	2	1	2	0	0	0	0	0	0	0	0	0	0	0	5	16-25	3
9:00 PM	1	1	0	1	0	0	0	0	0	0	0	0	0	0	3	15-24	1
10:00 PM	2	2	14	2	0	0	0	0	0	0	0	0	0	0	20	16-25	16
11:00 PM	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3	21-30	3
Day Total	100	172	326	56	6	0	0	0	0	0	0	0	0	0	660	16-25	498
Percent	15.2%	26.1%	49.4%	8.5%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

ADT
660

AM Peak Volume	10:00 AM 10	11:00 AM 23	10:00 AM 22	6:00 AM 4	8:00 AM 1	11:00 AM 56		
PM Peak Volume	2:00 PM 12	12:00 PM 27	3:00 PM 57	3:00 PM 10	12:00 PM 2	3:00 PM 93		

Comments: See aerial map for correct location of tubes

SUMMARY - Tube Count - Speed Data

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
Grand Total	100	172	326	56	6	0	0	0	0	0	0	0	0	0	660	16-25	498
Percent	15.2%	26.1%	49.4%	8.5%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Cumulative Percent	15.2%	41.2%	90.6%	99.1%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			

ADT
660

85th Percentile 24 MPH

Mean Speed(Average) 19 MPH

Median 20 MPH
Mode: 23 MPH

Comments: See aerial map for correct location of tubes

Report generated on 7/17/2013 12:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	Mon	Tue 16-Jul-13	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		6				6			6	
1:00 AM		0				0			0	
2:00 AM		0				0			0	
3:00 AM		7				7			7	
4:00 AM		5				5			5	
5:00 AM		3				3			3	
6:00 AM		21				21			21	
7:00 AM		34				34			34	
8:00 AM		28				28			28	
9:00 AM		35				35			35	
10:00 AM		46				46			46	
11:00 AM		**56**				**56**			**56**	
12:00 PM		65				65			65	
1:00 PM		47				47			47	
2:00 PM		69				69			69	
3:00 PM		**93**				**93**			**93**	
4:00 PM		62				62			62	
5:00 PM		32				32			32	
6:00 PM		14				14			14	
7:00 PM		6				6			6	
8:00 PM		5				5			5	
9:00 PM		3				3			3	
10:00 PM		20				20			20	
11:00 PM		3				3			3	
Day Total		660				660			660	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 56				11:00 AM 56			11:00 AM 56	
PM Peak Volume		3:00 PM 93				3:00 PM 93			3:00 PM 93	

Comments: See aerial map for correct location of tubes

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB/WB
DATE: Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	2	3	1	1	0	0	0	0	0	0	0	0	0	0	7	16-25	4
1:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11-20	1
2:00 AM	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	1	31-40	1
3:00 AM	3	5	13	5	0	0	0	0	0	0	0	0	0	0	26	16-25	18
4:00 AM	2	4	7	1	0	0	0	0	0	0	0	0	0	0	14	17-26	10
5:00 AM	5	4	12	0	0	0	0	0	0	0	0	0	0	0	21	16-25	16
6:00 AM	12	28	**43**	**12**	**2**	0	0	0	0	0	0	0	0	0	97	16-25	70
7:00 AM	6	26	40	10	0	0	0	0	0	0	0	0	0	0	82	16-25	66
8:00 AM	6	21	34	3	1	0	0	0	0	0	0	0	0	0	65	16-25	54
9:00 AM	15	21	35	7	1	0	0	0	0	0	0	0	0	0	79	16-25	56
10:00 AM	**24**	36	31	2	0	0	0	0	0	0	0	0	0	0	93	16-25	67
11:00 AM	15	**47**	38	4	0	0	0	0	0	0	0	0	0	0	**104**	16-25	84
12:00 PM	16	**52**	45	1	**2**	**1**	0	0	0	0	0	0	0	0	117	16-25	97
1:00 PM	9	41	46	5	0	0	0	0	0	0	0	0	0	0	101	16-25	86
2:00 PM	**22**	51	50	6	2	0	0	0	0	0	0	0	0	0	131	16-25	101
3:00 PM	14	39	**71**	**11**	2	0	0	0	0	0	0	0	0	0	**137**	16-25	109
4:00 PM	14	18	49	9	0	0	0	0	0	0	0	0	0	0	90	16-25	67
5:00 PM	0	10	26	5	1	0	0	0	0	0	0	0	0	0	42	16-25	36
6:00 PM	1	3	13	4	0	0	0	0	0	0	0	0	0	0	21	21-30	17
7:00 PM	2	0	5	1	0	0	0	0	0	0	0	0	0	0	8	21-30	5
8:00 PM	2	1	2	1	0	0	0	0	0	0	0	0	0	0	6	21-30	3
9:00 PM	3	2	5	1	1	0	0	0	0	0	0	0	0	0	12	16-25	7
10:00 PM	2	3	16	4	0	0	0	0	0	0	0	0	0	0	25	21-30	19
11:00 PM	0	1	2	3	0	0	0	0	0	0	0	0	0	0	6	23-32	4
Day Total	175	417	584	96	12	2	0	0	0	0	0	0	0	0	1286	16-25	1000
Percent	13.6%	32.4%	45.4%	7.5%	0.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

ADT 1286

AM Peak Volume	10:00 AM 24	11:00 AM 47	6:00 AM 43	6:00 AM 12	6:00 AM 2	2:00 AM 1	11:00 AM 104		
PM Peak Volume	2:00 PM 22	12:00 PM 52	3:00 PM 71	3:00 PM 11	12:00 PM 2	12:00 PM 1	3:00 PM 137		

Comments: See aerial map for correct location of tubes

SUMMARY - Tube Count - Speed Data

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB/WB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
Grand Total	175	417	584	96	12	2	0	0	0	0	0	0	0	0	1286	16-25	1000
Percent	13.6%	32.4%	45.4%	7.5%	0.9%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Cumulative Percent	13.6%	46.0%	91.4%	98.9%	99.8%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			

ADT 1286

85th Percentile 24 MPH

Mean Speed(Average) 19 MPH

Median 20 MPH
Mode: 23 MPH

Comments: See aerial map for correct location of tubes

Report generated on 7/17/2013 12:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: EB/WB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	Mon	Tue 16-Jul-13	Wed	Thu	Fri	Average Weekday Hourly Traffic	Sat	Sun	Average Week Hourly Traffic	Average Week Profile
12:00 AM		7				7			7	
1:00 AM		1				1			1	
2:00 AM		1				1			1	
3:00 AM		26				26			26	
4:00 AM		14				14			14	
5:00 AM		21				21			21	
6:00 AM		97				97			97	
7:00 AM		82				82			82	
8:00 AM		65				65			65	
9:00 AM		79				79			79	
10:00 AM		93				93			93	
11:00 AM		**104**				**104**			**104**	
12:00 PM		117				117			117	
1:00 PM		101				101			101	
2:00 PM		131				131			131	
3:00 PM		**137**				**137**			**137**	
4:00 PM		90				90			90	
5:00 PM		42				42			42	
6:00 PM		21				21			21	
7:00 PM		8				8			8	
8:00 PM		6				6			6	
9:00 PM		12				12			12	
10:00 PM		25				25			25	
11:00 PM		6				6			6	
Day Total		1286				1286			1286	
% Weekday Average		100.0%								
% Week Average		100.0%				100.0%				
AM Peak Volume		11:00 AM 104				11:00 AM 104			11:00 AM 104	
PM Peak Volume		3:00 PM 137				3:00 PM 137			3:00 PM 137	

Comments: See aerial map for correct location of tubes

Quality Counts
TRANSPORTATION DATA COLLECTION

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: WB
DATE: Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
12:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11-20	1
1:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11-20	1
2:00 AM	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	1	31-40	1
3:00 AM	1	4	11	3	0	0	0	0	0	0	0	0	0	0	19	21-30	14
4:00 AM	0	2	6	1	0	0	0	0	0	0	0	0	0	0	9	16-25	8
5:00 AM	3	4	11	0	0	0	0	0	0	0	0	0	0	0	18	17-26	14
6:00 AM	5	**26**	**35**	8	**2**	0	0	0	0	0	0	0	0	0	**76**	16-25	61
7:00 AM	0	15	24	**9**	0	0	0	0	0	0	0	0	0	0	48	16-25	38
8:00 AM	5	11	20	1	0	0	0	0	0	0	0	0	0	0	37	16-25	31
9:00 AM	8	14	17	4	1	0	0	0	0	0	0	0	0	0	44	16-25	30
10:00 AM	**14**	23	9	1	0	0	0	0	0	0	0	0	0	0	47	16-25	31
11:00 AM	6	24	16	2	0	0	0	0	0	0	0	0	0	0	48	16-25	40
12:00 PM	5	25	20	1	0	**1**	0	0	0	0	0	0	0	0	52	16-25	45
1:00 PM	6	22	**25**	1	0	0	0	0	0	0	0	0	0	0	54	16-25	47
2:00 PM	**10**	**32**	18	1	**1**	0	0	0	0	0	0	0	0	0	**62**	16-25	49
3:00 PM	4	24	14	1	1	0	0	0	0	0	0	0	0	0	44	16-25	37
4:00 PM	4	8	15	1	0	0	0	0	0	0	0	0	0	0	28	16-25	23
5:00 PM	0	5	4	1	0	0	0	0	0	0	0	0	0	0	10	16-25	9
6:00 PM	1	1	5	0	0	0	0	0	0	0	0	0	0	0	7	16-25	6
7:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	21-30	1
8:00 PM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	21-30	1
9:00 PM	2	1	5	0	1	0	0	0	0	0	0	0	0	0	9	16-25	6
10:00 PM	0	1	2	**2**	0	0	0	0	0	0	0	0	0	0	5	21-30	4
11:00 PM	0	1	1	1	0	0	0	0	0	0	0	0	0	0	3	21-30	2
Day Total	75	245	258	40	6	2	0	0	0	0	0	0	0	0	626	16-25	503
Percent	12.0%	39.1%	41.2%	6.4%	1.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
ADT 626																	
AM Peak Volume	10:00 AM 14	6:00 AM 26	6:00 AM 35	7:00 AM 9	6:00 AM 2	2:00 AM 1									6:00 AM 76		
PM Peak Volume	2:00 PM 10	2:00 PM 32	1:00 PM 25	10:00 PM 2	2:00 PM 1	12:00 PM 1									2:00 PM 62		

Comments: See aerial map for correct location of tubes

SUMMARY - Tube Count - Speed Data

LOCATION: NW Old River Rd west of Old River Rd
SPECIFIC LOCATION: 100 ft from Old River Rd
CITY/STATE: Vancouver, WA

QC JOB #: 11091501
DIRECTION: WB
DATE: Jul 16 2013 - Jul 16 2013

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	Pace Speed	Number in Pace
Grand Total	75	245	258	40	6	2	0	0	0	0	0	0	0	0	626	16-25	503
Percent	12.0%	39.1%	41.2%	6.4%	1.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Cumulative Percent	12.0%	51.1%	92.3%	98.7%	99.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%			

ADT
626

85th Percentile 24 MPH

Mean Speed(Average) 19 MPH

Median 19 MPH
Mode: 23 MPH

Comments: See aerial map for correct location of tubes

Report generated on 7/17/2013 12:05 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net)

Quality Counts
TRANSPORTATION DATA COLLECTION

Appendix L Construction In-Process Development

- Medium level of activity – typically averaging around 177 total employees on the site per work day. Out of the estimated 37 months for completion of site construction, approximately 23 months would see a medium level of activity.

- High level of activity – typically averaging around 265 total employees on the site per work day. Out of the estimated 37 months for completion of site construction, approximately 4 months would see a high level of activity.

Exhibit 4. BHP Billiton Traffic Study Construction Trip Estimates[1]

Table 14. Construction Trip Generation Estimates

		Trip Ends Monday Through Thursday					
		AM Peak (7-8 AM)			PM Peak (5-6 PM)		
Construction Activity	**Daily**	**In**	**Out**	**Total**	**In**	**Out**	**Total**
Low Level of Activity [a]							
Auto Trips by Workers	108	~~108~~ 54	0	~~108~~ 54	0	~~108~~ 54	~~108~~ 54
Truck Trips for Deliveries	18	2	2	4	2	2	4
Total Trip Ends	126	~~110~~ 56	2	112 58	2	~~110~~ 56	~~112~~ 58
Average Level of Activity [b]							
Auto Trips by Workers	354	~~354~~ 177	0	~~354~~ 177	0	~~354~~ 177	~~354~~ 177
Truck Trips for Deliveries	64	6	6	12	6	6	12
Total Trip Ends	418	~~360~~ 183	6	~~366~~ 189	6	~~360~~ 183	~~366~~ 189
High Level of Activity [c]							
Auto Trips by Workers	530	~~530~~ 265	0	~~530~~ 265	0	~~530~~ 265	~~530~~ 265
Truck Trips for Deliveries	88	9	9	18	9	9	18
Total Trip Ends	618	~~539~~ 274	9	~~548~~ 283	9	~~539~~ 274	~~548~~ 283

[a] 10 out of 37 months of anticipated construction activity, ranges from 30 to 80 workers on site.
[b] 23 out of 37 months of anticipated construction activity, ranges from 90 to 245 workers on site.
[c] 4 out of 37 months of anticipated construction activity, 265 workers on site.

[1] Note: Table 14 in Exhibit 4 updated by Kittelson & Associates, Inc. to reflect peak hour trip generation (assumes all employees enter and leave per the 2010 Terminal 5 traffic study text).

BHP Billiton Traffic Study Mitigation Recommendations

The BHPB study indicated that the Lower River Road/Gateway Avenue intersection will experience long delays during the p.m. peak hour through the period of highest construction traffic activity. The study recommended consideration be given to developing a temporary traffic management strategy at the intersection. This could include, but be limited to, such measures as:

- Staggering employee hours to reduce the impact of arriving and departing traffic during a single hour, or

Installation of a temporary traffic signal at the intersection[3].

[3] Per conversations with Port of Vancouver staff in April 2012, installation of a temporary traffic signal is no longer under consideration.

PHASE 5: TRAFFIC PLAN GATEWAY AVENUE OVERPASS COMPLETE

Duration: March 2013 to March 2015

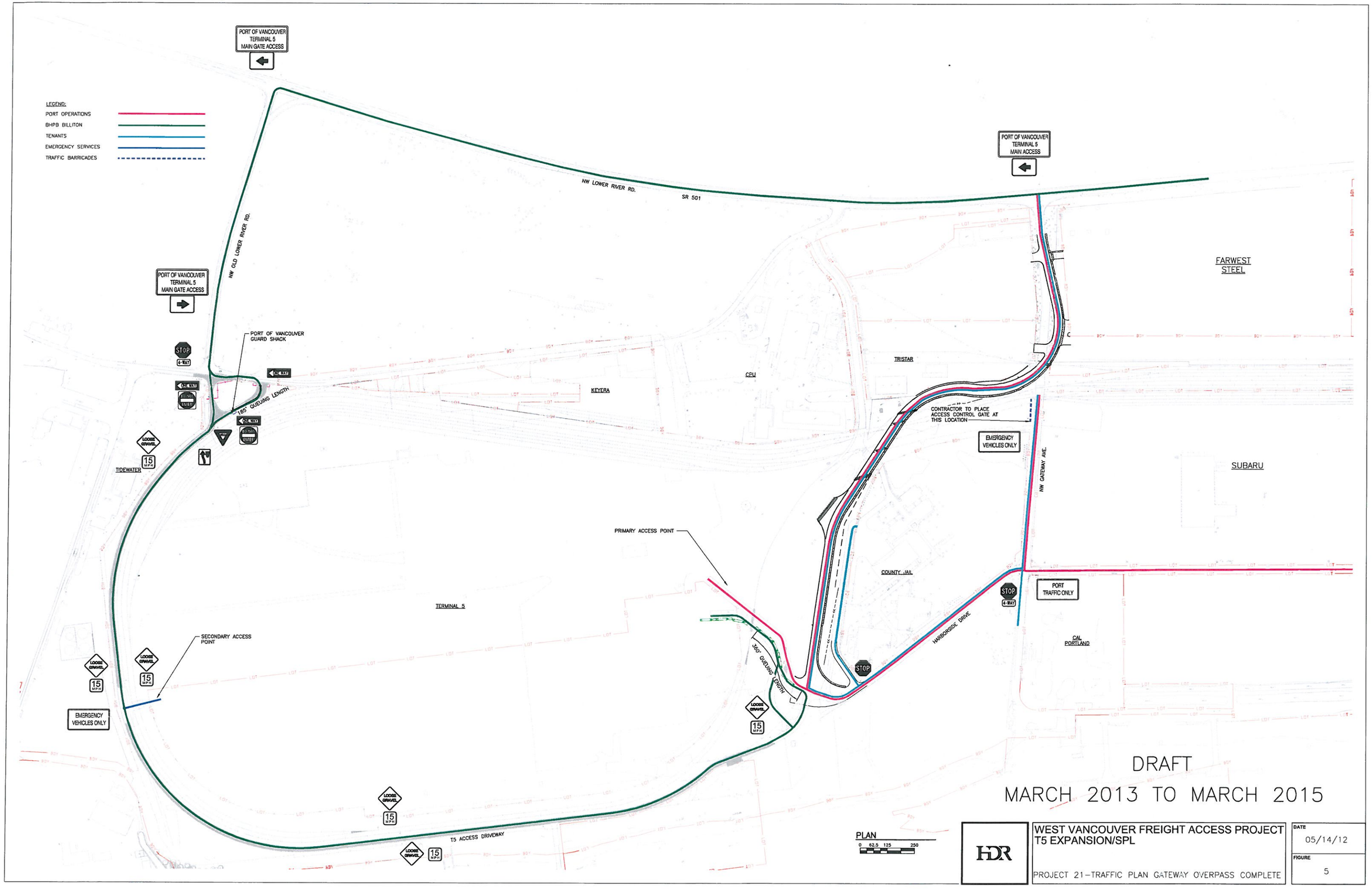
Figure 8 illustrates the Phase 5 traffic routing plan and Table 7 summarizes the corresponding roads that various properties within the study area will be directed to. All study area tenant traffic except BHP Billiton will be directed to the now complete Gateway Avenue overpass under Phase 5.

Table 7 Phase 5 Construction Roadway Use

Roadway User	Old Lower River Road Perimeter Road	Existing Gateway Avenue	Harborside Drive	Ultimate Gateway Avenue with Overpass
Port Operations			✓	✓
BHP Billiton	✓			
SPL Construction	No Longer On-Site			
Farwest Steel				✓
TriStar				✓
Subaru				✓
Clark County Jail			✓	✓
CalPortland			✓	✓
Emergency Services	✓		✓	✓

Phase 5 will require the following routing patterns:

- Port Operations traffic have the option of entering and exiting the Terminal 5 area via Harborside Drive or by traveling Gateway Avenue to SR 501.
- BHP Billiton traffic will enter and exit SR 501 at Old Lower River Road, pass through the regulated gate area, continue along the Perimeter Road, and then enter the BHP Billiton area via the signalized rail crossing.
- Farwest Street and TriStar traffic will enter and exit SR 501 via Gateway Avenue.
- Subaru traffic will enter and exit SR 501 via Gateway Avenue, crossing the overpass, traveling along Harborside Drive and following Gateway Avenue to the existing site driveway.
- Clark County Jail Work Center traffic will enter and exit SR 501 via Gateway Avenue, crossing the overpass and traveling along Harborside Drive.
- CalPortland traffic will enter and exit SR 501 via Gateway Avenue, crossing the overpass, traveling along Harborside Drive and turning to the existing site driveway.
- Emergency services vehicles will be able to enter the area via both Gateway Avenue or Old Lower River Road and will be routed by CRESA as appropriate for the destination.


LEGEND:
PORT OPERATIONS
BHPB BILLITON
TENANTS
EMERGENCY SERVICES
TRAFFIC BARRICADES
PORT OF VANCOUVER TERMINAL 5 MAIN GATE ACCESS
PORT OF VANCOUVER TERMINAL 5 MAIN ACCESS
PORT OF VANCOUVER TERMINAL 5 MAIN GATE ACCESS
NW LOWER RIVER RD.
SR 501
NW OLD LOWER RIVER RD.
PORT OF VANCOUVER GUARD SHACK
185' QUEUING LENGTH
STOP
4-WAY
ONE WAY
ONLY ONE ENTER
LOOSE GRAVEL
15 MPH
TIDEWATER
KEYERA
CPU
TRISTAR
FARWEST STEEL
CONTRACTOR TO PLACE ACCESS CONTROL GATE AT THIS LOCATION
EMERGENCY VEHICLES ONLY
NW GATEWAY AVE.
SUBARU
PRIMARY ACCESS POINT
COUNTY JAIL
TERMINAL 5
PORT TRAFFIC ONLY
HARBORSIDE DRIVE
CAL PORTLAND
SECONDARY ACCESS POINT
360' QUEUING LENGTH
EMERGENCY VEHICLES ONLY
T5 ACCESS DRIVEWAY
PLAN
0 62.5 125 250
DRAFT
MARCH 2013 TO MARCH 2015
HDR
WEST VANCOUVER FREIGHT ACCESS PROJECT
T5 EXPANSION/SPL
PROJECT 21–TRAFFIC PLAN GATEWAY OVERPASS COMPLETE
DATE
05/14/12
FIGURE
5

Appendix M Construction Year 2014 Traffic Conditions Level-of-Service Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	14	0	236	37	0	31
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	19	0	319	50	0	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			19		707	19
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			19		707	19
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			78		100	95
cM capacity (veh/h)			1471		317	899

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	19	319	50	42
Volume Left	0	319	0	0
Volume Right	0	0	0	42
cSH	1700	1471	1700	449
Volume to Capacity	0.01	0.22	0.03	0.09
Queue Length 95th (ft)	0	21	0	8
Control Delay (s)	0.0	8.1	0.0	13.8
Lane LOS		A		B
Approach Delay (s)	0.0	7.0		13.8
Approach LOS				B

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	44	0	60	279	0	52
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	51	0	69	321	0	60
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)						
pX, platoon unblocked						
vC, conflicting volume			52		510	52
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			52		510	52
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			95		100	94
cM capacity (veh/h)			1429		501	969

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	51	69	321	60
Volume Left	0	69	0	0
Volume Right	0	0	0	60
cSH	1700	1429	1700	969
Volume to Capacity	0.03	0.05	0.19	0.06
Queue Length 95th (ft)	0	4	0	5
Control Delay (s)	0.0	7.6	0.0	9.0
Lane LOS		A		A
Approach Delay (s)	0.0	1.4		9.0
Approach LOS				A

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	72	0	11	264	56	0	2	2	323	22	284
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1281	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	47	84	0	13	307	65	0	2	2	376	26	330
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	47	84	0	13	307	65	0	3	0	0	402	330
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.1	20.4		1.2	17.5	63.4		26.8			26.8	63.4
Effective Green, g (s)	4.1	20.4		1.2	17.5	63.4		26.8			26.8	63.4
Actuated g/C Ratio	0.06	0.32		0.02	0.28	1.00		0.42			0.42	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	173	812		25	426	1308		496			541	1468
v/s Ratio Prot	0.02	0.03		0.01	c0.20			0.00				
v/s Ratio Perm						0.05					c0.31	c0.22
v/c Ratio	0.27	0.10		0.52	0.72	0.05		0.01			0.74	0.22
Uniform Delay, d1	28.2	15.1		30.8	20.7	0.0		10.6			15.4	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.3	0.0		8.7	5.0	0.1		0.0			4.8	0.4
Delay (s)	28.5	15.1		39.5	25.8	0.1		10.6			20.2	0.4
Level of Service	C	B		D	C	A		B			C	A
Approach Delay (s)		19.9			21.9			10.6			11.3	
Approach LOS		B			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	63.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKAM - 2014

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.91	17.8
18X	R	9	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.86	17.8
Approach		11	86.0	0.021	12.3	LOS B	0.1	4.1	0.22	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	255	88.0	0.580	20.4	LOS C	8.4	336.9	0.64	0.75	16.0
16X	R	60	24.0	0.580	20.4	LOS C	8.4	336.9	0.64	0.35	16.0
Approach		315	75.8	0.580	20.4	LOS C	8.4	336.9	0.64	0.67	16.0
North West: NW Old Lower River Rc											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	1.08	18.5
2X	T	8	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.97	18.6
12X	R	1	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.95	18.5
Approach		11	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.98	18.5
All Vehicles		361	72.4	0.580	18.4	NA	8.4	336.9	0.56	0.68	16.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	38	0	33	32	1	243
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	48	0	41	40	1	304
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			48		170	48
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			48		170	48
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			97		100	69
cM capacity (veh/h)			1382		800	965

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	48	41	40	305
Volume Left	0	41	0	1
Volume Right	0	0	0	304
cSH	1700	1382	1700	969
Volume to Capacity	0.03	0.03	0.02	0.31
Queue Length 95th (ft)	0	2	0	34
Control Delay (s)	0.0	7.7	0.0	10.4
Lane LOS		A		B
Approach Delay (s)	0.0	3.9		10.4
Approach LOS				B

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	283	1	13	69	1	43
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	377	1	17	92	1	57
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			379		505	378
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			379		505	378
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			98		100	91
cM capacity (veh/h)			1074		522	653

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	379	17	92	59
Volume Left	0	17	0	1
Volume Right	1	0	0	57
cSH	1700	1074	1700	650
Volume to Capacity	0.22	0.02	0.05	0.09
Queue Length 95th (ft)	0	1	0	7
Control Delay (s)	0.0	8.4	0.0	11.1
Lane LOS		A		B
Approach Delay (s)	0.0	1.3		11.1
Approach LOS				B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	285	224	0	4	62	110	0	19	13	81	3	64
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1584			1628	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.71	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1584			1204	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	352	277	0	5	77	136	0	23	16	100	4	79
RTOR Reduction (vph)	0	0	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	352	277	0	5	77	136	0	26	0	0	104	79
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	11.4	39.5		1.2	29.3	66.3		10.6			10.6	66.3
Effective Green, g (s)	11.4	39.5		1.2	29.3	66.3		10.6			10.6	66.3
Actuated g/C Ratio	0.17	0.60		0.02	0.44	1.00		0.16			0.16	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.5		1.0	1.0			2.0			2.0	
Lane Grp Cap (vph)	528	1854		19	587	1491		253			192	1292
v/s Ratio Prot	c0.11	c0.09		0.00	0.06			0.02				
v/s Ratio Perm						0.09					c0.09	0.06
v/c Ratio	0.67	0.15		0.26	0.13	0.09		0.10			0.54	0.06
Uniform Delay, d1	25.7	5.9		32.1	11.0	0.0		23.8			25.6	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	2.5	0.2		2.7	0.5	0.1		0.1			1.7	0.1
Delay (s)	28.1	6.1		34.8	11.4	0.1		23.8			27.3	0.1
Level of Service	C	A		C	B	A		C			C	A
Approach Delay (s)		18.4			4.9			23.8			15.5	
Approach LOS		B			A			C			B	

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	66.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: BKPM_2014

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.85	18.7
18X	R	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.83	18.6
Approach		3	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.84	18.7
North East: NW Old Lower River Rd											
1X	L	8	0.0	0.034	8.0	LOS A	0.2	6.8	0.31	0.86	19.1
16X	R	35	22.0	0.034	8.0	LOS A	0.2	6.8	0.31	0.68	19.0
Approach		42	18.0	0.034	8.0	LOS A	0.2	6.8	0.31	0.71	19.0
North West: NW Old Lower River Rd											
7X	L	77	23.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		78	22.6	0.052	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	1.01	17.9
2X	T	236	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.91	18.0
12X	R	1	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.79	17.9
Approach		238	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.91	18.0
All Vehicles		362	9.0	0.308	8.7	NA	1.4	36.4	0.19	0.81	19.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	14	0	237	37	0	32
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74
Hourly flow rate (vph)	19	0	320	50	0	43
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			19		709	19
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			19		709	19
tC, single (s)			4.3		6.4	6.9
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.9
p0 queue free %			78		100	95
cM capacity (veh/h)			1471		316	899

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	19	320	50	43
Volume Left	0	320	0	0
Volume Right	0	0	0	43
cSH	1700	1471	1700	449
Volume to Capacity	0.01	0.22	0.03	0.10
Queue Length 95th (ft)	0	21	0	8
Control Delay (s)	0.0	8.1	0.0	13.9
Lane LOS		A		B
Approach Delay (s)	0.0	7.0		13.9
Approach LOS				B

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	45	0	185	280	0	52
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	52	0	213	322	0	60
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)						
pX, platoon unblocked						
vC, conflicting volume			53		800	53
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			53		800	53
tC, single (s)			4.3		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.5
p0 queue free %			85		100	94
cM capacity (veh/h)			1427		304	968

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	52	213	322	60
Volume Left	0	213	0	0
Volume Right	0	0	0	60
cSH	1700	1427	1700	968
Volume to Capacity	0.03	0.15	0.19	0.06
Queue Length 95th (ft)	0	13	0	5
Control Delay (s)	0.0	8.0	0.0	9.0
Lane LOS		A		A
Approach Delay (s)	0.0	3.2		9.0
Approach LOS				A

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	76	0	11	331	56	0	2	2	323	22	351
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.93			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.96	1.00
Satd. Flow (prot)	2673	2524		1327	1545	1308		1174			1659	1468
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.74	1.00
Satd. Flow (perm)	2673	2524		1327	1545	1308		1174			1281	1468
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	51	88	0	13	385	65	0	2	2	376	26	408
RTOR Reduction (vph)	0	0	0	0	0	0	0	1	0	0	0	0
Lane Group Flow (vph)	51	88	0	13	385	65	0	3	0	0	402	408
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	31%	43%	50%	36%	23%	22%	0%	100%	0%	9%	14%	10%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	4.2	24.7		1.2	21.7	67.5		26.6			26.6	67.5
Effective Green, g (s)	4.2	24.7		1.2	21.7	67.5		26.6			26.6	67.5
Actuated g/C Ratio	0.06	0.37		0.02	0.32	1.00		0.39			0.39	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.0		1.5	1.0			1.5			1.0	
Lane Grp Cap (vph)	166	924		24	497	1308		463			505	1468
v/s Ratio Prot	0.02	0.03		0.01	c0.25			0.00				
v/s Ratio Perm						0.05					c0.31	c0.28
v/c Ratio	0.31	0.10		0.54	0.77	0.05		0.01			0.80	0.28
Uniform Delay, d1	30.3	14.1		32.9	20.7	0.0		12.4			18.1	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	0.4	0.0		12.7	6.8	0.1		0.0			7.9	0.5
Delay (s)	30.6	14.1		45.6	27.5	0.1		12.4			26.0	0.5
Level of Service	C	B		D	C	A		B			C	A
Approach Delay (s)		20.2			24.1			12.4			13.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTAM_2014

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	86.0	0.024	12.3	LOS B	0.1	4.6	0.22	0.92	17.8
18X	R	11	86.0	0.024	12.3	LOS B	0.1	4.6	0.22	0.86	17.8
Approach		12	86.0	0.024	12.3	LOS B	0.1	4.6	0.22	0.87	17.8
North East: NW Old Lower River Rd											
1X	L	256	88.0	0.585	20.6	LOS C	8.8	355.3	0.65	0.75	16.0
16X	R	60	24.0	0.585	20.6	LOS C	8.8	355.3	0.65	0.33	16.0
Approach		316	75.8	0.585	20.6	LOS C	8.8	355.3	0.65	0.67	16.0
North West: NW Old Lower River Rc											
7X	L	24	56.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.58	22.7
4X	T	1	3.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		25	53.2	0.021	0.0	NA	0.0	0.0	0.00	0.55	22.8
South West: Private Access											
5X	L	1	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	1.08	18.5
2X	T	8	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.97	18.6
12X	R	1	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.95	18.5
Approach		11	3.0	0.012	9.2	LOS A	0.0	1.2	0.03	0.98	18.5
All Vehicles		364	72.5	0.585	18.6	NA	8.8	355.3	0.57	0.68	16.5

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used.

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Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	38	0	34	32	1	244
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	48	0	42	40	1	305
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						2
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			48		172	48
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			48		172	48
tC, single (s)			4.4		6.4	6.4
tC, 2 stage (s)						
tF (s)			2.5		3.5	3.5
p0 queue free %			97		100	68
cM capacity (veh/h)			1382		797	965

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	48	42	40	306
Volume Left	0	42	0	1
Volume Right	0	0	0	305
cSH	1700	1382	1700	969
Volume to Capacity	0.03	0.03	0.02	0.32
Queue Length 95th (ft)	0	2	0	34
Control Delay (s)	0.0	7.7	0.0	10.4
Lane LOS		A		B
Approach Delay (s)	0.0	4.0		10.4
Approach LOS				B

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	25.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	284	1	13	70	1	168
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	379	1	17	93	1	224
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			380		507	379
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			380		507	379
tC, single (s)			4.3		6.4	6.3
tC, 2 stage (s)						
tF (s)			2.4		3.5	3.4
p0 queue free %			98		100	66
cM capacity (veh/h)			1072		520	652

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	380	17	93	225
Volume Left	0	17	0	1
Volume Right	1	0	0	224
cSH	1700	1072	1700	651
Volume to Capacity	0.22	0.02	0.05	0.35
Queue Length 95th (ft)	0	1	0	39
Control Delay (s)	0.0	8.4	0.0	13.4
Lane LOS		A		B
Approach Delay (s)	0.0	1.3		13.4
Approach LOS				B

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	359	284	0	4	65	110	0	19	13	81	3	69
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	4.0		5.0			5.0	4.0
Lane Util. Factor	0.97	0.95		1.00	1.00	1.00		1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99		0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		0.94			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00			0.95	1.00
Satd. Flow (prot)	3072	3112		1031	1329	1491		1584			1628	1292
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00			0.71	1.00
Satd. Flow (perm)	3072	3112		1031	1329	1491		1584			1204	1292
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	443	351	0	5	80	136	0	23	16	100	4	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	13	0	0	0	0
Lane Group Flow (vph)	443	351	0	5	80	136	0	26	0	0	104	85
Confl. Peds. (#/hr)									2	2		
Confl. Bikes (#/hr)			2			1						
Heavy Vehicles (%)	14%	16%	0%	75%	43%	7%	0%	0%	31%	9%	67%	25%
Turn Type	Prot			Prot		Free	Perm			Perm		Free
Protected Phases	5	2		1	6			4			8	
Permitted Phases						Free	4			8		Free
Actuated Green, G (s)	12.5	40.6		1.2	29.3	67.4		10.6			10.6	67.4
Effective Green, g (s)	12.5	40.6		1.2	29.3	67.4		10.6			10.6	67.4
Actuated g/C Ratio	0.19	0.60		0.02	0.43	1.00		0.16			0.16	1.00
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	
Vehicle Extension (s)	1.5	1.5		1.0	1.0			2.0			2.0	
Lane Grp Cap (vph)	570	1875		18	578	1491		249			189	1292
v/s Ratio Prot	c0.14	c0.11		0.00	0.06			0.02				
v/s Ratio Perm						0.09					c0.09	0.07
v/c Ratio	0.78	0.19		0.28	0.14	0.09		0.10			0.55	0.07
Uniform Delay, d1	26.1	6.0		32.7	11.5	0.0		24.3			26.2	0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00			1.00	1.00
Incremental Delay, d2	6.0	0.2		3.0	0.5	0.1		0.1			2.0	0.1
Delay (s)	32.2	6.2		35.7	12.0	0.1		24.4			28.2	0.1
Level of Service	C	A		D	B	A		C			C	A
Approach Delay (s)		20.7			5.2			24.4			15.5	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	67.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: TTPM_2014

NW Old Lower River Rd
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South East: NW Old Lower River Rd											
8X	T	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.85	18.7
18X	R	1	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.83	18.6
Approach		3	0.0	0.003	9.3	LOS A	0.0	0.3	0.26	0.84	18.7
North East: NW Old Lower River Rd											
1X	L	9	0.0	0.035	8.0	LOS A	0.2	7.0	0.31	0.86	19.0
16X	R	35	22.0	0.035	8.0	LOS A	0.2	7.0	0.31	0.68	19.0
Approach		44	17.5	0.035	8.0	LOS A	0.2	7.0	0.31	0.72	19.0
North West: NW Old Lower River Rd											
7X	L	77	23.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.57	22.7
4X	T	1	0.0	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	25.0
Approach		78	22.6	0.052	0.0	NA	0.0	0.0	0.00	0.56	22.7
South West: Private Access											
5X	L	1	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	1.01	17.9
2X	T	236	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.91	18.0
12X	R	1	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.79	17.9
Approach		238	3.0	0.308	11.7	LOS B	1.4	36.4	0.22	0.91	18.0
All Vehicles		363	8.9	0.308	8.7	NA	1.4	36.4	0.19	0.81	19.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
HCM Delay Model used.

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