APPENDIX C

2015 Transportation Impact Analysis for Zone Change

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TRANSPORTATION IMPACT ANALYSIS

Date: July 23, 2015 Project #: 19072

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From: Julia Kuhn, P.E., Conor Semler, AICP, and Elizabeth Gordon

Project: Providence Willamette Falls

Subject: Transportation Impact Analysis for the Proposed Zone Change and Comprehensive Plan Amendment

Providence Health & Services (herein referred to as "Providence") is proposing a Master Plan Boundary Change for its Willamette Falls Medical Center. At the same time, they are proposing a Comprehensive Plan Amendment and Zone Change for two of the properties within the boundary. These parcels are located to the west of Division Street between 15th Street and 16th Street, and total 22,500 square feet in size. The change in zoning of these properties will enable the provision of off-street parking to support the medical office building contemplated as part of Phase 3 of the Master Plan on the adjacent property. The property in which the medical office building would be constructed is already contained within the existing Master Plan boundary and is zoned appropriately for its use.

Today, these subject parcels are zoned R-6 – Single Family Dwelling District. Providence would like to rezone these parcels to MUE – Mixed Use Employment District. Title 17 of Oregon City's Municipal Code identifies the permitted uses and dimensional standards allowed under each zoning designation. Per Chapter 17.12, R-6 zoning enables the development of single family homes with a minimum lot size of 6,000 square feet. With these provisions, a reasonable worse case development under the R-6 zoning would enable three single family homes to be developed (assuming 22,500 square feet of property and minimum lot size of 6,000 square feet).

Per Chapter 17.31, MUE allows for a variety of office uses, including hospital and medical office building. The minimum floor area ratio is 0.25, which would enable an approximately 6,000 square foot office building. As noted above, Providence would like to use these properties to supply off-street parking for a future medical office building adjacent to Division Street but not for an actual building. However, for the purposes of addressing Oregon's Transportation Planning Rule (TPR), as defined in Oregon Administrative Rule (OAR) 660-012-0060, a traffic analysis is required to demonstrate whether the zone change could result in a significant impact on the transportation system. This memorandum presents the results of the TPR analysis.

The results of this study indicate that the proposed zone change and Comprehensive Plan Amendment are consistent with the requirements of the TPR and applicable Oregon City transportation-related approval criteria. No mitigation measures or changes to the transportation standards are needed to support the proposed zone change and Comprehensive Plan amendment.

Additional details of the study methodology and findings are provided within this report.

SCOPE OF THE REPORT

This report presents the transportation-related impacts associated with the proposed zone change and Comprehensive Plan Amendment and was prepared in accordance with Oregon City's requirements for a traffic impact study and the TPR (OAR 660-012-0060).

The study intersection and scope of work for this project were developed in coordination with City staff. As part of the study, operational analyses were performed at the intersection of 15th Street and Division Street.

*This report evaluat*es the following transportation scenarios:

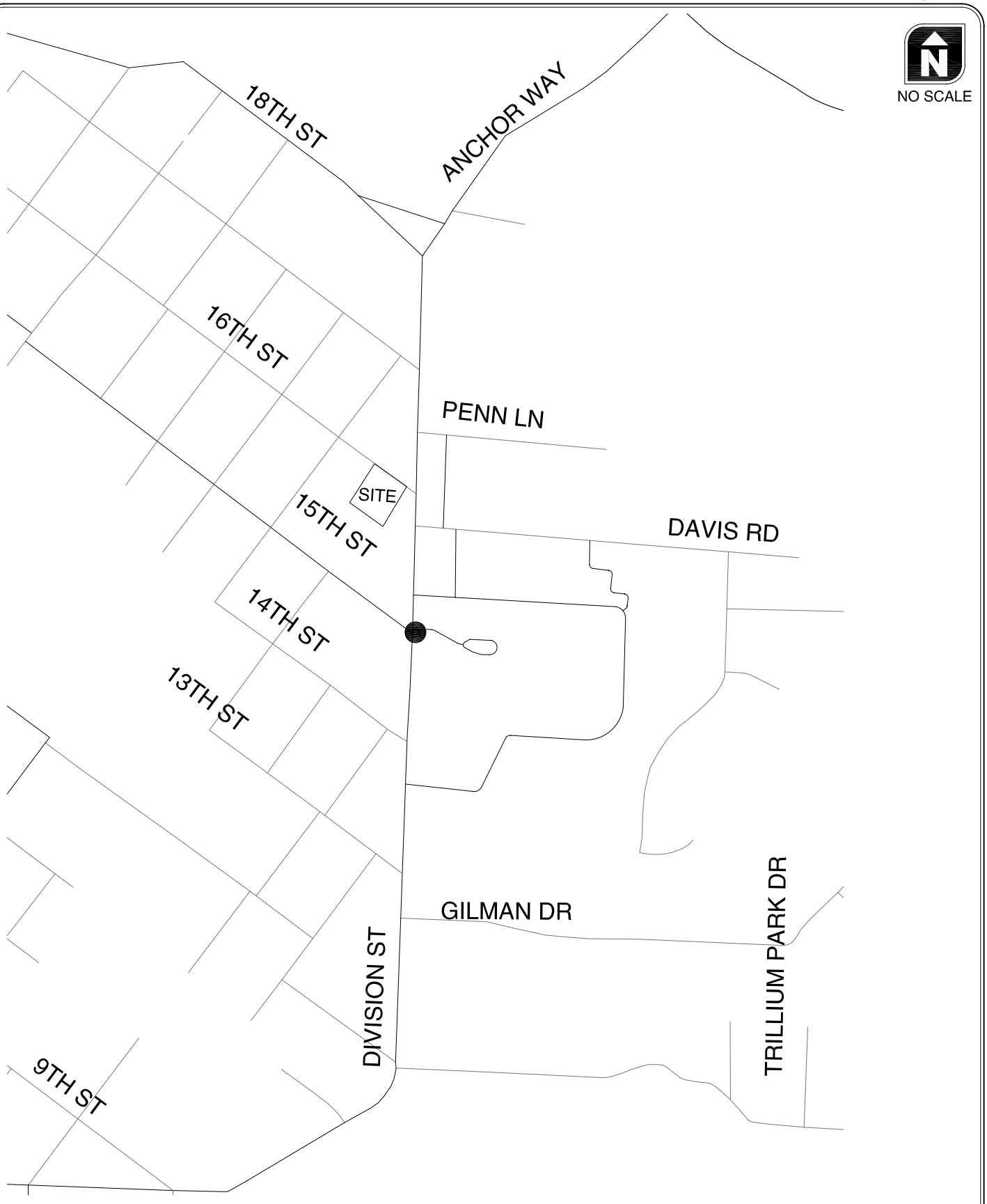
- Year 2015 existing traffic conditions at the study intersection during the weekday AM and PM peak periods;
- Year 2035 existing zoning traffic conditions at the study intersection during the weekday AM and PM peak periods; and,
- Year 2035 proposed zoning traffic conditions at the study intersection during the weekday AM and PM peak periods.

EXISTING CONDITIONS

The existing conditions analysis identifies the site conditions and the current physical and operational characteristics of the transportation facilities and services within the study area. These conditions will be compared with future conditions later in this report.

SITE CONDITIONS AND ADJACENT LAND USES

The parcels that comprise the site are located to the west of Division Street between 15th Street and 16th Street and are a total 22,500 square feet in size. The site is currently occupied by two single-family residential homes. Adjacent land uses include a mix of residential and medical uses. Figure 1 illustrates the site vicinity.



LEGEND

● - STUDY INTERSECTION

SITE VICINITY MAP AND STUDY INTERSECTION
OREGON CITY, OREGON

FIGURE 1

TRANSPORTATION FACILITIES

Table 1 summarizes the characteristics of the existing transportation facilities in the study area.

Table 1: Existing Transportation Facilities

Roadway	Functional Classification	Number of Lanes	Posted Speed (mph[1])	Sidewalks	Bicycle Lanes	On-Street Parking
Division Street	Collector	2	25	Partial	No	Yes
15th Street	Collector	2	25	Yes	No	Yes
16th Street	Local	2	25	yes	No	Yes

[1]mph represents miles per hour

Figure 2 illustrates the existing lane configurations and traffic control devices at the study intersection.

Pedestrian Facilities

Sidewalks are present on both sides of 15th and 16th Streets and are partially complete on Division Street. If the property is redeveloped in the future, sidewalks will be provided along all site frontages consistent with Oregon City street design standards.

Bicycle Facilities

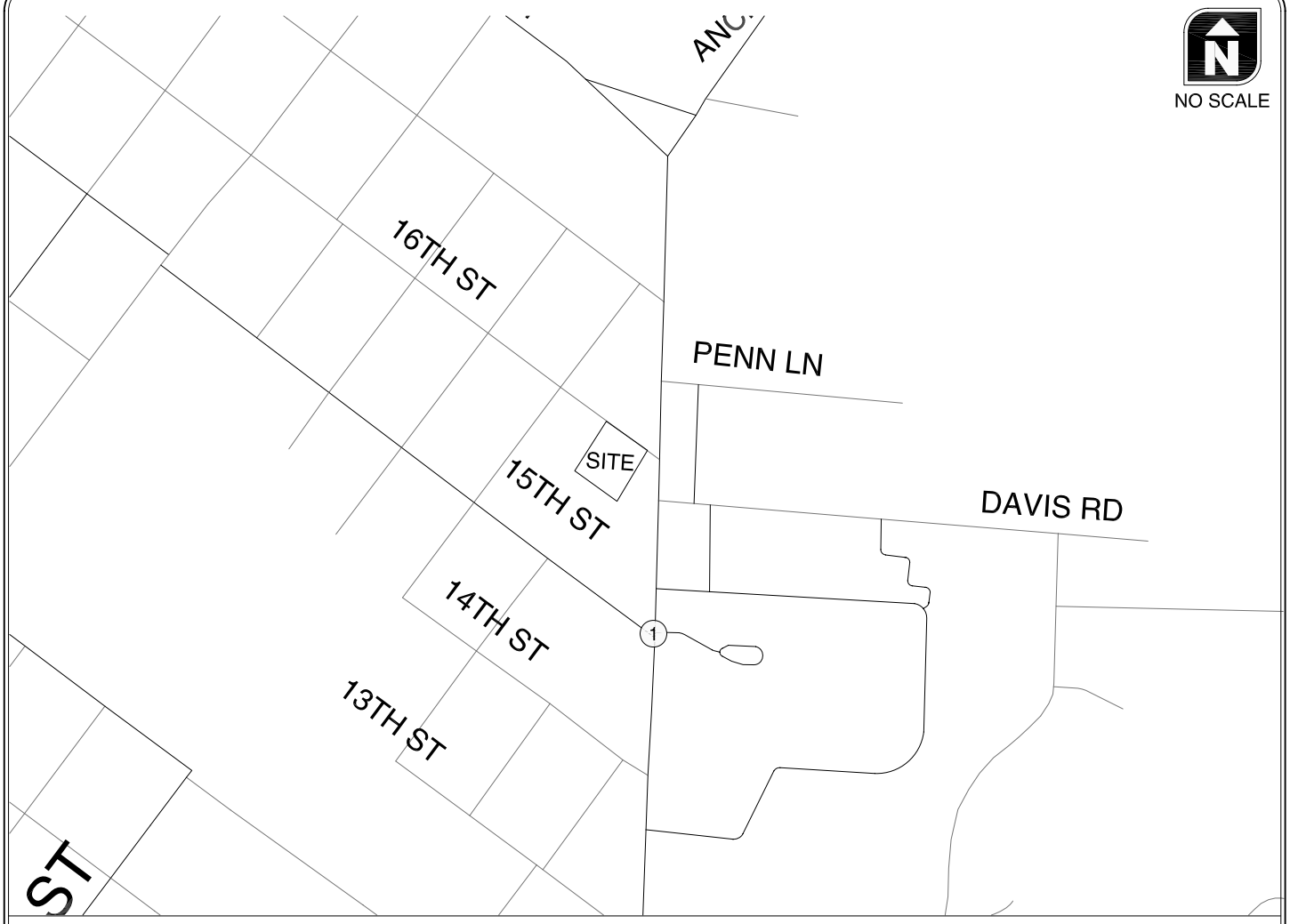
There are no on-street bicycle facilities within the study area. Future site frontage improvements will include bike lanes along 15th Street and Division Street, consistent with Oregon City street design standards.

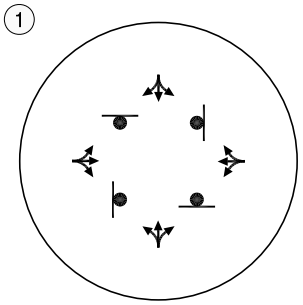
Transit Facilities

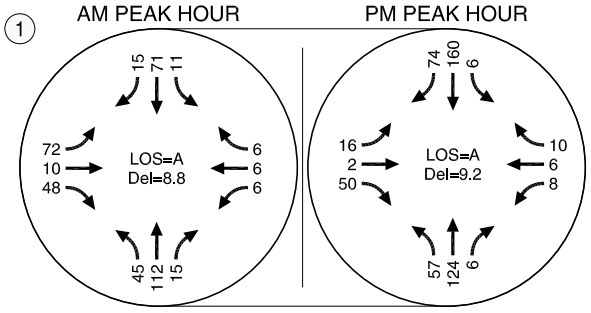
Trimet operates Route 32 – Oatfield on Division Street and 16th Street. During the weekday AM and PM peak periods, Bus 32 provides service between Clackamas Community College and Portland City Center. Outside of the weekday AM and PM peak periods, the route runs from Milwaukie City Center to Clackamas Community College. Weekday service runs from 7:00 AM to 7:00 PM. Saturday service runs between Oregon City Transit Center and Clackamas Community College hourly between 10:00 AM and 5:00 PM. Service is not provided on Sundays. The nearest bus stops are located at the 15th Street/Division Street intersection for southbound buses on Division Street and at the 14th Street/Division Street intersection for northbound buses.

TRAFFIC VOLUMES AND PEAK HOUR OPERATIONS

Manual turning movement counts were conducted at the study intersection in June 2015 on a mid-week day. Figure 2 provides a summary of the measured year 2015 traffic volumes. *Attachment "A" contains the traffic count worksheets used in this study.*







LEGEND

- STOP SIGN

LOS = INTERSECTION LEVEL OF SERVICE

Del = INTERSECTION AVERAGE CONTROL DELAY

EXISTING LANE CONFIGURATIONS, TRAFFIC CONTROL DEVICES AND TRAFFIC OPERATIONS
OREGON CITY, OREGON

FIGURE 2

Current Levels of Service

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the 2010 *Highway Capacity Manual*. *A description of level of service and the criteria by which it is determined is presented in Attachment "B".* Attachment "B" also indicates how level of service (LOS) is measured and what is generally considered an acceptable range.

Per Oregon City's Transportation System Plan, the applicable mobility standard for unsignalized intersection operations during the peak hour is:

"All movements serving more than 20 vehicles shall be maintained at LOS "E" or better. LOS "F" will be tolerated at movements serving no more than 20 vehicles during the peak hour."

All intersection level-of-service evaluations used the traffic volumes from the AM and PM peak hours, adjusted with a peak hour factor so that the analysis reflects a reasonable worst-case scenario. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. The transportation system will likely operate under conditions better than those described in this report during all other time periods.

Figure 2 summarizes the level-of-service analysis results for the study intersection under existing traffic conditions. As shown, the study intersection currently meets the City's LOS "E" standard during the weekday AM and PM peak hours. *Attachment "C" includes the existing traffic conditions level-of-service analysis worksheets.*

TRANSPORTATION PLANNING RULE ANALYSIS

Per Oregon Administrative Rule 660-012-0060, also known as the Transportation Planning Rule (TPR), a zone change and Comprehensive Plan amendment must not create an unmitigated *significant effect* on an existing or planned transportation system. If a significant effect is expected to occur, it must be mitigated within the planning horizon. The City of Oregon City Transportation System Plan (TSP) planning horizon is year 2035. Therefore, in order to determine if there is a significant effect, the following analyses were conducted:

- Year 2035 existing zoning traffic conditions (assuming development of the property under the existing zoning and comprehensive plan designations) at the study intersection during the weekday AM and PM peak periods; and,
- Year 2035 proposed zoning traffic conditions (assuming a reasonable worst case development scenario under the proposed zoning and comprehensive plan designations) at the study intersection during the weekday AM and PM peak periods.

LAND USE SCENARIO DEVELOPMENT

As indicated previously, these subject parcels are currently zoned R-6 – Single Family Dwelling District. Providence would like to rezone these parcels to MUE – Mixed Use Employment District.

Existing Zoning and Comprehensive Plan Designation

Title 17 of Oregon City's Municipal Code identifies the permitted uses and dimensional standards allowed under each zoning designation. Per Chapter 17.12, R-6 zoning enables the development of single family homes with a minimum lot size of 6,000 square feet. With these provisions, a reasonable worse case development under the R-6 zoning would enable three single family homes to be developed (assuming 22,500 square feet of property and minimum lot size of 6,000 square feet).

Proposed Zoning and Comprehensive Plan Designation

The proposed MUE zoning allows for a variety of office uses, including hospital and medical office building. The minimum floor area ratio is 0.25, which would enable an approximately 6,000 square foot office building. As noted above, Providence would like to use these properties to supply off-street parking for a future medical office building adjacent to Division Street but not for an actual building. However, for the purposes of addressing the TPR, a traffic analysis is required to demonstrate whether buildout of the property consistent with the proposed zoning would result in a significant effect on the transportation system.

Trip Generation

A trip generation estimate was prepared for the existing and proposed designations based on information provided in the standard reference manual, *Trip Generation, 9th Edition*, published by the Institute of Transportation Engineers. ITE land use code 210 (Single Family Homes) was used to reflect the existing R-6 designation while ITE land use code 720 (Medical Office Building) was used to reflect the proposed MUE designation. Table 2 summarizes the daily, weekday AM, and weekday PM peak hour trips associated with both designations.

Table 2: Trip Generation Comparison

Land Use	ITE Code	Size	Total Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total Trips	In	Out	Total Trips	In	Out
Existing Zoning - Single Family Homes	210	3 homes	28	2	1	1	3	2	1
Proposed Zoning - Medical Office Building	720	6,000 square feet	216	14	11	3	21	6	15
Proposed Zoning – Existing Zoning			**+188**	**+12**	**+10**	**+2**	**+18**	**+4**	**+14**

YEAR 2035 EXISTING ZONING TRAFFIC CONDITIONS

The existing zoning analysis forecasts how the study area's transportation system will operate in 2035 assuming development of the property consistent with the residential zoning and comprehensive plan designations.

Traffic Volumes

The year 2035 traffic volumes were developed by applying a growth rate of 0.5% per year to existing traffic volumes and adding the number of additional trips expected from the approved Master Plan for Providence Willamette Falls Medical Center. In addition, the residential trips shown in Table 2 were added to account for the buildout of the site under the existing zoning.

Given the site fronts on 16th Street and applying a distribution of 30 percent to the south and 70 percent to the northeast/northwest, only 30 percent of the potential site trips would travel through the 15th Street/Division Street intersection under either zoning scenario.

Intersection Operations

As shown in Figure 3, the study intersection is forecast to continue to operate acceptably under the existing zoning scenario. *Attachment "D" includes the horizon year 2035 existing zoning traffic conditions level-of-service analysis worksheets.*

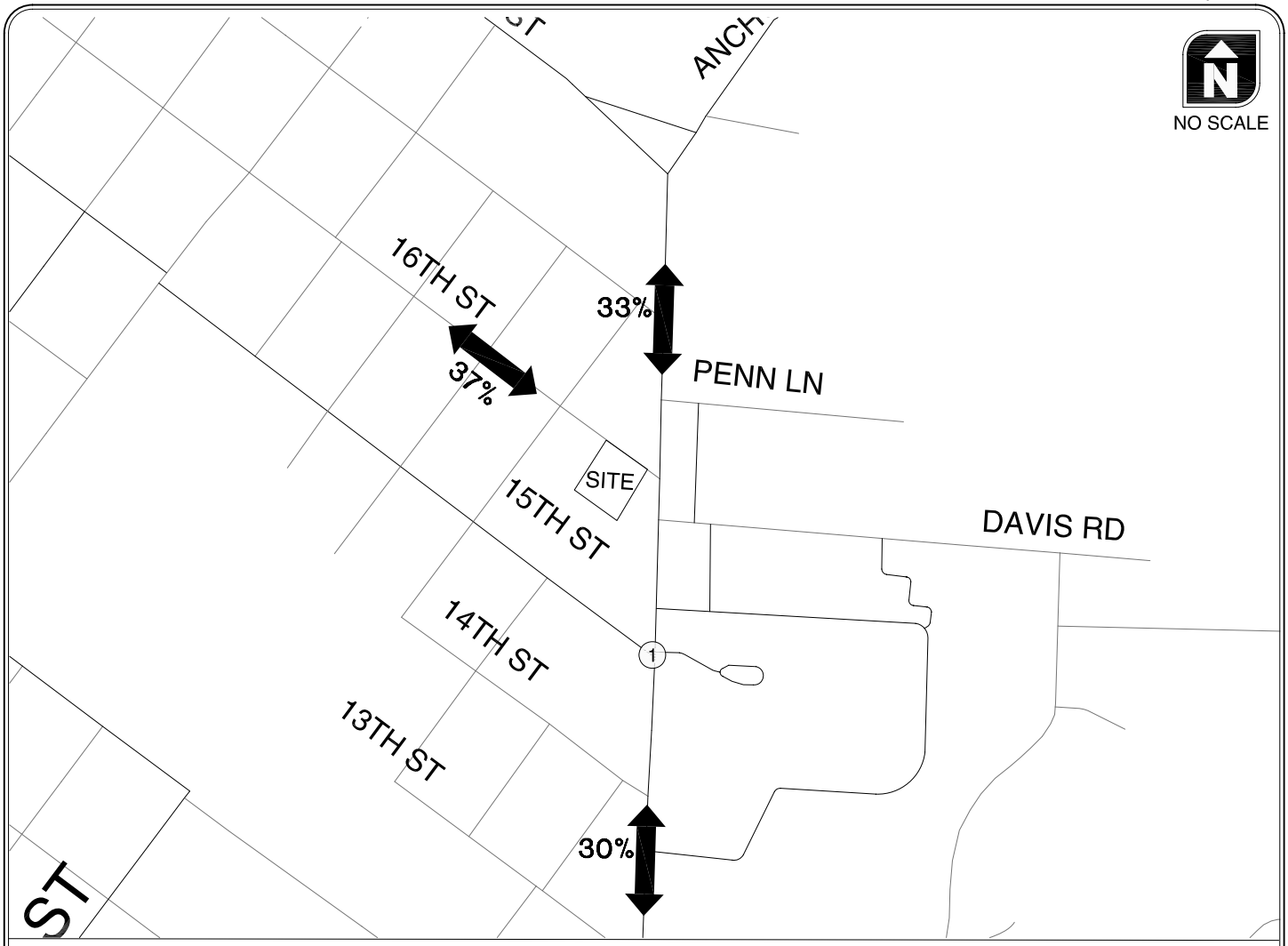
YEAR 2035 PROPOSED ZONING TRAFFIC CONDITIONS

The proposed zoning analysis forecasts how the study intersection will operate assuming a reasonable worst case development under the proposed zone change and Comprehensive Plan Amendment. The medical office building trips shown in Table 2 were distributed onto the study area roadway system based on forecast travel patterns identified in the Providence Willamette Falls Medical Center Master Plan.

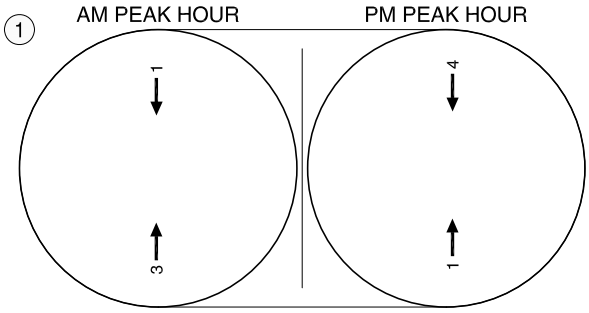
Figure 3 illustrates the future traffic conditions under both the existing and proposed zoning. It illustrates the trip distribution pattern along with the assignment of the proposed zoning trips at the study intersection. The horizon year 2035 existing zoning traffic volumes were added to the net new trips shown to arrive at the year 2035 proposed zoning traffic volumes.

Intersection Operations

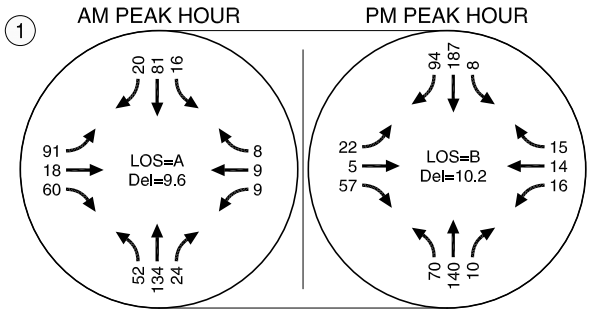
As shown in Figure 3, the study intersection is forecast to continue to operate acceptably assuming the buildout of the property consistent with the proposed zone change and Comprehensive Plan amendment. As such, the proposed amendments do not create a significant effect on the transportation system as defined by the TPR. *Attachment "E" includes the year 2035 proposed zoning traffic conditions level-of-service analysis worksheets.*



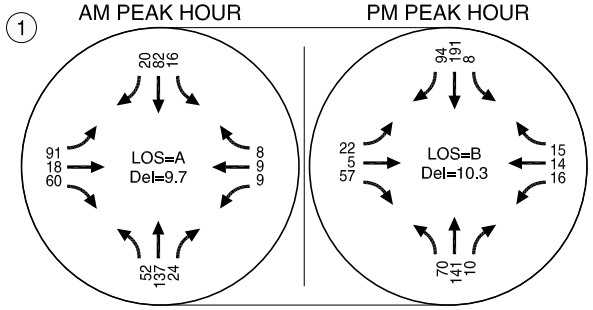
NET NEW TRIPS THROUGH STUDY INTERSECTION



EXISTING ZONING 2035 TRAFFIC OPERATIONS



PROPOSED ZONING 2035 TRAFFIC OPERATIONS



LEGEND

TRIP DISTRIBUTION PATTERN
LOS = INTERSECTION LEVEL OF SERVICE
Del = INTERSECTION AVERAGE CONTROL DELAY

2035 FUTURE TRAFFIC CONDITIONS
UNDER EXISTING AND PROPOSED ZONING
OREGON CITY, OREGON

FIGURE 3

H:\profile\19072 - Providence Willamette Falls\dwgs\19072_Fig tia.dwg Jul 23, 2015 - 3:07pm - CBREHMER Layout Tab: Fig03

POLICY REVIEW

Approval of the Comprehensive Plan Amendment is dependent on meeting the criteria outlined in the Transportation Planning Rule (TPR). Table 3 summarizes the criteria identified in the TPR and their applicability to the proposed zone change and Comprehensive Plan Amendment.

Table 3: TPR Criteria

Section	Criteria	Applicable?
1	Describes how to determine if a proposed land use action results in a significant impact.	Yes
2	Describes measures for complying with Criteria #1 where a significant impact is determined.	No
3	Describes measures for complying with Criteria #1 and #2 without assuring that the allowed land uses are consistent with the function, capacity and performance standards of the facility	No
4	Determinations under Criteria #1, #2, and #3 are coordinated with other local agencies.	No
5	Indicates that the presence of a transportation facility shall not be the basis for an exception to allow development on rural lands.	No
6	Indicates that local agencies should credit developments that provide a reduction in trips.	No
7	Outlines requirements for a local street plan, access management plan, or future street plan.	No
8	Defines a mixed-use, pedestrian-friendly neighborhood	No
9	Indicates that there is not a significant affect if the proposed zoning is consistent with existing plans	No
10	Defines a multi-modal mixed-use area (MMA) and the requirements that support it.	No
11	Encourages establishment of traded-sector jobs	No

As noted in Table 3, there is one criterion that applies to the proposed zone change and Comprehensive Plan Amendment. The criterion is provided below in italics with our response shown in standard font.

(1) If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:

(a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);

(b) Change standards implementing a functional classification system; or

(c) Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.

(A) Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;

(B) Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or

(C) Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.

Response: Per the analysis described above, the study intersection is forecast to meet Oregon City's operational standards with and without the proposed zone change and Comprehensive Plan Amendment during the weekday AM and PM peak hours, and therefore there is no significant effect. Further, the proposed zone change is consistent with the existing functional classifications of the adjacent street system and adopted standards; no changes to the standards are required as part of the proposed amendments.

CONCLUSION

The results of this study indicate that the proposed zone change and Comprehensive Plan Amendment are consistent with the requirements of the Transportation Planning Rule and applicable City standards. The key findings of this analysis are summarized below.

FINDINGS

- The study intersection operates acceptably during the weekday AM and PM peak hours under all scenarios analyzed.
- Buildout of the property consistent with the zoning designations could result in a net increase of 188 daily trips, including 12 trips (10 inbound, 2 outbound) during the weekday AM peak hour and 18 trips (4 inbound, 14 outbound) during the weekday PM peak hour.
- The proposed zone change and Comprehensive Plan amendment is not anticipated to result in a significant effect on the transportation system, as defined by Oregon's Transportation Planning Rule.
- No mitigation measures or changes to the transportation standards are needed to support the proposed zone change and Comprehensive Plan amendment.

Please let us know if you need any additional information or have any questions about the analysis presented herein.

ATTACHMENTS

A. Traffic Counts

B. Description of Level of Service

C. Existing Traffic Conditions

D. Horizon Year 2035 Existing Zoning Traffic Conditions

E. Horizon Year 2035 Proposed Zoning Traffic Conditions

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

LOCATION: Division St -- 15th St/Providence Dwy

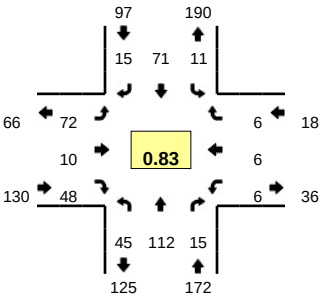
CITY/STATE: Oregon City, OR

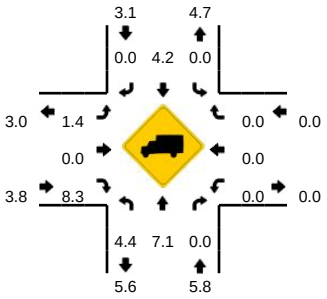
QC JOB #: 13432701

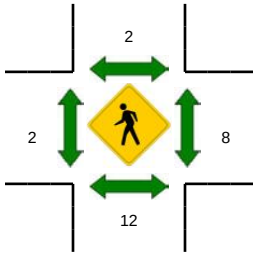
DATE: Tue, Jun 30 2015

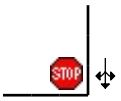
Peak-Hour: 7:35 AM -- 8:35 AM

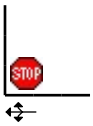
Peak 15-Min: 7:45 AM -- 8:00 AM

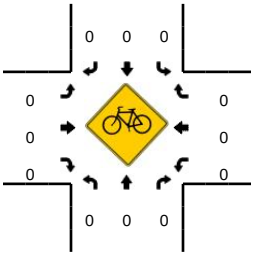


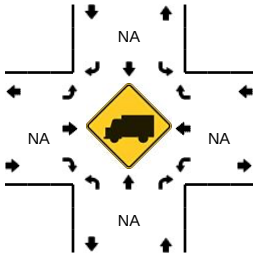


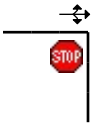


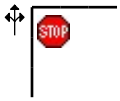


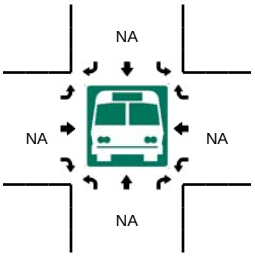












5-Min Count Period Beginning At	Division St (Northbound)				Division St (Southbound)				15th St/Providence Dwy (Eastbound)				15th St/Providence Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	4	0	0	1	2	3	0	4	2	4	0	0	0	0	0	23	
7:05 AM	6	8	1	0	0	1	0	0	3	1	0	0	0	0	1	0	21	
7:10 AM	4	9	0	0	0	5	3	0	1	0	3	0	0	0	0	0	25	
7:15 AM	2	3	1	0	1	7	2	0	4	2	3	0	0	1	1	0	27	
7:20 AM	3	8	1	0	2	6	0	0	3	0	4	0	0	1	1	0	29	
7:25 AM	0	7	1	0	1	7	3	0	3	0	4	0	0	0	1	0	27	
7:30 AM	1	6	0	0	0	6	0	0	6	1	8	0	1	0	0	0	29	
7:35 AM	3	14	1	0	0	5	0	0	4	0	3	0	2	0	2	0	34	
7:40 AM	8	10	0	0	3	7	1	0	4	1	3	0	0	2	0	0	39	
7:45 AM	3	10	2	0	1	6	1	0	10	1	2	0	0	1	1	0	38	
7:50 AM	3	13	4	0	0	11	2	0	4	1	7	0	0	0	0	0	45	
7:55 AM	3	11	0	0	2	9	2	0	8	2	3	0	1	1	0	0	42	379
8:00 AM	5	5	2	0	1	6	0	0	7	2	6	0	1	1	0	0	36	392
8:05 AM	2	9	1	0	2	6	2	0	7	1	3	0	0	0	0	0	33	404
8:10 AM	5	4	0	0	0	2	2	0	7	1	6	0	0	0	0	0	27	406
8:15 AM	2	11	2	0	0	5	0	0	5	0	2	0	0	0	2	0	29	408
8:20 AM	3	6	1	0	0	3	3	0	8	1	5	0	0	0	0	0	30	409
8:25 AM	4	11	1	0	1	4	0	0	3	0	4	0	1	1	0	0	30	412
8:30 AM	4	8	1	0	1	7	2	0	5	0	4	0	1	0	1	0	34	417
8:35 AM	5	11	0	0	0	6	4	0	1	1	2	0	0	0	2	0	32	415
8:40 AM	1	9	1	0	0	7	1	0	6	0	3	0	2	0	1	0	31	407
8:45 AM	3	10	1	0	1	9	6	0	1	3	5	0	1	0	3	0	43	412
8:50 AM	4	9	2	0	3	6	3	0	6	0	2	0	1	1	1	0	38	405
8:55 AM	2	12	1	0	0	10	1	0	5	2	6	0	0	0	0	0	39	402

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	36	136	24	0	12	104	20	0	88	16	48	0	4	8	4	0	500
Heavy Trucks	0	12	0		0	4	0		0	0	4		0	0	0		20
Pedestrians		16				4				0				16			36
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/20/2015 12:59 PM

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

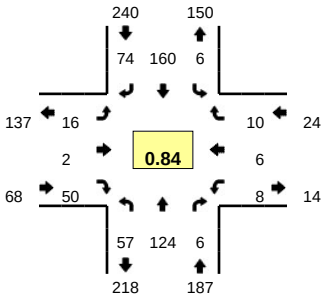
Type of peak hour being reported: Intersection Peak

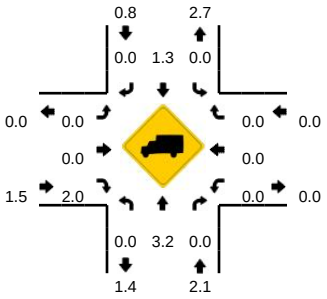
Method for determining peak hour: Total Entering Volume

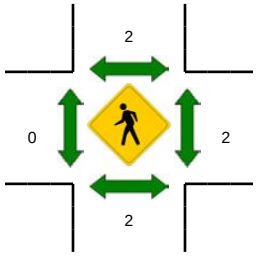
LOCATION: Division St -- 15th St/Providence Dwy
CITY/STATE: Oregon City, OR

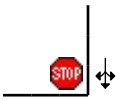
QC JOB #: 13432702
DATE: Tue, Jun 30 2015

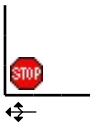
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

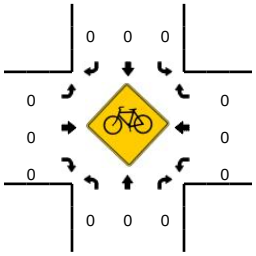


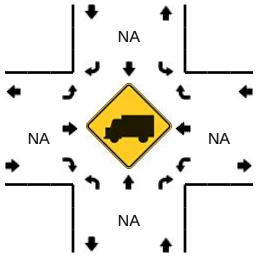


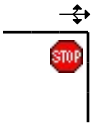


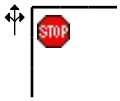


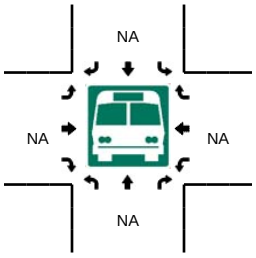












5-Min Count Period Beginning At	Division St (Northbound)				Division St (Southbound)				15th St/Providence Dwy (Eastbound)				15th St/Providence Dwy (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	5	1	0	0	8	4	0	2	1	6	0	1	1	1	0	33	
4:05 PM	13	8	1	0	0	9	7	0	2	1	4	0	0	1	0	0	46	
4:10 PM	3	11	0	0	2	9	5	0	3	0	5	0	0	3	1	0	42	
4:15 PM	8	8	0	0	0	11	3	0	2	0	4	0	2	0	0	0	38	
4:20 PM	11	12	1	0	1	11	11	0	4	0	4	0	2	1	2	0	60	
4:25 PM	4	17	0	0	0	13	4	0	1	1	3	0	0	1	0	0	44	
4:30 PM	7	8	0	0	2	16	9	0	1	0	6	0	0	0	2	0	51	
4:35 PM	2	11	1	0	1	11	8	0	1	0	4	0	0	0	2	0	41	
4:40 PM	5	10	0	0	0	14	3	0	0	0	7	0	0	0	0	0	39	
4:45 PM	1	9	0	0	0	15	1	0	2	0	2	0	1	0	1	0	32	
4:50 PM	4	5	2	0	1	17	7	0	4	0	1	0	0	2	0	0	43	
4:55 PM	5	9	0	0	0	11	1	0	1	0	7	0	1	0	0	0	35	504
5:00 PM	3	11	0	0	0	12	10	0	0	0	4	0	1	0	0	0	41	512
5:05 PM	7	14	1	0	0	17	6	0	0	1	3	0	1	1	0	0	51	517
5:10 PM	5	9	0	0	0	11	9	0	1	0	2	0	0	1	1	0	39	514
5:15 PM	3	9	1	0	1	12	5	0	1	0	7	0	2	0	2	0	43	519
5:20 PM	5	12	0	0	1	15	2	0	1	0	4	0	0	0	0	0	40	499
5:25 PM	2	9	1	0	0	13	2	0	0	1	2	0	2	0	1	0	33	488
5:30 PM	7	2	0	0	0	9	4	0	0	0	1	0	0	1	0	0	24	461
5:35 PM	5	11	2	0	2	10	8	0	1	2	5	0	0	1	0	0	47	467
5:40 PM	4	6	1	0	0	12	5	0	2	0	3	0	0	0	1	0	34	462
5:45 PM	3	6	1	0	0	10	4	0	1	0	4	0	3	0	1	0	33	463
5:50 PM	2	8	1	0	0	16	2	0	0	0	5	0	1	0	0	0	35	455
5:55 PM	2	5	0	0	0	5	2	0	1	1	2	0	0	2	1	0	21	441

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	88	148	4	0	12	160	96	0	24	4	52	0	8	8	16	0	620
Heavy Trucks	0	4	0		0	0	0		0	0	0		0	0	0		4
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 7/20/2015 12:59 PM

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

Attachment B Description of Level-of-Service

DESCRIPTION OF LEVEL-OF-SERVICE

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from "A" to "F".1

Signalized Intersections

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service "D" is generally considered to represent the minimum acceptable design standard.

Table B1: Level-of-Service Definitions (Signalized Intersections)

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

1 Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table B2: Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and [20
C	>20 and [35
D	>35 and [55
E	>55 and [80
F	>80

Unsignalized Intersections

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service "E" is generally considered to represent the minimum acceptable design standard.

Table B3: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B4: Level-of-Service Criteria for Unsignalized Intersections

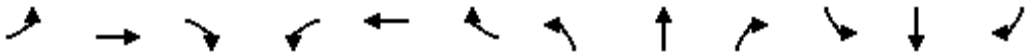
Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying

acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left-turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left-turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

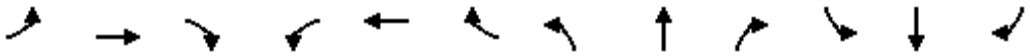
Attachment C Existing Traffic Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	72	10	48	6	6	6	45	112	15	11	71	15
Future Volume (vph)	72	10	48	6	6	6	45	112	15	11	71	15
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	87	12	58	7	7	7	54	135	18	13	86	18

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	157	21	207	117
Volume Left (vph)	87	7	54	13
Volume Right (vph)	58	7	18	18
Hadj (s)	-0.05	-0.13	0.10	-0.02
Departure Headway (s)	4.6	4.7	4.6	4.6
Degree Utilization, x	0.20	0.03	0.26	0.15
Capacity (veh/h)	721	690	754	743
Control Delay (s)	8.8	7.9	9.2	8.4
Approach Delay (s)	8.8	7.9	9.2	8.4
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.8			
Level of Service	A			
Intersection Capacity Utilization	35.1%	ICU Level of Service	A	
Analysis Period (min)	15			

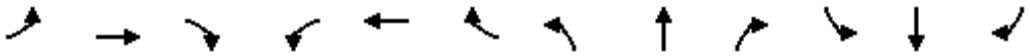


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	16	2	50	8	6	10	57	124	6	6	160	74
Future Volume (vph)	16	2	50	8	6	10	57	124	6	6	160	74
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	19	2	60	10	7	12	68	148	7	7	190	88

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	81	29	223	285
Volume Left (vph)	19	10	68	7
Volume Right (vph)	60	12	7	88
Hadj (s)	-0.37	-0.18	0.08	-0.17
Departure Headway (s)	4.7	5.0	4.6	4.3
Degree Utilization, x	0.11	0.04	0.28	0.34
Capacity (veh/h)	685	639	761	813
Control Delay (s)	8.3	8.2	9.3	9.4
Approach Delay (s)	8.3	8.2	9.3	9.4
Approach LOS	A	A	A	A

Intersection Summary				
Delay	9.2			
Level of Service	A			
Intersection Capacity Utilization	38.1%	ICU Level of Service	A	
Analysis Period (min)	15			

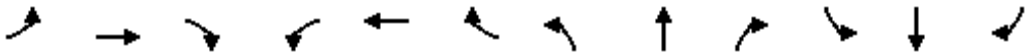
Attachment D Horizon Year 2035 Existing Zoning Traffic Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	91	18	60	9	9	8	52	134	24	16	81	20
Future Volume (vph)	91	18	60	9	9	8	52	134	24	16	81	20
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	110	22	72	11	11	10	63	161	29	19	98	24

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	204	32	253	141
Volume Left (vph)	110	11	63	19
Volume Right (vph)	72	10	29	24
Hadj (s)	-0.05	-0.12	0.07	-0.03
Departure Headway (s)	4.9	5.0	4.8	4.8
Degree Utilization, x	0.28	0.04	0.33	0.19
Capacity (veh/h)	687	635	721	700
Control Delay (s)	9.7	8.3	10.1	8.9
Approach Delay (s)	9.7	8.3	10.1	8.9
Approach LOS	A	A	B	A

Intersection Summary				
Delay	9.6			
Level of Service	A			
Intersection Capacity Utilization	40.2%	ICU Level of Service	A	
Analysis Period (min)	15			

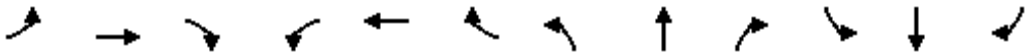


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	22	5	57	16	14	15	70	140	10	8	187	94
Future Volume (vph)	22	5	57	16	14	15	70	140	10	8	187	94
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	26	6	68	19	17	18	83	167	12	10	223	112

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	100	54	262	345
Volume Left (vph)	26	19	83	10
Volume Right (vph)	68	18	12	112
Hadj (s)	-0.33	-0.13	0.07	-0.18
Departure Headway (s)	5.1	5.3	4.8	4.5
Degree Utilization, x	0.14	0.08	0.35	0.43
Capacity (veh/h)	629	585	721	774
Control Delay (s)	8.9	8.8	10.3	10.7
Approach Delay (s)	8.9	8.8	10.3	10.7
Approach LOS	A	A	B	B

Intersection Summary				
Delay	10.2			
Level of Service	B			
Intersection Capacity Utilization	43.8%	ICU Level of Service	A	
Analysis Period (min)	15			

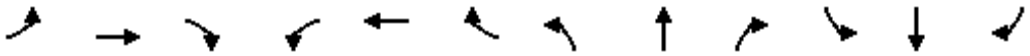
Attachment E Horizon Year 2035 Proposed Zoning Traffic Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	91	18	60	9	9	8	52	137	24	16	82	20
Future Volume (vph)	91	18	60	9	9	8	52	137	24	16	82	20
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	110	22	72	11	11	10	63	165	29	19	99	24

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	204	32	257	142
Volume Left (vph)	110	11	63	19
Volume Right (vph)	72	10	29	24
Hadj (s)	-0.05	-0.12	0.07	-0.03
Departure Headway (s)	4.9	5.1	4.8	4.8
Degree Utilization, x	0.28	0.04	0.34	0.19
Capacity (veh/h)	685	633	720	699
Control Delay (s)	9.7	8.3	10.2	8.9
Approach Delay (s)	9.7	8.3	10.2	8.9
Approach LOS	A	A	B	A

Intersection Summary				
Delay	9.7			
Level of Service	A			
Intersection Capacity Utilization	40.4%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	22	5	57	16	14	15	70	141	10	8	191	94
Future Volume (vph)	22	5	57	16	14	15	70	141	10	8	191	94
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
Hourly flow rate (vph)	26	6	68	19	17	18	83	168	12	10	227	112

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	100	54	263	349
Volume Left (vph)	26	19	83	10
Volume Right (vph)	68	18	12	112
Hadj (s)	-0.33	-0.13	0.07	-0.18
Departure Headway (s)	5.1	5.4	4.8	4.5
Degree Utilization, x	0.14	0.08	0.35	0.43
Capacity (veh/h)	627	583	720	774
Control Delay (s)	8.9	8.8	10.3	10.8
Approach Delay (s)	8.9	8.8	10.3	10.8
Approach LOS	A	A	B	B

Intersection Summary				
Delay	10.3			
Level of Service	B			
Intersection Capacity Utilization	44.1%	ICU Level of Service	A	
Analysis Period (min)	15			