

TECHNICAL MEMORANDUM

Project: Port of Woodland – Austin Point Dockside Infrastructure

Subject: Due Diligence Review – Transportation Analysis

Date: December 7, 2022

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The Port of Woodland is assessing the feasibility and economic opportunity of developing a shipping terminal at Austin Point, a currently undeveloped area located at the confluence of the Columbia and Lewis Rivers. The property is located within Cowlitz County southwest of the City of Woodland, Washington. In order to better understand the full potential of the Austin Point site, the Port determined that a master planning process should occur, the first step of which was to perform a due diligence study to assess the development feasibility of Austin Point as a rail served marine terminal. As part of the due diligence study, the Port retained Heffron Transportation to assist the overall project team (led by KPFF) with analysis of land-side access requirements. This memorandum presents the transportation analysis review results and recommendations in support of the overall due-diligence review.

1. Potential Austin Point Site Development

Two conceptual alternatives were developed to provide a framework for technical studies to analyze feasibility to develop the site. These alternatives are consistent with the Port of Woodland's published resolutions for Austin Point and based on the results from the Preliminary Market Analysis.

1.1. Conceptual Terminal Plan

Both alternatives would have a single-tenant grain exporter occupying the site. Alternative 1 has all the tenant's infrastructure, including the grain storage silos, located waterside of the levee. Alternative 2 assumes the grain storage silos and supportive infrastructure located landside of the levee. Both alternatives would be supported by a tenant-provided rail-car unloader which would be located landside of the levee. The location of the on-terminal infrastructure would not likely affect vehicular traffic since the site access would likely be the same for either alternative. There are three existing access driveways along Dike Road serving the Port's property, with the primary access located in the center of the site. For the purpose of analysis, it is assumed that this center driveway would serve as the primary access to the new development, although all driveways could remain active for maintenance or emergency purposes. This study does not address potential future rail access or landside infrastructure needed for additional development of the site.

For the purposes of this due diligence transportation review, it was assumed the new terminal could be completed and operating by 2030. Therefore, all future analysis were prepared for year 2030 conditions.

1.2. Enhanced Public Access

As part of this feasibility study, the Port is also reviewing maintaining or enhancing public access. Enhanced public access could potentially be a developed park utilizing the site entrance and unimproved space that is currently being used for public access south of the West Coast Training Center site. The park

could potentially be 2 to 5 acres in size with accessory parking. See the *Public Access Plan*¹ in Appendix M of the overall Due Diligence Report for more details.

2. Vicinity Traffic Volumes

The following sections describe historical, existing, and forecast traffic volumes at key locations likely to serve as part of the access routes to and from the Austin Point site.

2.1. Existing and Historic Traffic Volumes

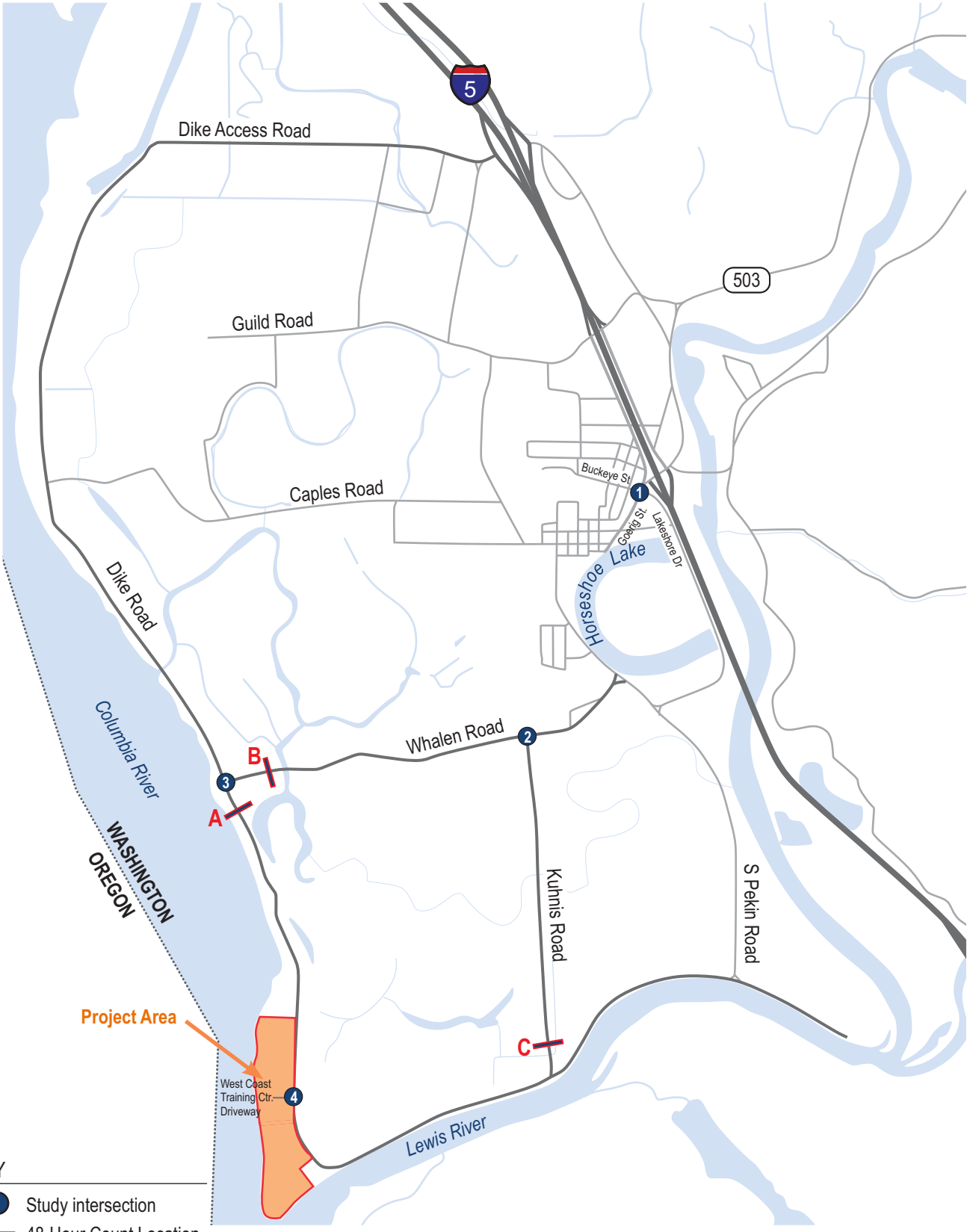
To assess the current and potential future traffic operations at key roadways and intersections, two-day (48-hour) machine traffic counts were commissioned at three locations along routes that could be used to access the Austin Point site including: A) Dike Road south of Whalen Road; B) Whalen Road east of Dike Road; and C) Kuhn Road north of Dike Road. The counts were collected Wednesday, April 13 and Thursday, April 14, 2022 and included volume, speed, and vehicle classification data. In addition, AM and PM peak period video turning movement counts were performed on Wednesday, April 13, 2022 at the following four key intersections (traffic control is listed for each):

1. Lakeshore Drive / Buckeye Street / Goerig Street (stop-sign controlled east-west legs);
2. Whalen Road / Kuhn Road (stop-sign controlled south leg);
3. Dike Road / Whalen Road (yield-sign controlled east leg); and
4. Dike Road / Site (West Coast Training Center) Access Driveway (implied-stop-controlled driveway).



Figure 1 also shows the traffic count locations. All counts were performed by Idax Data Solutions.

The 48-hour traffic counts were compiled to show how volumes in the site vicinity change by time of day. Figure 2, Figure 3, and Figure 4 show the average weekday volumes by hour of the day for Dike Road, Whalen Road, and Kuhn Road, respectively. All three have the same y-axis scale to show relative volumes on each roadway. As shown, the volumes on all three roadways are relatively low with average daily traffic volumes of about 690 vehicles on Dike Road (340 northbound, 350 southbound), about 410 vehicles on Whalen Road (170 eastbound, 240 westbound), and about 330 vehicles in on Kuhn Road (170 northbound, 160 southbound). Volumes on Dike Road are negligible overnight and begin growing sharply at about 4:00 A.M. They remain relatively steady at about 60 to 70 vehicles per hour from 6:00 A.M. to 1:00 P.M. There are two smaller afternoon peaks at 4:00 and 6:00 P.M. Peaking patterns on Kuhn Road and Whalen Road are more typical with noticeable morning (5:00 and 6:00 A.M.), midday (11:00 A.M.), and PM peak (3:00 and 4:00 P.M.) periods.

¹ Makers, 2022.



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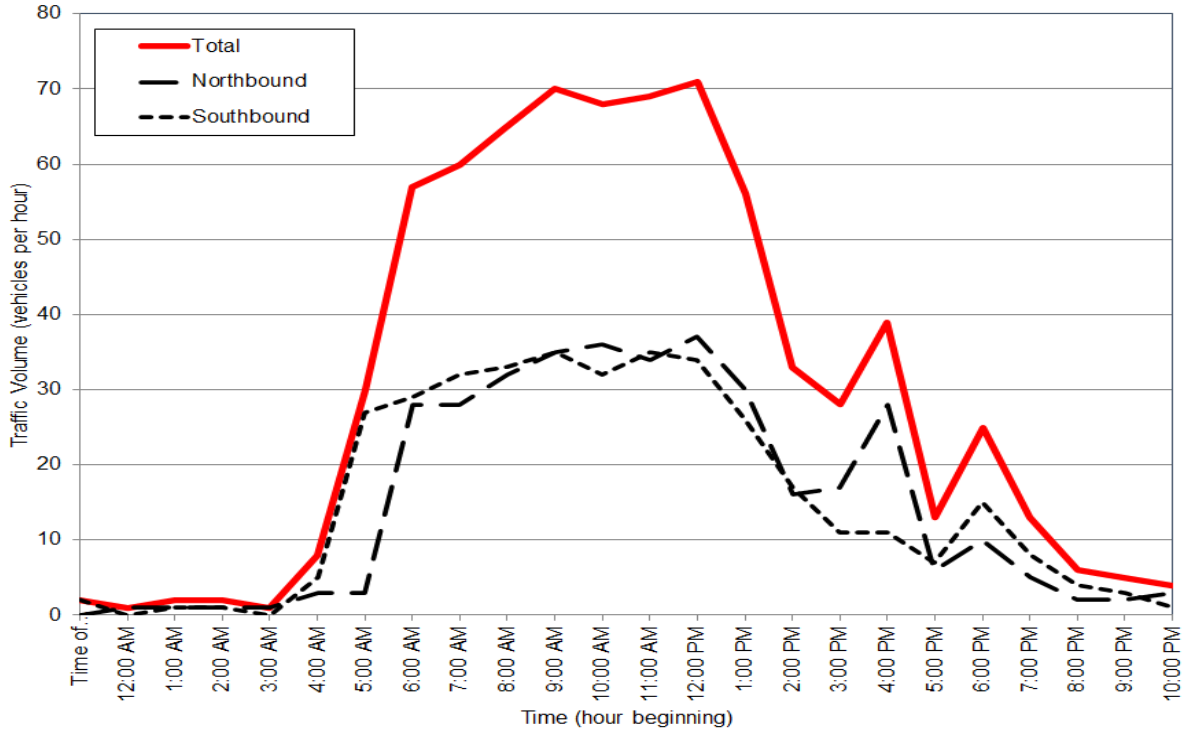
-  Study intersection
-  48-Hour Count Location

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Austin Point Dockside Infrastructure
Due Diligence Review - Transportation Analysis

Figure 1
Site Vicinity Map

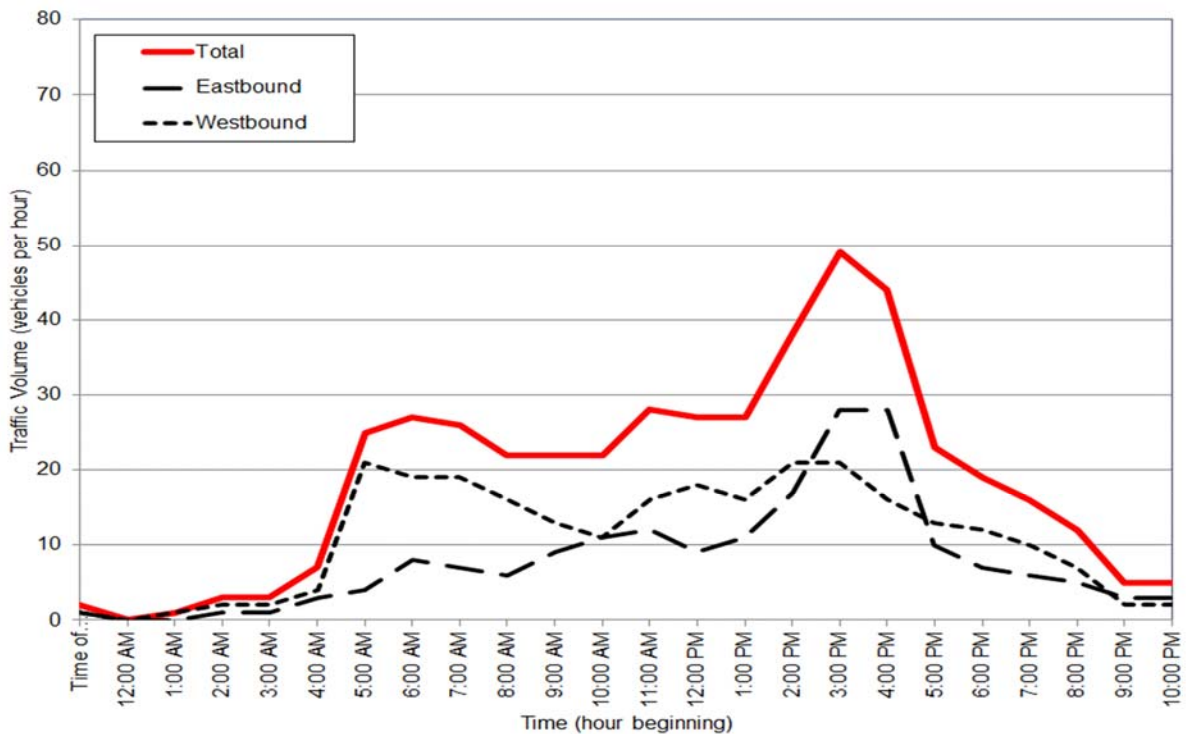


Figure 2. Dike Road south of Whalen Road – Average Weekday Traffic Volumes



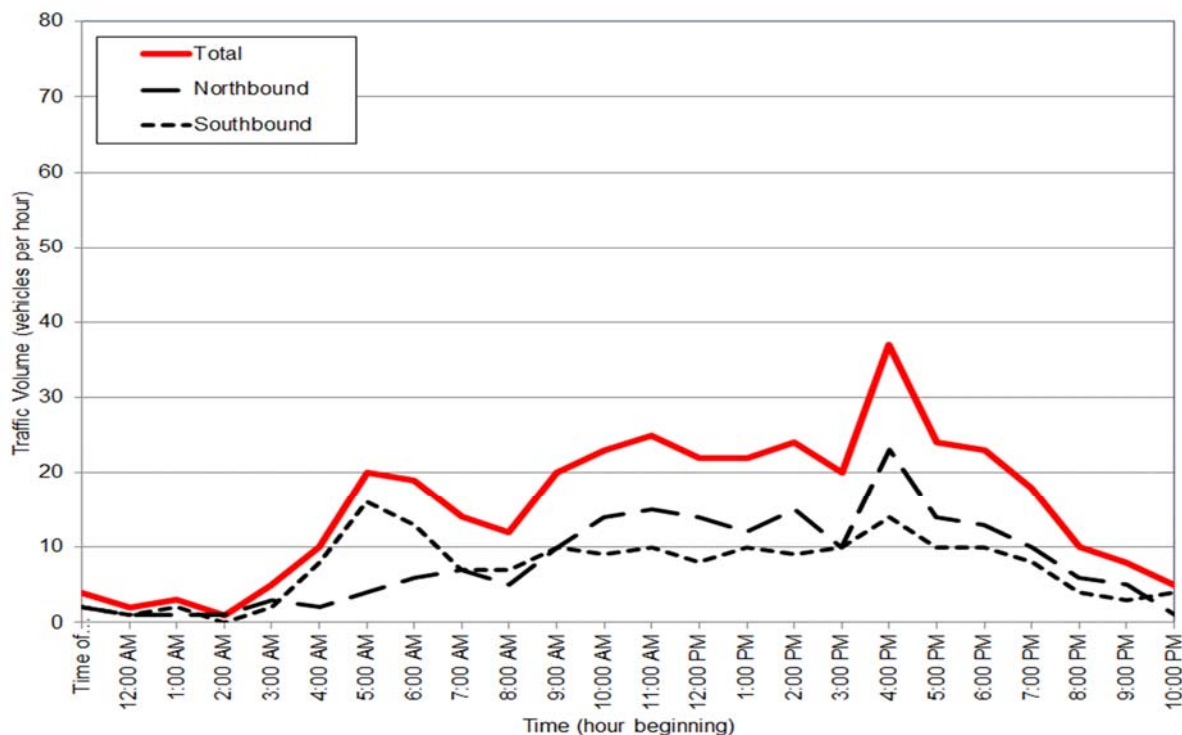
Source: Heffron Transportation, Inc., compiled from counts taken April 13-14, 2022 by Idax Data Solutions.

Figure 3. Whalen Road east of Dike Road – Average Weekday Traffic Volumes



Source: Heffron Transportation, Inc., compiled from counts taken April 13-14, 2022 by Idax Data Solutions.

Figure 4. Kuhn's Road north of Dike Road – Average Weekday Traffic Volumes



Source: Heffron Transportation, Inc., compiled from counts taken April 13-14, 2022 by Idax Data Solutions.

The data found that the 85th-percentile speed of vehicles was about 46 miles per hour (mph) for both directions on Dike Road (posted speed limit is 40 mph), 43 mph eastbound and 45 mph westbound on Whalen Road (posted speed limit is 40 mph), and 47 mph northbound and 50 mph southbound on Kuhn's Road (posted speed limit is 45 mph). The vehicle classification data indicated that trucks (including buses and single-unit two-axle trucks) make up about 59% of the total daily traffic on Dike Road; 23% on Whalen Road, and 14% on Kuhn's Road.

Historical traffic count data were obtained for one of the study intersections—Lakeshore Drive / Buckeye Street / Goerig Street—from the publicly available *South Woodland Properties Subdivision Revised Traffic Impact Analysis*.² Based on a comparison of the count from April 2022 and prior counts from May 2018, May 2019, and June 2020, the most recent volumes were about 10% lower (in terms of total entering volume) than the highest pre-pandemic values from May 2019. However, they are 16% higher than the June 2020 volume counted during the pandemic. Based on these comparisons, the peak hour volumes at all four study intersections were increased by 10% to reflect normalized existing 2022 conditions. Figure 5 shows the normalized 2022 AM and PM Peak hour turning-movement volumes at the four intersections listed previously. The traffic count data sheets are attached.

2.2. Forecast Future Traffic Volumes

Future 2030 traffic volumes were forecast for the study area intersections assuming a combination of general background growth and specific pipeline development traffic. Based on a review of other recent transportation impact analyses prepared for developments in the City of Woodland and the larger surrounding Cowlitz County vicinity, background growth rates of between 1% and 2.3% have been applied.

² PBS, Revised October 7, 2021.

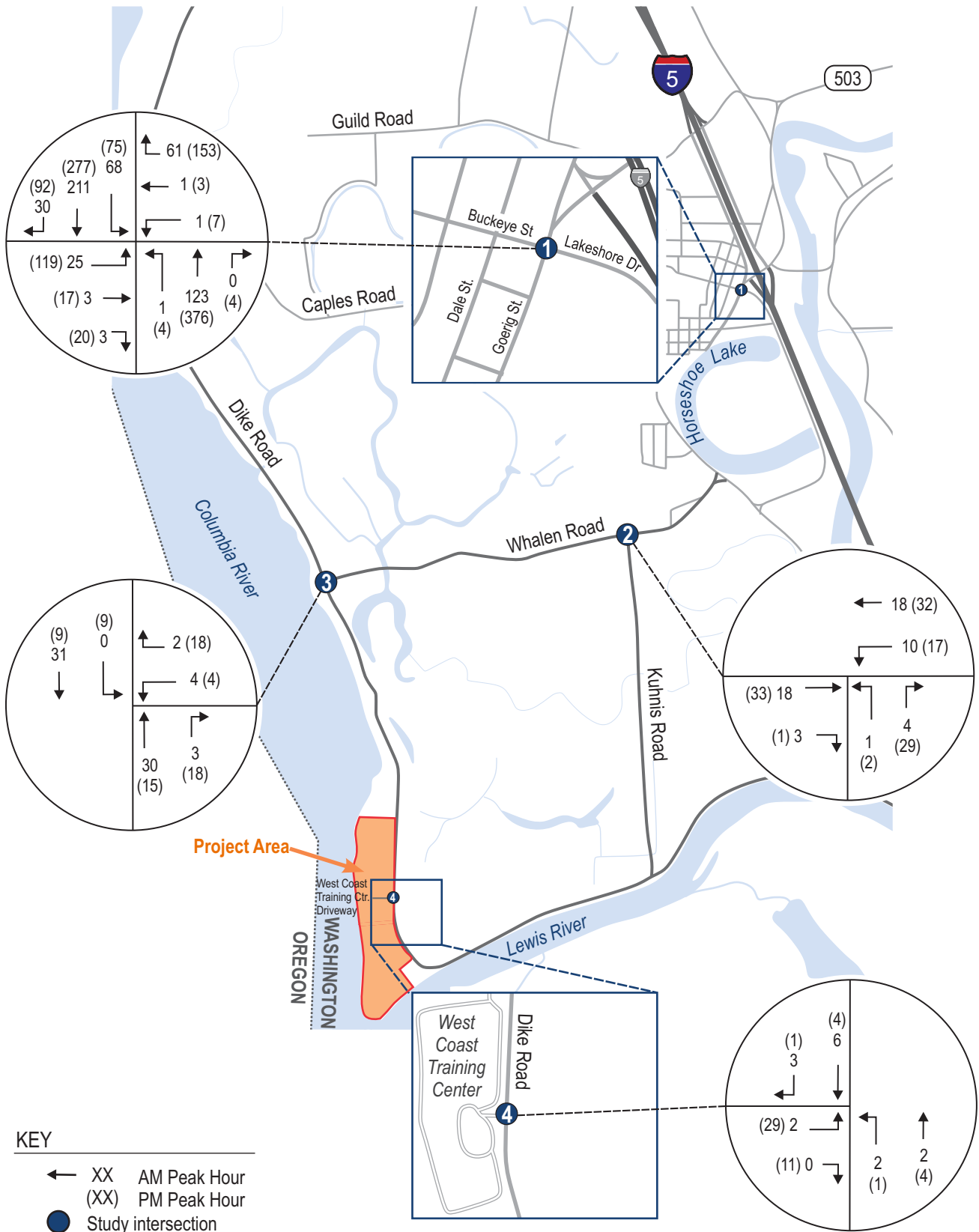


Figure 5
 Normalized 2022 Traffic Volumes
 AM and PM Peak Hours

The higher end of the range of 2.3% was selected for this analysis and is based on City of Woodland population forecasts in the *Woodland Comprehensive Plan 2016-2036*.³ The 2.3% compound annual growth rate was applied to the normalized 2022 traffic volumes to forecast year 2030 background traffic volumes within the study area. In addition, program and traffic forecast information about three specific pipeline development projects was reviewed. Those developments included:

- Logans Landing ;
- Tulip Meadows Phases 1 and 2 (Traffic Impact Analysis by SCJ Alliance, August 2020); and
- Carpinito Woodland Business Park (Traffic Impact Analysis by Transportation Engineering Northwest (TENW), June 2019).

Trips generated by the three pipeline projects were added to the study area intersections. One large residential development, known as the *South Woodland Properties Subdivision*, had been proposed in the site vicinity but it was denied and is no longer assumed to be part of the future pipeline development in the area. Cowlitz County planning staff did not identify any other specific planned future development for inclusion in the forecasts.⁴ Figure 6 shows the forecast-2030-without-project AM and PM Peak hour turning-movement volumes at the four study intersections.

3. Terminal Vehicular Trip Generation

The project’s vehicular trips, including employee vehicle trips and occasional maintenance vehicle trips, were estimated to evaluate potential site access requirements and operational impacts. Trip generation is based on employee estimates developed by the project team. The following describes the range of possible traffic generation.

3.1. Employees and Shift Estimates

The project team estimated the potential terminal’s employment by shift.⁵ It is assumed that the terminal would operate seven days per week with 20% of its employees serving office/administrative roles working traditional days and hours (Monday through Friday 7:30 A.M. to 5:00 P.M.). It is assumed 80% of all employees would be shift workers with three shifts per day, seven days per week. The shift employees are assumed to be distributed with about two-thirds (66%) on day shift and the remaining third split evenly between swing shift and night shift. The number of employees was then inflated by 33% to reflect a reasonable high-end for this due diligence review. The base-level and worst-case level employee estimates are summarized in Table 1.

Table 1. Austin Point Grain Terminal – Range of Potential Employees

Base Forecast	Portion	Employees	High-End (+33%) ^a	Portion	Employees
Administration	20%	6	Administration	20%	8
Shift Workers			Shift Workers		
Day Shift	53%	16	Day Shift	53%	22
Swing Shift	13.5%	4	Swing Shift	13.5%	5
Night Shift	13.5%	4	Night Shift	13.5%	5
Total		30	Total		40

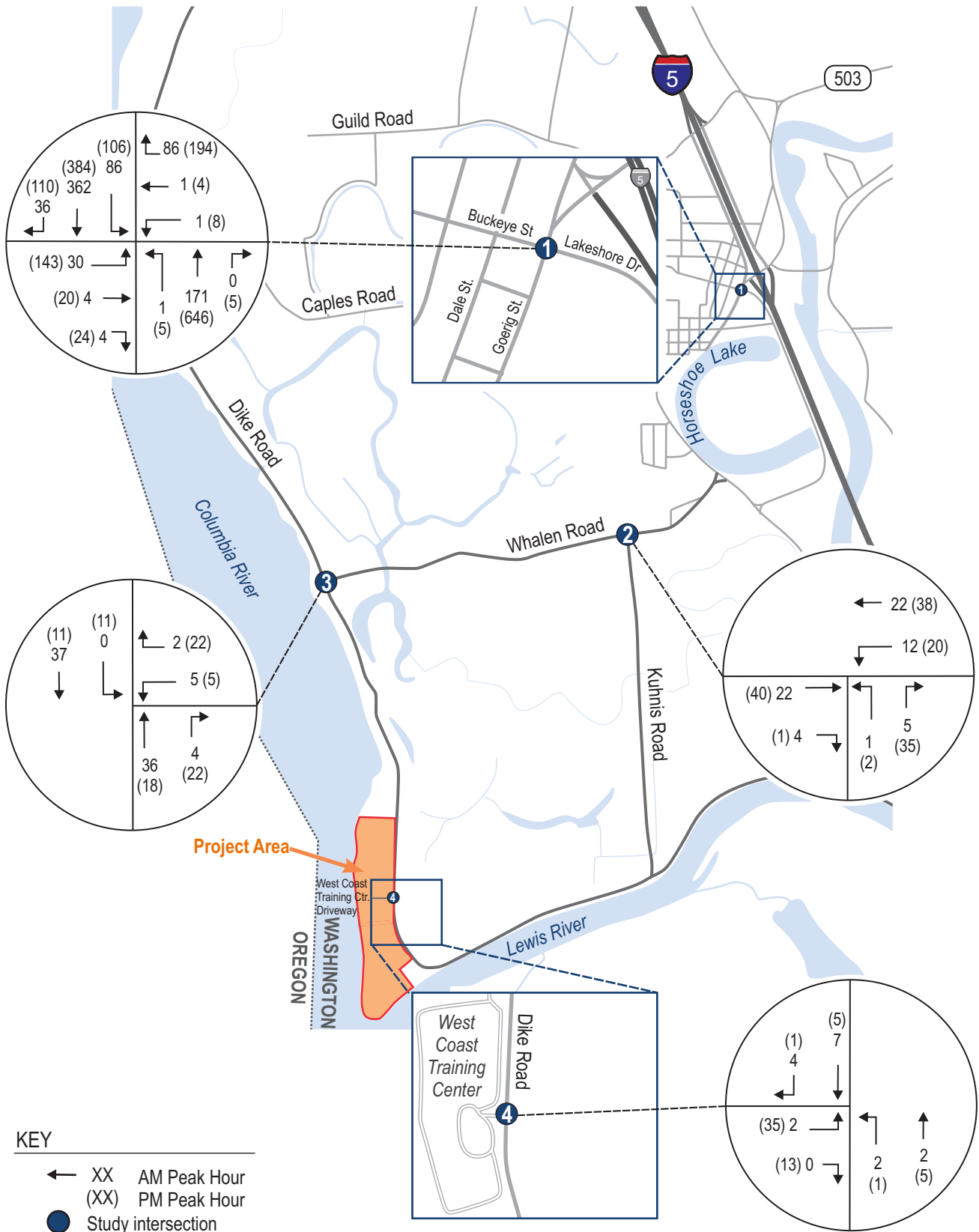
Source: KPFF, October 12, 2022.

a. The number of employees increased by 33% to reflect a high-end condition for the purpose of the transportation analysis.

³ City of Woodland, Table 3-1, March 22, 2016, Amended: July 15, 2019, Ordinance #1433.

⁴ Email communication, Cowlitz County, Greta Holmstrom, Planning Manager, October 27, 2022.

⁵ KPFF, October 12, 2022.



3.2. Trip Generation Estimates

Trip generation estimates for the terminal options were developed using two methods. First, rates and equations published by the Institute of Transportation Engineers [ITE] in its *Trip Generation Manual*⁶ for General Light Industrial (Land Use 110) were reviewed and applied based on the total number of employees at the site, regardless of shift. The second method developed trip estimates based on expected arrival and departure times for the employees in each shift, and assumed that trips associated with deliveries and maintenance would occur evenly during the midday periods (e.g., not during the peak arrival and departure times). The resulting trip generation estimates for the morning and evening peak hours (the times when the terminal is expected to generate the highest volume of traffic) are presented in Table 2.

Table 2. Austin Point Grain Terminal – Trip Generation Estimates

Terminal Option / Method	AM Peak Hour Trips			PM Peak Hour Trips		
	In	Out	Total	In	Out	Total
Base Forecast						
Based on ITE Rates ¹	13	3	16	3	12	15
Based on Employee Shift Estimates ²	17	3	20	3	17	20
Worst Case (133%)						
Based on ITE Rates ¹	17	4	21	4	16	20
Based on Employee Shift Estimates ²	24	4	28	4	24	28

Source: Heffron Transportation, Inc., November 2022.

1. Trip estimates based on total employees (30 for the Base Forecast and 40 for the Worst Case Forecast with 133% safety factor). ITE rates for General Light Industrial (LU 110) were applied.
2. Based on total employees, 20% administration (Mon-Fri, 7:30 A.M. to 5:00 P.M.), 80% shift seven days per week, with two-thirds of those on day shift and the remaining one-third split evenly between swing shift and night shift.

As shown, the terminal is estimated to generate between 20 and 28 trips during the AM and PM peak hours, depending on the level of employment. Traffic operations analysis presented later in this report assumes the highest results for employee trips: 28 AM peak hour trips (24 in, 4 out) and 28 PM peak hour trips (4 in, 24 out).

Potential traffic generation by the enhanced public access and possible park component is estimated at 0 to 1 peak hour trips based on its potential size (2 to 5 acres) and ITE rates published for Public Park (Land Use 411). The possible additional trips were not specifically added to area roadways or intersections since, as noted, the April 2022 counts at the existing primary site access driveway showed the site generated 7 trips in the AM peak hour (5 in, 2 out), and 38 trips (2 in, 36 out) in the PM peak hour. As a result, the potential grain terminal and enhanced public access/park could result in an increase of 21 or 22 AM peak hour trips and a decrease of 9 or 10 PM peak hour trips. While these net changes may be considered in future analysis to support site permitting or environmental review, this Due Diligence Review assumes no credit for removing trips associated with the existing site use and represents a conservative worst case for potential project-related impacts.

4. Trip Distribution and Assignment

Travel routes and the percentage of trips that may use each route (also known as the trip distribution pattern) was estimated based on a combination of resources including: 1) the expected site access location

⁶ ITE, 11th Edition, September 2021.

on Dike Road, 2) population density data from the US Census Bureau for locations where terminal employees may reside (the Cities of Longview, Kelso, Woodland, Vancouver, and unincorporated Cowlitz and Clark Counties); 3) *Google Maps* predictive travel-route and travel-time mapping resource; and 4) the traffic counts and directional patterns at intersections in the study area.

Figure 7 shows the distribution patterns and trip assignments for the AM and PM peak hours. Although the net change in site-generated traffic is expected to be lower, all 28 of the terminal-generated peak hour trips were assigned to the roadway network as if they would be new. Although the new terminal is likely to have more than one access driveway, all terminal generated traffic was assumed to occur at one location on Dike Road to reflect worst-case conditions.

The potential project trips were added to the background 2030 peak hour traffic forecasts presented in Section 2 to reflect 2030 conditions with the terminal project. Figure 8 shows the forecast-2030-with-project AM and PM Peak hour turning-movement volumes at the four study intersections.

5. Traffic Operations

Level of service (LOS) analyses were performed for the four study-area intersections to understand current and potential future operations during the AM and PM peak hours. Level of service is a qualitative measure used to characterize traffic operating conditions. Six letter designations, “A” through “F,” are used to define level of service. LOS A is the best and represents good traffic operations with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. The *City of Woodland Comprehensive Plan*⁷ outlines the established LOS standard of LOS D or better for arterial state highways (State Route [SR] 503), major arterials, and minor arterials. Cowlitz County has established an overall standard of LOS D or better for signalized and unsignalized intersections. Attachment A summarizes level of service thresholds and definitions.

Levels of service for the four identified study-area intersections were calculated using Trafficware’s *Synchro 11* traffic operations analysis software. Input data for this analysis reflect the existing intersection channelization and traffic control for each location. Table 3 summarizes the level of service results for normalized year 2022 conditions. The analyses indicate that all four intersections operate at LOS A in the AM peak hour with all movements at LOS C or better. All but one intersection operate at LOS A overall in the PM peak hour. The Goerig Road / Buckeye Street / Lakeshore Drive intersection operates at LOS F overall. This poor operation is primarily due high volumes on Goerig Road, which cause long delays for side street (primarily eastbound) movements.

The assumed growth in background traffic along with the specific pipeline development traffic added to represent 2030-without-project volumes would add delay to all four intersections. However, all but the Goerig Road / Buckeye Street / Lakeshore Drive intersection are forecast to remain at LOS A overall during both peak hours. The Goerig Road / Buckeye Street / Lakeshore Drive intersection is forecast to operate at a very poor LOS F condition with long delays on the side streets, particularly approaching the stop sign on eastbound Lakeshore Drive. Operations of this intersection were addressed in the *I-5 at SR 503 Interchange Improvements – Exit 21 Transportation Assessment (Phase 1)*.⁸ That study examined options to improve the I-5 interchange and included long-term (2040) analysis with review of applicable *Manual on Uniform Traffic Control Devices (MUTCD)* warrants to signalize the Goerig Road / Buckeye Street / Lakeshore Drive intersection. The analysis concluded the intersection does warrant a signal, which combined with changes to the intersection’s channelization, would improve operations to an acceptable level of service (LOS D) during the PM peak hour in 2040 (which is 10 years beyond the horizon year for this Due Diligence Review.)

⁷ City of Woodland, Amended July 15, 2019, Ordinance #1433.

⁸ Kittelson & Associates, November 6, 2020.

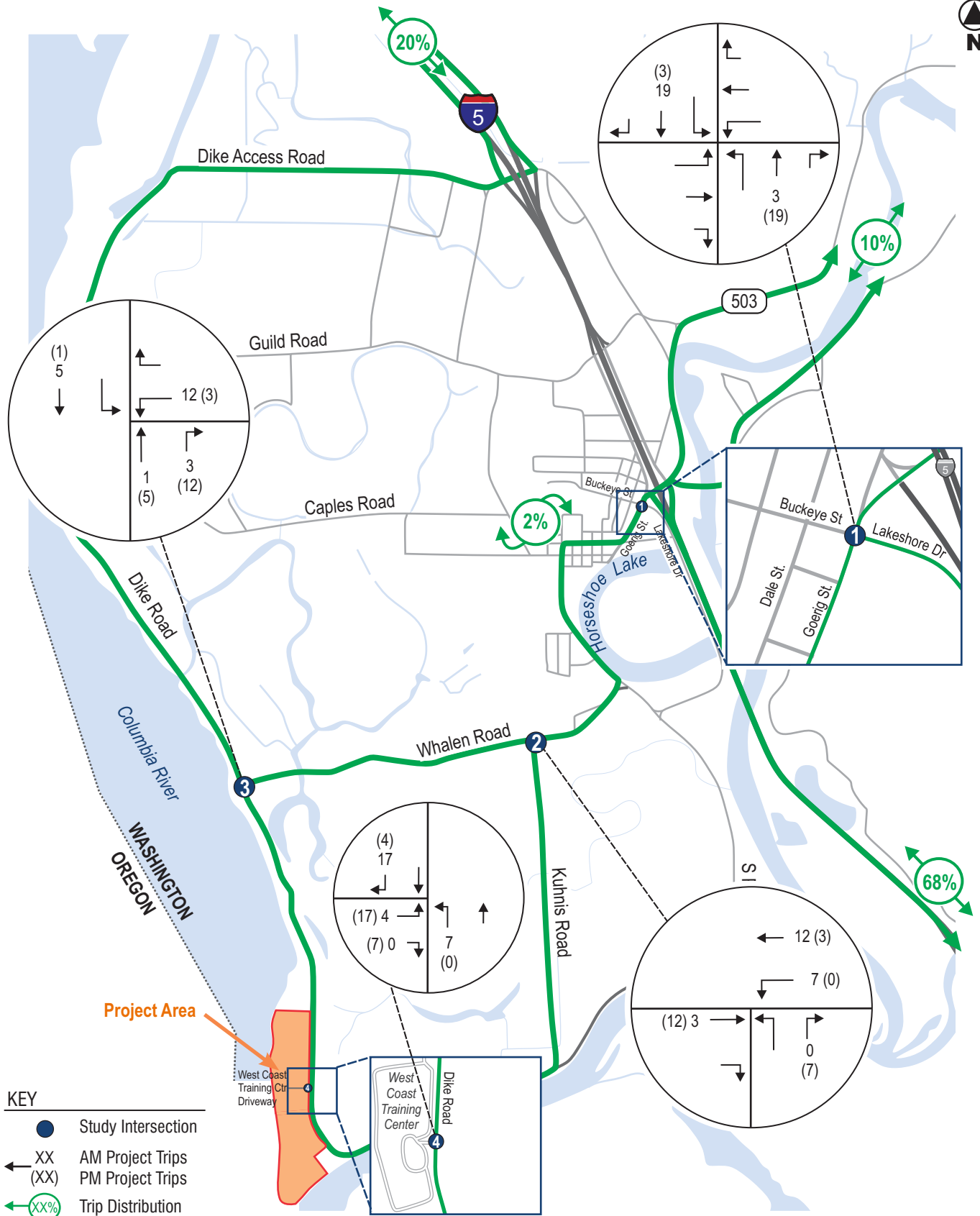
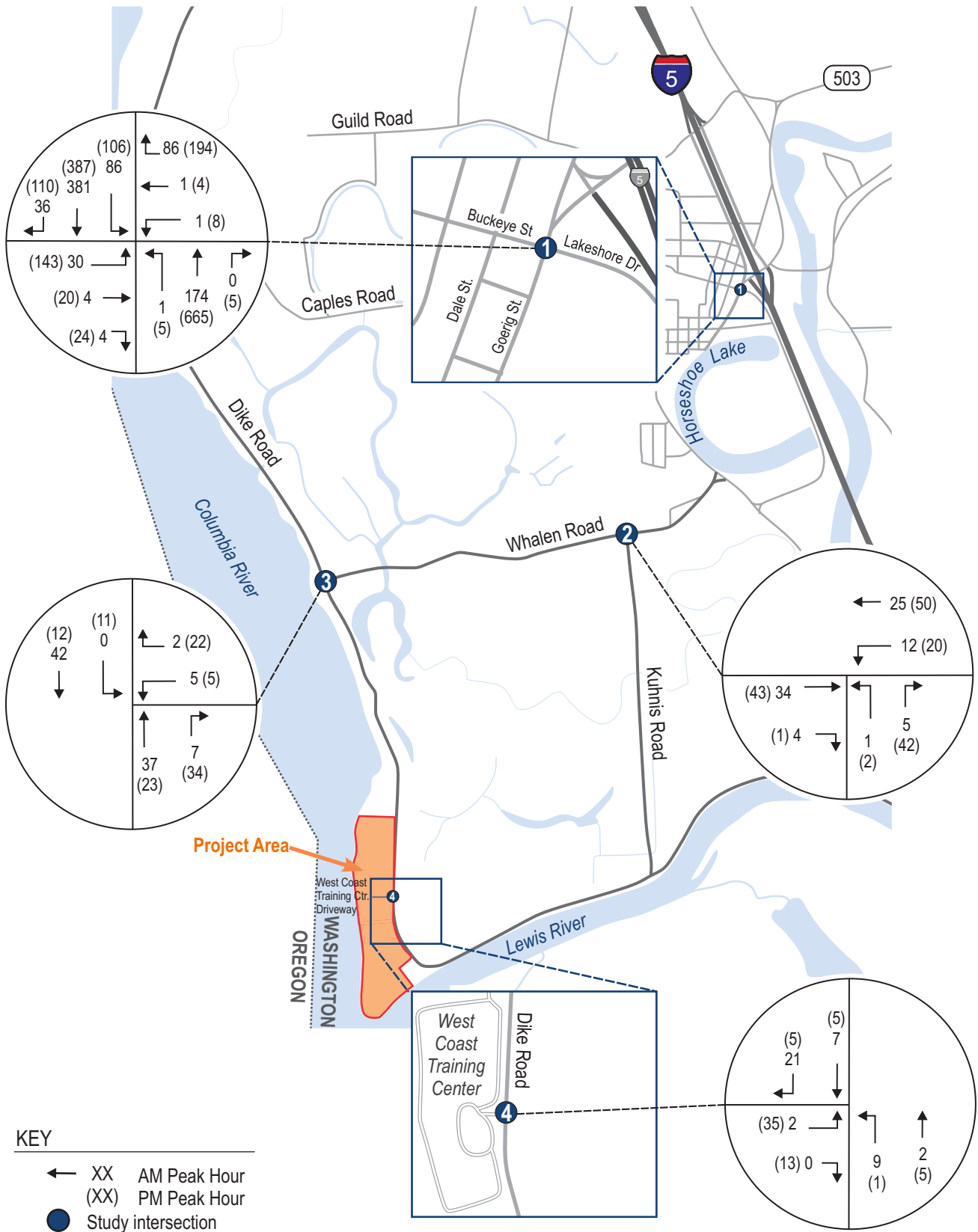


Figure 7
 Project Trip Distribution and Assignments
 AM and PM Peak Hours



The trips forecast to be added by the potential Austin Point grain terminal development would contribute negligible amounts of delay to study-area intersections during the AM peak hour and to three of four intersections during the PM peak hour. Due to the poor existing and forecast without-project operations of the Goerig Road / Buckeye Street / Lakeshore Drive intersection, the small increase in trips generated by the planned terminal would result in disproportionate increases in delay if the intersection remains stop-sign controlled. However, if signalized as suggested in the *I-5 at SR 503 Interchange Improvements – Exit 21 Transportation Assessment (Phase 1)*, it is forecast to operate at LOS B in 2030 without and with the project during the PM peak hour. All LOS calculations are provided in Attachment B.

Table 3. Existing 2022 Peak Hour Levels of Service – Austin Point Study Area

No:	Intersection	Existing (2022)		2030 Without-Project		2030 With-Project	
		LOS ¹	Delay ²	LOS	Delay	LOS	Delay
AM Peak Hour							
1	Goerig St / Buckeye St / Lakeshore Dr (overall)	A	3.5	A	4.1	A	4.0
	Northbound Left-Turn	A	8.0	A	8.6	A	8.7
	Eastbound Movements	C	19.0	E	36.8	E	39.5
	Westbound Movements	A	9.9	B	10.8	B	10.8
	Southbound Left-Turn	A	7.7	A	7.9	A	7.9
2	Kuhnis Rd / Whalen Rd (overall)	A	2.3	A	2.3	A	1.9
	Northbound Turns	A	8.6	A	8.7	A	8.8
	Westbound Left Turn	A	7.8	A	7.8	A	7.9
3	Dike Rd / Whalen Rd (overall)	A	0.7	A	0.7	A	0.6
	Westbound Turns	A	9.2	A	9.3	A	9.3
	Southbound Left Turn	A	0.0	A	0.0	A	0.0
4	Dike Rd / Site Access (overall)	A	2.5	A	2.3	A	2.5
	Northbound Left Turn	A	7.5	A	7.5	A	7.5
	Eastbound Turns	A	8.6	A	8.6	A	8.9
PM Peak Hour							
1	Goerig St / Buckeye St / Lakeshore Dr (overall)	F	52.1	F	606.9	F	726.7
	Northbound Left-Turn	A	8.3	A	8.7	A	8.7
	Eastbound Movements	F	379.3	F	>5,000	F	>6,000
	Westbound Movements	C	17.7	F	104.2	F	119.7
	Southbound Left-Turn	A	8.8	B	10.6	A	10.8
2	Kuhnis Rd / Whalen Rd (overall)	A	3.4	A	3.4	A	3.4
	Northbound Turns	A	8.8	A	8.8	A	8.9
	Westbound Left Turn	A	7.4	A	7.4	A	7.4
3	Dike Rd / Whalen Rd (overall)	A	3.5	A	3.6	A	3.0
	Westbound Turns	A	8.7	A	8.8	A	8.9
	Southbound Left Turn	A	7.4	A	7.4	A	7.5
4	Dike Rd / Site Access (overall)	A	7.0	A	7.0	A	6.6
	Northbound Left Turn	A	7.6	A	7.6	A	7.6
	Eastbound Turns	A	8.8	A	8.9	A	8.9

Source: Heffron Transportation, May 2022 using the Synchro 11 software and HCM 6th Edition reporting module.

1. LOS = Level of service.
2. Delay = Average seconds of delay per vehicle.

6. Site Access Channelization Requirements

As previously described, primary vehicular access is planned from a single access roadway on Dike Road in approximately the same location as the existing south access to the West Coast Training Center. The channelization requirements for this terminal site access were determined using the forecast 2030 peak hour traffic volume forecasts described in the previous section. Based on the low volumes forecast for Dike Road as well as at the site access, the site access driveway is forecast to operate at LOS A overall with all movements at LOS A. No additional turn-lane channelization (such as left- or right-turn storage) would be required.

7. Access Sight Distance

Along the Austin Point site frontage, Dike Road is generally flat. It is a two-lane roadway with approximately four-foot gravel shoulders. Sight distance requirements for the access were evaluated using guidelines published in *A Policy on Geometric Design of Highways and Streets* by the American Association of State Highway and Transportation Officials (AASHTO).⁹

Stopping sight distance (SSD) is the length of the roadway ahead that is visible to a driver and should be sufficiently long to enable a driver traveling at or near the design speed to stop the vehicle before reaching a stationary object in its path. As described previously, the posted speed limit is 40 mph, and the 85th-percentile vehicles speeds on this stretch were measured range between 43 and 45 mph depending on the direction. Therefore, a 50-mph design speed was assumed for the sight distance analysis. At this speed, the minimum required SSD for vehicles on Dike Road approaching the proposed driveway location was determined to be 425 feet as measured from a driver's eye height of 3.5 feet to an object height of 2 feet. Since Dike Road is straight and relatively flat with no sight-line limitations, adequate SSD (greater than 800 feet) would be achievable from either of the existing access locations.

Intersection sight distance (ISD) allows a driver stopped on a minor intersection (or driveway) to have an adequate view of approaching vehicles to determine an appropriate gap to enter the major street traffic without causing the major-street traffic to slow. ISD is determined based on a driver's eye located 14.5 feet from the edge of the major-road traveled way at a height of 3.5 feet to an object height of 3.5 feet (representing an oncoming vehicle). The minimum recommended ISD for vehicles turning left from a driveway onto Dike Road was determined to be 555; the minimum recommended ISD for vehicles turning right was determined to be 480 feet. Adequate ISD (greater than 800 feet) would be achievable from either of the existing access locations. No adjustment for grade was applied since the access is expected to be located at a point where grades on Dike Road are less than 3%.

8. Findings and Considerations

The potential Austin Point grain terminal development being considered is forecast to generate relatively little daily traffic and fewer than 30 trips during the AM and PM peak hours. Those trips would have negligible impacts to delays at key intersections along access routes between the terminal site and I-5. There is already considerable congestion at the intersections serving I-5 Exit 21 along Goerig Road, especially at the Lakeshore Drive / Buckeye Street intersection. However, the City of Woodland and WSDOT have identified a number of improvements, including channelization and signalization that would address those conditions. No off-site transportation improvements are anticipated to be required, but the City of Woodland and/or WSDOT could request a cost share contribution to the improvements associated with the I-5 Exit 21 projects. The potential grain terminal traffic is estimated to be about 1.3% of the total entering volumes at the Goerig Road / Lakeshore Drive / Buckeye Street intersection.

⁹ AASHTO, *A Policy on Geometric Design of Highways and Streets*, 7th Edition, 2018, Tables 9-7 and 9-9.

We understand from the project team that the City, WSDOT, and/or local community may request analysis of the potential project impacts to the I-5 interchange intersections at Exit 21 (Lewis River Road (SR 503)) and Exit 22 (Dike Access Road). The project-generated trips would represent a very small portion of total entering traffic at these locations and are not expected to cause any operational degradation or noticeable added delay. The *I-5 at SR 503 Interchange Improvements – Exit 21 Transportation Assessment (Phase 1)* evaluated major improvements at Exit 21, and forecast both ramp intersections to operate at LOS C and D (for southbound and northbound respectively) in 2040 during the PM peak hour. The recent *Logan’s Landing Traffic Impact Analysis*,¹⁰ included analysis of the roundabout controlled I-5 ramp intersections with Dike Access Road at Exit 22. That analysis forecast both intersections to operate at LOS D and B (for southbound and northbound respectively) in 2025 during the PM peak hour. Based on these recent analyses and the relatively small number of trips expected to be added by the contemplated grain terminal at Austin Point, it is not expected to result in adverse impacts to either of the I-5 interchanges. However, additional analysis could be requested to document those expected results as part of any subsequent environmental review and permitting.

In addition, analysis of potential off-site traffic impacts caused by any new at-grade rail crossings or new blockages of existing at-grade rail crossings caused by trains transporting grain to the new terminal would likely be required as part of future environmental review and permitting.

Attachments: Attachment A: Level of Service (LOS) Definitions and Thresholds
Attachment B: LOS Calculation Sheets

TSM/tsm

PoW Austin Pt - Due Diligence Transportation Review - FINAL

¹⁰ Heath & Associates, Inc., March 2022.

Attachment A

Level of Service (LOS) Definitions and Thresholds

Levels of service (LOS) are qualitative descriptions of traffic operating conditions. These levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. Levels of service for this analysis were developed using procedures presented in the *Highway Capacity Manual, Sixth Edition* (Transportation Research Board, 2016).

Signalized Intersections

Level of service for signalized intersections is defined in terms of average delay for all vehicles that travel through the intersection. Delay can be a cause of driver discomfort, frustration, inefficient fuel consumption, and lost travel time. Specifically, level-of-service criteria are stated in terms of the average delay per vehicle in seconds. Delay is a complex measure and is dependent on a number of variables including: number and type of vehicles by movement, intersection lane geometry, signal phasing, the amount of green time allocated to each phase, transit stops and parking maneuvers. Table A-1 shows the level of service criteria for signalized intersections from the *Highway Capacity Manual, Sixth Edition*.

Table A-1. Level of Service for Signalized Intersections

Level of Service	Average Control Delay Per Vehicle
A	≤ 10 seconds
B	> 10 – 20 seconds
C	> 20 – 35 seconds
D	> 35 – 55 seconds
E	> 55 – 80 seconds
F	> 80 seconds

Source: Transportation Research Board, *Highway Capacity Manual, Exhibit 19.8, 2016*.

Unsignalized Intersections

For unsignalized intersections, level of service is based on the average delay per vehicle for each turning movement. The level of service for all-way stop or roundabout-controlled intersections is based upon the average delay for all vehicles that travel through the intersection. The level of service for a one- or two-way, stop-controlled intersection, delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. Table A-2 shows the level of service criteria for unsignalized intersections from the *Highway Capacity Manual, Sixth Edition*.

Table A-2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle
A	0 – 10 seconds
B	> 10 – 15 seconds
C	> 15 – 25 seconds
D	> 25 – 35 seconds
E	> 35 – 50 seconds
F	> 50 seconds

Source: Transportation Research Board, *Highway Capacity Manual, Exhibit 20.2, 2016*.

Attachment B

LOS Calculation Sheets

Port of Woodland - Austin Point Dockside Infrastructure
 1: Goerig St & Buckeye St/Lakeshore Dr

Normalized 2022 AM Peak Hour
 HCM 6th TWSC

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	25	3	3	1	1	61	1	123	0	68	211	30
Future Vol, veh/h	25	3	3	1	1	61	1	123	0	68	211	30
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	68	68	68	88	88	88	72	72	72
Heavy Vehicles, %	24	24	24	19	19	19	4	4	4	4	4	4
Mvmt Flow	34	4	4	1	1	90	1	140	0	94	293	42

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	691	645	315	648	666	140	336	0	0	140	0	0
Stage 1	503	503	-	142	142	-	-	-	-	-	-	-
Stage 2	188	142	-	506	524	-	-	-	-	-	-	-
Critical Hdwy	7.34	6.74	6.44	7.29	6.69	6.39	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Follow-up Hdwy	3.716	4.216	3.516	3.671	4.171	3.471	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	331	364	677	361	359	865	1212	-	-	1431	-	-
Stage 1	512	507	-	822	748	-	-	-	-	-	-	-
Stage 2	765	739	-	519	503	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	277	334	676	333	329	865	1211	-	-	1431	-	-
Mov Cap-2 Maneuver	277	334	-	333	329	-	-	-	-	-	-	-
Stage 1	511	465	-	821	747	-	-	-	-	-	-	-
Stage 2	684	738	-	470	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	19	9.9	0.1	1.7
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1211	-	-	299	823	1431	-
HCM Lane V/C Ratio	0.001	-	-	0.142	0.113	0.066	-
HCM Control Delay (s)	8	0	-	19	9.9	7.7	0
HCM Lane LOS	A	A	-	C	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.5	0.4	0.2	-

Intersection

Int Delay, s/veh 2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	18	3	10	18	1	4
Future Vol, veh/h	18	3	10	18	1	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	59	59	39	39	63	63
Heavy Vehicles, %	11	11	48	48	0	0
Mvmt Flow	31	5	26	46	2	6

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	36
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.58
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.632
Pot Cap-1 Maneuver	-	-	1324
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1324
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	999	-	-	1324	-
HCM Lane V/C Ratio	0.008	-	-	0.019	-
HCM Control Delay (s)	8.6	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection

Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	2	30	3	0	31
Future Vol, veh/h	4	2	30	3	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	75	75	64	64
Heavy Vehicles, %	33	33	77	77	79	79
Mvmt Flow	5	3	40	4	0	48

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	90	42	0	0	44
Stage 1	42	-	-	-	-
Stage 2	48	-	-	-	-
Critical Hdwy	6.73	6.53	-	-	4.89
Critical Hdwy Stg 1	5.73	-	-	-	-
Critical Hdwy Stg 2	5.73	-	-	-	-
Follow-up Hdwy	3.797	3.597	-	-	2.911
Pot Cap-1 Maneuver	840	947	-	-	1186
Stage 1	907	-	-	-	-
Stage 2	901	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	840	947	-	-	1186
Mov Cap-2 Maneuver	840	-	-	-	-
Stage 1	907	-	-	-	-
Stage 2	901	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	873	1186
HCM Lane V/C Ratio	-	-	0.009	-
HCM Control Delay (s)	-	-	9.2	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Port of Woodland - Austin Point Dockside Infrastructure
4: Dike Rd & WC Training Ctr

Normalized 2022 AM Peak Hour
HCM 6th TWSC

Intersection

Int Delay, s/veh	2.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	0	2	2	6	3
Future Vol, veh/h	2	0	2	2	6	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	50	50	50	50	67	67
Heavy Vehicles, %	0	0	25	25	0	0
Mvmt Flow	4	0	4	4	9	4

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	23	11	13	0	0
Stage 1	11	-	-	-	-
Stage 2	12	-	-	-	-
Critical Hdwy	6.4	6.2	4.35	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.425	-	-
Pot Cap-1 Maneuver	998	1076	1468	-	-
Stage 1	1017	-	-	-	-
Stage 2	1016	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	995	1076	1468	-	-
Mov Cap-2 Maneuver	995	-	-	-	-
Stage 1	1014	-	-	-	-
Stage 2	1016	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	3.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1468	-	995	-	-
HCM Lane V/C Ratio	0.003	-	0.004	-	-
HCM Control Delay (s)	7.5	0	8.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Port of Woodland - Austin Point Dockside Infrastructure
 1: Goerig St & Buckeye St/Lakeshore Dr

Normalized 2022 PM Peak Hour
 HCM 6th TWSC

Intersection

Int Delay, s/veh	52.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	119	17	20	7	3	153	4	376	4	75	277	92
Future Vol, veh/h	119	17	20	7	3	153	4	376	4	75	277	92
Conflicting Peds, #/hr	0	0	1	1	0	0	3	0	1	1	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	76	76	76	77	77	77	82	82	82
Heavy Vehicles, %	3	3	3	2	2	2	1	1	1	7	7	7
Mvmt Flow	142	20	24	9	4	201	5	488	5	91	338	112

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1182	1083	398	1101	1137	492	453	0	0	494	0	0
Stage 1	579	579	-	502	502	-	-	-	-	-	-	-
Stage 2	603	504	-	599	635	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.12	6.52	6.22	4.11	-	-	4.17	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.518	4.018	3.318	2.209	-	-	2.263	-	-
Pot Cap-1 Maneuver	166	216	649	189	202	577	1113	-	-	1044	-	-
Stage 1	499	499	-	552	542	-	-	-	-	-	-	-
Stage 2	484	539	-	488	472	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 96	189	647	151	176	576	1110	-	-	1043	-	-
Mov Cap-2 Maneuver	~ 96	189	-	151	176	-	-	-	-	-	-	-
Stage 1	495	439	-	548	538	-	-	-	-	-	-	-
Stage 2	311	535	-	395	415	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s\$	379.3	17.7	0.1	1.5
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1110	-	-	115	495	1043	-	-
HCM Lane V/C Ratio	0.005	-	-	1.615	0.433	0.088	-	-
HCM Control Delay (s)	8.3	0	-	\$ 379.3	17.7	8.8	0	-
HCM Lane LOS	A	A	-	F	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	13.9	2.2	0.3	-	-

Notes

-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh	3.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	33	1	17	32	2	29
Future Vol, veh/h	33	1	17	32	2	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	92	92	70	70
Heavy Vehicles, %	3	3	2	2	0	0
Mvmt Flow	55	2	18	35	3	41

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	57	0	127
Stage 1	-	-	-	-	56
Stage 2	-	-	-	-	71
Critical Hdwy	-	-	4.12	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.218	-	3.5
Pot Cap-1 Maneuver	-	-	1547	-	872
Stage 1	-	-	-	-	972
Stage 2	-	-	-	-	957
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1547	-	862
Mov Cap-2 Maneuver	-	-	-	-	862
Stage 1	-	-	-	-	972
Stage 2	-	-	-	-	946

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1004	-	-	1547	-
HCM Lane V/C Ratio	0.044	-	-	0.012	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection

Int Delay, s/veh	3.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	18	15	18	9	9
Future Vol, veh/h	4	18	15	18	9	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	63	63	57	57
Heavy Vehicles, %	5	5	3	3	6	6
Mvmt Flow	6	29	24	29	16	16

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	87	39	0	0	53
Stage 1	39	-	-	-	-
Stage 2	48	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.16
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.254
Pot Cap-1 Maneuver	907	1024	-	-	1527
Stage 1	976	-	-	-	-
Stage 2	967	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	897	1024	-	-	1527
Mov Cap-2 Maneuver	897	-	-	-	-
Stage 1	976	-	-	-	-
Stage 2	956	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	998	1527
HCM Lane V/C Ratio	-	-	0.035	0.01
HCM Control Delay (s)	-	-	8.7	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection

Int Delay, s/veh 7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	29	11	1	4	4	1
Future Vol, veh/h	29	11	1	4	4	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	42	42	63	63
Heavy Vehicles, %	3	3	40	40	0	0
Mvmt Flow	48	18	2	10	6	2

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	21	7	8	0	0
Stage 1	7	-	-	-	-
Stage 2	14	-	-	-	-
Critical Hdwy	6.43	6.23	4.5	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.56	-	-
Pot Cap-1 Maneuver	993	1072	1396	-	-
Stage 1	1013	-	-	-	-
Stage 2	1006	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	992	1072	1396	-	-
Mov Cap-2 Maneuver	992	-	-	-	-
Stage 1	1012	-	-	-	-
Stage 2	1006	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1396	-	1013	-	-
HCM Lane V/C Ratio	0.002	-	0.066	-	-
HCM Control Delay (s)	7.6	0	8.8	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	30	4	4	1	1	86	1	171	0	86	362	36
Future Vol, veh/h	30	4	4	1	1	86	1	171	0	86	362	36
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	68	68	68	88	88	88	72	72	72
Heavy Vehicles, %	24	24	24	19	19	19	4	4	4	4	4	4
Mvmt Flow	41	5	5	1	1	126	1	194	0	119	503	50

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1027	963	529	967	988	194	554	0	0	194	0	0
Stage 1	767	767	-	196	196	-	-	-	-	-	-	-
Stage 2	260	196	-	771	792	-	-	-	-	-	-	-
Critical Hdwy	7.34	6.74	6.44	7.29	6.69	6.39	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Follow-up Hdwy	3.716	4.216	3.516	3.671	4.171	3.471	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	194	235	509	218	231	806	1006	-	-	1367	-	-
Stage 1	363	381	-	768	708	-	-	-	-	-	-	-
Stage 2	699	699	-	368	377	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	147	205	509	191	201	806	1005	-	-	1367	-	-
Mov Cap-2 Maneuver	147	205	-	191	201	-	-	-	-	-	-	-
Stage 1	362	332	-	767	707	-	-	-	-	-	-	-
Stage 2	588	698	-	313	329	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	36.8		10.8		0		1.4	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1005	-	-	164	753	1367	-	-
HCM Lane V/C Ratio	0.001	-	-	0.317	0.172	0.087	-	-
HCM Control Delay (s)	8.6	0	-	36.8	10.8	7.9	0	-
HCM Lane LOS	A	A	-	E	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.3	0.6	0.3	-	-

Port of Woodland - Austin Point Dockside Infrastructure 2030 Without-Project AM Peak Hour
 2: Kuhn Rd & Whalen Rd HCM 6th TWSC

Intersection

Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	22	4	12	22	1	5
Future Vol, veh/h	22	4	12	22	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	59	59	39	39	63	63
Heavy Vehicles, %	11	11	48	48	0	0
Mvmt Flow	37	7	31	56	2	8

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	44	0	159
Stage 1	-	-	-	-	41
Stage 2	-	-	-	-	118
Critical Hdwy	-	-	4.58	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.632	-	3.5
Pot Cap-1 Maneuver	-	-	1314	-	837
Stage 1	-	-	-	-	987
Stage 2	-	-	-	-	912
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1314	-	817
Mov Cap-2 Maneuver	-	-	-	-	817
Stage 1	-	-	-	-	987
Stage 2	-	-	-	-	890

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	992	-	-	1314	-
HCM Lane V/C Ratio	0.01	-	-	0.023	-
HCM Control Delay (s)	8.7	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Port of Woodland - Austin Point Dockside Infrastructure 2030 Without-Project AM Peak Hour
 3: Dike Rd & Whalen Rd HCM 6th TWSC

Intersection

Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	2	36	4	0	37
Future Vol, veh/h	5	2	36	4	0	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	75	75	64	64
Heavy Vehicles, %	33	33	77	77	79	79
Mvmt Flow	7	3	48	5	0	58

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	109	51	0	0	53
Stage 1	51	-	-	-	-
Stage 2	58	-	-	-	-
Critical Hdwy	6.73	6.53	-	-	4.89
Critical Hdwy Stg 1	5.73	-	-	-	-
Critical Hdwy Stg 2	5.73	-	-	-	-
Follow-up Hdwy	3.797	3.597	-	-	2.911
Pot Cap-1 Maneuver	819	936	-	-	1176
Stage 1	898	-	-	-	-
Stage 2	891	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	819	936	-	-	1176
Mov Cap-2 Maneuver	819	-	-	-	-
Stage 1	898	-	-	-	-
Stage 2	891	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	849	1176
HCM Lane V/C Ratio	-	-	0.011	-
HCM Control Delay (s)	-	-	9.3	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection

Int Delay, s/veh 2.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	0	2	2	7	4
Future Vol, veh/h	2	0	2	2	7	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	50	50	50	50	67	67
Heavy Vehicles, %	0	0	25	25	0	0
Mvmt Flow	4	0	4	4	10	6

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	25	13	16	0	-
Stage 1	13	-	-	-	-
Stage 2	12	-	-	-	-
Critical Hdwy	6.4	6.2	4.35	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.425	-	-
Pot Cap-1 Maneuver	996	1073	1464	-	-
Stage 1	1015	-	-	-	-
Stage 2	1016	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	993	1073	1464	-	-
Mov Cap-2 Maneuver	993	-	-	-	-
Stage 1	1012	-	-	-	-
Stage 2	1016	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.6	3.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1464	-	993	-	-
HCM Lane V/C Ratio	0.003	-	0.004	-	-
HCM Control Delay (s)	7.5	0	8.6	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Port of Woodland - Austin Point Dockside Infrastructure 2030 Without-Project PM Peak Hour
 1: Goerig St & Buckeye St/Lakeshore Dr HCM 6th TWSC

Intersection

Int Delay, s/veh	606.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	143	20	24	8	4	194	5	646	5	106	384	110
Future Vol, veh/h	143	20	24	8	4	194	5	646	5	106	384	110
Conflicting Peds, #/hr	0	0	1	1	0	0	3	0	1	1	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	76	76	76	77	77	77	82	82	82
Heavy Vehicles, %	3	3	3	2	2	2	1	1	1	7	7	7
Mvmt Flow	170	24	29	11	5	255	6	839	6	129	468	134

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1780	1654	539	1676	1718	843	605	0	0	846	0	0
Stage 1	796	796	-	855	855	-	-	-	-	-	-	-
Stage 2	984	858	-	821	863	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.12	6.52	6.22	4.11	-	-	4.17	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.518	4.018	3.318	2.209	-	-	2.263	-	-
Pot Cap-1 Maneuver	~ 64	98	541	76	90	364	978	-	-	770	-	-
Stage 1	379	398	-	353	375	-	-	-	-	-	-	-
Stage 2	298	372	-	369	372	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 14	72	539	43	66	364	975	-	-	769	-	-
Mov Cap-2 Maneuver	~ 14	72	-	43	66	-	-	-	-	-	-	-
Stage 1	373	295	-	348	370	-	-	-	-	-	-	-
Stage 2	~ 87	367	-	238	275	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, \$	5529.5		104.2			0.1			1.9		
HCM LOS	F		F								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	975	-	-	18	264	769	-	-
HCM Lane V/C Ratio	0.007	-	-	12.368	1.027	0.168	-	-
HCM Control Delay (s)	8.7	0		\$ 5529.5	104.2	10.6	0	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	28.5	10.5	0.6	-	-

Notes

-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Port of Woodland - Austin Point Dockside Infrastructure 2030 Without-Project PM Peak Hour
 2: Kuhn Rd & Whalen Rd HCM 6th TWSC

Intersection

Int Delay, s/veh	3.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	40	1	20	38	2	35
Future Vol, veh/h	40	1	20	38	2	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	92	92	70	70
Heavy Vehicles, %	3	3	2	2	0	0
Mvmt Flow	67	2	22	41	3	50

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	69	0	153
Stage 1	-	-	-	-	68
Stage 2	-	-	-	-	85
Critical Hdwy	-	-	4.12	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.218	-	3.5
Pot Cap-1 Maneuver	-	-	1532	-	843
Stage 1	-	-	-	-	960
Stage 2	-	-	-	-	943
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1532	-	830
Mov Cap-2 Maneuver	-	-	-	-	830
Stage 1	-	-	-	-	960
Stage 2	-	-	-	-	929

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	990	-	-	1532	-
HCM Lane V/C Ratio	0.053	-	-	0.014	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection

Int Delay, s/veh	3.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	22	18	22	11	11
Future Vol, veh/h	5	22	18	22	11	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	63	63	57	57
Heavy Vehicles, %	5	5	3	3	6	6
Mvmt Flow	8	35	29	35	19	19

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	104	47	0	0	64
Stage 1	47	-	-	-	-
Stage 2	57	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.16
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.254
Pot Cap-1 Maneuver	887	1014	-	-	1513
Stage 1	968	-	-	-	-
Stage 2	958	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	875	1014	-	-	1513
Mov Cap-2 Maneuver	875	-	-	-	-
Stage 1	968	-	-	-	-
Stage 2	946	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	3.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	985	1513
HCM Lane V/C Ratio	-	-	0.044	0.013
HCM Control Delay (s)	-	-	8.8	7.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection

Int Delay, s/veh 7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	13	1	5	5	1
Future Vol, veh/h	35	13	1	5	5	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	42	42	63	63
Heavy Vehicles, %	3	3	40	40	0	0
Mvmt Flow	58	22	2	12	8	2

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	25	9	10	0	0
Stage 1	9	-	-	-	-
Stage 2	16	-	-	-	-
Critical Hdwy	6.43	6.23	4.5	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.56	-	-
Pot Cap-1 Maneuver	988	1070	1394	-	-
Stage 1	1011	-	-	-	-
Stage 2	1004	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	987	1070	1394	-	-
Mov Cap-2 Maneuver	987	-	-	-	-
Stage 1	1010	-	-	-	-
Stage 2	1004	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.9	1.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1394	-	1008	-	-
HCM Lane V/C Ratio	0.002	-	0.079	-	-
HCM Control Delay (s)	7.6	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Intersection

Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	30	4	4	1	1	86	1	174	0	86	381	36
Future Vol, veh/h	30	4	4	1	1	86	1	174	0	86	381	36
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	68	68	68	88	88	88	72	72	72
Heavy Vehicles, %	24	24	24	19	19	19	4	4	4	4	4	4
Mvmt Flow	41	5	5	1	1	126	1	198	0	119	529	50

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1057	993	555	997	1018	198	580	0	0	198	0	0
Stage 1	793	793	-	200	200	-	-	-	-	-	-	-
Stage 2	264	200	-	797	818	-	-	-	-	-	-	-
Critical Hdwy	7.34	6.74	6.44	7.29	6.69	6.39	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.34	5.74	-	6.29	5.69	-	-	-	-	-	-	-
Follow-up Hdwy	3.716	4.216	3.516	3.671	4.171	3.471	2.236	-	-	2.236	-	-
Pot Cap-1 Maneuver	184	225	491	207	222	802	984	-	-	1363	-	-
Stage 1	351	370	-	764	705	-	-	-	-	-	-	-
Stage 2	695	696	-	356	367	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	139	195	491	180	193	802	983	-	-	1363	-	-
Mov Cap-2 Maneuver	139	195	-	180	193	-	-	-	-	-	-	-
Stage 1	350	322	-	763	704	-	-	-	-	-	-	-
Stage 2	584	695	-	301	319	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	39.5		10.8		0		1.3	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	983	-	-	155	746	1363	-	-
HCM Lane V/C Ratio	0.001	-	-	0.336	0.173	0.088	-	-
HCM Control Delay (s)	8.7	0	-	39.5	10.8	7.9	0	-
HCM Lane LOS	A	A	-	E	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.4	0.6	0.3	-	-

Intersection

Int Delay, s/veh 1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	34	4	12	25	1	5
Future Vol, veh/h	34	4	12	25	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	59	59	39	39	63	63
Heavy Vehicles, %	11	11	48	48	0	0
Mvmt Flow	58	7	31	64	2	8

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	65
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.58
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.632
Pot Cap-1 Maneuver	-	-	1289
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1289
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	963	-	-	1289	-
HCM Lane V/C Ratio	0.01	-	-	0.024	-
HCM Control Delay (s)	8.8	-	-	7.9	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection

Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	2	37	7	0	42
Future Vol, veh/h	5	2	37	7	0	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	75	75	64	64
Heavy Vehicles, %	33	33	77	77	79	79
Mvmt Flow	7	3	49	9	0	66

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	120	54	0	0	58
Stage 1	54	-	-	-	-
Stage 2	66	-	-	-	-
Critical Hdwy	6.73	6.53	-	-	4.89
Critical Hdwy Stg 1	5.73	-	-	-	-
Critical Hdwy Stg 2	5.73	-	-	-	-
Follow-up Hdwy	3.797	3.597	-	-	2.911
Pot Cap-1 Maneuver	807	932	-	-	1170
Stage 1	895	-	-	-	-
Stage 2	884	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	807	932	-	-	1170
Mov Cap-2 Maneuver	807	-	-	-	-
Stage 1	895	-	-	-	-
Stage 2	884	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	839	1170
HCM Lane V/C Ratio	-	-	0.011	-
HCM Control Delay (s)	-	-	9.3	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
----------	-----	-----	-----	-----	-----	-----

Lane Configurations						
Traffic Vol, veh/h	2	0	9	2	7	21
Future Vol, veh/h	2	0	9	2	7	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	50	50	50	50	67	67
Heavy Vehicles, %	0	0	25	25	0	0
Mvmt Flow	4	0	18	4	10	31

Major/Minor	Minor2	Major1	Major2
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Conflicting Flow All	66	26	41	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	40	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.35	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.425	-	-	-
Pot Cap-1 Maneuver	944	1056	1432	-	-	-
Stage 1	1002	-	-	-	-	-
Stage 2	988	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	932	1056	1432	-	-	-
Mov Cap-2 Maneuver	932	-	-	-	-	-
Stage 1	989	-	-	-	-	-
Stage 2	988	-	-	-	-	-

Approach	EB	NB	SB
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HCM Control Delay, s	8.9	6.2	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
-----------------------	-----	-----	-------	-----	-----

Capacity (veh/h)	1432	-	932	-	-
HCM Lane V/C Ratio	0.013	-	0.004	-	-
HCM Control Delay (s)	7.5	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection

Int Delay, s/veh	726.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	143	20	24	8	4	194	5	665	5	106	387	110
Future Vol, veh/h	143	20	24	8	4	194	5	665	5	106	387	110
Conflicting Peds, #/hr	0	0	1	1	0	0	3	0	1	1	0	3
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	76	76	76	77	77	77	82	82	82
Heavy Vehicles, %	3	3	3	2	2	2	1	1	1	7	7	7
Mvmt Flow	170	24	29	11	5	255	6	864	6	129	472	134

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1809	1683	543	1705	1747	868	609	0	0	871	0	0
Stage 1	800	800	-	880	880	-	-	-	-	-	-	-
Stage 2	1009	883	-	825	867	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.12	6.52	6.22	4.11	-	-	4.17	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.518	4.018	3.318	2.209	-	-	2.263	-	-
Pot Cap-1 Maneuver	~ 61	94	538	72	86	352	974	-	-	753	-	-
Stage 1	377	396	-	342	365	-	-	-	-	-	-	-
Stage 2	288	362	-	367	370	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 12	68	536	40	62	352	971	-	-	752	-	-
Mov Cap-2 Maneuver	~ 12	68	-	40	62	-	-	-	-	-	-	-
Stage 1	371	290	-	338	360	-	-	-	-	-	-	-
Stage 2	~ 77	357	-	234	271	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, \$	6721.1	119.7	0.1	1.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	971	-	-	15	253	752	-	-
HCM Lane V/C Ratio	0.007	-	-	14.841	1.071	0.172	-	-
HCM Control Delay (s)	8.7	0		\$ 6721.1	119.7	10.8	0	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0	-	-	28.8	11.3	0.6	-	-

Notes

-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Intersection

Int Delay, s/veh 3.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	43	1	20	50	2	42
Future Vol, veh/h	43	1	20	50	2	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	92	92	70	70
Heavy Vehicles, %	3	3	2	2	0	0
Mvmt Flow	72	2	22	54	3	60

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	74
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1526
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1526
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	985	-	-	1526	-
HCM Lane V/C Ratio	0.064	-	-	0.014	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection

Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	5	22	23	34	11	12
Future Vol, veh/h	5	22	23	34	11	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	63	63	63	63	57	57
Heavy Vehicles, %	5	5	3	3	6	6
Mvmt Flow	8	35	37	54	19	21

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	123	64	0	0	91
Stage 1	64	-	-	-	-
Stage 2	59	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.16
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.254
Pot Cap-1 Maneuver	865	992	-	-	1479
Stage 1	951	-	-	-	-
Stage 2	956	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	854	992	-	-	1479
Mov Cap-2 Maneuver	854	-	-	-	-
Stage 1	951	-	-	-	-
Stage 2	944	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	3.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	963	1479
HCM Lane V/C Ratio	-	-	0.045	0.013
HCM Control Delay (s)	-	-	8.9	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection

Int Delay, s/veh	6.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	35	13	1	5	5	5
Future Vol, veh/h	35	13	1	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	42	42	63	63
Heavy Vehicles, %	3	3	40	40	0	0
Mvmt Flow	58	22	2	12	8	8




















Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	28	12	16	0	0
Stage 1	12	-	-	-	-
Stage 2	16	-	-	-	-
Critical Hdwy	6.43	6.23	4.5	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-
Critical Hdwy Stg 2	5.43	-	-	-	-
Follow-up Hdwy	3.527	3.327	2.56	-	-
Pot Cap-1 Maneuver	984	1066	1386	-	-
Stage 1	1008	-	-	-	-
Stage 2	1004	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	983	1066	1386	-	-
Mov Cap-2 Maneuver	983	-	-	-	-
Stage 1	1007	-	-	-	-
Stage 2	1004	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.9	1.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1386	-	1004	-	-
HCM Lane V/C Ratio	0.002	-	0.08	-	-
HCM Control Delay (s)	7.6	0	8.9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.3	-	-

Port of Woodland - Austin Point
1: Goerig St & Buckeye St/Lakeshore Dr

2030 With-Proj PM - Imps at Goerig/Lakeshore
Lanes, Volumes, Timings

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	20	24	8	4	194	5	665	5	106	387	110
Future Volume (vph)	143	20	24	8	4	194	5	665	5	106	387	110
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		125	100		0	0		0
Storage Lanes	0		0	0		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor		1.00			1.00		1.00	1.00		1.00	0.99	
Frt		0.982				0.850		0.999			0.967	
Flt Protected		0.963			0.968		0.950			0.950		
Satd. Flow (prot)	0	1740	0	0	1803	1583	1787	3570	0	1687	1708	0
Flt Permitted		0.767			0.803		0.950			0.950		
Satd. Flow (perm)	0	1386	0	0	1495	1583	1783	3570	0	1686	1708	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12				230		1			23	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		269			378			393			324	
Travel Time (s)		7.3			10.3			10.7			8.8	
Confl. Peds. (#/hr)			1	1			3		1	1		3
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles (%)	3%	3%	3%	2%	2%	2%	1%	1%	1%	7%	7%	7%
Adj. Flow (vph)	170	24	29	10	5	231	6	792	6	126	461	131
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	223	0	0	15	231	6	798	0	126	592	0
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8						
Detector Phase	4	4		8	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Minimum Split (s)	29.0	29.0		29.0	29.0	29.0	10.0	28.0		10.0	29.0	
Total Split (s)	29.0	29.0		29.0	29.0	29.0	10.0	28.0		13.0	31.0	
Total Split (%)	41.4%	41.4%		41.4%	41.4%	41.4%	14.3%	40.0%		18.6%	44.3%	
Maximum Green (s)	24.0	24.0		24.0	24.0	24.0	5.0	23.0		8.0	26.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None	None	None	Min		None	Min	
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		10.0			10.0	
Flash Dont Walk (s)	14.0	14.0		14.0	14.0	14.0		12.0			12.0	
Pedestrian Calls (#/hr)	0	0		0	0	0		0			0	
Act Effect Green (s)		14.0			14.0	14.0	5.3	20.2		7.9	28.2	
Actuated g/C Ratio		0.26			0.26	0.26	0.10	0.37		0.15	0.52	
v/c Ratio		0.61			0.04	0.40	0.03	0.60		0.51	0.66	

Port of Woodland - Austin Point
 1: Goerig St & Buckeye St/Lakeshore Dr

2030 With-Proj PM - Imps at Goerig/Lakeshore
 Lanes, Volumes, Timings

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay		26.0			16.6	5.3	28.4	18.0		35.2	16.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		26.0			16.6	5.3	28.4	18.0		35.2	16.9	
LOS		C			B	A	C	B		D	B	
Approach Delay		26.0			6.0			18.1			20.1	
Approach LOS		C			A			B			C	
Queue Length 50th (ft)		64			4	0	2	116		41	109	
Queue Length 95th (ft)		119			15	35	12	184		#105	#358	
Internal Link Dist (ft)		189			298			313			244	
Turn Bay Length (ft)						125	100					
Base Capacity (vph)		655			700	864	174	1604		263	995	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.34			0.02	0.27	0.03	0.50		0.48	0.59	

Intersection Summary

Area Type: Other
 Cycle Length: 70
 Actuated Cycle Length: 54.4
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 18.2
 Intersection Capacity Utilization 61.0%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 1: Goerig St & Buckeye St/Lakeshore Dr

