APPENDIX H

RIVERFRONT MASTER PLAN
City of Newberg

Technical Memorandum 8:

Transportation Planning Rule (TPR) Assessment

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Portland, OR 97205
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MEMORANDUM

DATE: August 13, 2019

TO: Andrew Parish | Angelo Planning Group

FROM: Garth Appanaitis, P.E. | DKS

SUBJECT: Newberg Riverfront Master Plan
Technical Memorandum #8: Transportation Planning Rule (TPR) Assessment
P #18066-000

The purpose of this memorandum is to address Oregon Administrative Rule (OAR) 660-012-0060, Transportation Planning Rule (TPR), requirements for Riverfront Master Plan map and code amendments. The following sections summarized the proposed land use changes, transportation analysis, and findings to address TPR.

LAND USE

The following sections describe the planned land uses within the Riverfront for the existing Comprehensive Plan and the Riverfront Master Plan.

The Riverfront Study Area

The Riverfront is generally defined as the land within the Newberg Urban Growth Boundary (UGB) south of E Ninth Street. This area contains a mix of existing neighborhoods, parks and natural areas, a small amount of buildable vacant land, and the roughly 115-acre Riverfront Industrial Site.

The following section will provide a comparison of the land use described in the current comprehensive plan to the proposed land use with the Newberg Riverfront Master Plan re-zone.

Comprehensive Plan Land Use

The land use designations for the currently adopted Comprehensive Plan include:

- Residential Medium Density (R-2). Most residential land within the study area today has a designation of R-2, intended to "provide a wide range of dwelling types and styles at an average overall density of nine units per gross buildable acre in the district." (15.302.032.B).
- Residential High-Density (R-3). Portions of the study area with frontage on E Ninth Street have a designation of R-3, which is intended to "provide multifamily dwellings of different types and styles at an average overall density of 16.5 units per gross buildable acre in the district." (15.302.032.C).

- Industrial. Land designated as “Industrial” is generally consistent with the City’s M-2 and M-3 district, which are “intended to create, preserve, and enhance areas containing a wide variety of sites with good rail or highway access.” (15.302.032.K).

The 2035 Newberg Transportation System Plan (TSP) includes travel forecasts for future land uses consistent with the adopted Comprehensive Plan. Total households (HH) and employees (EMP) in each Transportation Analysis Zone (TAZ) within the Riverfront that were assumed for the TSP travel demand model (Figure 1) are listed in Table 1. The TSP land use included 864 households and 534 total employees, which predominately included industrial and service employment.

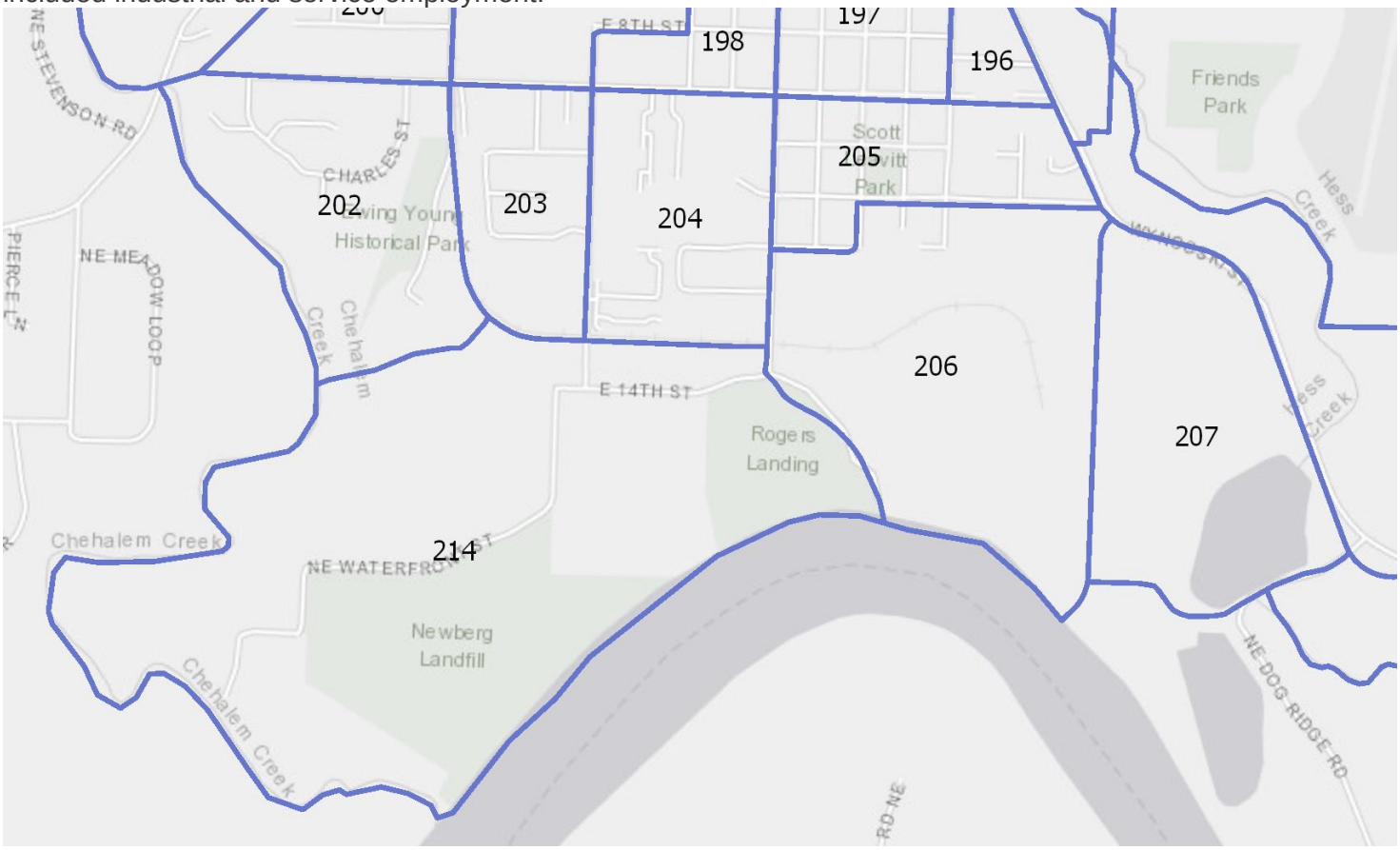

Figure 1. Newberg Travel Demand Model Riverfront TAZs

Table 1. 2035 TSP (Comprehensive Plan) Land Use by TAZ

TAZ	Total HH	Total Emp	AGR	IND	RET	SER	EDU	GOV	OTH
202	108	2	-	-	-	-	-	-	2
203	185	2	-	-	-	-	-	-	2
204	271	2	-	-	-	-	-	-	2
205	142	16	-	-	3	11	-	-	2
206	0	139	-	139	-	-	-	-	-
207	0	208	-	208	-	-	-	-	-
214	158	165	-	-	33	121	-	-	10
Total	***864***	***534***	***0***	***347***	***36***	***132***	***0***	***0***	***18***

Note: Employment types are listed as number of employees and include agriculture (AGR), industrial (IND), retail (RET), service (SER), education (EDU), government (GOV), and other (OTH).

Newberg Riverfront Master Plan Proposed Land Use

The plan development included consideration for several land use alternatives that differ primarily in the use of the large industrial site and whether it remains entirely in industrial use or whether some portion becomes available over time for non-industrial uses. For the purposes of the TPR assessment, the Preferred Alternative[1] was analyzed, which includes additional employment growth (relative to the other scenarios) as a conservative threshold for considering impacts. Figure 1 shows the proposed uses for the Preferred Alternative[2].

[1] The Preferred Alternative was previously referred as “Alternative E” and denotes the same alternative.

[2] Figure 1 indicates the land uses that were included in the analysis for the preferred alternative. These uses include an assumed R3 designation south of the Bypass and west of College Street for area that is currently zoned R2. Following the completion of the analysis it was determined that this area would remain R2 and would not become R3. Therefor, the TPR analysis and traffic impacts documented in this memorandum are conservative and assume additional growth potential (R3 provides more density) than included in the final preferred alternative. The final plan designation would result in fewer trips than what is summarized in this document.

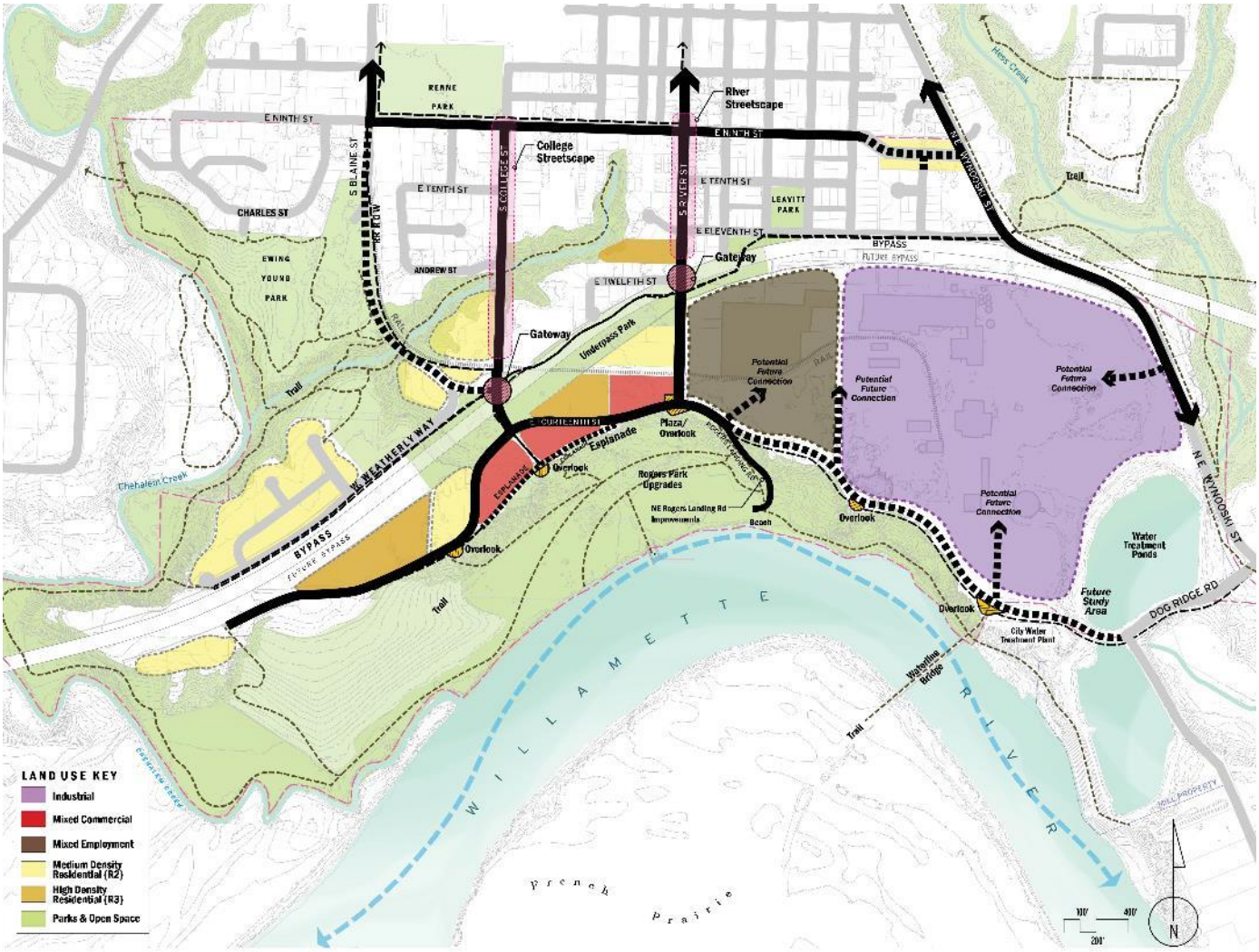

Figure 1. Riverfront Master Plan Preferred Alternative Land Uses[3]

The land use for the Riverfront Master Plan (households and employees) was quantified to analyze the potential transportation impacts. The assumptions regarding type and density of uses are consistent with the Master Plan and Technical Memorandum 7 – Zoning Amendments.

Employment Assumptions

The land use designations described in the Newberg Riverfront Master Plan under the preferred alternative[4] include the mixed-use land type *Mixed Employment*. The new Mixed Employment (M-E) Zone allows for a mix of light industrial and limited commercial uses intended to create a buffer between heavy industrial uses and pedestrian-friendly, mixed-use development within the core of the Riverfront District. Table 2 lists the number

[3] Figure 1 indicates the land uses there were included in the TPR analysis and results in more trips than the actual final plan designations. See prior footnote for additional details.

[4] Alternative E was selected as the preferred alternative from the Newberg Riverfront Master Plan.

of employees assumed for each land use type proposed by the Newberg Riverfront Master Plan. Notably, the number of industrial employees in the proposed land use will be less than the number of industrial employees in the current comprehensive plan, as the mixed employment land use will replace an area currently zoned as industrial only. TAZ 206 and TAZ 214 will be impacted by these zoning changes for employment. Key assumptions related to proposed land use and employment include:

- Mixed commercial designations were assumed to have no net change from the existing comprehensive plan.
- Mixed employment designations were assumed[5] to be comprised of 25 percent retail use, 25 percent office use, and 50 percent industrial use with a floor-area ratio (FAR) of 0.5

Table 2. Employment Summary for Mixed- Employment Area

Land Use	Subcategory Land Use	Acreage	Share of Acreage	Net/Gross Takeout	Floor-Area Ratio (FAR)	Area (SF)	Employee Density (emp/ksf)	# of Employees
Mixed Employment		21.5						
	Retail		0.25	0.5	0.5	58,533	1.5	88
	Office		0.25	0.5	0.5	58,533	3	176
	Industrial		0.5	0.5	0.5	117,067	1	117

Household Assumptions

Under the proposed zoning alternative with the Newberg Riverfront Master Plan, an additional 186 households would be added to the Riverfront. The following points summarize where the additional households are assumed:

- TAZ 202 does not change from the existing comprehensive plan zoning to the proposed zoning.
- TAZ 206 and TAZ 207 do not include any households in the existing comprehensive plan, and no households are proposed under the preferred alternative.
- A small area of medium-density residential was added to TAZ 205, an estimated addition of 22 households, or about 1/8 of the total additional households added to the riverfront planning area.
- The remaining 164 households were distributed evenly among TAZ 203, TAZ 204, and TAZ 214. These TAZ's experienced varying re-distributions of medium and high-density households which were determined to have minimal impact on the location of the added housing.

[5] Assumptions are consistent with Technical Memorandum 7 – Zoning Amendments.

Summary of Proposed Land Use Changes

Total households and employment totals in each TAZ for the proposed Riverfront are listed in Table 3.

Table 3. Total Household (HH) and Employment (Emp) in Newberg Riverfront Master Plan

TAZ	Total HH	Total Emp	AGR	IND	RET	SER	EDU	GOV	OTH
202	108	2	-	-	-	-	-	-	2
203	239	2	-	-	-	-	-	-	2
204	326	2	-	-	-	-	-	-	2
205	164	16	-	-	3	11	-	-	2
206	0	364	-	100	88	-	-	-	176
207	0	208	-	208	-	-	-	-	-
214	213	164	-	-	33	121	-	-	10
Total	***1,050***	***758***	***0***	***308***	***124***	***132***	***0***	***0***	***194***

Note: Employment types are listed as number of employees and include agriculture (AGR), industrial (IND), retail (RET), service (SER), education (EDU), government (GOV), and other (OTH).

Area-Wide Land Use Scenario Comparison

Table 4 summarizes the differences in overall land use totals that would result with the proposed changes in the Newberg Riverfront Plan. These changes include:

- Total households would increase by 186 (864 to 1,050)
- Total employment would increase by 224 employees (534 to 758)

Table 4. Comparison of Total Land Use in the Riverfront

Scenario	Total HH	Total Emp	AGR	IND	RET	SER	EDU	GOV	OTH
Existing Comprehensive Plan	864	534	0	347	36	132	0	0	18
Newberg Riverfront Plan	1050	758	0	308	124	132	0	0	194
Difference	**+186**	**+224**	**-**	**-39**	**+88**	**-**	**-**	**-**	**+176**

Note: Employment types are listed as number of employees and include agriculture (AGR), industrial (IND), retail (RET), service (SER), education (EDU), government (GOV), and other (OTH).

FUTURE TRAFFIC FORECASTS

A 2035 travel demand model run was coordinated with ODOT and performed with the proposed land uses in the Riverfront. All other assumed land uses (other TAZ) and model inputs were retained from the TSP travel model assumptions. The resulting difference in 2035 PM peak hour trips on the transportation network (relative to the travel forecasts included in the 2035 TSP) included the following nominal increases:

- S Blaine Street – approximately 50 additional trips southbound entering the Riverfront and approximately 15 additional trips northbound
- S College Street – approximately 15 additional trips southbound and approximately 35 trips northbound
- S River Street – approximately 20 additional trips southbound and approximately 35 trips northbound
- NE Wynooski Street – approximately five additional trips eastbound and approximately 15 additional trips westbound

The approximate figures noted above are raw model differences and additional processing was performed at individual study intersections. The travel demand model has a limited roadway network (three streets) linking downtown Newberg and the Riverfront. While S Blaine Street and S River Street provide the most direct connections, the remaining grid system south of the downtown couplet (twelve streets connect between Harrison Street and River Street) would likely further moderate (reduce) the magnitude of additional trips added to individual streets.

Intersection level traffic forecasts were prepared for four study intersections for both the Existing Plan (TSP and existing Comprehensive Plan) and Riverfront Master Plan scenarios. The intersection forecasts for the Existing Plan were prepared by post-processing traffic counts and the background growth assumptions used for the Newberg TSP. Traffic forecasts for the Riverfront Plan were prepared by post-processing the model difference resulting from the proposed land use changes.

TRAFFIC ANALYSIS

Level of service (LOS) ratings and volume-to-capacity (V/C) ratios are two commonly used performance measures that provide a good indication of intersection performance. In addition, they are often incorporated into agency mobility standards.

- Level of service (LOS): A “report card” rating (A through F) based on the average delay experienced by vehicles at the intersection. LOS A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. LOS D and E are progressively worse operating conditions. LOS F represents conditions where average vehicle

delay has become excessive and demand has exceeded capacity. The City of Newberg uses LOS D as the intersection performance standard[6].

- Volume-to-capacity (V/C) ratio: A decimal representation (typically between 0.00 and 1.00) of the proportion of capacity that is being used at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection, approach, or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays. The performance standard that ODOT uses along the OR 99W downtown corridor is v/c = 0.85 and along OR 219 is 0.95.

To quantify the impacts of the proposed land use changes in the Newberg Riverfront Master Plan, 2035 PM Peak Hour operations at the four study intersections were analyzed and listed in Table 5. The intersection of OR 219 / NE Wynooski Road would meet ODOT mobility targets with a v/c lower than 0.95 under both the Existing Plan and Proposed Riverfront Plan. The three intersections located in the downtown core would all exceed the ODOT mobility target of 0.85 for both scenarios. The two intersections on Blaine Street would also exceed the City's standard due to the high level of side street delay.

Table 5. 2035 PM Peak Hour Study Intersection Operations

Intersection	Mobility Target (V/C)	Existing Plan			Riverfront Plan		
		V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
OR 219 / NE Wynooski Road	0.95	0.46	31.6	D	0.48	32.6	D
S River Street / OR 99W (E First Street)	0.85	**0.98**	33.1	C	**1.00**	35.3	D
S Blaine Street / OR 99W NB (E First Street)	0.85	**0.86**	80	F	**1.30**	>100	F
N Blaine Street / OR 99W SB (E Hancock Street)	0.85	**>2**	>100	F	**>2**	>100	F

Note: Bold text indicates that the operations exceed the mobility target.

Mitigations

The following section summarizes potential mitigation measures to address mobility needs at the study intersections.

While the intersection of OR 219/NE Wynooski Road would meet mobility targets, it is a key gateway that provides access to the Riverfront. The traffic analysis indicates that the intersection would have high delay

[6] While the City standard is listed here for reference, all four study intersections are located on state operated facilities and are subject to ODOT's performance standards for determination of TPR.

from the NE Wynooski Road approach. While the traffic forecasts do not meet the minimum minor street approach thresholds for traffic signal warrants, this location should continue to be monitored for future signalization or traffic control needs. Further, project BY5 in the Newberg TSP would realign Wynooski Road to the south as part of future bypass extension to the east of OR 219[7].

The intersection operations of S River Street / OR 99W (E First Street) would marginally degrade with the added traffic for the proposed land use changes increasing the v/c from 0.98 to 1.00. The intersection already includes a traffic signal and lane channelization to support the critical movements at the intersection. While the intersection was not analyzed as part of the TSP, ODOT is currently assessing alternate mobility targets for Newberg as a continuation of the TSP policies. The draft target revisions would update the current mobility targets of 0.85 in the downtown core to be a v/c of 0.99 during the peak hour (using a peak hour factor of 1.0). This intersection would meet those draft targets.

The two intersections on S Blaine Street are currently unsignalized and would not meet mobility targets in either scenario. These intersections were not included in prior traffic analysis conducted for the TSP or Newberg Downtown Improvement Plan. Similar mitigation options exist at both locations (turn channelization from the minor street or a traffic signal) and yield similar tradeoffs.

- S Blaine Street / OR 99W NB (E First Street) – Adding a southbound left turn lane would improve capacity for the side street approach and would improve the v/c to 0.73, which would meet the mobility target of 0.85. However, the widening required for a southbound left turn lane would require widening, removal of parking, potential right of way impacts, potential alignment challenges, and would further degrade the pedestrian experience. The current rail connection that runs along Blaine Street may also limit the ability to widen the approach. Adding a traffic signal to the intersection would provide additional capacity to the Blaine Street approaches and improve the v/c to 0.47. The traffic signal, which would require approval of the state traffic engineer, would be located one block (approximately 200 feet) from the existing traffic signal at Howard Street. While the traffic signal would reduce capacity along E First Street (which is currently uncontrolled), it would provide protected crossing opportunities for pedestrians and would improve traffic flow between the Riverfront and downtown. It is imperative that any potential mitigation at this intersection consider the function and vision for the Downtown Improvement Plan and any related corridor and connectivity improvements. Incorporate planned improvements to support mobility need to/from the Riverfront into corridor improvements related to the Downtown Improvement Plan.
- N Blaine Street / OR 99W (E Hancock Street) – Similar options and tradeoffs exist at this location as the other Blaine Street intersection. While at this location a northbound left turn lane would improve the Preferred Alternative Riverfront Plan conditions relative to the Existing Comprehensive Plan, the resulting v/c (1.3) would exceed capacity and the mobility target. A traffic signal (which would require approval of the state traffic engineer) would improve

[7] BY5 (Wynooski Realignment) When the bypass interchange at OR 219 is constructed as part of Phase 2, Wynooski Road will be closed at its current location and rerouted south to create a 4-way intersection with realigned Wilsonville Road (BY17).

conditions to a v/c of 0.67. As with S Blaine Street / E First Street, planned improvements that support mobility to/from the Riverfront should be incorporated into corridor improvements related to the Downtown Improvement Plan.

FINDINGS

The TPR provides a means for ensuring that future land use and traffic growth is consistent with transportation system planning. The TPR requires that a change of allowable land uses do not create a significant impact on the transportation system beyond currently allowed (planned) uses. The TPR can be addressed through a variety of means, but typically compares the change in trip potential (simply trip generation or traffic impacts) between the allowed use (existing zoning) and proposed use (proposed zoning). In many cases the reasonable worst-case use (for either the existing or propose zoning) will not reflect the actual existing use for a site or the specific use that may ultimately be developed on a site. Rather, the reasonable worst case considers the allowed trip potential for either zoning condition and is rarely development specific (e.g., no site plan, nor intent to use the site for that purpose).

The proposed land use changes to support the Riverfront Master Plan would increase the housing and employment potential for the area. Traffic modeling and analysis indicated that the changes to the allowed uses have the potential to increase traffic beyond what is currently included in the current Comprehensive Plan and TSP. The transportation analysis identified the magnitude of mobility impacts that would result to the transportation system. The analysis also identified future improvements that be required to mitigate the potential impacts to the transportation system and address Transportation Planning Rule requirements. The following findings would address TPR requirements:

1) In conjunction with the ongoing update to alternate mobility targets in Newberg, the intersection of S River Street/ OR 99W (E First Street) would meet the planned target v/c of 0.99 for the peak hour (PHF = 1.0). This location would have no significant effect caused by the proposed changes to the Riverfront Master Plan and would meet the alternate mobility target.
2) Incorporate intersection control upgrade (traffic signal) at the intersection of S Blaine Street / OR 99W (E First Street) to support mobility need to/from the Riverfront into corridor improvements related to the Downtown Improvement Plan. Pending review by the state traffic engineer, this improvement would be identified in the TSP. Inclusion of this project in the TSP through a TSP Amendment would provide the planned capacity in the transportation system that would mitigate the impact of the proposed plan changes.
3) Incorporate intersection control upgrade (traffic signal) at the intersection of N Blaine Street / OR 99W (E Hancock Street) to support mobility need to/from the Riverfront into corridor improvements related to the Downtown Improvement Plan. Pending review by the state traffic engineer, this improvement would be identified in the TSP. Inclusion of this project in the TSP through a TSP Amendment would provide the planned capacity in the transportation system that would mitigate the impact of the proposed plan changes

While not required to address TPR, the following finding should be considered in future planning efforts related to the Riverfront:

4) While the intersection of OR 219/NE Wynooski Road would meet mobility targets, it is a key gateway that provides access to the Riverfront. The traffic analysis indicates that the intersection would have high delay from the Wynooski Road approach. While the traffic forecasts do not meet the minimum minor street approach thresholds for traffic signal warrants, this location should continue to be monitored for future signalization or traffic control needs.

ATTACHMENTS

- Analysis Methodology Coordination
- Proposed Riverfront Uses – Scenario E
- Traffic Counts
- Model Difference Plot
- Traffic Analysis Worksheets

DKS

Garth Appanaitis <gaa@dksassociates.com>

RE: Newberg Riverfront Master Plan - TPR Methods and Assumptions

1 message

BLAIR Keith P <Keith.P.BLAIR@odot.state.or.us> Mon, Jan 14, 2019 at 10:55 AM
To: Garth Appanaitis <gaa@dksassociates.com>, HELTON David I <David.I.Helton@odot.state.or.us>, GLADHILL Kristie W <Kristie.W.GLADHILL@odot.state.or.us>, UPTON Dorothy J <Dorothy.J.UPTON@odot.state.or.us>
Cc: Andrew Parish <aparish@angeloplanning.com>, Joe Dills <jdills@angeloplanning.com>, Kyra Schneider <KSchneider@angeloplanning.com>, Cheryl Caines <Cheryl.Caines@newbergoregon.gov>, Doug Rux <Doug.Rux@newbergoregon.gov>

Garth:

Unless I'm not checking all of my records, this is the first I recall hearing about a Newberg "Riverfront Master Plan" and its purpose or context. That said, I am familiar with the TSP and the Downtown Improvement Plan, but would appreciate some background information on the "Riverfront Master Plan" and will assess if it changes any of my below comments on the emailed methods and assumptions (I don't expect it to):

1. If the results of the model run indicate that the proposed change would result in an impact broader than the four (4) identified intersection, also include Region 2 Traffic (Dorothy Upton and Keith Blair) and TPAU (Kristie Gladhill) in discussions to revise the scope to analyze additional locations.

2. For information on ODOT counts, contact Don Crownover at (503) 986-4132 or Don.R.Crownover@odot.state.or.us. Counts older than two (2) years should not be used.

Please let me know if there are any questions or anything further needed. Thanks!

Keith P. Blair, P.E.
Senior Transportation Analyst | **ODOT Region 2**
455 Airport Road SE, Bldg. A | Salem, Oregon 97301
(503) 986-2857 | Keith.P.Blair@odot.state.or.us

ODOT's mission is to provide a safe and reliable multimodal transportation system that connects people and helps Oregon's communities and economy thrive.

From: Garth Appanaitis [mailto:gaa@dksassociates.com]
Sent: Friday, January 11, 2019 5:31 PM
To: HELTON David I; GLADHILL Kristie W; BLAIR Keith P
Cc: Andrew Parish; Joe Dills; Kyra Schneider; Cheryl Caines; Doug Rux
Subject: Newberg Riverfront Master Plan - TPR Methods and Assumptions

David - I'm assuming that Kristie and Keith are the two parties that we need to review these methods, but please let me know if other staff are the appropriate contacts.

Kristie/Keith - I suspect you are the correct persons to coordinate this information, but let me know if I should be coordinating with someone else at TPAU/R2. I know you have a basic understanding of the Riverfront Master Plan work, but let me know if I (or David) can provide any other context about the project.

We are preparing to conduct the Transportation Planning Rule assessment to determine if the proposed land uses and network would result in a significant effect on the transportation system. The purpose of this email is to provide an overview of the methods and assumptions for the TPR traffic analysis. It is intended to be a streamlined version of what may typically be scoped for an M&A document.

- For schedule needs and consistency with recent planning efforts, we will use the existing travel demand model that was used for the TSP and Downtown Improvement Plan. The travel demand model includes a horizon year of 2035.
- We will request a model run (using the model run form) to be completed by TPAU. We will provide a list of households and employees for each TAZ in the study area. The land use (households and employees) will reflect the proposed plan modifications for the preferred alternative. Only this single model run will be conducted.
- The model run will be compared to the existing comprehensive plan (2035 future year) model that was used for the development of the TSP and traffic analysis. The traffic analysis previously conducted for the TSP will be the basis for comparison to the updated traffic conditions.
- The results of the model run will be used to develop 2035 p.m. peak hour 30 HV traffic volumes for the study intersections. Traffic volumes will be post-processed using methods consistent with NCHRP 765 methodology.
- The analysis will include four intersections for the 2035 p.m. peak hour (OR 219/Wynooski Road, OR 99W/River, OR99W/1st/Blaine, OR99W/Hancock/Blaine). If the results of the model run indicate that the proposed change would result in a broader impact, we will coordinate with David to revise the scope/budget to analyze additional locations.
- ODOT will provide p.m. peak hour intersection turn counts for Blaine /1st and Blaine/Hancock. Prior counts from other studies will be used unless ODOT provides new traffic counts at the other locations. (David - Who should I coordinate with to get the ball rolling on these traffic counts?)
- Traffic analysis will be conducted using HCM 2000 methodologies to retain consistency with the prior (Existing Plan) analysis conducted for the TSP and Downtown Improvement Plan.
- A technical memorandum will summarize the traffic analysis, including providing intersection capacity analysis for the four study intersections.

Kristie/Keith - Please let us know if you have any comments or if we can proceed with the planned analysis.

Thanks,
Garth

Garth Appanaitis, PE | Project Manager | Portland Planning Group Manager
Phone: (503.243.3500) | Cell: (971.570.4709) | gaa@dksassociates.com

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Appendix B: Estimates of Residential Capacity within Land Use Alternatives
UPDATED 4/2/2018 to include Alternative E

Alternative E

Land Use	Acres	Existing Residential Units	New Residential Units	Total Residential Units
*Medium Density Residential**	87.5	459	185	640
*High Density Residential**	20.4	221	144	365
*Mixed Commercial***	7.6	N/A	45	45
Mixed Employment	21.5	N/A	N/A	N/A
Industrial	94.5	N/A	N/A	N/A
Parks & Open Spaces	164.5	N/A	N/A	N/A
TOTAL	**396**	**680**	**374**	**1,050**

New residential units calculated based on the following current zoning regulations:

- ***MDR: R-2, averaging 9 units/gross acre***
- ***HDR: R-3, averaging 16.5 units/gross acre***

****New residential Units for Mixed Commercial calculated as 1/3 of total acres based on HDR density of 16.5 units/gross acre***

Transportation Development Division
Transportation System Monitoring Unit
Vehicular Volume

Time settings

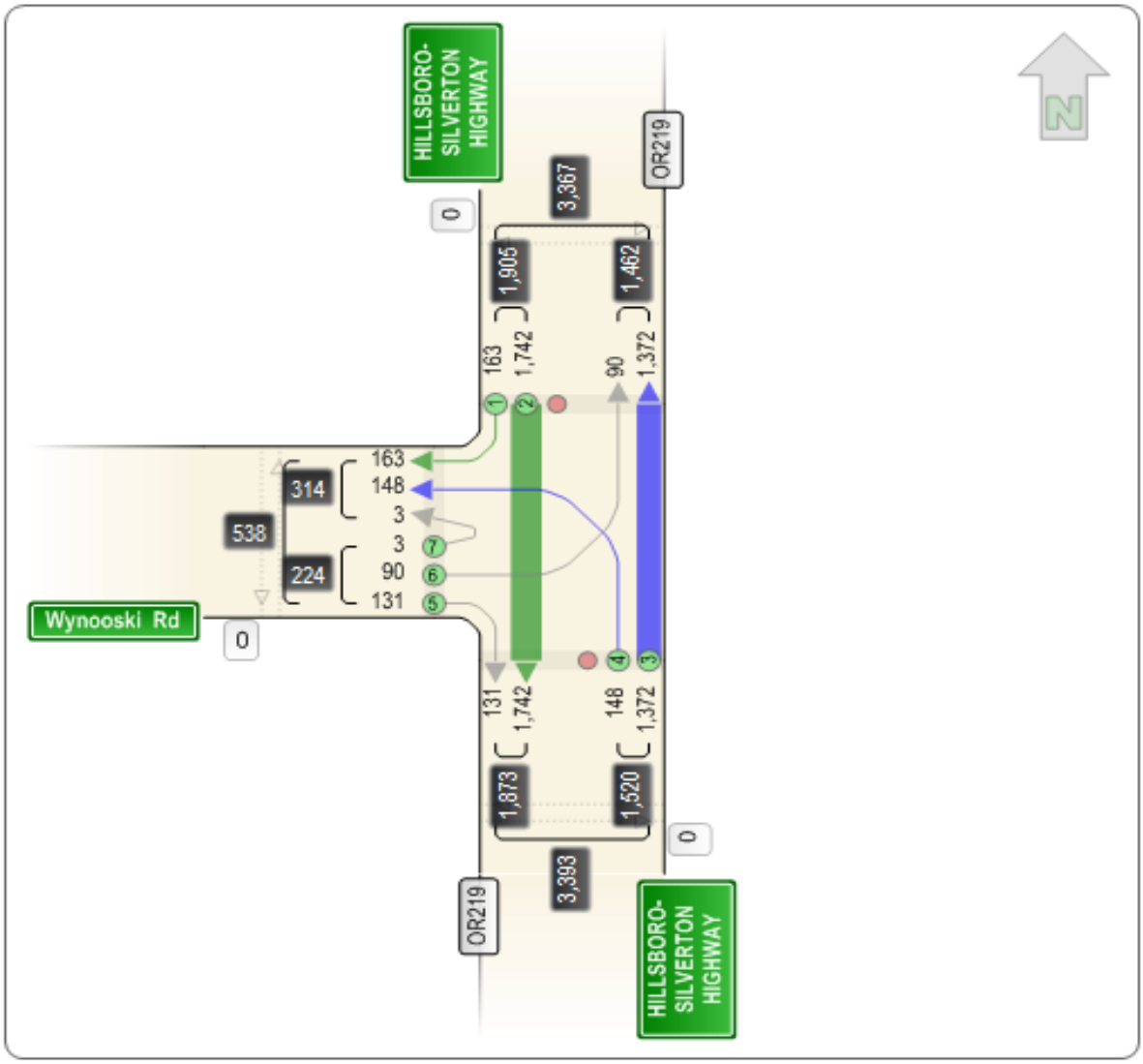
Date: 3/19/2019
Hours: 4:00 PM-6:00 PM
Weather: Clear

Source

Site Number: 45911
Mile Point: 22.17
Street Number: 140
Vehicle Type: Vehicles
Crossing Flow: Pedestrians

Source Description

Location Description: HILLSBORO-SILVERTON HIGHWAY NO. 140 (OR219) at Wynooski Rd
County: Yamhill
City: Newberg



Transportation Development Division
Transportation System Monitoring Unit
Vehicular Volume

Time settings

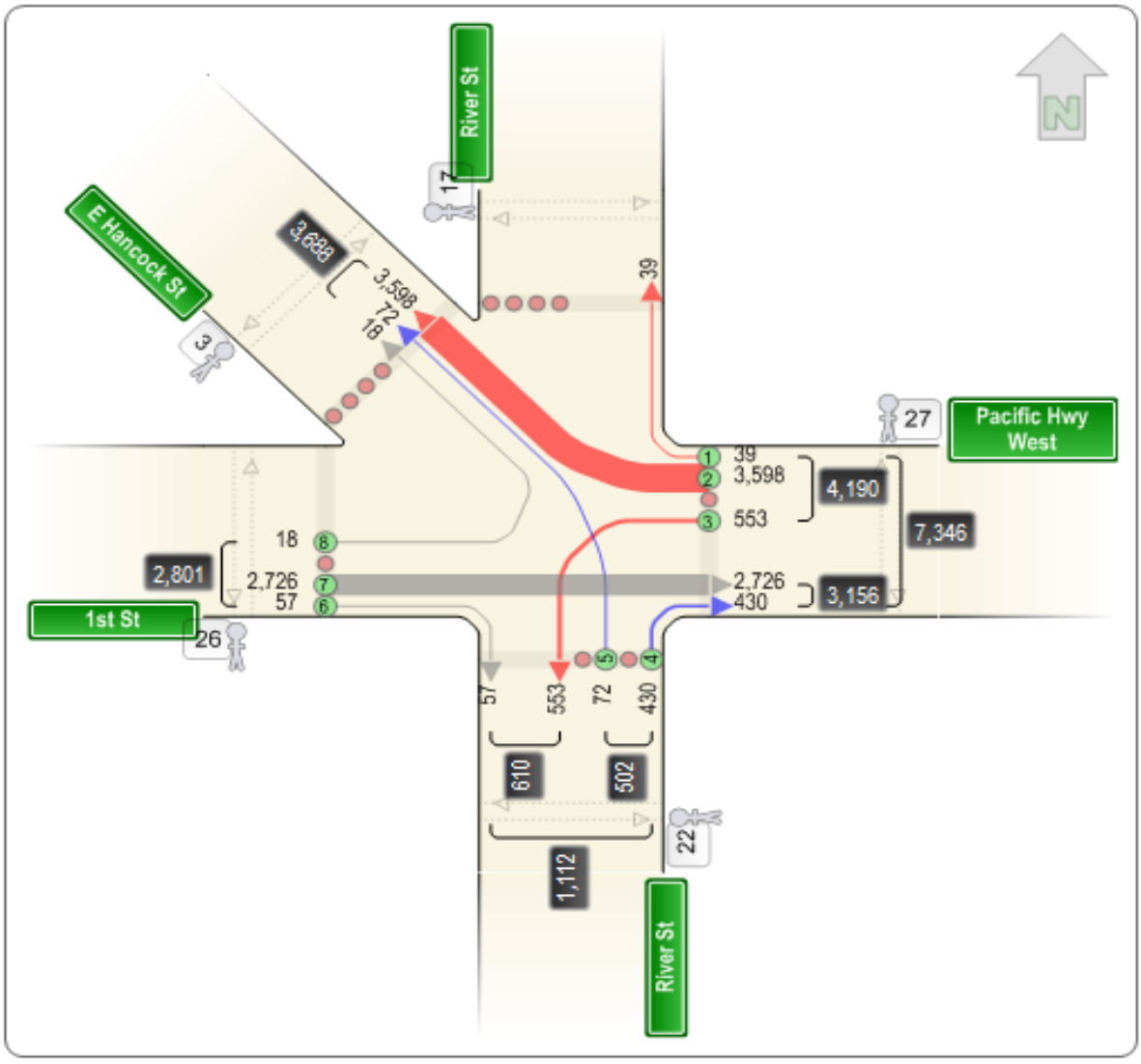
Date: 3/19/2019
Hours: 4:00 PM-6:00 PM
Weather: Cloudy

Source

Site Number: 45912
Mile Point: 23.20
Street Number: 091
Vehicle Type: Vehicles
Crossing Flow: Pedestrians

Source Description

Location Description: PACIFIC HIGHWAY WEST NO. 91 (OR99W) at River St.
County: Yamhill
City: Newberg



Transportation Development Division
Transportation System Monitoring Unit
Vehicular Volume

Time settings

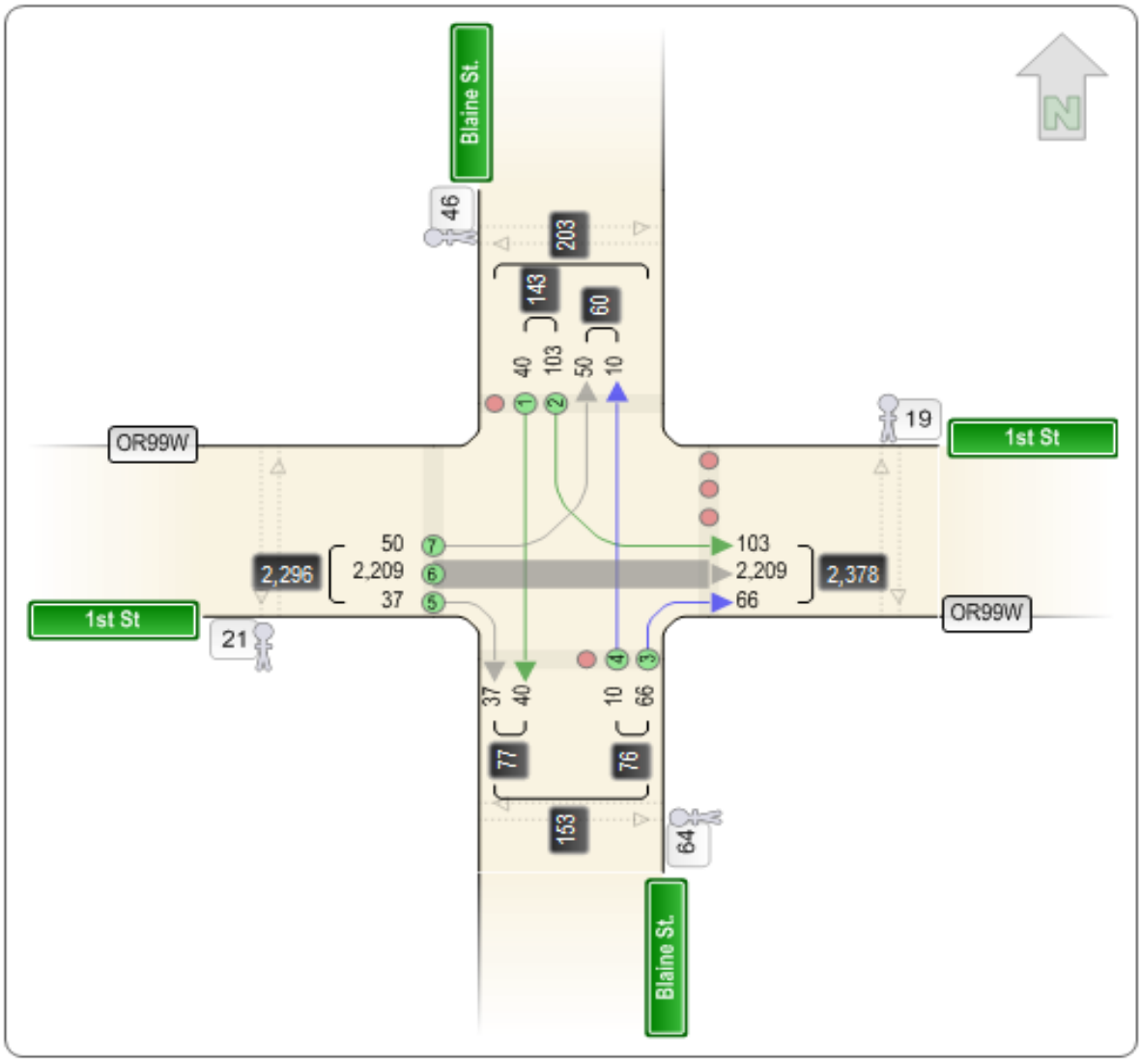
Date: 3/19/2019
Hours: 4:00 PM-6:00 PM
Weather: Cloudy

Source

Site Number: 45913
Mile Point: 23.57
Street Number: 091
Vehicle Type: Vehicles
Crossing Flow: Pedestrians

Source Description

Location Description: PACIFIC HIGHWAY WEST NO. 91 (OR99W EB / 1st St) at Blaine St.
County: Yamhill
City: Newberg



Transportation Development Division
Transportation System Monitoring Unit
Vehicular Volume

Time settings

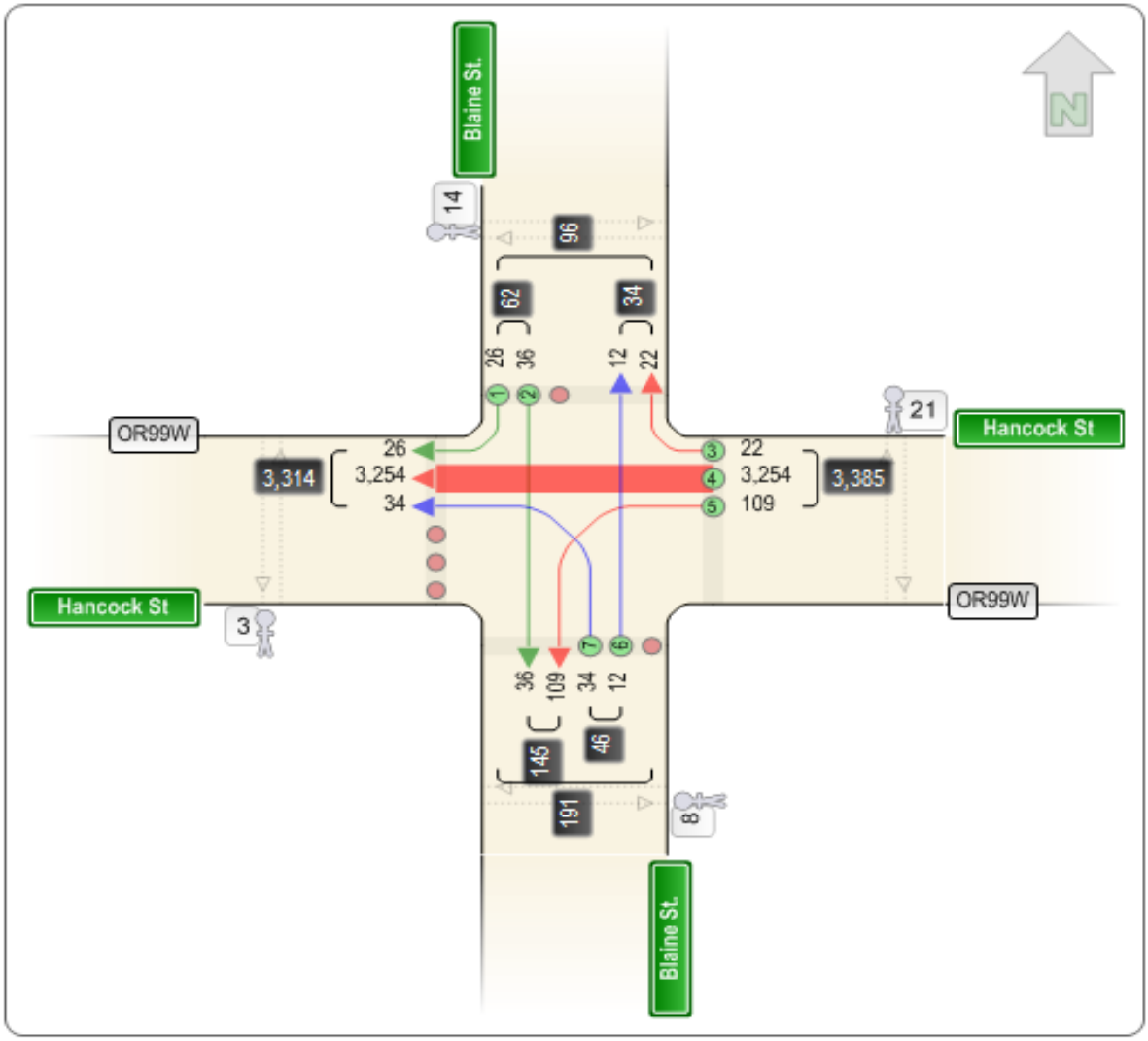
Date: 3/19/2019
Hours: 4:00 PM-6:00 PM
Weather: Clear

Source

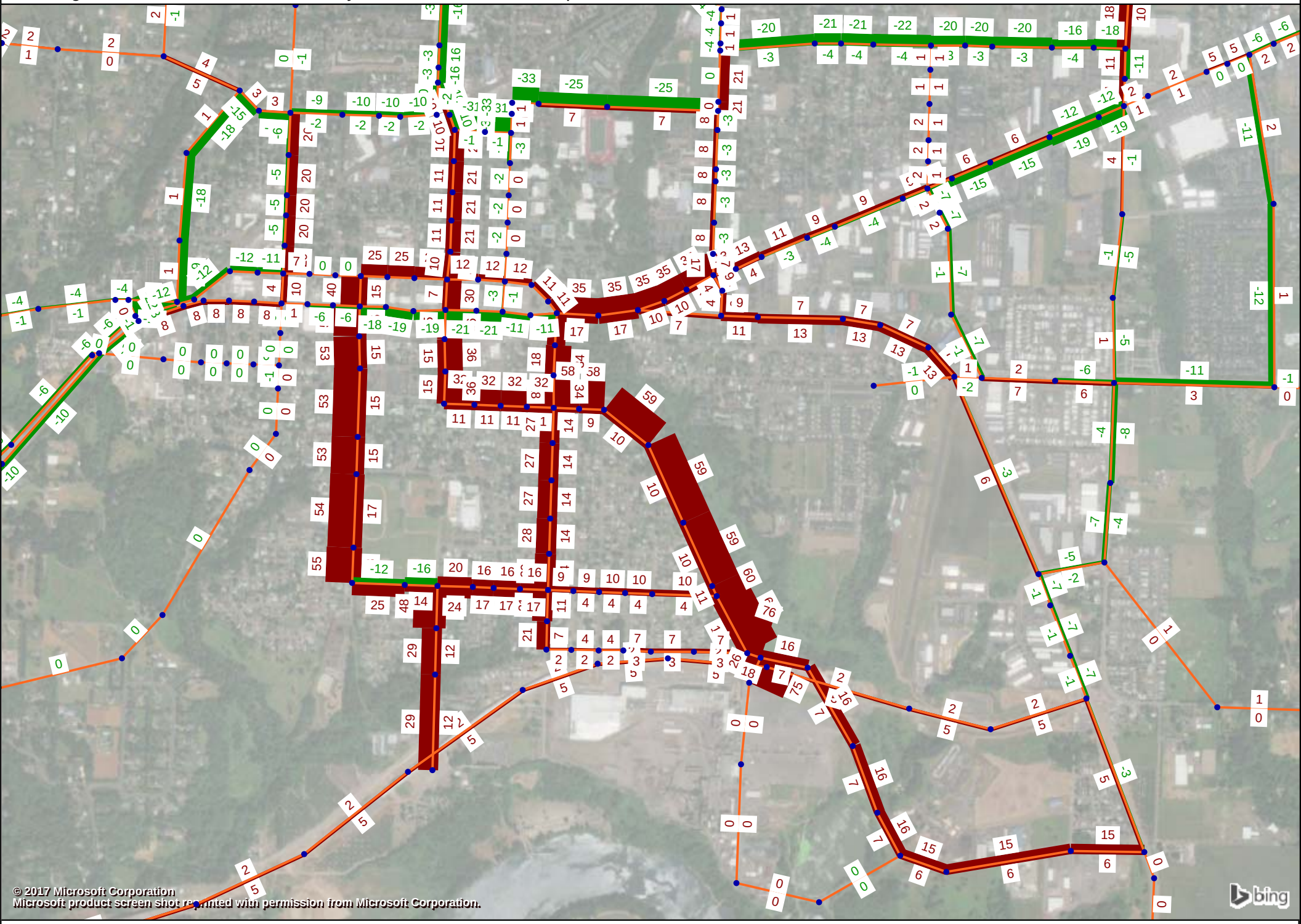
Site Number: 45914
Mile Point: 23.61
Street Number: 091
Vehicle Type: Vehicles
Crossing Flow: Pedestrians

Source Description

Location Description: PACIFIC HIGHWAY WEST NO. 91 (OR99W WB / Hancock St) at Blaine St.
County: Yamhill
City: Newberg



Newberg Model V3 2035 with Phase1 ByPass Volume difference plot PM Peak: revised land use - base



Please be aware that link volumes reflected in this analysis represent raw model output and had not been post-processed by TPAU.

Using the data for additional analysis will require post-processing according to guidelines as described in TPAU's "An

Date: 30.05.2019

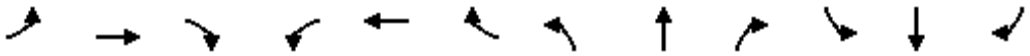
Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	44	76	84	706	940	74
Future Vol, veh/h	44	76	84	706	940	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	283	415	-	-	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	3	6	6	4	3
Mvmt Flow	46	79	88	735	979	77

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1890	979	979	0	-	0
Stage 1	979	-	-	-	-	-
Stage 2	911	-	-	-	-	-
Critical Hdwy	6.45	6.23	4.16	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.327	2.254	-	-	-
Pot Cap-1 Maneuver	76	302	689	-	-	0
Stage 1	359	-	-	-	-	0
Stage 2	387	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	66	302	689	-	-	-
Mov Cap-2 Maneuver	214	-	-	-	-	-
Stage 1	313	-	-	-	-	-
Stage 2	387	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23	1.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT
Capacity (veh/h)	689	-	214	302	-
HCM Lane V/C Ratio	0.127	-	0.214	0.262	-
HCM Control Delay (s)	11	-	26.3	21.1	-
HCM Lane LOS	B	-	D	C	-
HCM 95th %tile Q(veh)	0.4	-	0.8	1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1509	24	293	1779	20	36	0	224	0	0	0
Future Volume (vph)	0	1509	24	293	1779	20	36	0	224	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5		4.5	4.5		4.5		4.5			
Lane Util. Factor		0.95		1.00	0.91		1.00		1.00			
Frpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Frt		1.00		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		3129		1646	4541		1630		1473			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		3129		1646	4541		1630		1473			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1556	25	302	1834	21	37	0	231	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	94	0	0	0
Lane Group Flow (vph)	0	1580	0	302	1854	0	37	0	137	0	0	0
Confl. Peds. (#/hr)			5			7						
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	2%	6%	4%	1%	5%	2%	2%	2%	1%	2%	2%	2%
Turn Type		NA		Prot	NA		Prot		Perm			
Protected Phases		2		1	6		7					
Permitted Phases									2			
Actuated Green, G (s)		53.2		16.5	74.2		6.8		53.2			
Effective Green, g (s)		53.2		16.5	74.2		6.8		53.2			
Actuated g/C Ratio		0.59		0.18	0.82		0.08		0.59			
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5			
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		1849		301	3743		123		870			
v/s Ratio Prot		c0.51		c0.18	0.41		c0.02					
v/s Ratio Perm									0.09			
v/c Ratio		0.85		1.00	0.50		0.30		0.16			
Uniform Delay, d1		15.2		36.8	2.3		39.4		8.3			
Progression Factor		1.00		1.00	1.00		1.00		1.00			
Incremental Delay, d2		5.3		52.7	0.5		1.4		0.4			
Delay (s)		20.5		89.5	2.8		40.7		8.7			
Level of Service		C		F	A		D		A			
Approach Delay (s)		20.5			14.9			13.1			0.0	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	1130	22	0	0	0	0	4	33	54	22	0
Future Vol, veh/h	26	1130	22	0	0	0	0	4	33	54	22	0
Conflicting Peds, #/hr	12	0	26	0	0	0	0	0	13	13	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	7	2	2	2	2	2	2	2	2	5	2
Mvmt Flow	28	1228	24	0	0	0	0	4	36	59	24	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	12	0	0	-	1334	665	574	1346	-
Stage 1	-	-	-	-	1322	-	12	12	-
Stage 2	-	-	-	-	12	-	562	1334	-
Critical Hdwy	5.38	-	-	-	6.54	7.14	6.44	6.6	-
Critical Hdwy Stg 1	-	-	-	-	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.6	-
Follow-up Hdwy	3.14	-	-	-	4.02	3.92	3.82	4.05	-
Pot Cap-1 Maneuver	1132	-	-	0	153	345	451	146	0
Stage 1	-	-	-	0	224	-	-	-	0
Stage 2	-	-	-	0	-	-	437	216	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1119	-	-	-	135	336	364	129	-
Mov Cap-2 Maneuver	-	-	-	-	135	-	364	129	-
Stage 1	-	-	-	-	200	-	-	-	-
Stage 2	-	-	-	-	-	-	350	193	-

Approach	EB	NB	SB
HCM Control Delay, s	0.4	19.5	28
HCM LOS		C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1
Capacity (veh/h)	289	1119	-	-	238
HCM Lane V/C Ratio	0.139	0.025	-	-	0.347
HCM Control Delay (s)	19.5	8.3	0.2	-	28
HCM Lane LOS	C	A	A	-	D
HCM 95th %tile Q(veh)	0.5	0.1	-	-	1.5

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	54	1690	7	16	7	0	0	20	19
Future Vol, veh/h	0	0	0	54	1690	7	16	7	0	0	20	19
Conflicting Peds, #/hr	0	0	0	6	0	5	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	3	2	2	14	2	2	2	2
Mvmt Flow	0	0	0	60	1878	8	18	8	0	0	22	21

Major/Minor	Major2			Minor1			Minor2			
Conflicting Flow All	6	0	0	890	2017	-	-	2013	950	
Stage 1	-	-	-	6	6	-	-	2007	-	
Stage 2	-	-	-	884	2011	-	-	6	-	
Critical Hdwy	5.34	-	-	6.44	6.78	-	-	6.54	7.14	
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.54	-	
Critical Hdwy Stg 2	-	-	-	6.74	5.78	-	-	-	-	
Follow-up Hdwy	3.12	-	-	3.82	4.14	-	-	4.02	3.92	
Pot Cap-1 Maneuver	1147	-	-	296	50	0	0	58	224	
Stage 1	-	-	-	-	-	0	0	102	-	
Stage 2	-	-	-	278	88	0	0	-	-	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	1140	-	-	186	49	-	-	57	223	
Mov Cap-2 Maneuver	-	-	-	186	49	-	-	57	-	
Stage 1	-	-	-	-	-	-	-	101	-	
Stage 2	-	-	-	196	88	-	-	-	-	

Approach	WB	NB	SB
HCM Control Delay, s	0.3	52.9	79
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	100	1140	-	-	89
HCM Lane V/C Ratio	0.256	0.053	-	-	0.487
HCM Control Delay (s)	52.9	8.3	0	-	79
HCM Lane LOS	F	A	A	-	F
HCM 95th %tile Q(veh)	0.9	0.2	-	-	2.1

Intersection	
Int Delay, s/veh	3.5

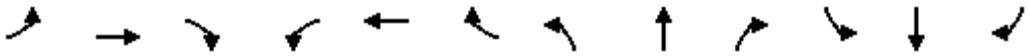
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	65	110	105	850	1085	95
Future Vol, veh/h	65	110	105	850	1085	95
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	283	415	-	-	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	3	6	6	4	3
Mvmt Flow	68	115	109	885	1130	99

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2233	1130	1130	0	-	0
Stage 1	1130	-	-	-	-	-
Stage 2	1103	-	-	-	-	-
Critical Hdwy	6.45	6.23	4.16	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.327	2.254	-	-	-
Pot Cap-1 Maneuver	~ 46	247	604	-	-	0
Stage 1	304	-	-	-	-	0
Stage 2	313	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 38	247	604	-	-	-
Mov Cap-2 Maneuver	153	-	-	-	-	-
Stage 1	249	-	-	-	-	-
Stage 2	313	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	36.9	1.3	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT
Capacity (veh/h)	604	-	153	247	-
HCM Lane V/C Ratio	0.181	-	0.443	0.464	-
HCM Control Delay (s)	12.3	-	46	31.6	-
HCM Lane LOS	B	-	E	D	-
HCM 95th %tile Q(veh)	0.7	-	2	2.3	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1650	30	315	2320	20	135	0	240	0	0	0
Future Volume (vph)	0	1650	30	315	2320	20	135	0	240	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5		4.5	4.5		4.5		4.5			
Lane Util. Factor		0.95		1.00	0.91		1.00		1.00			
Frpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Frt		1.00		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		3127		1646	4543		1630		1473			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		3127		1646	4543		1630		1473			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1701	31	325	2392	21	139	0	247	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	115	0	0	0
Lane Group Flow (vph)	0	1731	0	325	2412	0	139	0	132	0	0	0
Confl. Peds. (#/hr)			5			7						
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	2%	6%	4%	1%	5%	2%	2%	2%	1%	2%	2%	2%
Turn Type		NA		Prot	NA		Prot		Perm			
Protected Phases		2		1	6		7					
Permitted Phases									2			
Actuated Green, G (s)		48.1		15.5	68.1		12.9		48.1			
Effective Green, g (s)		48.1		15.5	68.1		12.9		48.1			
Actuated g/C Ratio		0.53		0.17	0.76		0.14		0.53			
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5			
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		1671		283	3437		233		787			
v/s Ratio Prot		c0.55		c0.20	0.53		c0.09					
v/s Ratio Perm									0.09			
v/c Ratio		1.04		1.15	0.70		0.60		0.17			
Uniform Delay, d1		20.9		37.2	5.7		36.1		10.7			
Progression Factor		1.00		1.00	1.00		1.00		1.00			
Incremental Delay, d2		31.8		99.7	1.2		4.1		0.5			
Delay (s)		52.8		137.0	6.9		40.2		11.2			
Level of Service		D		F	A		D		B			
Approach Delay (s)		52.8			22.3			21.6			0.0	
Approach LOS		D			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	33.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	14.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	1225	25	0	0	0	0	45	120	65	25	0
Future Vol, veh/h	30	1225	25	0	0	0	0	45	120	65	25	0
Conflicting Peds, #/hr	12	0	26	0	0	0	0	0	13	13	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	7	2	2	2	2	2	2	2	2	5	2
Mvmt Flow	33	1332	27	0	0	0	0	49	130	71	27	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	12	0	0	-	1450	719	648	1463	-
Stage 1	-	-	-	-	1438	-	12	12	-
Stage 2	-	-	-	-	12	-	636	1451	-
Critical Hdwy	5.38	-	-	-	6.54	7.14	6.44	6.6	-
Critical Hdwy Stg 1	-	-	-	-	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.6	-
Follow-up Hdwy	3.14	-	-	-	4.02	3.92	3.82	4.05	-
Pot Cap-1 Maneuver	1132	-	-	0	130	318	409	124	0
Stage 1	-	-	-	0	197	-	-	-	0
Stage 2	-	-	-	0	-	-	394	189	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1119	-	-	-	110	310	139	105	-
Mov Cap-2 Maneuver	-	-	-	-	110	-	139	105	-
Stage 1	-	-	-	-	169	-	-	-	-
Stage 2	-	-	-	-	-	-	142	162	-

Approach	EB	NB	SB
HCM Control Delay, s	0.5	80	91.8
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1
Capacity (veh/h)	207	1119	-	-	128
HCM Lane V/C Ratio	0.866	0.029	-	-	0.764
HCM Control Delay (s)	80	8.3	0.3	-	91.8
HCM Lane LOS	F	A	A	-	F
HCM 95th %tile Q(veh)	6.7	0.1	-	-	4.5

Intersection	
Int Delay, s/veh	30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	70	2115	10	50	25	0	0	20	20
Future Vol, veh/h	0	0	0	70	2115	10	50	25	0	0	20	20
Conflicting Peds, #/hr	0	0	0	6	0	5	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	3	2	2	14	2	2	2	2
Mvmt Flow	0	0	0	78	2350	11	56	28	0	0	22	22

Major/Minor	Major2			Minor1			Minor2		
Conflicting Flow All	6	0	0	1115	2528	-	-	2523	1188
Stage 1	-	-	-	6	6	-	-	2517	-
Stage 2	-	-	-	1109	2522	-	-	6	-
Critical Hdwy	5.34	-	-	6.44	6.78	-	-	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	6.74	5.78	-	-	-	-
Follow-up Hdwy	3.12	-	-	3.82	4.14	-	-	4.02	3.92
Pot Cap-1 Maneuver	1147	-	-	219	~ 23	0	0	27	155
Stage 1	-	-	-	-	-	0	0	56	-
Stage 2	-	-	-	201	47	0	0	-	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1140	-	-	58	~ 23	-	-	27	154
Mov Cap-2 Maneuver	-	-	-	58	~ 23	-	-	27	-
Stage 1	-	-	-	-	-	-	-	56	-
Stage 2	-	-	-	104	47	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0.3	$ 775	260.3
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	38	1140	-	-	46
HCM Lane V/C Ratio	2.193	0.068	-	-	0.966
HCM Control Delay (s)	$ 775	8.4	0	-	260.3
HCM Lane LOS	F	A	A	-	F
HCM 95th %tile Q(veh)	9.1	0.2	-	-	4

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

Intersection	
Int Delay, s/veh	3.7

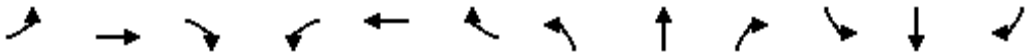
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	65	115	110	845	1085	100
Future Vol, veh/h	65	115	110	845	1085	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	Free
Storage Length	0	283	415	-	-	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	5	3	6	6	4	3
Mvmt Flow	68	120	115	880	1130	104

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2240	1130	1130	0	-	0
Stage 1	1130	-	-	-	-	-
Stage 2	1110	-	-	-	-	-
Critical Hdwy	6.45	6.23	4.16	-	-	-
Critical Hdwy Stg 1	5.45	-	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-	-
Follow-up Hdwy	3.545	3.327	2.254	-	-	-
Pot Cap-1 Maneuver	~ 45	247	604	-	-	0
Stage 1	304	-	-	-	-	0
Stage 2	311	-	-	-	-	0
Platoon blocked, %				-	-	
Mov Cap-1 Maneuver	~ 36	247	604	-	-	-
Mov Cap-2 Maneuver	148	-	-	-	-	-
Stage 1	246	-	-	-	-	-
Stage 2	311	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	38.3	1.4	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT
Capacity (veh/h)	604	-	148	247	-
HCM Lane V/C Ratio	0.19	-	0.457	0.485	-
HCM Control Delay (s)	12.3	-	48.4	32.6	-
HCM Lane LOS	B	-	E	D	-
HCM 95th %tile Q(veh)	0.7	-	2.1	2.4	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1650	30	330	2340	20	140	0	250	0	0	0
Future Volume (vph)	0	1650	30	330	2340	20	140	0	250	0	0	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5		4.5	4.5		4.5		4.5			
Lane Util. Factor		0.95		1.00	0.91		1.00		1.00			
Frpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Flpb, ped/bikes		1.00		1.00	1.00		1.00		1.00			
Frt		1.00		1.00	1.00		1.00		0.85			
Flt Protected		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (prot)		3127		1646	4543		1630		1473			
Flt Permitted		1.00		0.95	1.00		0.95		1.00			
Satd. Flow (perm)		3127		1646	4543		1630		1473			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	1701	31	340	2412	21	144	0	258	0	0	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	121	0	0	0
Lane Group Flow (vph)	0	1731	0	340	2432	0	144	0	137	0	0	0
Confl. Peds. (#/hr)			5			7						
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	2%	6%	4%	1%	5%	2%	2%	2%	1%	2%	2%	2%
Turn Type		NA		Prot	NA		Prot		Perm			
Protected Phases		2		1	6		7					
Permitted Phases									2			
Actuated Green, G (s)		47.9		15.5	67.9		13.1		47.9			
Effective Green, g (s)		47.9		15.5	67.9		13.1		47.9			
Actuated g/C Ratio		0.53		0.17	0.75		0.15		0.53			
Clearance Time (s)		4.5		4.5	4.5		4.5		4.5			
Vehicle Extension (s)		3.0		3.0	3.0		3.0		3.0			
Lane Grp Cap (vph)		1664		283	3427		237		783			
v/s Ratio Prot		c0.55		c0.21	0.54		c0.09					
v/s Ratio Perm									0.09			
v/c Ratio		1.04		1.20	0.71		0.61		0.18			
Uniform Delay, d1		21.1		37.2	5.8		36.0		10.9			
Progression Factor		1.00		1.00	1.00		1.00		1.00			
Incremental Delay, d2		33.2		119.4	1.3		4.4		0.5			
Delay (s)		54.3		156.7	7.1		40.4		11.3			
Level of Service		D		F	A		D		B			
Approach Delay (s)		54.3			25.5			21.8			0.0	
Approach LOS		D			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	35.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	34

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	1190	45	0	0	0	0	55	125	80	55	0
Future Vol, veh/h	35	1190	45	0	0	0	0	55	125	80	55	0
Conflicting Peds, #/hr	12	0	26	0	0	0	0	0	13	13	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	7	2	2	2	2	2	2	2	2	5	2
Mvmt Flow	38	1293	49	0	0	0	0	60	136	87	60	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	12	0	0	-	1432	710	648	1456	-
Stage 1	-	-	-	-	1420	-	12	12	-
Stage 2	-	-	-	-	12	-	636	1444	-
Critical Hdwy	5.38	-	-	-	6.54	7.14	6.44	6.6	-
Critical Hdwy Stg 1	-	-	-	-	5.54	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.6	-
Follow-up Hdwy	3.14	-	-	-	4.02	3.92	3.82	4.05	-
Pot Cap-1 Maneuver	1132	-	-	0	133	323	409	125	0
Stage 1	-	-	-	0	201	-	-	-	0
Stage 2	-	-	-	0	-	-	394	190	0
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1119	-	-	-	111	315	120	104	-
Mov Cap-2 Maneuver	-	-	-	-	111	-	120	104	-
Stage 1	-	-	-	-	169	-	-	-	-
Stage 2	-	-	-	-	-	-	125	160	-

Approach	EB	NB	SB
HCM Control Delay, s	0.5	104.2	256.1
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1
Capacity (veh/h)	202	1119	-	-	113
HCM Lane V/C Ratio	0.969	0.034	-	-	1.299
HCM Control Delay (s)	104.2	8.3	0.3	-	256.1
HCM Lane LOS	F	A	A	-	F
HCM 95th %tile Q(veh)	8.2	0.1	-	-	9.8

Intersection	
Int Delay, s/veh	7.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	105	2105	10	60	25	0	0	25	15
Future Vol, veh/h	0	0	0	105	2105	10	60	25	0	0	25	15
Conflicting Peds, #/hr	0	0	0	6	0	5	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	3	2	2	14	2	2	2	2
Mvmt Flow	0	0	0	117	2339	11	67	28	0	0	28	17

Major/Minor	Major2			Minor1			Minor2		
Conflicting Flow All	6	0	0	1192	2595	-	-	2590	1182
Stage 1	-	-	-	6	6	-	-	2584	-
Stage 2	-	-	-	1186	2589	-	-	6	-
Critical Hdwy	5.34	-	-	6.44	6.78	-	-	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	6.74	5.78	-	-	-	-
Follow-up Hdwy	3.12	-	-	3.82	4.14	-	-	4.02	3.92
Pot Cap-1 Maneuver	1147	-	-	197	~ 21	0	0	~ 25	157
Stage 1	-	-	-	-	-	0	0	51	-
Stage 2	-	-	-	180	43	0	0	-	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1140	-	-	-	~ 21	-	-	~ 25	156
Mov Cap-2 Maneuver	-	-	-	-	~ 21	-	-	~ 25	-
Stage 1	-	-	-	-	-	-	-	51	-
Stage 2	-	-	-	73	43	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0.4		$ 399.3
HCM LOS		-	F

Minor Lane/Major Mvmt	NBLn1	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1140	-	-	36
HCM Lane V/C Ratio	-	0.102	-	-	1.235
HCM Control Delay (s)	-	8.5	0	-	$ 399.3
HCM Lane LOS	-	A	A	-	F
HCM 95th %tile Q(veh)	-	0.3	-	-	4.6

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

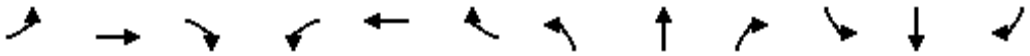
Intersection	
Int Delay, s/veh	19.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	1190	45	0	0	0	0	55	125	80	55	0
Future Vol, veh/h	35	1190	45	0	0	0	0	55	125	80	55	0
Conflicting Peds, #/hr	12	0	26	0	0	0	0	0	13	13	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	-	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	4	7	2	2	2	2	2	2	2	2	5	2
Mvmt Flow	38	1293	49	0	0	0	0	60	136	87	60	0

Major/Minor	Major1			Minor1			Minor2			
Conflicting Flow All	12	0	0	-	1432	710	648	1456	-	
Stage 1	-	-	-	-	1420	-	12	12	-	
Stage 2	-	-	-	-	12	-	636	1444	-	
Critical Hdwy	5.38	-	-	-	6.54	7.14	6.44	6.6	-	
Critical Hdwy Stg 1	-	-	-	-	5.54	-	-	-	-	
Critical Hdwy Stg 2	-	-	-	-	-	-	6.74	5.6	-	
Follow-up Hdwy	3.14	-	-	-	4.02	3.92	3.82	4.05	-	
Pot Cap-1 Maneuver	1132	-	-	0	133	323	409	125	0	
Stage 1	-	-	-	0	201	-	-	-	0	
Stage 2	-	-	-	0	-	-	394	190	0	
Platoon blocked, %		-	-							
Mov Cap-1 Maneuver	1119	-	-	-	111	315	120	104	-	
Mov Cap-2 Maneuver	-	-	-	-	111	-	120	104	-	
Stage 1	-	-	-	-	169	-	-	-	-	
Stage 2	-	-	-	-	-	-	125	160	-	

Approach	EB	NB	SB
HCM Control Delay, s	0.5	104.2	85.2
HCM LOS		F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	SBLn1	SBLn2
Capacity (veh/h)	202	1119	-	-	120	104
HCM Lane V/C Ratio	0.969	0.034	-	-	0.725	0.575
HCM Control Delay (s)	104.2	8.3	0.3	-	89.8	78.5
HCM Lane LOS	F	A	A	-	F	F
HCM 95th %tile Q(veh)	8.2	0.1	-	-	4	2.7



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	1190	45	0	0	0	0	55	125	80	55	0
Future Volume (vph)	35	1190	45	0	0	0	0	55	125	80	55	0
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)		4.5						4.5			4.5	
Lane Util. Factor		0.91						1.00			1.00	
Frpb, ped/bikes		1.00						0.98			1.00	
Flpb, ped/bikes		1.00						1.00			0.99	
Frt		0.99						0.91			1.00	
Flt Protected		1.00						1.00			0.97	
Satd. Flow (prot)		4429						1521			1633	
Flt Permitted		1.00						1.00			0.75	
Satd. Flow (perm)		4429						1521			1258	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	1293	49	0	0	0	0	60	136	87	60	0
RTOR Reduction (vph)	0	5	0	0	0	0	0	23	0	0	0	0
Lane Group Flow (vph)	0	1375	0	0	0	0	0	173	0	0	147	0
Confl. Peds. (#/hr)	12		26						13	13		
Heavy Vehicles (%)	4%	7%	2%	2%	2%	2%	2%	2%	2%	2%	5%	2%
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4									6		
Actuated Green, G (s)		40.9						40.1			40.1	
Effective Green, g (s)		40.9						40.1			40.1	
Actuated g/C Ratio		0.45						0.45			0.45	
Clearance Time (s)		4.5						4.5			4.5	
Vehicle Extension (s)		3.0						3.0			3.0	
Lane Grp Cap (vph)		2012						677			560	
v/s Ratio Prot								0.11				
v/s Ratio Perm		0.31									c0.12	
v/c Ratio		0.68						0.26			0.26	
Uniform Delay, d1		19.4						15.6			15.7	
Progression Factor		1.00						1.00			1.00	
Incremental Delay, d2		1.0						0.9			1.1	
Delay (s)		20.4						16.5			16.8	
Level of Service		C						B			B	
Approach Delay (s)		20.4			0.0			16.5			16.8	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	7.2

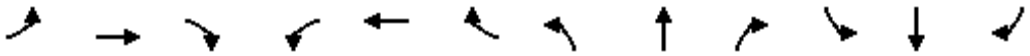
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	105	2105	10	60	25	0	0	25	15
Future Vol, veh/h	0	0	0	105	2105	10	60	25	0	0	25	15
Conflicting Peds, #/hr	0	0	0	6	0	5	2	0	0	0	0	2
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	-	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	3	2	2	14	2	2	2	2
Mvmt Flow	0	0	0	117	2339	11	67	28	0	0	28	17

Major/Minor	Major2			Minor1			Minor2		
Conflicting Flow All	6	0	0	1192	2595	-	-	2590	1182
Stage 1	-	-	-	6	6	-	-	2584	-
Stage 2	-	-	-	1186	2589	-	-	6	-
Critical Hdwy	5.34	-	-	6.44	6.78	-	-	6.54	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	5.54	-
Critical Hdwy Stg 2	-	-	-	6.74	5.78	-	-	-	-
Follow-up Hdwy	3.12	-	-	3.82	4.14	-	-	4.02	3.92
Pot Cap-1 Maneuver	1147	-	-	197	~ 21	0	0	~ 25	157
Stage 1	-	-	-	-	-	0	0	51	-
Stage 2	-	-	-	180	43	0	0	-	-
Platoon blocked, %		-	-						
Mov Cap-1 Maneuver	1140	-	-	-	~ 21	-	-	~ 25	156
Mov Cap-2 Maneuver	-	-	-	-	~ 21	-	-	~ 25	-
Stage 1	-	-	-	-	-	-	-	51	-
Stage 2	-	-	-	73	43	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0.4		$ 399.3
HCM LOS		-	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	21	1140	-	-	36
HCM Lane V/C Ratio	-	1.323	0.102	-	-	1.235
HCM Control Delay (s)	-$	576.6	8.5	0	-$	399.3
HCM Lane LOS	-	F	A	A	-	F
HCM 95th %tile Q(veh)	-	3.7	0.3	-	-	4.6

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	105	2105	10	60	25	0	0	25	15
Future Volume (vph)	0	0	0	105	2105	10	60	25	0	0	25	15
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)					4.5			4.5			4.5	
Lane Util. Factor					0.91			1.00			1.00	
Frpb, ped/bikes					1.00			1.00			0.99	
Flpb, ped/bikes					1.00			1.00			1.00	
Frt					1.00			1.00			0.95	
Flt Protected					1.00			0.97			1.00	
Satd. Flow (prot)					4623			1599			1619	
Flt Permitted					1.00			0.78			1.00	
Satd. Flow (perm)					4623			1294			1619	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	117	2339	11	67	28	0	0	28	17
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	0	0	0	2466	0	0	95	0	0	38	0
Confl. Peds. (#/hr)				6		5	2					2
Heavy Vehicles (%)	2%	2%	2%	2%	3%	2%	2%	14%	2%	2%	2%	2%
Turn Type				Perm	NA		Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					60.5			20.5			20.5	
Effective Green, g (s)					60.5			20.5			20.5	
Actuated g/C Ratio					0.67			0.23			0.23	
Clearance Time (s)					4.5			4.5			4.5	
Vehicle Extension (s)					3.0			3.0			3.0	
Lane Grp Cap (vph)					3107			294			368	
v/s Ratio Prot											0.02	
v/s Ratio Perm					0.53			c0.07				
v/c Ratio					0.79			0.32			0.10	
Uniform Delay, d1					10.4			29.0			27.5	
Progression Factor					1.00			0.77			1.00	
Incremental Delay, d2					1.5			2.7			0.6	
Delay (s)					11.8			25.0			28.0	
Level of Service					B			C			C	
Approach Delay (s)		0.0			11.8			25.0			28.0	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group