MEMORANDUM

Salem River Crossing Project
Study Area Refinement

TO: Salem River Crossing Task Force

FROM: Steve Perone/PTV America
Sumi Malik/CH2M HILL
Dave Simmons/CH2M HILL

DATE: October 20, 2006

A new bridge for the Salem region would need to address traffic problems today and in the future. Part of the planning process is to evaluate how new transportation connections would perform in the future. At this stage, the future performance of new connections have been evaluated, not for the purpose of including or excluding any one solution, but instead as a way to refine the study area. Better performing connections help narrow where potential river crossings would meet travel demand.

This memorandum summarizes analysis that has evaluated the performance of new transportation connections under future year (2030) p.m. peak hour conditions to refine the study area, and to help establish the project purpose and need statement. The p.m. peak hours are 5 to 6 p.m. The corridors used for this analysis were evaluated in the previous study, the Willamette River Crossing Capacity Study General Corridor Evaluation (June 2002), which used a 2015 future year. The analysis presented in this memorandum was conducted using the current land use and transportation model, SKATS EMME/2 model, 2030 land use assumptions and travel demand rates derived from the 1994/95 household travel survey.

The thirteen corridors included in this analysis are listed below and are illustrated in Figure 1.

1. Lockhaven Drive
2. Chemawa Road
3. Tryon Street
4. Pine Street
5. Shipping Street
6. Hood Street
7. Market Street
8. Division Street
9. Union Street
10. Pringle Parkway
11. Mission Street
12. Cross Street
13. Kuebler Road

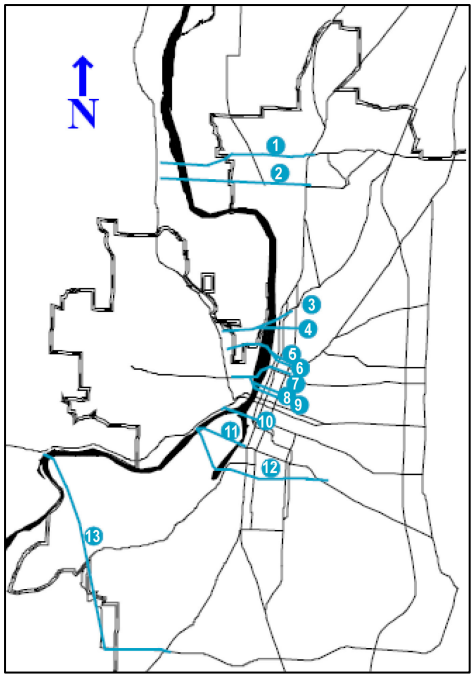


Figure 1 - 2030 Bridge Crossing Corridors

In addition to the thirteen corridors listed above, a no-build scenario is included in the analysis to serve as a reference. The analysis presented in this memorandum focuses on two key performance measures: 1). Volume-to-capacity ratio (v/c) and 2). Vehicle hours of delay (VHD). The v/c ratio describes the portion of the bridge's capacity that is predicted to be used by the number of vehicles traveling on the corridor during the 2030 PM peak hour. A ratio of 1.0 means traffic volume is equal to the capacity. V/C ratios in the 0.90 to 1.0 range represent conditions that are near or at capacity, where there are very few gaps in traffic and maneuverability is limited. Comparison of the proposed corridor v/c ratio to existing bridge v/c ratio describes how much congestion relief the proposed corridor could be expected to provide the existing facilities. VHD is used to quantify the amount of delay experienced by all the vehicles traveling on the corridor when the facilities are predicted to operate above a v/c ratio of 0.90 during the 2030 PM peak hour.

Bridge Volume-to-Capacity Performance

The first measure, volume-to-capacity ratio (v/c), evaluates how well each proposed corridor improves performance on the existing bridge by attracting trips to the proposed corridor. Table 1 is grouped into two parts: 1) proposed corridor; and 2) existing bridges. It presents the v/c ratio for the proposed corridor and existing bridges for both eastbound (EB) and westbound (WB) directions, and relative rank. The proposed corridors are listed in order of furthest north to furthest south. The best performing corridor has the lowest v/c ratio on the existing bridges and the highest v/c ratio on the proposed corridor, meaning the new corridor attracts the greatest volume of trips off of the existing bridges.

Table 1: Bridge V/C Ratio

		Proposed Corridors						Existing Bridge					
	Corridor	Eastbound (EB)	v/c[1]	Rank	Westbound (WB)	v/c	Rank	Eastbound (EB)	v/c[2]	Rank	Westbound (WB)	v/c	Rank
	No-Build							EB	1.07		WB	1.66	
1	Lockhaven	EB	0.45	9	WB	0.70	11	EB	0.88	13	WB	1.39	12
2	Chemawa	EB	0.45	8	WB	0.76	6	EB	0.88	12	WB	1.38	11
3	Tryon	EB	0.37	11	WB	0.68	12	EB	0.81	6	WB	1.22	9
4	Pine	EB	0.33	13	WB	0.61	13	EB	0.82	8	WB	1.25	10
5	Shipping	EB	0.77	2	WB	0.72	9	EB	0.83	9	WB	1.18	7
6	Hood	EB	0.89	1	WB	0.71	10	EB	0.83	10	WB	1.19	8
7	Market	EB	0.36	12	WB	0.74	8	EB	0.81	7	WB	1.18	6
8	Division	EB	0.40	10	WB	0.84	3	EB	0.78	5	WB	1.11	3
9	Union	EB	0.47	7	WB	0.91	2	EB	0.74	4	WB	1.07	2
10	Pringle	EB	0.66	4	WB	0.99	1	EB	0.62	1	WB	1.01	1
11	Mission	EB	0.50	6	WB	0.79	5	EB	0.71	3	WB	1.13	5
12	Cross	EB	0.52	5	WB	0.80	4	EB	0.70	2	WB	1.13	4
13	Kuebler	SB	0.70	3	NB	0.75	7	EB	0.84	11	WB	1.41	13

[1] For proposed corridors, higher v/c ratios receive a higher rank

[2] For the existing bridges, lower v/c ratios receive a higher rank

As shown in Table 1, none of the proposed corridors relieves congestion enough to reduce performance on the existing bridges below capacity or a v/c of 1.0 in the westbound direction during the PM peak. All of the corridors provide sufficient eastbound capacity to meet the forecasted demand; therefore, corridors are evaluated based on westbound performance. Overall, the Pringle corridor provides the best v/c ratio performance on the bridges (proposed corridor WB v/c 0.99 and existing bridge WB v/c 1.01). The next two best performing corridors are connections just north of the existing bridges (Union and Division), indicating that demand for travel is in these areas. The most obvious pattern evident from the v/c result is that the furthest south (Kuebler) and northern two (Lockhaven and Chemawa) corridors do the poorest job improving river crossing demand in the peak westbound direction.

Facility VHD Performance

The bridge v/c analysis, while critical, only provides a preliminary measure of system performance. The analysis was broadened to examine VHD performance on key State Highways in the central downtown study area. The facilities analyzed included:

- OR 221 (Wallace Road) – between River Bend Road and Edgewater Street
- OR 22 - Just west of Rosemont to eastside bridgeheads
- OR 99E – Salem Parkway intersection with Liberty and Commercial Street (northern couplet) going south including Front Street, the Trade/Ferry Couplet, continuing east to 12th/Pringle Parkway

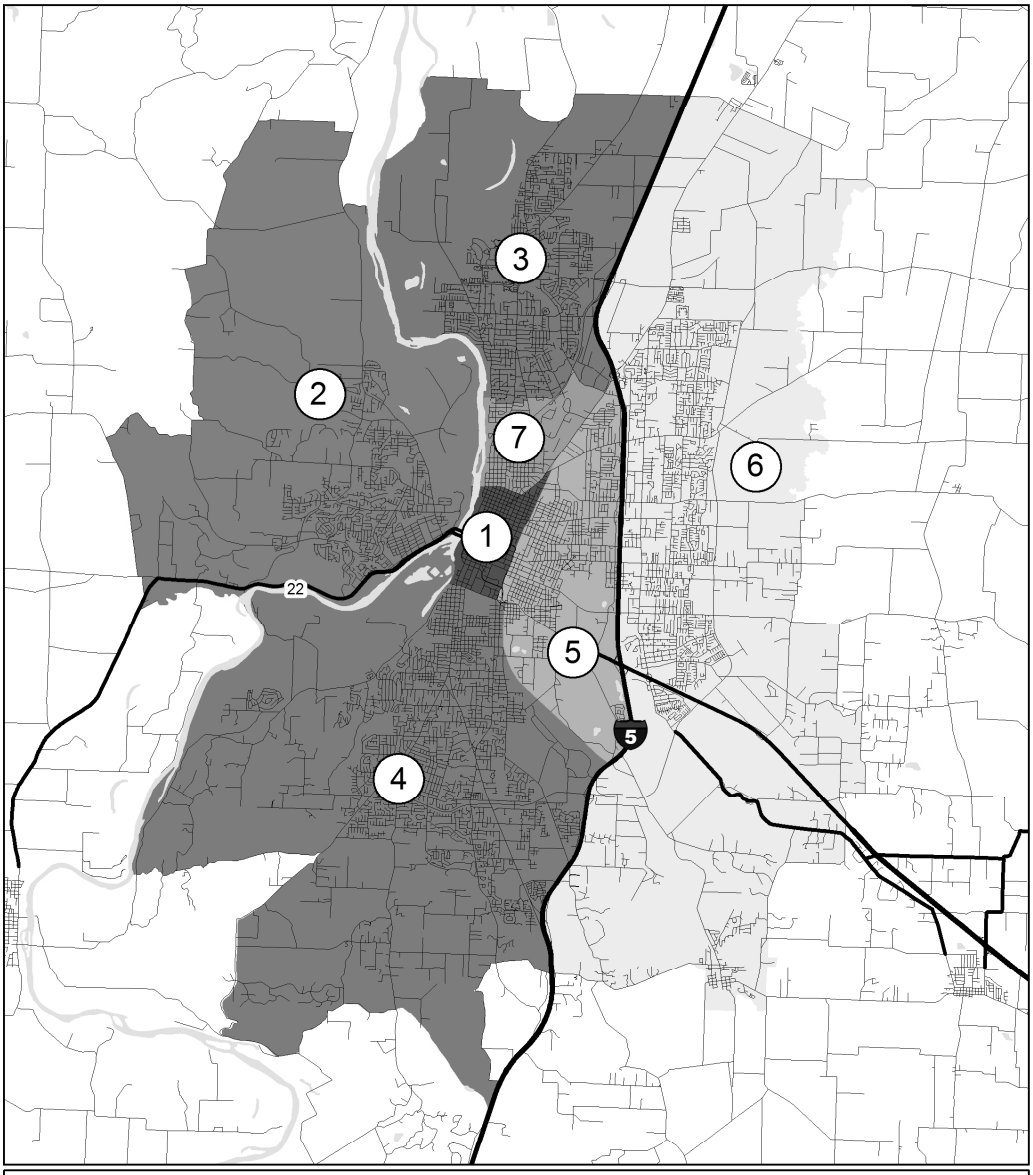
Vehicle hours of delay is a better measure of congestion than purely v/c ratio because it quantifies the hours of congestion over a given v/c ratio threshold based on the travel demand for a given corridor. When calculated on a facility basis, the VHD measure quantifies impacts the ability of any one facility to handle the flow of trips generated by the proposed bridge corridor. This is a more in depth measure than v/c, because it does not merely measure the traffic volume coming off of the existing bridges and going to the proposed corridor, but quantifies the district and the overall system's ability to handle the resulting traffic flow. The VHD reported in the Table 2 below (and in subsequent tables) uses a v/c ratio of 0.9 as the threshold for calculating VHD. Under the No-build scenario both OR22 and OR221 have approximately 300 vehicle hours of delay per facility. Table 2 presents VHD for each facility and in total. The table also provides an order ranking of each corridor for each measure.

Table 2: Vehicle Hours of Delay by Facility									
		Highway/Facility				Corridor Rank			
	Corridor	OR22	OR221	OR99E	Total	OR22	OR221	OR99E	Overall
				VHD					
	No-Build	289.3	309.8	50.2	649.4				
1	Lockhaven	107.9	140.9	30.6	279.5	12	7	4	12
2	Chemawa	99.7	147.0	32.5	279.2	11	8	5	11
3	Tryon	42.0	74.7	25.4	142.0	9	4	1	3
4	Pine	50.7	82.0	59.1	191.7	10	5	12	6
5	Shipping	35.7	52.6	64.4	152.6	7	2	13	4
6	Hood	36.8	51.7	51.4	140.0	8	1	10	2
7	Market	35.0	94.3	55.1	184.4	6	6	11	5
8	Division	21.6	63.2	44.2	129.0	5	3	8	1
9	Union	20.7	161.6	45.3	227.6	4	9	9	9
10	Pringle	15.8	207.8	39.2	262.8	3	13	7	10
11	Mission	15.7	177.8	26.8	220.3	2	11	2	8
12	Cross	15.4	172.2	30.4	218.1	1	10	3	7
13	Kuebler	113.6	182.8	33.8	330.2	13	12	6	13

The table shows that the top six performing corridors (numbers 3 through 8) are all corridors with a new bridge north of the existing bridges. This is because the new bridge in these corridors provides significant congestion relief to both OR22 and OR221. Among the six top performing corridors, the average VHD is 157 hours, the best corridor south of the bridges is Cross with a total of 218 vehicle hours of delay, nearly a 40% increase.

District VHD Performance

A set of seven districts were created to isolate and measure VHD impacts on specific areas of the region and to better understand overall benefits by considering system-wide impact on both State and local facilities. Analyzing VHD impact on a district-by-district basis and system-wide helps determine the ability of a district and the system to handle traffic volumes resulting from each proposed corridor. Figure 2 displays the seven district boundaries.



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VHD was summarized by district and is presented below in Table 3.

Table 3: Total VHD by District

Corridor	District						
	Downtown	West	Keizer	South	Mid	East	N. Downtown
	1	2	3	4	5	6	7
	VHD						
No-Build	399.3	610.5	76.9	485.5	130.3	220.7	67.6
Lockhaven	199.6	238.1	94.3	456.9	105.2	203.2	35.8
Chemawa	192.2	237.4	85.8	453.5	106.3	202.7	36.4
Tryon	121.0	131.6	75.2	436.9	100.9	210.3	75.1
Pine	137.0	141.4	73.5	447.1	103.9	211.7	118.0
Shipping	141.5	116.3	72.6	447.5	103.3	212.8	88.2
Hood	141.8	118.0	72.9	445.9	104.8	211.8	69.1
Market	148.6	158.2	72.7	447.2	105.2	215.9	67.0
Division	120.7	124.7	72.8	444.7	103.6	210.0	64.8
Union	111.7	247.8	73.3	451.1	105.9	212.2	66.1
Pringle	110.5	300.8	74.1	450.5	107.3	212.0	67.6
Mission	86.2	259.1	73.9	488.2	104.9	208.1	68.4
Cross	80.0	249.3	72.9	419.0	80.2	189.1	69.9
Kuebler	185.6	291.3	72.1	309.5	76.2	174.6	67.0

Table 3 shows that in the No-build scenario there are more than 1,000 vehicle hours of delay downtown (#1) and west Salem (#2). The total delay in these two districts is greater than the total delay in the remaining districts. VHD does not change significantly among districts such as east of I-5 (#6) and Keizer (#3) between corridors, indicating that the demand for travel over the river is mainly between downtown and west Salem. A few corridors have large impacts on specific districts, for example the Kuebler scenario reduces VHD in district #4 (south Salem) from 486 hours in the No-build to 310 hours.

Table 4: Total Downtown and west Salem VHD

	Corridor	VHD District 1 & 2	Rank
	No-Build	1010	
1	Lockhaven	438	12
2	Chemawa	430	11
3	Tryon	253	2
4	Pine	278	5
5	Shipping	258	3
6	Hood	260	4
7	Market	307	6
8	Division	245	1
9	Union	359	9
10	Pringle	411	10
11	Mission	345	8
12	Cross	329	7
13	Kuebler	477	13

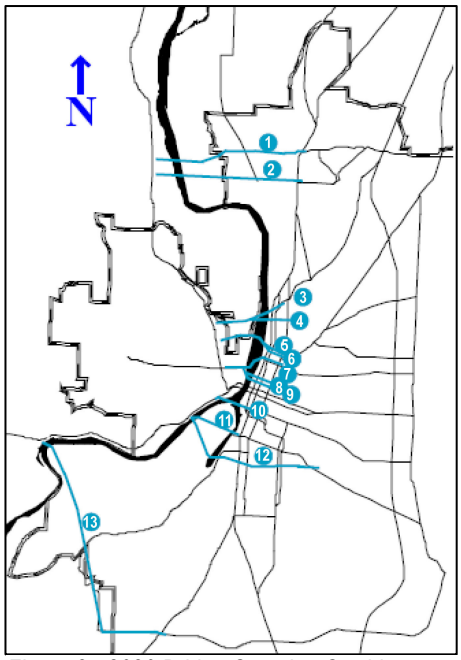

Figure 3 - 2030 Bridge Crossing Corridors

The greatest impact in terms of system performance results from corridors that reduce VHD in districts #1 and #2, downtown and west Salem. Table 4 presents VHD for downtown and west Salem as well as the ranking by least VHD. Similar to the results presented in Table 2, the top six performing corridors are north of the existing bridge locations and have an average delay of 267 hours. The next best corridor (Cross Street) has over twenty percent more VHD.

A rough comparison of VHD on facilities verses districts in Tables 2 and 4 indicate that about sixty-five percent (649/1010) of the VHD of delay occurs on State verses local facilities.

Conclusions

The analysis presented in this memorandum demonstrates that from both a State and local system perspective, corridors that provide the most system benefit are serving demands in west Salem and downtown. Table 5 summarizes the data from Table 2 and Table 4 to compare the results of the VHD analysis for both facilities and districts. By either analysis method, the top 6 performing corridors are geographically clustered between Tryon Street and the existing bridges and would therefore be proposed as the northern and southern boundaries for the project study area.

The future performance of new connections has been evaluated at a coarse level, not for the purpose of selecting any one solution, but instead as a way to define the study area. With a defined study area and a project Purpose and Need, the next step in evaluating potential solutions will be to develop alternatives within the study area.

Table 5: Comparison of District Level VHD and Facility VHD

Corridor		VHD District 1 & 2	District VHD Rank	Total VHD for OR22, OR221 & OR99E	Overall Facility VHD Rank
	No-Build	1010		649.4	
1	Lockhaven	438	12	279.5	12
2	Chemawa	430	11	279.2	11
3	Tryon	253	2	142.0	3
4	Pine	278	5	191.7	6
5	Shipping	258	3	152.6	4
6	Hood	260	4	140.0	2
7	Market	307	6	184.4	5
8	Division	245	1	129.0	1
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