STATE OF OREGON **INTEROFFICE MEMO**

Department of Transportation
Transportation Development Division
Mill Creek Office Park
555 13th Street NE Suite 2
Salem, Oregon 97301-4178
(503) 986-4110 FAX (503) 986-4174

File Code:

Date: January 26, 2006

TO: **Tom Guevara, Project Leader**
Region 3 Planning

FROM: **Alexander Bettinardi, Transportation Analyst**
Transportation Planning Analysis Unit

Peter Schuytema, P.E., Senior Transportation Analyst
Transportation Planning Analysis Unit

SUBJECT: **Technical Memo #4 –Future No-Build Analysis**
Constitution Area Refinement Study

The purpose of this memo is to present the future years, 2010 & 2030, No-Build conditions for the US 101 (Chetco Avenue) / Constitution Area Refinement Study. The 2010 and 2030 conditions were evaluated to describe the future traffic operating conditions for the study area.

The future no-build analysis found that LOS, v/c ratios, blocking conditions[1], and queue lengths[1] are unacceptable in 2010 and 2030 causing much of the study to have deteriorated beyond the OHP v/c criteria by 2030. The v/c ratios improve if the "Brookings EA - Alternative 5" is implemented, however, in both 2010 and 2030, the OHP v/c criteria was still exceeded.

The movement of most concern is the southbound left at Constitution Way and US 101, which is at an LOS F and v/c ratio of 2+, in 2010 and 2030. This failure causes North Bank and Constitution Way to be blocked by queues nearly 100% of the peak hour and to form queues which extend outside of the study area (greater than a quarter mile).

[1] Blocking conditions and queue lengths are produced by micro-simulation analysis and are used to help understand the "true" operating conditions of future scenarios. Significant blocking and queuing point to repeated intersection failure, which create unsafe driving conditions and lead to drivers acting erratically.

INTRODUCTION

Two "No-build" possibilities were investigated, representing the most likely future "No-build" cases. The two are described here:

A. No changes are made to the current study area, a true No-Build (Figure 2).
B. Assumes the Brookings EA Preferred Alternative – Alternative 5 is built and functioning by 2010, a highly plausible No-Build (Figure 7).

No-Build A assumed that no other infrastructure within the study area is changed (Figure 1), while No-Build B assumed that the preferred alternative, "Alternative 5", from the "Downtown Brookings – US101 Transportation Solutions Project" is constructed by 2010. The improvements to the study area that are in Alternative 5 are considered to be a part of the No-build scenario because current timelines suggest that these improvements will be in place by 2010, regardless of the outcomes or findings of this study.

Alternative 5 includes the following improvements in the study area:

- Oak Street & US 101: Left turns bays are added for all four approaches and a right turn bay is added to the northbound Oak Street approach.
- Alder Street & US 101: A left turn bay is added for westbound traffic on US 101 and the northbound left turn lane on Alder Street is removed so that only a right turn lane remains on Alder.
- Constitution Way & US 101: Constitution Way was outside of the study area for Alternative 5 and, consequently, retains its current geometry.

FUTURE TRAFFIC DEVELOPMENT

Future year 2010 and 2030 design hour volumes (DHV) in the study area were linearly interpolated and extrapolated from the published Brookings EA volumes. For No-Build A, future volumes were developed using the base year 2002 and future year 2027 no-build volumes from the Downtown Brookings Transportation Solutions EA. For No-Build B, the Brookings EA Alternative 5 2007 and 2027 volumes were used to find the 2010 and 2030 volumes

<u>Weigh Station:</u>

The ODOT Weigh Station is one-way, with no entering traffic from US 101, and is stop-controlled at the intersections of North Bank / Azalea Park Road / Constitution Way and US 101. Approximately 30 trucks are predicted to use the weigh station during the peak hour in 2030 (20 trucks during the peak hour in 2010) for No-Build A & B. A botanical garden is located between Constitution Way and the ODOT Weigh Station. No parking is provided for the botanical garden therefore, visiting tourists and locals improperly use the Weigh Station lane to park and access the botanical garden. Tourists also improperly use the weigh station exit to turn onto US 101 because of the confusing North Bank / Constitution Way intersection. Locals improperly use the weigh station exit to turn onto US 101 when queues are long at the Constitution Way intersection. This improper use

has been calculated as approximately 25 vehicles in 2030 (15 vehicles for 2010) for No-Build A & B.

ANALYSIS METHODOLOGY

The v/c ratios and Level of Services (LOS) for signalized and unsignalized intersections were analyzed using Synchro (Version 6) and SimTraffic software. The 95th percentile queue length and blocking conditions were calculated using SimTraffic. US 101 between Oak and Alder Street is designated as part of a Special Transportation Area (STA), therefore Oregon Highway Plan (OHP) v/c standards of 0.90 (STA-statewide non-freight route) were applied at these two intersections. OHP v/c standards of 0.80 (statewide non-freight route) were applied to US 101 at the Weigh Station, Constitution Way and Bridge Street intersections and v/c standards of 0.85 (district / local interest roads) were applied to the intersection of Constitution Way, Azalea Park Rd, North Bank Road and the weigh station lane.

ANALYSIS RESULTS

Preliminary Signal Warrants:

There are eight traffic signal warrants found in the Manual on Uniform Traffic Control Devices (MUTCD), however OAR 734-020-0460 (1) stipulates that only MUTCD warrant 1 Case A and Case B may be used to project a future need for a traffic signal. The Transportation Planning Analysis Unit (TPAU) uses average daily traffic for preliminary signal warrant analysis rather than the MUTCD eighth highest hour volumes. Brookings is projected to have population of less than or very close to 10,000 therefore; seventy percent of the standard warrants were used for the preliminary signal warrant analysis. Meeting preliminary signal warrants does not guarantee that a signal will be installed. Before a signal can be installed, a traffic investigation must be conducted or reviewed by the Region Traffic Manager. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

Table 1 summarizes the results of the preliminary signal warrant analysis for the unsignalized intersections in the Constitution Area Refinement Study. Four intersections were evaluated for preliminary signal warrants. Constitution Way at US 101 met signal warrants in 2005 and continues to meet them in 2010 and 2030, for No-Build A & B. All other unsignalized intersections any not projected to meet preliminary signal warrants, again, regardless of No-Build.

Table 1. Future Preliminary Signal Warrants[1,2]

Location	Preliminary Signal Warrants Met for: 2010	2030
US 101 / Constitution Way	**Y**	**Y**
US 101 / Weigh Station	N	N
US 101 / Alder Street	N	N
North Bank / Azalea Park / Constitution Way	N	N

[1] **Black shaded cell's indicate preliminary signal warrants have been met**

[2] **Meeting preliminary signal warrants does not guarantee that a signal will be installed. Before a signal can be installed, a traffic investigation must be conducted or reviewed by the Region Traffic Manager. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.**

2010 No-Build Analysis Results:

For 2010, the two No-Build cases were evaluated to describe the future traffic operating conditions. Table 2 summarizes the controlling approach LOS and respective v/c ratio for the four unsignalized intersections in the study area and the intersection LOS and v/c for the signalized intersection at Oak and US 101 (LOS and v/c ratios for all movements along Constitution Way, the study area focus, are included in Figures 12 & 13).

Table 2. 2010 LOS and v/c Ratios the Five Intersections in the Study Area[1]

Intersection	Movement	LOS		v/c Ratio	
		A	B	A	B
Signalized Intersections					
• Oak & US 101		LOS B	LOS B	0.83	0.69
Unsignalized Intersections					
• Constitution & US 101	SBL	**LOS F**	**LOS F**	**2+**	**2+**
• Alder & US 101	NBL/WBL	**LOS F**	LOS C	**1.38**	0.37
• Weigh Station & US 101	SBR	LOS C	LOS C	0.12	0.12
• Constitution & N. Bank	NBLR	LOS B	LOS B	0.44	0.44

[1] Black shaded cells indicate that the standard is exceeded and the potential for crashes is highly increased

From Table 2, there are two movements that are beyond the maximum allowable LOS and v/c ratio in 2010, these are: the southbound left turn movement at Constitution Way and US 101 (LOS F, v/c ratio greater than 2.0); and northbound left turn movement at Alder and US 101 (LOS F, v/c ratio of 1.38). The southbound left turn movement at Constitution Way and US101 remains a constant issue for No-Build A & B. However, the northbound left turn movement at Alder and US 101 is removed in No-Build B, where Alternative 5 is built[2], which lowers the LOS and v/c ratio for Alder and US 101 to an acceptable level. In addition, No-Build B shows an improved v/c ratio for Oak and US

[2] The addition of Alternative 5 does not change the design of Constitution Way & US 101 or Constitution Way & North Bank (although it does change the design of Alder & US 101 and Oak and US 101). However, the addition of Alternative 5 does affect Constitution Way by increasing the thru capacity along US 101 and affecting traffic patterns along Constitution Way, increasing the volume along US 101 and decreasing turn movements onto and off of Constitution Way.

101. The northbound left-thru-right movement at Constitution Way and US 101, although not the controlling movement, also failed to meet LOS and v/c standards in 2010, having a LOS F for No-Build A & B and a v/c ratio of 1.08 and 1.01 respectively.

For most of the study area blocking conditions are relatively localized for the 2010 analysis. However, the Constitution Way & US 101 southbound left turn movement blocks the thru and right turn movements along with the upstream intersection (North Bank & Constitution), which includes the entrance to the weigh station, nearly 100% of the time regardless of if Alternative 5 is put in place or not (Table 3). Blocking the weigh station entrance will create a situation where heavy truck traffic will need to "force" their way into the weigh station, causing sight restrictions and unsafe driving conditions.

Similarly to the blocking conditions, queue lengths are at acceptable levels in 2010, except of those affected by the southbound movement at Constitution Way and US 101 (see Figures 3 & 4 and 8 & 9 for 2010 No-Build A & B 95th percentile queue lengths respectively).

Table 3. Future 2010 Blocking Conditions

Intersection	Approach	Blocked Bay	Blocked Intersection	Average % Time Blocked for Scenario:	
				A	B
US 101 & Constitution	SB		North Bank & Constitution	87%	91%
US 101 & Constitution	SB	SBL		99%	99%
US 101 & Alder	NBL	NBR		10%	N/A
US 101 & Oak	SBL	SBT		N/A	6%

<u>2030 No-Build Analysis Results:</u>

For 2030, the two No-Build cases were evaluated to describe the future traffic operating conditions. Table 4 summarizes the controlling approach LOS and respective v/c ratio for the four unsignalized intersections in the study area and the intersection LOS and v/c for the signalized intersection at Oak and US 101 (LOS and v/c ratios for all movements along Constitution Way, the study area focus, are included in Figures 12 & 13).

Table 4. 2030 LOS and v/c Ratios the Five Intersections in the Study Area[1]

Intersection	Movement	LOS		v/c Ratio	
		A	B	A	B
Signalized Intersections					
• Oak & US 101		**LOS F**	**LOS D**	**1.35**	**1.03**
Unsignalized Intersections					
• Constitution & US 101	N&SB-LTR	**LOS F**	**LOS F**	**2+**	**2+**
• Alder & US 101	N&WBL/WBL	**LOS F**	**LOS F**	**2+**	**1.93**
• Weigh Station & US 101	SBR	**LOS E**	**LOS E**	0.31	0.34
• Constitution & N. Bank	NBLR	LOS C	LOS C	0.72	0.76

[1] Black shaded cells indicate that the standard is exceeded and the potential for crashes is highly increased

When 2030 volumes are applied to No-Build A & B, Constitution Way and US 101 (all of the northbound and southbound movements), Oak and US 101, Alder and US 101 (westbound left), and Weigh Station & US 101 (southbound right) fail regardless of the No-Build case. Oak and US 101's LOS and v/c is above the maximum allowable for A & B, but improves significantly in B, the Alternative 5 build. For No-Build A, Oak and US 101 reaches the max v/c (0.90) by 2013 and a v/c of 1.0 by 2017. The construction of Alternative 5 slows the deterioration of Oak and US 101, however the max v/c is still reached before 2030, happening in 2023 (a v/c of 1.0 is reached in 2029 for No-Build B).

The northbound left turn movement at Alder and US 101 fails for No-Build A, where the movement is allowed, however, the WBL movement at Alder and US 101 fails for both A & B. The eastbound approach at Constitution Way and US 101 develops a LOS E by 2030 for No-Build A & B, although not the critical movement at this intersection (the v/c ratio remained below maximum allowable).

The extreme failures in 2030, at the intersection of Constitution Way and US 101, lead to the hypothesis that traffic would redistribute to locations with lower v/c ratios. Sensitivity tests were conducted to determine how the traffic would most likely redistribute given the assumption that vehicles would not wait at a location with a v/c greater than 2.0. These tests revealed that in 2030, even one vehicle attempting to make a left on to, or across US 101 from Constitution Way, would create a v/c greater than 2.0. This created the scenario that all thru and left turning vehicles southbound on Constitution Way would have to divert to Oak Street and then go south on US 101. This case created v/c ratios above 2.0 at the intersections of Oak & US 101 and Alder & US 101.

These findings lead to the conclusion that the entire study area would, essentially, be at a jam density (above capacity) by the year 2030. This made any redistribution of volume an impractical task, and left the main finding that the study area for No-build A & B, critically fails by 2030 (similar findings, although not as severe, were found for 2010, and alternative traffic patterns were rejected for the same reasons).

Unlike 2010, by the year 2030 all five intersections in the study area have developed significant blocking issues, which vary between No-Build A & B. Blockage greater than 5% of the time can have a significant effect on an intersection's operation. If too many vehicles are in the queue, or stopped at an intersection, they could "back-up" or block turn refuges and/or adjacent intersections. Percent time blocked is equivalent to percent time of intersection or cycle failure. The measure of "percent time blocked" is used to track the reason of failure downstream to origin of the congestion. Table 5 reports the percent time blocked conditions for the future year, 2030.

Table 5. Future 2030 Blocking Conditions

Intersection	Approach	Blocked Bay	Blocked Intersection	Average % of Peak Hour Blocked for Scenario:	
				A	B
US 101 & Constitution	WB	WBL		66%	74%
US 101 & Constitution	WB	WBR		43%	38%
US 101 & Constitution	SB		North Bank & Constitution	99%	80%
US 101 & Constitution	SB	SBL		100%	87%
US 101 & Weigh Sta.	SB		North Bank & Constitution	94%	88%
US 101 & Alder	NBL	NBR	US 101 & Constitution	79%	N/A
US 101 & Alder	NB		Alder & Railroad	62%	77%
US 101 & Alder	WB		US 101 & Constitution	46%	51%
US 101 & Alder	WBL	WBT		N/A	78%
US 101 & Oak	WB		US 101 & Alder	16%	7%
US 101 & Oak	WB	WBL		N/A	8%
US 101 & Oak	EB		US 101 & Fern	46%	52%
US 101 & Oak	EB	EBL		N/A	59%
US 101 & Oak	NB		Oak & Railroad	0%	21%
US 101 & Oak	SB		Oak & Redwood	36%	74%
US 101 & Oak	SB	SBL		N/A	71%

With a few exceptions every approach in the study area is predicted to experience a level of blocking in 2030 under No-build A & B. An intersection of important note is Oak and US 101. By 2030, Oak / US 101 fails during the design hour for No-Build A & B. This failure creates queues that propagate upstream through the Constitution Way / US 101 intersection and will be an issue for Constitution Way independent of any build alternative. The queues from Oak & US 101 will also block the NBL movement at Alder & US 101 (for No-Build A) and the weigh station exit. The weigh station exits onto US 101, and with standing queues on US 101, the heavy vehicle traffic will have to "force" their way out of the weigh station and onto US 101. This will be an issue regardless of the solution at Constitution Way, unless the weigh station is moved, to area outside of the Brookings EA and Constitution Way Study areas.

Similarly to the future year 2010, in 2030 the southbound movements at Constitution Way & US 101 are creating blocking conditions nearly 100% of the time. The southbound left turn lane is blocked 100% of the time, indicating that there is always a vehicle blocking the entrance to the left turn bay, whether a left turner or not. This creates blockage in the North Bank & Constitution Way intersection 94% of the time under No-Build A. Again, this also creates a blocking condition for the weigh station entrance, causing heavy vehicles to "force" their entrance into the weigh station, creating a dangerous and unsafe situation.

The southbound Constitution Way & US 101 percentages do decrease with No-Build B, however, over the entire study area no clear trend for blocking conditions was found between A and B. The lack of a relationship is due to high variation in blocking percentages when the queues propagate outside the boundaries of the study area. Increasing the modeled area to include all queues was considered, but later rejected, as increasing storage areas in the model would not represent the "real world" case and adding to the modeled network would be outside the scope of this project. The main conclusion to be drawn here is that, both No-build A & B fail critically, for all intersections in the study area, when blocking conditions are considered.

Similarly to the blocking conditions, queuing is predicted to be a significant problem for most approaches in the study area. Again the key issue being that queues extend outside the model boundaries. Like blocking conditions no clear benefits were seen between No-Build A & B (see Figures 5 & 6 and 10 & 11 for 2030 No-Build A & B 95th percentile queue lengths respectively).

SUMMARY

The Future No-Build Analysis indicates that:

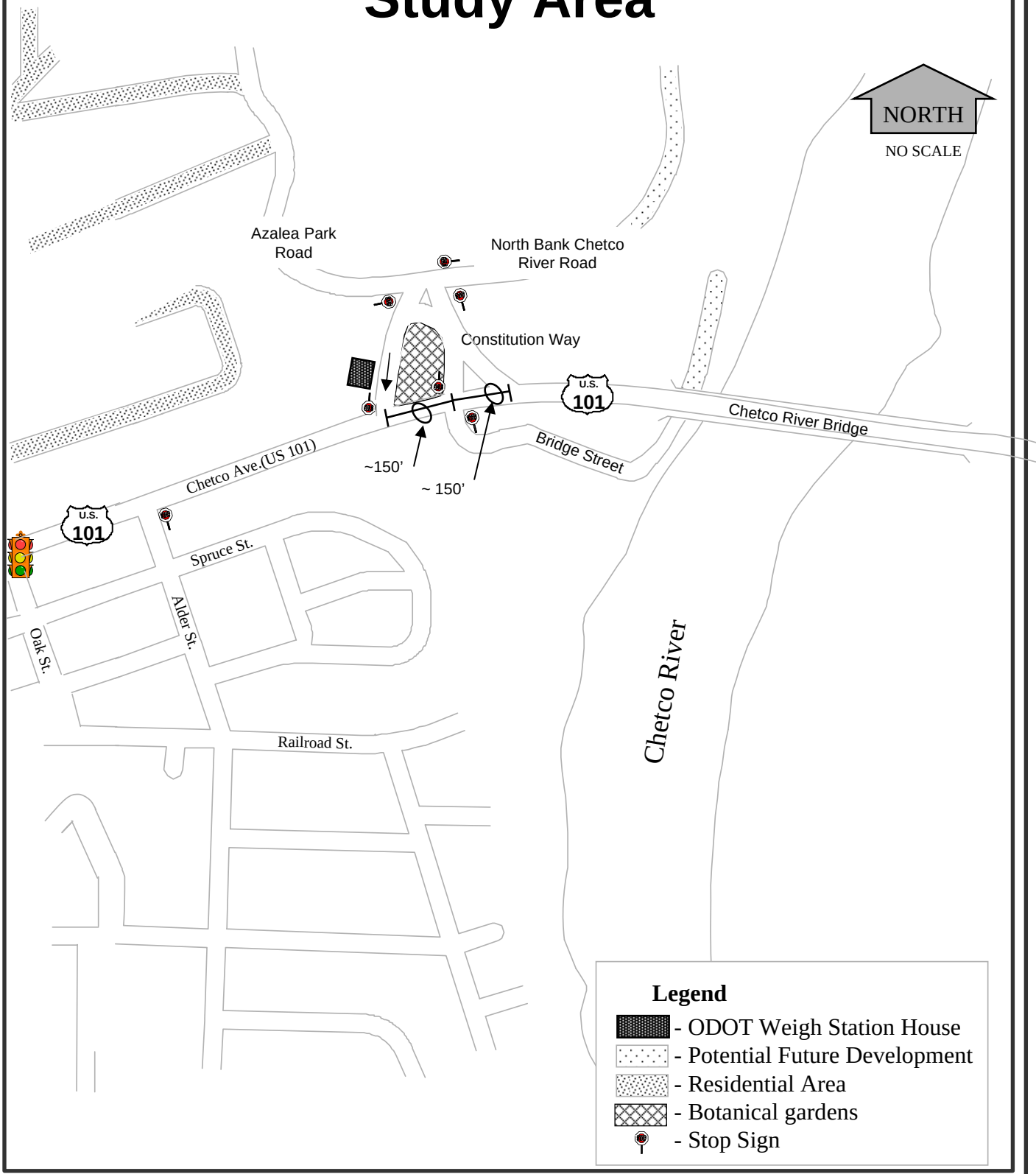
- No-Build B, which includes Alternative 5 from the Brookings Transportation Solutions EA has lower v/c ratios and better LOS than No-Build A.
- The stop controlled intersection at Constitution Way and US 101 creates significant and beyond acceptable (above 0.85 v/c or lower than LOS C) queuing, blocking, LOS and v/c conditions in 2010 and 2030.
- The operation of Constitution Way and North Bank is adversely, and greatly, affected by queuing caused by the southbound left movement at Constitution Way and US 101 in 2010 (LOS F, v/c 2+) and all of the southbound movements (left-thru-right) by 2030 (LOS F, v/c 2+).
- In 2010 and 2030, the queuing along Constitution Way blocks the entrance to the weigh station creating a situation where heavy vehicles must "force" their way into the weigh station, limiting sight distance and creating unsafe driving conditions. In addition, by 2030 queuing has formed along US 101 at the exit of the weigh station, causing a similar situation for the exit of heavy vehicles.
- By 2030 Oak and US 101 has failed for No-Build A & B. The queuing from this intersection will propagate into any solution at the Constitution Way / US 101 intersection and cause issues for the weigh station exit. For the weigh station to avoid these issues, it will have to be moved outside of the both the Brookings EA and Constitution Way study areas.
- Redistribution of the volume in the study area to locations with higher LOS and lower v/c ratios had no effect on the overall operations of the study area. Meaning that the study area has unacceptable LOS and v/c ratios regardless of how the traffic attempts to avoid areas of high congestion.

If there are any questions or comments, please contact Peter Schuytema at 503-986-4110 or Alex Bettinardi at 503-986-4398.

---

cc: Ray Lapke, Region 3 Traffic
Mark Thompson, Region 3 Traffic
Ron Hughes, Region 3 Access Management
Ingrid Weisenbach, Region 3 Project Delivery
Dorothy Upton, Transportation Planning Analysis Unit
Christina McDaniel-Wilson, Transportation Planning Analysis Unit
File

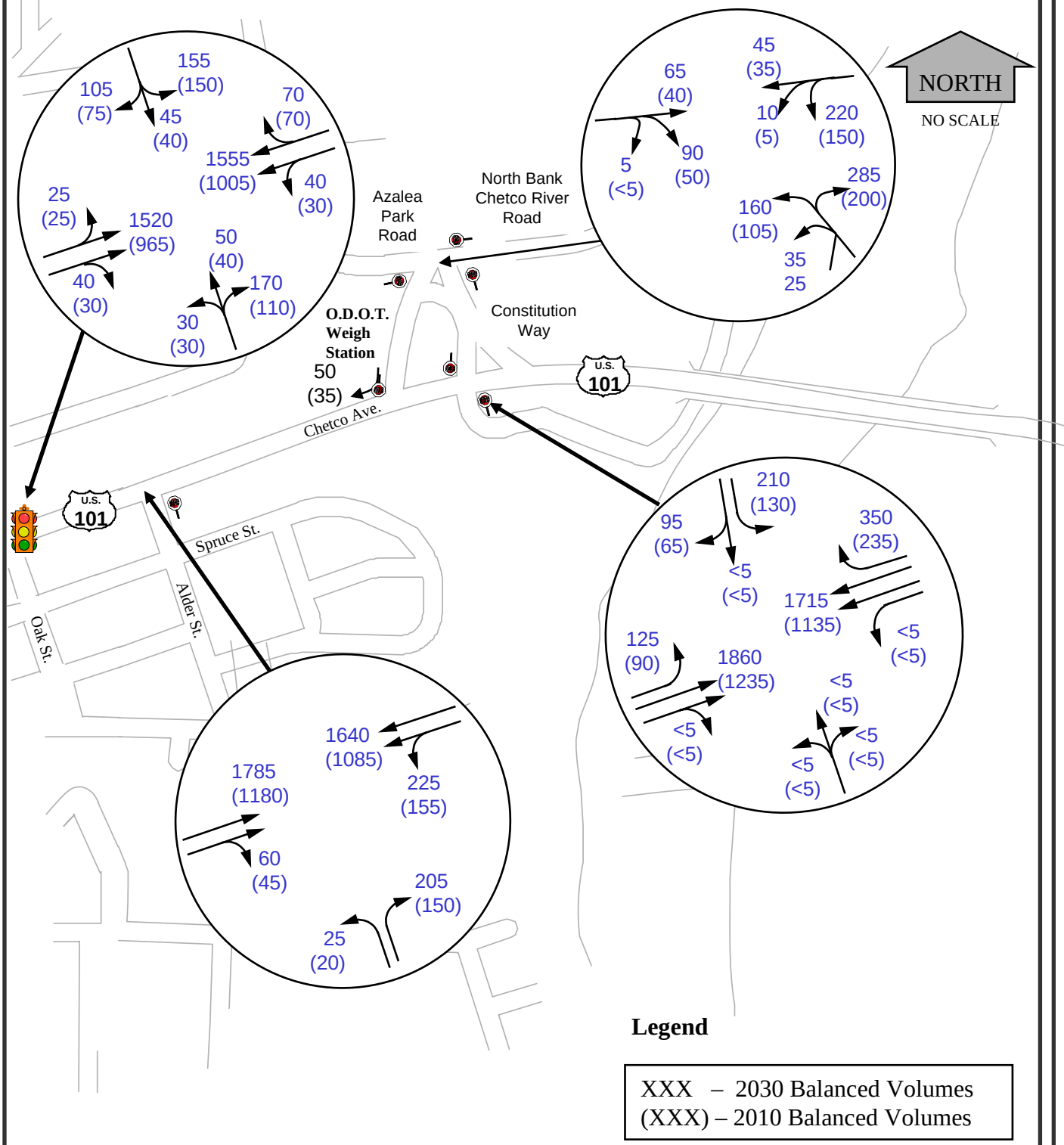
Study Area



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY AREA	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 1
	Date : 11/28/2005	**Rev. By: P. Schuytema,PE**	

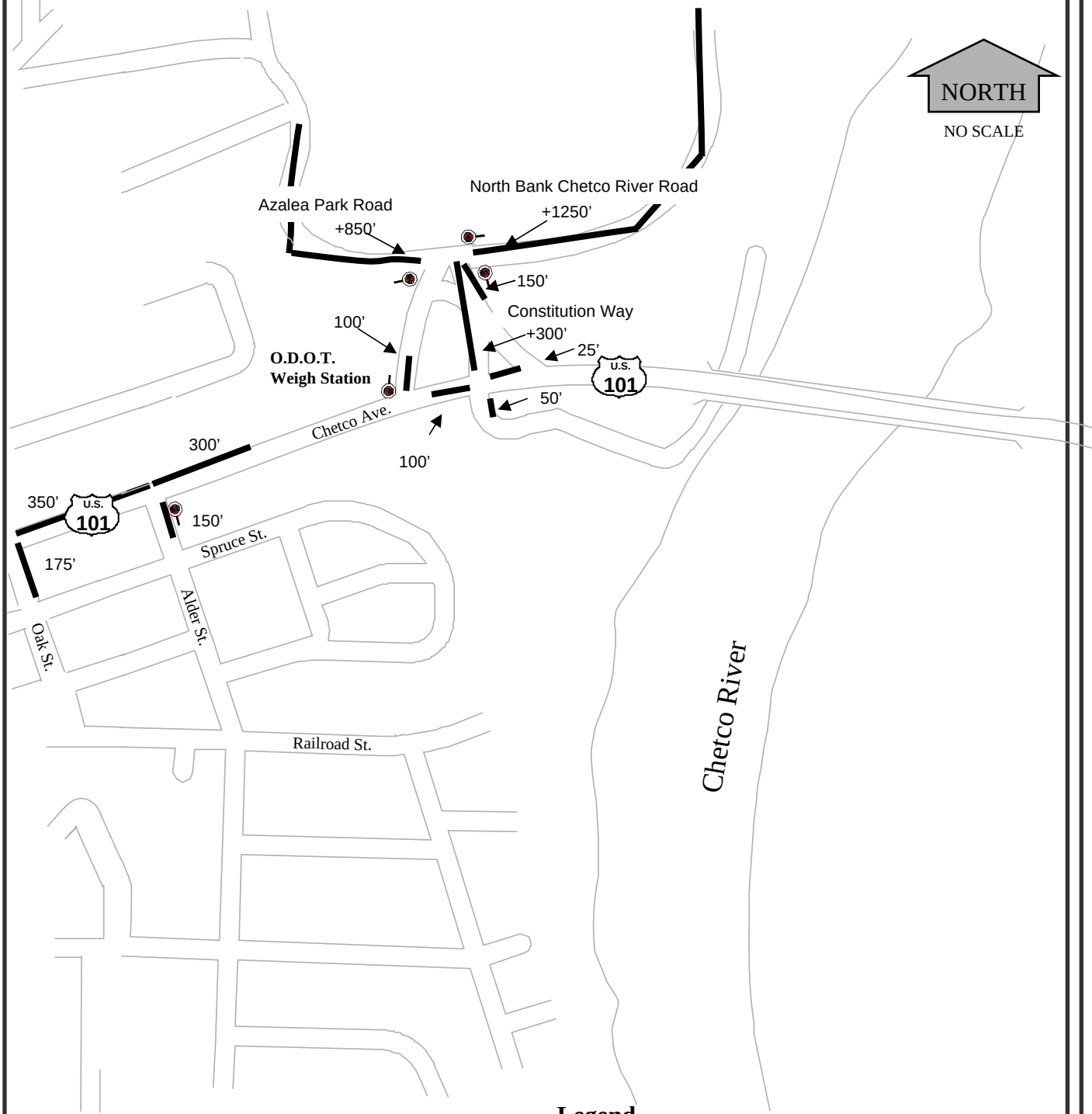
Future Year – No Build A



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** TRANSPORTATION PLANNING ANALYSIS UNIT

CONSTITUTION AREA REFINEMENT STUDY FUTURE YEAR BALANCED DESIGN HOUR VOLUMES (MP 357.49 TO MP 357.87) No-Build A	File :ConWay_TM4.PPT	Prepared By: A.Bettinardi	FIGURE 2
	Date : 12/12/2005	Rev. By: P. Schuytema,PE	

Year 2010 – No Build A



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2010 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 3
	Date : 12/13/2005	**Rev. By: P. Schuytema,PE**	

Year 2010 – No Build A

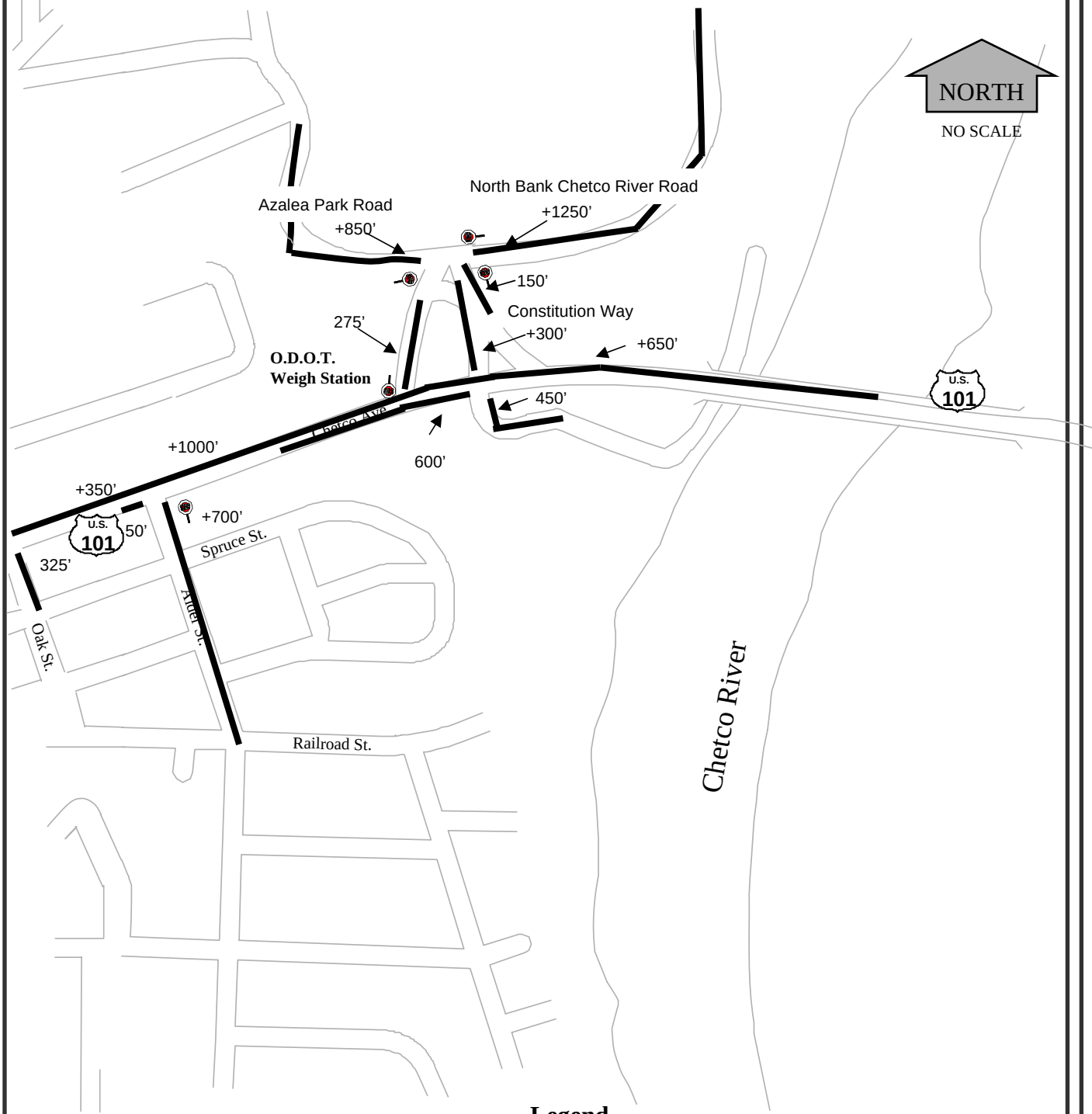
Legend

XXX – 2010 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2010 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 4
	Date : 12/13/2005	**Rev. By: P. Schuytema,PE**	

Year 2030 – No Build A



Legend

XXX – 2030 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2030 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 5
	Date : 12/13/2005	**Rev. By: P. Schuytema,PE**	

Year 2030 – No Build A

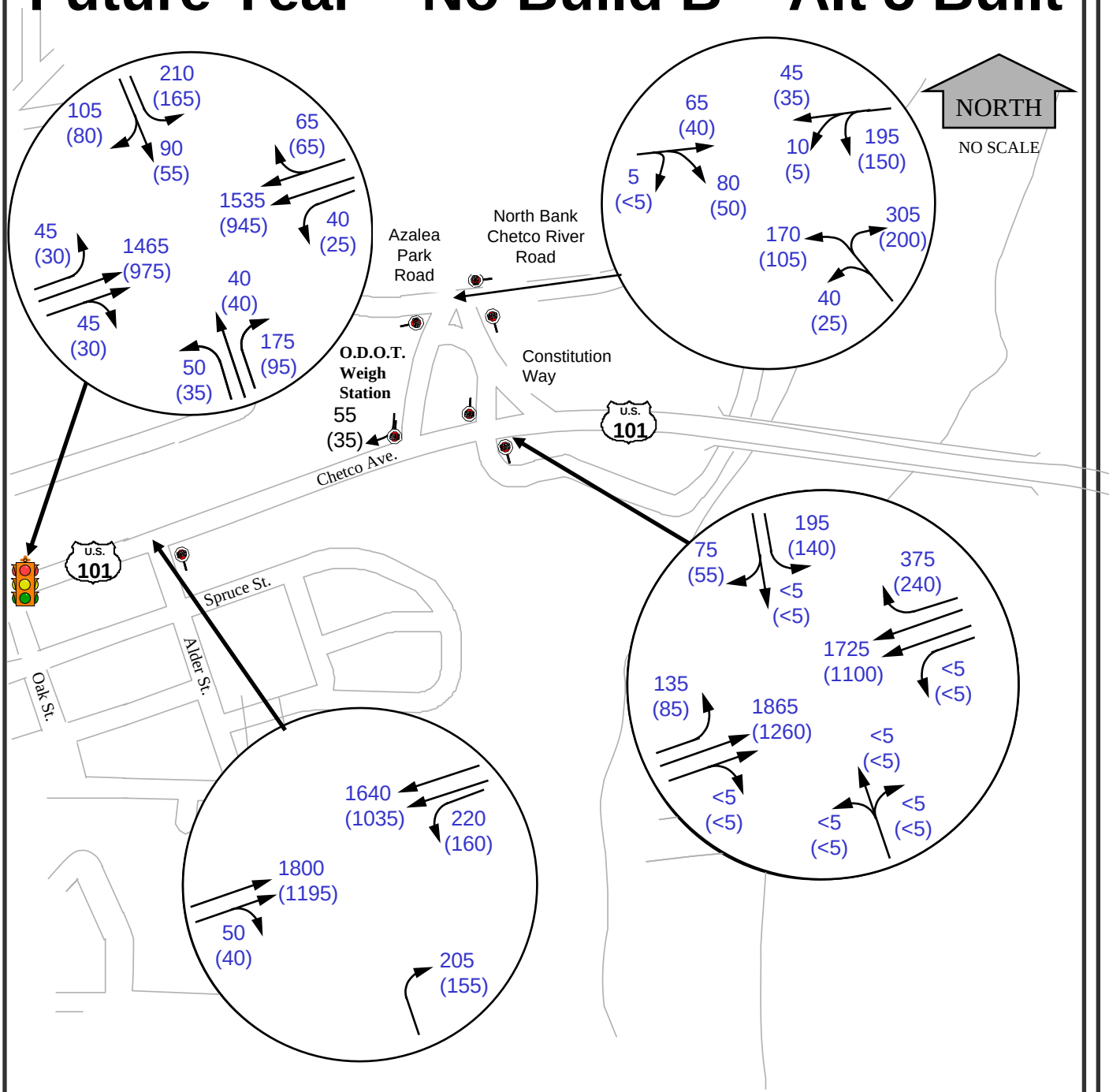
Legend

XXX – 2030 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2030 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 6
	Date : 12/13/2005	**Rev. By: P. Schuytema,PE**	

Future Year – No Build B – Alt 5 Built



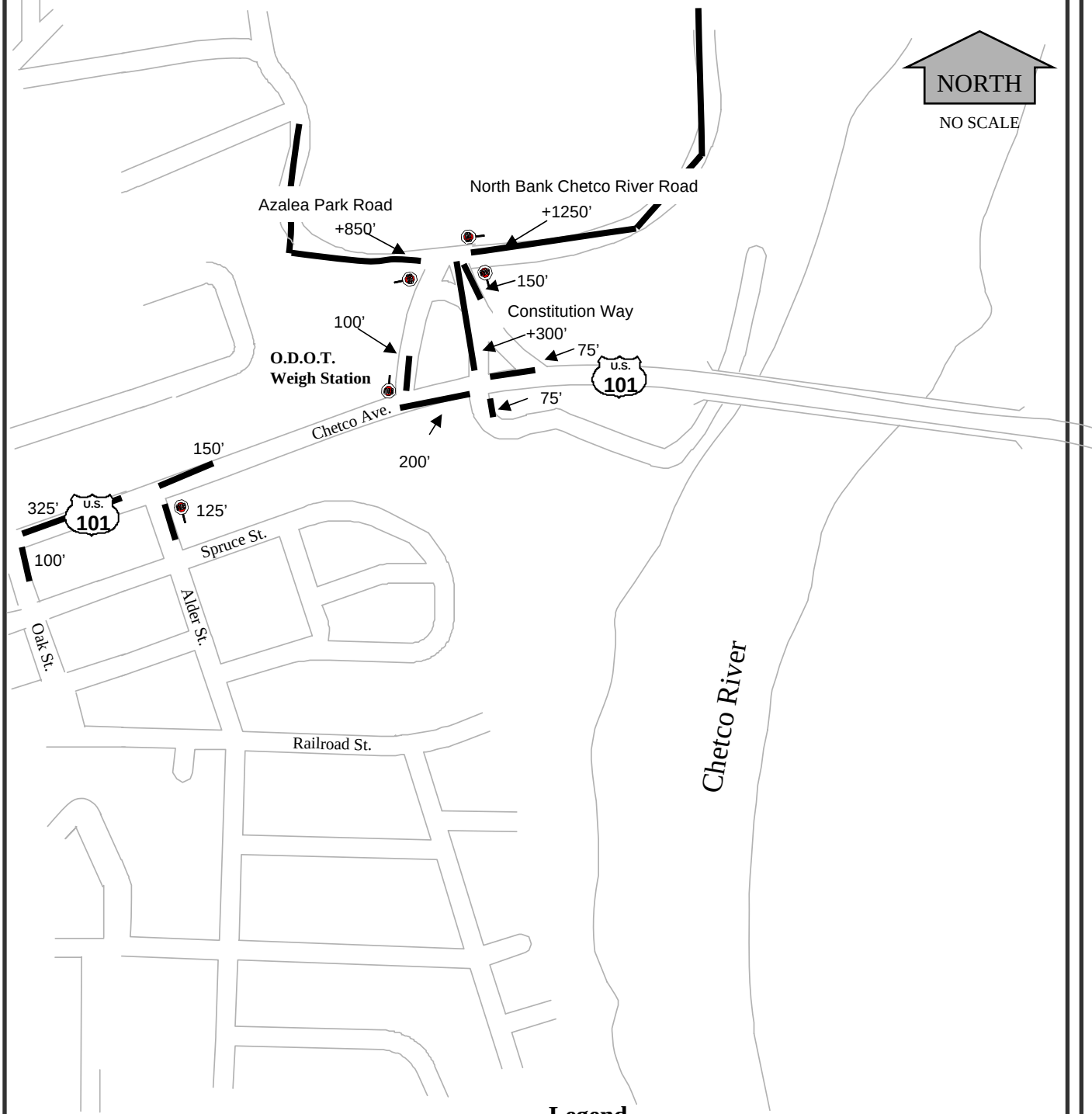
Legend

XXX – 2030 Balanced Volumes
(XXX) – 2010 Balanced Volumes

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY FUTURE YEAR 2010 & 2030 BALANCED VOLUMES – No Build B - Assumes that Alternative 5 is built.	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 7
	Date : 12/14/2005	**Rev. By: P. Schuytema,PE**	

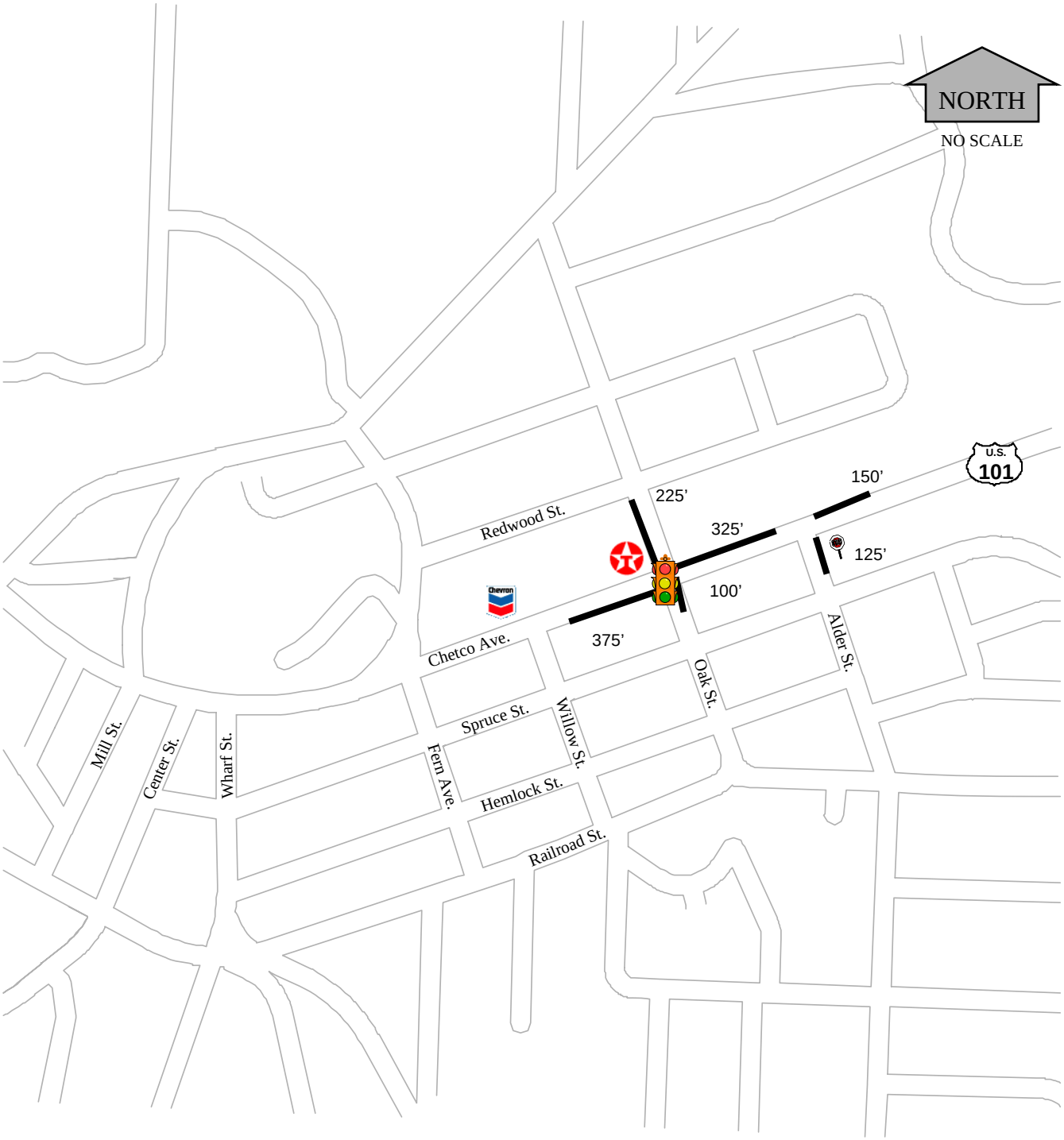
Year 2010 – No Build B – Alt 5 Built



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2010 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 8
	Date : 12/15/2005	**Rev. By: P. Schuytema,PE**	

Year 2010 – No Build B – Alt 5 Built



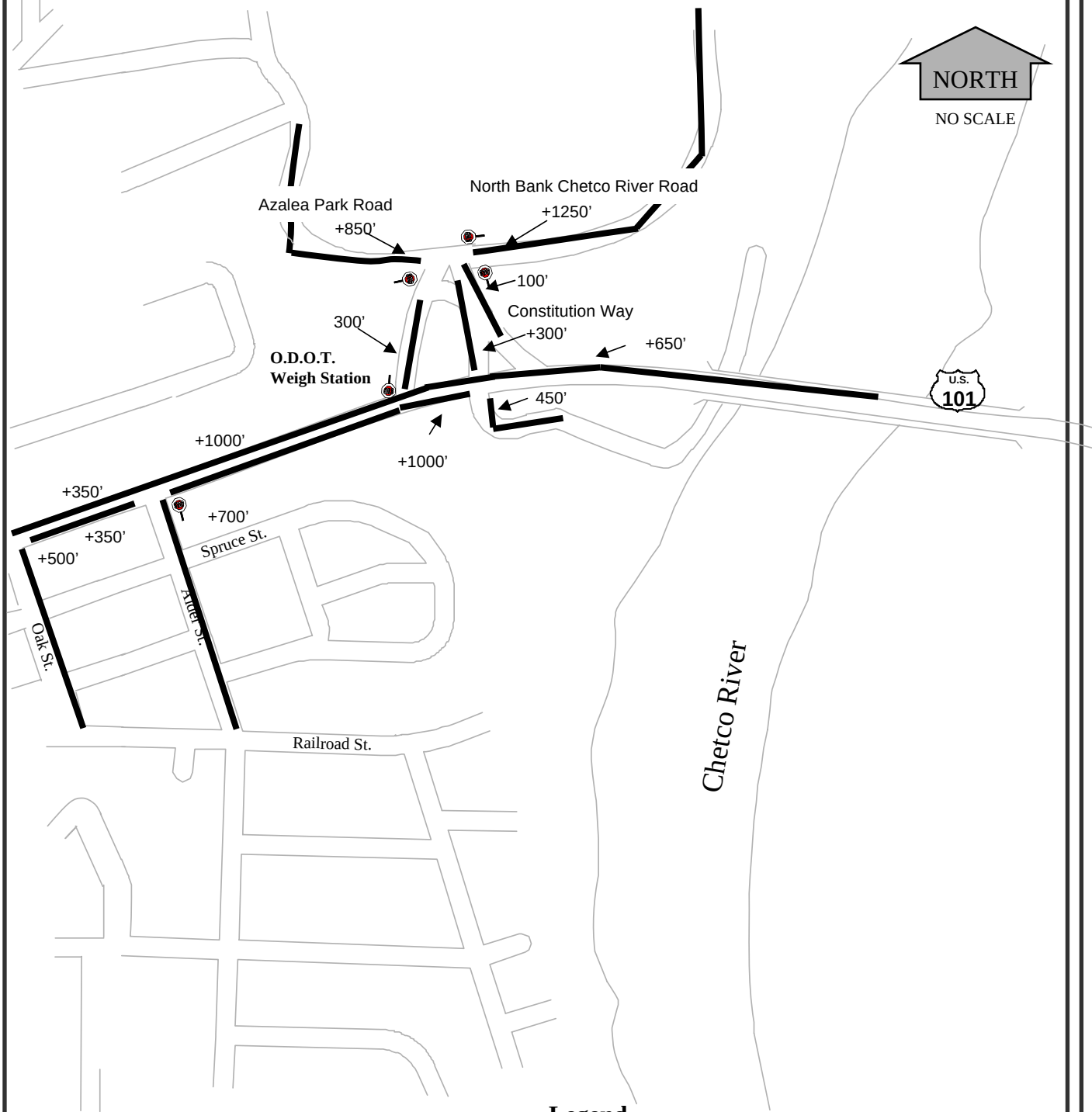
Legend

XXX – 2010 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2010 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 9
	Date : 12/15/2005	**Rev. By: P. Schuytema,PE**	

Year 2030 – No Build B – Alt 5 Built



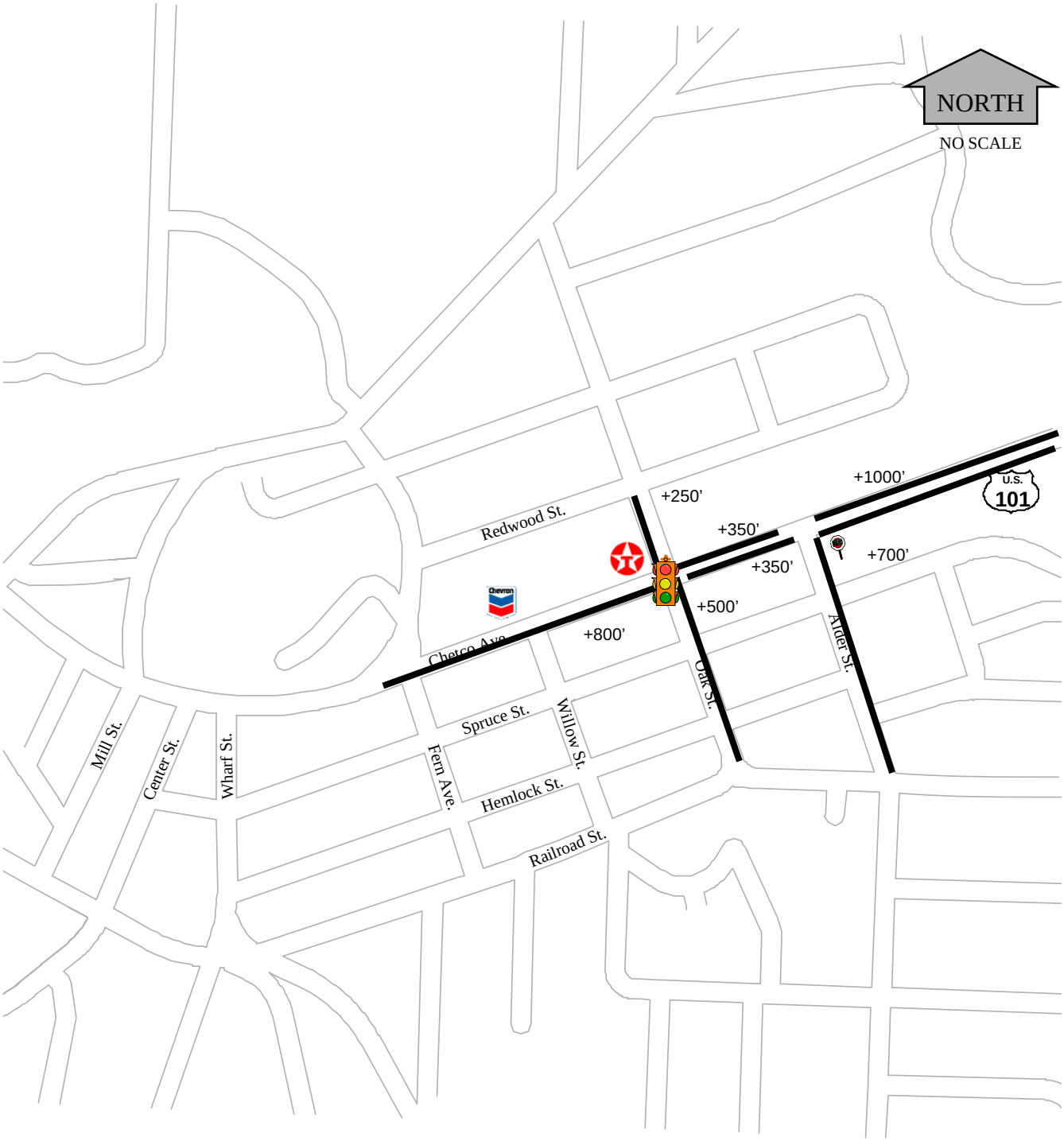
Legend

XXX – 2030 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2030 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 10
	Date : 12/15/2005	**Rev. By: P. Schuytema,PE**	

Year 2030 – No Build B – Alt 5 Built



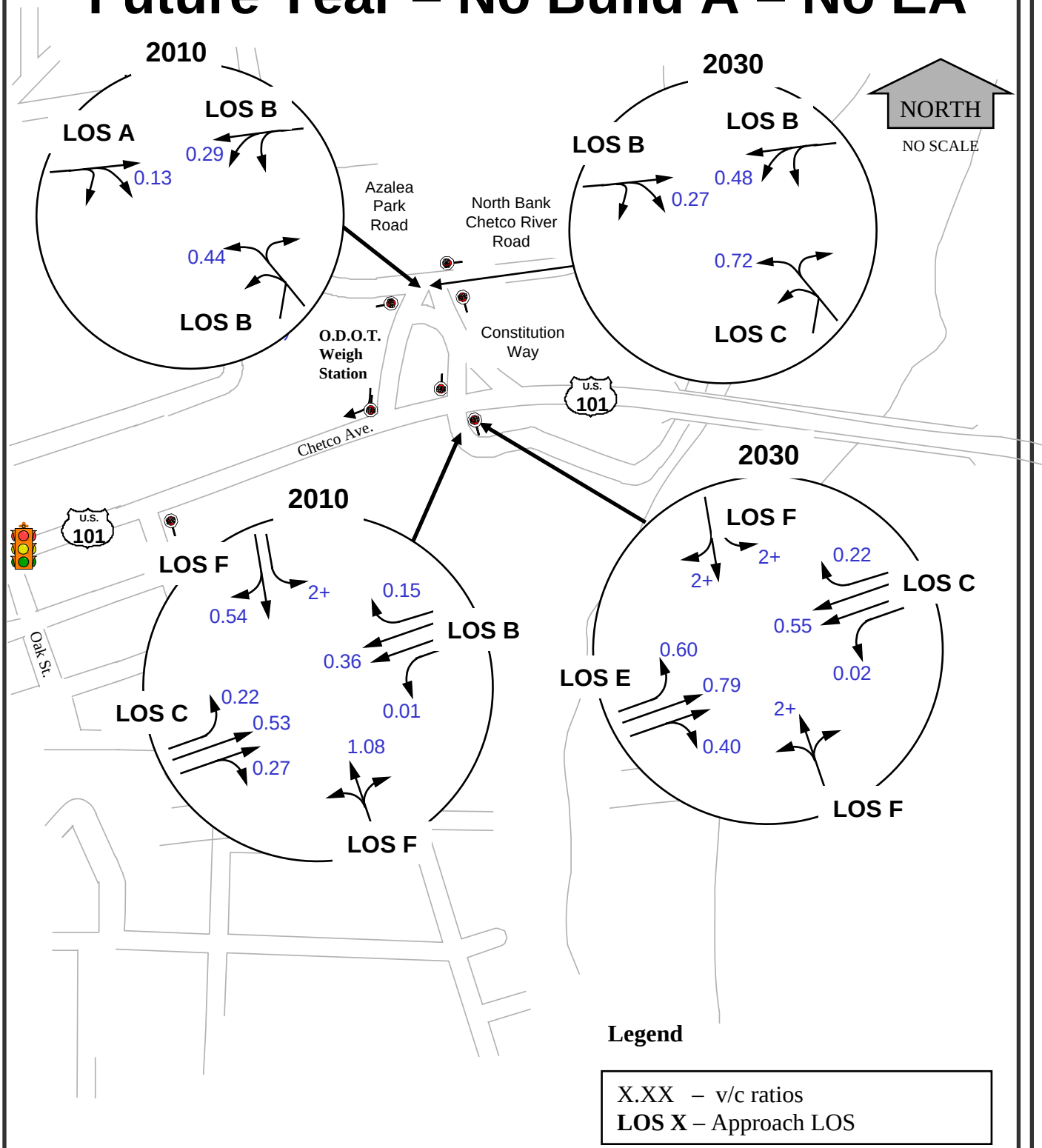
Legend

XXX – 2030 95th Percentile Queue Length (ft)

OREGON DEPARTMENT OF TRANSPORTATION **TPAU** **TRANSPORTATION PLANNING ANALYSIS UNIT**

CONSTITUTION AREA REFINEMENT STUDY– 2030 95th Percentile Queue Length	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 11
	Date : 12/15/2005	**Rev. By: P. Schuytema,PE**	

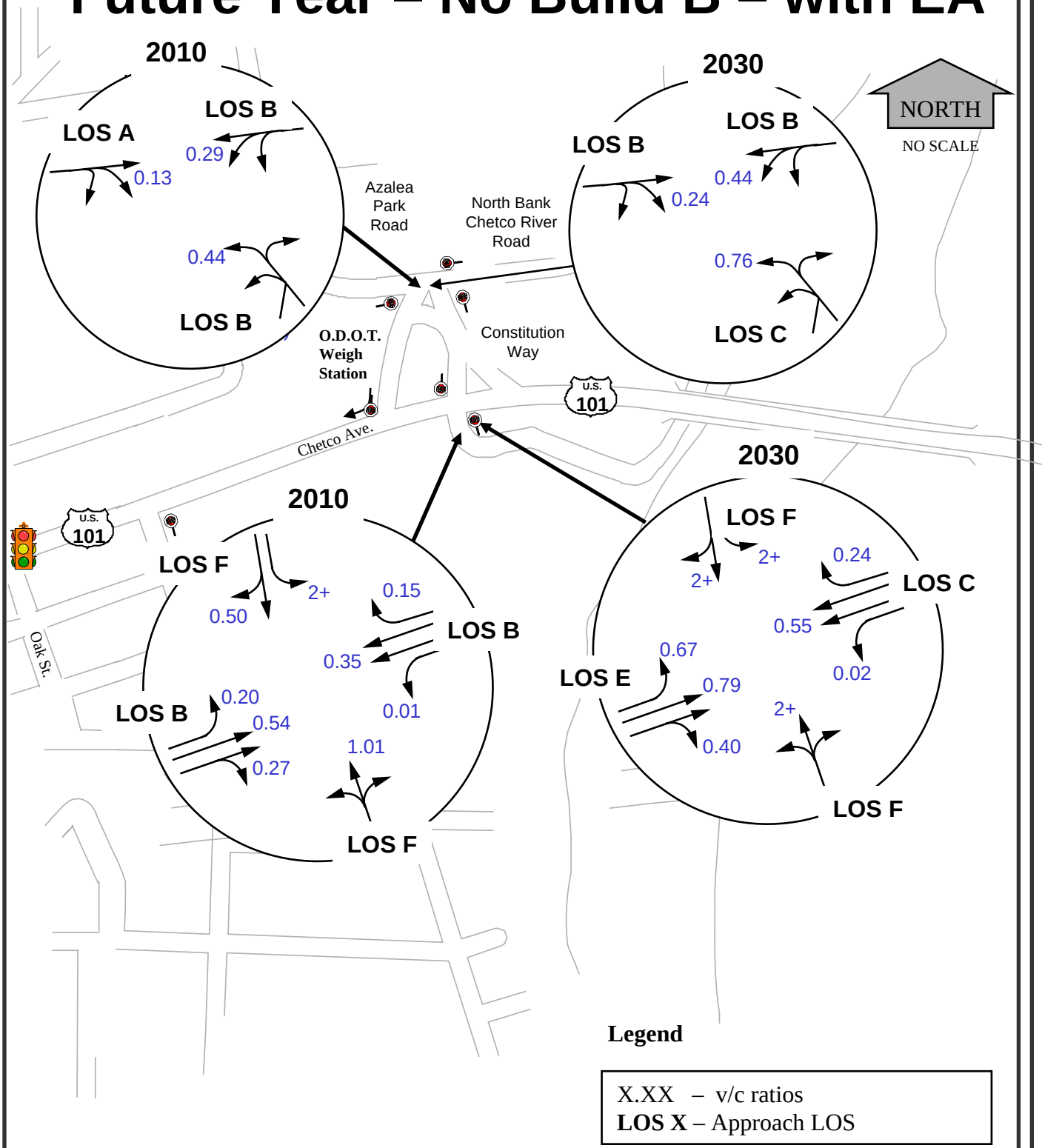
Future Year – No Build A – No EA



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** TRANSPORTATION PLANNING ANALYSIS UNIT

CONSTITUTION AREA REFINEMENT STUDY FUTURE YEAR LOS and v/c ratios for North Bank & Constitution and Constitution and US 101 for 2010 and 2030 – Without EA Impovements	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 12
	Date : 2/3/2006	**Rev. By: P. Schuytema,PE**	

Future Year – No Build B – with EA



OREGON DEPARTMENT OF TRANSPORTATION **TPAU** TRANSPORTATION PLANNING ANALYSIS UNIT

CONSTITUTION AREA REFINEMENT STUDY FUTURE YEAR LOS and v/c ratios for North Bank & Constitution and Constitution and US 101 for 2010 and 2030 – With EA Impovements	**File :ConWay_TM4.PPT**	**Prepared By: A.Bettinardi**	FIGURE 13
	Date : 2/3/2006	**Rev. By: P. Schuytema,PE**	