

# Salem Willamette River Crossing Alternate Modes Study: Review of Available Information

PREPARED FOR: Salem Willamette River Crossing Alternate Modes Study  
Stakeholder Advisory Committee

PREPARED BY: Kristina Evanoff/CH2M HILL  
Dave Sokolowski/CH2M HILL  
Jessica Roberts/Alta Planning + Design  
Steve Perone/PTV America

COPIES: Theresa Carr/CH2M HILL

DATE: June 15, 2009

This memorandum describes the literature and data available for Transportation Demand Management (TDM) and Transportation System Management (TSM), both for the transportation practice at large and for the Salem area. This memo is organized into two sections:

1. Survey of the literature on TDM and TSM programs
2. Survey of Salem-specific alternate modes data

The objective of this memo is to identify what data exist for the Salem area, and what additional data are needed for the team to conduct the study. This memo will serve as the basis for Technical Memorandum #4 Existing and Anticipated Future Markets, Opportunities, and Barriers which analyzes the potential for improvements in alternate mode share based on available information and current usage.

## Literature Review

This section provides a survey of existing literature on TDM and TSM programs. This survey includes programs throughout the United States and focuses on practices that are effective in influencing individuals to shift modes away from the single-occupant vehicle (SOV). Emphasis has been placed on employer programs and the commute trip.

## TDM

TDM is defined by the U.S. Department of Transportation as programs designed to reduce demand for transportation through various means, such as the use of transit and of alternative work hours.<sup>1</sup> Alternative modes of transportation such as public transit, carpool/vanpool, bicycling, and walking not only reduce congestion but are also environmentally friendly modes of transport through energy conservation and emission reductions. Other specific benefits of TDM planning include road construction and maintenance cost savings, parking savings, consumer savings, improved mobility options,

---

<sup>1</sup> <http://www.plan4operations.dot.gov/glossary.htm> (last accessed May 15, 2009).

improved road safety, efficient land use, and improved public fitness and health (Broadus et al. 2009, complete references are found in Appendix A). TDM programs have been implemented throughout the United States with varying degrees of success.

Transit, in many cases, provides the best opportunity for large-scale SOV trip reduction compared to other TDM mode choices. This is because the capacity that public transit is able to accommodate equates into the potential for significant reduction in congestion, energy consumption, and emissions. However, the challenge is being able to create additional transit capacity so that individuals realize a significant enough cost and time savings that they will be willing to make the mode shift from SOV to transit. Methods to implement TDM through transit have included employer-based trip reduction (EBTR) and decreased travel distance from workplace to the nearest transit stop.

EBTR strategies are the transportation demand management elements of commute options programs that target commute travel (Zuehlke et al. 2007). Incentives to use transit as opposed to the SOV mode as a means of transportation to work can be developed by large employers to achieve significant results. These incentives, also known as Commuter Checks, include free or discounted transit fares. In November 1994, survey cards were sent to San Francisco Bay Area employers that purchased Commuter Checks for their employees. Results showed that 31% of the employees who received Commuter Checks increased their use of transit (VTPI 2009). Another study looked at the Washington State Commute Trip Reduction (CTR) programs implemented by employers in the Seattle downtown area. The analysis found the reduction in AM and PM peak delay due to TDM programs implemented in the study area was over 300,000 vehicle-minutes. VMT reductions equated to almost 8,000 gallons of fuel savings (Georggi et al. 2007). In terms of disincentives, employers regard the distance of their work location to transit as a significant barrier to implementing trip reduction programs. On average, only 4 percent of companies that regard distance to transit as a barrier offer any transit-related benefit to their employees (Zuehlke et al. 2007). This emphasizes the importance of transit stop placement such that the location of the stop minimizes the distance to employment centers.

Carpooling and vanpooling, also referred to as ridesharing, have an advantage over other TDM alternate modes in that they most closely replicate the SOV experience. Carpooling is defined as 2 or more people commuting to and from work together in an automobile typically owned by one of the drivers. Vanpooling is generally defined as 5 to 15 people commuting to and from work together in a van typically not-owned by any of the riders. Vanpools and carpools are most successful where one-way lengths exceed 20 miles, where work schedules are fixed and regular, where there are a sufficient number of workers from the same residential area to form a pool, where public transit is unable to meet worker needs, and where there is some parking or traffic congestion. Benefits include reduced fuel consumption, vehicle emissions, traffic on state and local roads, need for roadway construction and maintenance, and parking needs at participating facilities (Mielke 2006).

A vanpool study which collected data from rideshare organizations around the U.S. concluded that employer subsidies to vanpool users influence employee mode choice decisions regarding vanpool versus auto as a means of transportation. Holding everything else constant, the presence of vanpool subsidy increases the odds of choosing vanpool over automobile as a mode choice. Using data from the Puget Sound area, typically the number of people choosing vanpool with respect to drive alone increase when the employee is

offered a subsidy. The study also concluded that vanpool demand is relatively elastic meaning that decreases in vanpool price result in higher vanpool ridership (Wambalaba et al. 2004). In April 2008, the Texas Transportation Institute conducted a comprehensive survey of TDM programs in the U.S. to identify similarities and differences among TDM programs in different types of communities. Results were provided for carpool programs, vanpool programs, guaranteed ride home, employer outreach, regional marketing, and performance evaluation. It was concluded that small and medium sized TDM programs are generally doing the same types of activities as larger TDM programs (Ungemah et al. 2008). This shows that TDM methods applied in larger cities can be applied to smaller communities with similar success.

Bicycling is a health-beneficial, environmentally friendly, and cost effective alternative transportation mode that can be a significant contributor to a TDM program's goals. Bicycling is a mode choice that can substitute directly for automobile trips for shorter commute distances. In many communities people would bicycle more frequently if there were more bicycle infrastructure and resources available (VTPI 2009). In addition to availability of bicycle infrastructure, weather typically is a factor that influences a person's decision to bicycle. A U.S. survey found that 17% of adults claim they would sometimes bicycle commute if secure storage and changing facilities were available, 18% would if employers offered financial incentives, and 20% would if they had safer cycling facilities (Bicycling 1991). SmartTrips Downtown is an individualized marketing program in Portland, Oregon that is designed to reduce traffic congestion downtown by assisting downtown employees to utilize more efficient and environmentally sustainable modes of transport. In one exercise, SmartTrips sent out a bicycle kit and a customized bicycle route plan to participants who lived within 5 miles of downtown. Among those who responded to the 12-month follow up survey, bicycle ridership increased 142%. This affirms SmartTrips' assumption that many people will shift to more sustainable, inexpensive, and healthy transportation modes if they learn about all their options (SmartTrips 2008).

Pedestrian transportation supports most other TDM strategies, particularly transit and ridesharing. In a walkable environment, individuals have easier and safer access to transit stops and common vanpool meeting locations (VTPI 2009). Similar to biking, walking is a healthy transportation alternative, environmentally friendly, and an affordable alternative to SOV transport. Spreading awareness regarding the health benefits of walking may increase the modal split of pedestrian transportation. However, pedestrian transportation is most influenced by pedestrian infrastructure and connectivity which will be discussed further in the TSM section.

Parking, with its associated costs and availability, is one of the most significant factors affecting individual's transportation mode choice. One of the most effective ways of discouraging SOV trips is to implement parking pricing or limit parking supply. Parking pricing is defined as when motorists pay directly for the use of parking facilities. It may be implemented as a TDM strategy (to reduce vehicle traffic in an area), as a parking management strategy (to reduce parking problems in a particular area), to recover parking facility costs, to generate revenue for other purposes such as a local transportation program, or for a combination of these objectives (VTPI 2009). One survey of automobile commuters found that nearly 35 percent would consider shifting to another mode if they were required to pay for parking, with fees of \$1-3 per day in suburban locations and \$3-8 per day in urban

locations (Kuppam et al. 1998). Shoup (2005) defines parking “cash out” as when commuters who are offered subsidized parking are also offered the cash equivalent if they use alternate travel modes. Giving commuters the choice between free parking or its equivalent cash values show that even free parking has a cost, the forgone cash. The option to cash out raises the effective price of commuter parking without charging for it. Shoup goes on to recommend to price parking for full cost recovery, price the most convenient parking, dedicate some or all of the revenue from on-street parking to benefit local businesses and residents, unbundle parking from building rents, and allow private developers and building managers to decide how much parking to provide at each destination.

## TSM

TSM is defined by the U.S. Department of Transportation as an integrated program to optimize the performance of existing infrastructure through the implementation of systems, services, and projects designed to preserve capacity and improve security, safety, and reliability. Intelligent Transportation Systems (ITS) is one method towards TSM implementation and is defined as the use of information technologies such as computers, telecommunications, Global Positional System (GPS), and the Internet to improve transportation system performance and efficiency. Examples of ITS include multi-modal navigation devices, traffic management, traffic control, telematics, driver information, fleet management, emergency warning systems, emergency response, automated vehicle control, electronic pricing, transit information, transit priority systems, computerized dispatching, taxi information, and rideshare matching (VTPI 2009). A TSM infrastructure improvement example would be intersection queue jumps which are defined as an elevated ramp or side lane that can be used to bypass the intersection and traffic congestion (Burriss et al. 2003). Best practice is to always conduct TSM analysis before any capacity increasing infrastructure is built.

Policy 1G of the 1999 Oregon Highway Plan identifies state priorities for responding to highway needs by directing agencies to improve system efficiency and management before adding capacity. The following priority measures, in order of highest to lowest, are used for developing plans to respond to highway needs: protect the existing system, improve efficiency and capacity of the existing transportation system, add capacity to the existing system, and add new facilities to the system. Policy 2E considers a broad range of ITS services to improve system efficiency and safety in a cost-effective manner. Deployment of ITS shall reflect the user service priorities established in the Oregon Intelligent Transportation Systems Strategic Plan. This includes incident management, en-route driver information, traffic control, route guidance, commercial vehicle electronic clearance, pre-trip travel information, public transportation management, emergency notification and personal security, emergency vehicle management, and commercial fleet management. Policy 4B recognizes the State’s responsibility in promoting the use of alternative passenger modes in commute corridors to preserve the performance and function of the state highway system, as well as in considering how alternative passenger modes can be integrated into broader corridor strategies. Policy 4D supports the efficient use of the state transportation system through investment in transportation demand management strategies.

Transit and ridesharing modes of transportation provide many opportunities to implement TSM strategies. These include high occupant vehicle (HOV) lanes, park-and-ride facilities, and transit oriented development (TOD). HOV lanes give priority to transit buses, vanpools,

and carpools. Users in HOV lanes typically experience a less congested and faster commute compared to SOV users in the regular lanes. Park-and-ride facilities consist of parking facilities at transit stations, bus stops, and highway on-ramps, particularly on the urban fringe, to facilitate transit and rideshare use. Parking is generally free or significantly less expensive than in urban centers which provide a greater incentive for users to use the alternative transportation modes available at the park-and-ride facility. Finally, TOD is defined as residential and commercial centers designed to maximize access by transit and non-motorized transportation, and with other features to encourage transit ridership. Increasing density around transit stops provides more people direct access to transit therefore increasing odds of transit ridership (VTPI 2009). One study estimates that HOV facilities can reduce peak-period vehicle trips on individual facilities by 2-10% and up to 30% on very congested highways if HOV lanes are separated from general-purpose lanes by a barrier (Ewing 1993). Queue-jumper HOV facilities can provide time savings up to 20 minutes (Turnbull et al. 2006). The Minnesota Department of Transportation has implemented a system to provide priority to buses at metered freeway entrance ramps lacking HOV bypass lanes. The system presets the ramp meter controller cycle to provide a long green time in advance of the scheduled arrival of a bus at a ramp, clearing the queue of waiting vehicles, and allowing the bus to move directly onto the freeway. Buses entered the freeway an average of 40 percent faster (Turnbull et al. 2006).

Bicycling infrastructure plays an important role in an individual's decision to select the bicycle over the SOV as their mode choice. Constructing and maintaining this infrastructure is critical towards shifting mode share away from the SOV and towards the bicycle. A significant amount of cycling occurs on roads, highway shoulders, and sidewalks that have no special designation or design features for cycling. For example, potholes and cracks, particularly along the right side of outside lanes, should be paved and maintained in good condition so as not to cause a safety concern for bicycle tires (VTPI 2009). One study showed that for U.S. cities with more than 250,000 population, each additional mile of bike lanes per square miles is associated with approximately a one percent increase in bicycle commute mode share (Dill and Carr 2003). Finally, bicycling integrates well with transit. A transit stop normally draws riders with a 10-minute walking distance. At a modest riding speed a cyclist can travel three or four times that distance in the same time therefore increasing the transit catchment area about ten-fold. This is particularly important in suburban areas where densities are lower and destinations are dispersed (Bracher 2000). Therefore when planning additional bicycle infrastructure, consideration should be given to the location of existing and future transit stops.

Pedestrian infrastructure and connectivity are important factors in individual's decision to choose walking as a transportation mode choice. Walkability is defined as the overall pedestrian friendliness of an area. Walkability can be evaluated at various scales. At a site scale, walkability is affected by the quality of pathways, building accessways and related facilities. At a street or neighborhood level, it is affected by the existence of sidewalks and crosswalks, and roadway conditions (road widths, traffic volumes and speeds). At the community level it is also affected by land use accessibility, such as the relative location of common destinations and the quality of connections between them (VTPI 2009). Creating a walkable environment also benefits transit use. One study found that residents in a pedestrian friendly community walked, bicycled, or rode transit for 49% of work trips and

15% of their non-work trips. That is 18- and 11-percentage points more than residents of a comparable automobile oriented community (Cervero and Radisch 1995).

Parking restrictions are a logical addition to the TSM tool kit. Most jurisdictions specify minimum parking requirements associated with new development, generally on the order of three to five parking spaces per 1,000 square feet of office or commercial space. By contrast, Portland, OR specifies maximum parking requirements in the downtown area, with no more than 0.7 parking spaces per 1,000 square feet allowed adjacent to the light rail corridor's transit mall and 1.0 parking space per 1,000 square feet further way from the mall. Such restrictions are intended to encourage alternatives, particularly public transit, to driving alone (Ferguson 1998).

## Salem-Specific Information

This section surveys existing data and programs that encourage use of alternate modes in Salem. Additional information about existing programs can be found in Technical Memorandum 1: Summary of Stakeholder Interviews.

### Vision 2020 Action Plan

Salem Vision 2020 Action Plan is a collection of ideas, energy and projects from a wide representation of the Salem community (City of Salem, 2008). There are two dozen Vision 2020 projects listed in the action plan. Relevant projects to this study include enhancements to pedestrian facilities (streetscapes), improvements to security (lighting and increased security), improvements to access through implementation of signage and wayfinding, parking resource management, better connections between east and west Salem, development of a people-mover system for local and regional connections, and improved bicycle facilities.

### Salem Transportation System Plan

The Salem Transportation System Plan (TSP), comprised of 13 elements, contains the goals, objectives, policies, project maps, and project lists that guide the provision of transportation facilities and services for the Salem Urban Area (City of Salem, 2007). These elements include TSM, bicycle system, pedestrian system, transit system, and parking management.

The goal of the Salem TSP is to provide increased mobility opportunities for all travel modes by placing an emphasis on providing people with transportation choices while reducing reliance on any single mode of travel (City of Salem, 2007). The plan looked at regional mobility, integrated networks of facilities and services for motorized and nonmotorized modes, connectivity and circulation for each mode of travel, integration of transportation and land use plans to improve livability and provide a more convenient system for people to use modes other than the personal vehicle. The plan also identifies alternative commuting methods such as transit, teleworking, carpool/vanpool, walking, and bicycling. A summary of the TSM element is provided below. A discussion of other elements (bicycle, pedestrian, transit, and parking management) is included under the relevant sections of this memo.

Under the Salem TSM element, Salem has established goals, objectives, and policies to maximize the capacity of the street system as well as reduce the demand on it. These TSM measures include traffic management and channelization; intersection modification and

widening; access management; improved traffic control devices; and on-street parking management (City of Salem, 2007). These measures will be used by the project team as they begin to develop potential TSM concepts later in the project.

### **Regional Transportation Systems Plan**

The Salem-Keizer Area Transportation Study (SKATS) 2031 Regional Transportation Systems Plan (RTSP), covering the cities of Salem, Keizer, and Turner and portions of Marion and Polk counties (within SKATS boundary), was established to address the goal of providing an adequate level of mobility for area residents and businesses while maintaining or improving the overall quality of life in the region. To achieve this goal the RTSP identifies and evaluates current and expected problems and opportunities associated with transportation systems in the Salem-Keizer urban area, provides a recommended package of integrated, multimodal investments to improve these systems, and presents a financial analysis to ensure that the resources necessary to implement this Plan can be provided (SKATS, 2007).

This plan recognizes the need to continue to preserve and balance transportation system investments by improving the connectivity of the transportation system, providing viable modal alternatives to the single-occupant automobile and encouraging daily use of those modes. The plan identifies investments and improvements of the specific components of a regional transportation system including bicycle and pedestrian systems, public transportation system, and regional transportation system efficiency management (including programs to reduce reliance on the single-occupant vehicle). (SKATS, 2007). The RTSP includes several projects that will be useful to the project team as it begins to develop TSM and TDM concepts later in the project.

### **1994 Origin/Destination Survey**

In 1994, SKATS sponsored an Origin Destination survey at 13 locations - on 12 major roadways that cross the SKATS boundary and one for the Willamette River bridges. For the bridge survey, survey cards were handed to drivers who filled them out and returned them by mail. About 35 percent of the 10,000 survey cards were returned. Average vehicle occupancy for those returning the survey for all trip purposes was 1.6 persons per vehicle (1.24 for work trips).

It was determined from the survey responses that 57 percent of trips on the bridge are local (both trip ends in Salem-Keizer); another 36 percent of trips had one trip end in Salem-Keizer (e.g., Dallas to downtown Salem, or West Salem to Portland); and 7 percent of trips were "through trips" (both trip ends outside of Salem-Keizer).

### **2000 Census Journey to Work Data**

The 2000 Census and its Census Transportation Planning Package (CTPP) provides a snapshot of information about journey to work trips, including travel patterns, travel times, and mode of transportation to work. The CTPP includes detailed information about both people who live within SKATS (resident workers) and those who live outside the SKATS area but commute into SKATS for work (i.e. non-resident workers). The information below focuses on West Salem and Polk County residents' journey to work.

*Travel Times and Leaving for Work Data*

The table below shows the journey-to-work travel times (in minutes) by mode. These data are for residents who live within the SKATS area, who may be working either within or outside of the SKATS boundary. Average travel time is 21.6 minutes. Carpoolers' travel time is 6-7 minutes longer at 28 minutes. Commute trips by public transportation averaged 36 minutes, but were longer for West Salem workers (44 minutes). Bike and walk to work had the shortest travel times (13-14 minutes).

TABLE 1  
Average Travel Time to Work (Minutes) by Mode by Residence (CTPP table 1-118)

Means of Transportation	Travel Time (Minutes)		
	Total SKATS	West Salem	Rest of SKATS
Total	21.6	20.1	21.8
Drove Alone	21.2	19.7	21.4
Total Carpool	28.1	28.3	28.1
Public Transportation	35.6	43.6	35.0
Bicycle/Walked	13.6	11.6	13.8
Taxi, Motorcycle, Other	35.6	38.3	35.3

Time of day for leaving to work (self-reported from the survey sample) is shown in Table 2 below. The most common time to leave home was between 7:00 and 8:00 a.m. West Salem commuters are not different than other workers within SKATS.

TABLE 2  
Time Leaving Home to Go to Work (by Residence) (CTPP Table 1-001)

Residence	Total SKATS		West Salem		Rest of SKATS	
	Number	Percent	Number	Percent	Number	Percent
Total	100,550	100.0%	10,685	100.0%	89,865	100.0%
Worked Away From Home	96,190	95.7%	10,084	94.4%	86,106	95.8%
5:00am to 5:59am	7,126	7.1%	585	5.5%	6,541	7.3%
6:00am to 6:59am	19,448	19.3%	2,000	18.7%	17,448	19.4%
7:00am to 7:59am	31,653	31.5%	3,560	33.3%	28,093	31.3%
8:00am to 8:59am	12,914	12.8%	1,490	13.9%	11,424	12.7%
9:00am to 9:59am	4,726	4.7%	487	4.6%	4,239	4.7%
10:00am to 11:59am	3,575	3.6%	525	4.9%	3,050	3.4%
12:00pm to 2:59pm	5,095	5.1%	274	2.6%	4,821	5.4%
3:00pm to 5:59pm	4,822	4.8%	480	4.5%	4,342	4.8%

TABLE 2  
Time Leaving Home to Go to Work (by Residence) (CTPP Table 1-001)

Residence	Total SKATS		West Salem		Rest of SKATS	
6:00pm to 8:59pm	1,725	1.7%	169	1.6%	1,556	1.7%
9:00pm to 11:59pm	1,836	1.8%	114	1.1%	1,722	1.9%
12:00am to 4:59am	3,270	3.3%	400	3.7%	2,870	3.2%
Worked at home	4,185	4.2%	575	5.4%	3,610	4.0%

Source: CTPP 2000, Part 1. Universe: Workers.

Within the 7:00 – 8:00am timeframe, as shown in Table 3, the predominant leave time is 7:30 to 7:44, which could result in congestion on the Center Street bridge right before 8:00 a.m.

TABLE 3  
Time Leaving Home to Go to Work (by Residence) – 7:00 a.m. – 8:00 a.m. (CTPP Table 1-001)

Residence	Total SKATS		West Salem		Rest of SKATS	
Time leaving home	Number	Percent	Number	Percent	Number	Percent
Total	100,550	100.0%	10,685	100.0%	89,865	100.0%
7:00 a m to 7:14 a m	10,244	10.2%	1,030	9.6%	9,214	10.3%
7:15 a m to 7:29 a m	4,165	4.1%	480	4.5%	3,685	4.1%
7:30 a m to 7:44 a m	13,554	13.5%	1,670	15.6%	11,884	13.2%
7:45 a m to 7:59 a m	3,690	3.7%	380	3.6%	3,310	3.7%

### Mode of Transportation

As shown in Table 4 below, commuting by bus was lowest for West Salem residents, while working from home was the highest in the region.

TABLE 4  
Mode of Transportation to Work (by Residence) - (CTPP Table 1-013)

Residence -> Mode	South Salem	East Salem	Keizer/ Brooks	West Salem	Central Salem	NE Salem	Totals
Drove alone	76.6%	71.8%	77.5%	75.1%	63.0%	63.1%	73.6%
Carpool	12.6%	18.9%	13.6%	14.3%	13.9%	24.9%	15.1%
Bus or trolley bus	2.9%	2.7%	1.8%	1.6%	3.7%	3.1%	2.7%
Bicycled or walked	2.7%	2.0%	2.0%	3.0%	14.0%	5.1%	3.6%
Taxicab, motorcycle or other means	0.7%	1.1%	0.6%	0.6%	1.9%	1.4%	0.9%
Worked at home	4.5%	3.6%	4.4%	5.4%	3.5%	2.4%	4.2%

### *Commute Patterns*

As the state capitol and largest urban area in the mid-Willamette Valley, the Salem-Keizer area attracts many workers who live outside of SKATS. Of the roughly 102,000 jobs in the Salem-Keizer area (in the year 2000), 77 percent are held by people with residences within the Salem-Keizer area, and 23 percent are held by people who commute from outside cities and communities.

In 2000, approximately 10,600 West Salem residents were employed and approximately 2,000 (19 percent) worked in the West Salem area. A much larger percent (77 percent) or 8,200 worked across the Willamette River in another area of SKATS (with Central Salem accounting for 3,800 of those jobs). About 750 (7 percent) crossed the river to access jobs in to either north Marion County or the Portland area.

Approximately 14,600 employed persons lived in the Census Tracts that comprise the Dallas, Monmouth, and Independence areas. Of those, more than one in four (26 percent) commuted to jobs east of the Willamette River within the SKATS area. An additional six percent of these commuters traveled across the Willamette River to jobs in north Marion County or Portland area.

### **Transit**

The Salem Area Mass Transit District, also known as Cherriots, is a public agency that operates public transit services in the metropolitan area of Salem and Keizer, OR. Cherriots was formed by a vote of the Salem/Keizer area electorate in 1979, with the purpose of consolidating transit services within the urban growth boundary and securing an ongoing funding base for the operation of the system. In its current configuration, the Board consists of seven members who provide policy direction for a 70-bus transit operation serving nearly 200,000 residents in the Salem and Keizer urban areas. Transit service from West Salem to downtown involves the five neighborhood routes in West Salem meeting at the Glen Creek Transit Station. From there riders transfer to a shuttle bus (Route 25) that transports them across the Willamette River to the Courthouse Square transit mall. Cherriots ridership grew from 2.7 million trips in 1990 to over 4.3 million in 2000, a 60 percent increase during the decade. In 2003, Cherriots carried over 5 million passengers for the first time in its history (Salem 2009). As of March 2009, the Route 25 carried around 24,000 passengers per month which accounts for approximately 6 percent of total ridership on the Cherriots system. <sup>2</sup>

The mode split for journey-to-work trips according to the U.S. Census Bureau from the 2005-2007 American Community Survey (ACS) is shown in Figure 1. As shown in the graph, 73 percent of Salem commuters drove to work alone, while 15 percent drove or rode in a car with two or more persons. Only 2.5 percent of Salem commuters took public transportation. This information is based on a small sample of persons living in the Salem-Keizer area and represents only journey to work trips. Information on journey to work for commuters using the existing bridges is not available from 2005-2007 ACS.

---

<sup>2</sup> ROUTE BY ROUTE STATISITCS, March 2009, Data provided by Cherriots.

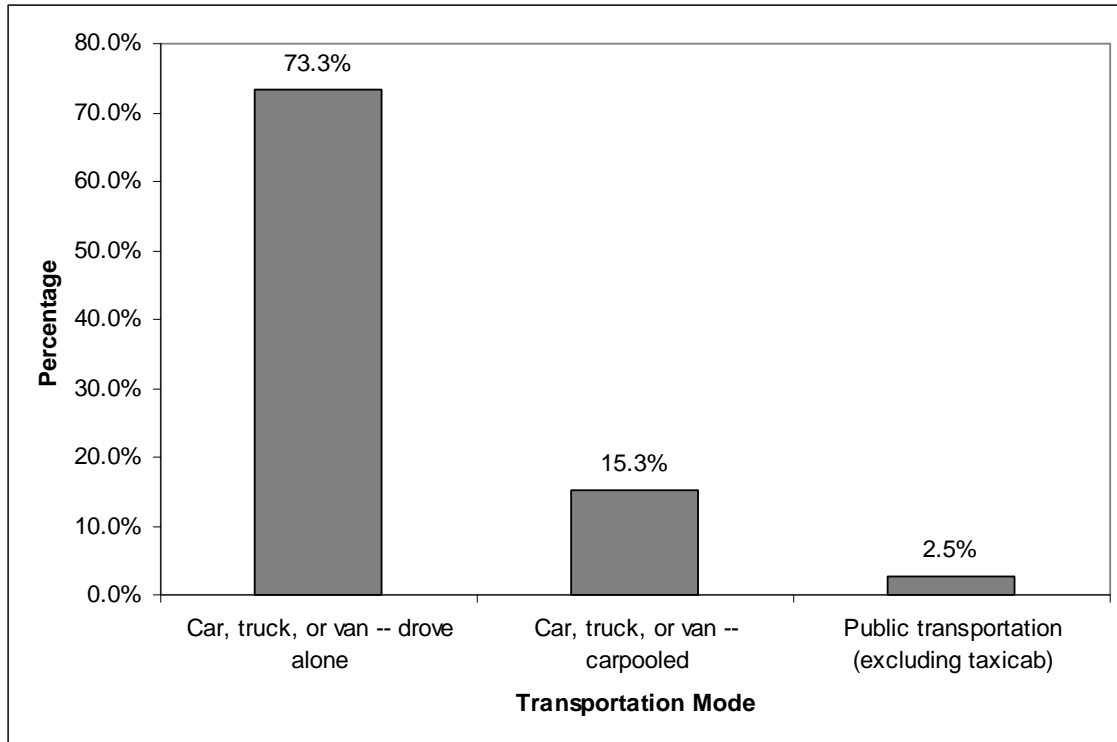


FIGURE 1: SALEM, OR TRANSPORTATION MODE SPLIT - U.S. CENSUS BUREAU: 2005-2007 AMERICAN COMMUNITY SURVEY<sup>3</sup>

Table 5 compares the City of Salem's mode split with that of the City of Portland and the State of Oregon.

TABLE 5  
Comparison of Mode Splits between Salem, Portland, and the State of Oregon

Geography	Drove Alone	Carpooled	Public Transportation
City of Salem	73.3	15.3	2.5
City of Portland	66.4	10.9	11.8
State of Oregon	72.8	11.5	4.2

As can be seen, the City of Salem has similar characteristics to the State as a whole, with almost three in four commuters driving alone. However, more people carpool and fewer people ride transit in Salem than in either Portland or the state as a whole. Portland, representing larger cities, has a much higher transit commute and lower SOV average, with two out of three drivers driving alone.

Cherriots issued several surveys in 2008 and 2009 in order to better understand public perception and knowledge of the transit system. These surveys were available on-line and

<sup>3</sup> U.S. Department of Commerce, Bureau of the Census. American Community Survey 2005-2007. S0804. Means of Transportation to Work by Selected Characteristics for Workplace Geography.

were predominantly filled out by Cherriots riders. Results of these surveys were used to assist in service reduction and redesign decisions.

### Cherriots March 2008 Survey

The first survey conducted by Cherriots included 2,592 respondents to a series of questions asked in March 2008. Primary transportation mode split is shown in Figure 2.

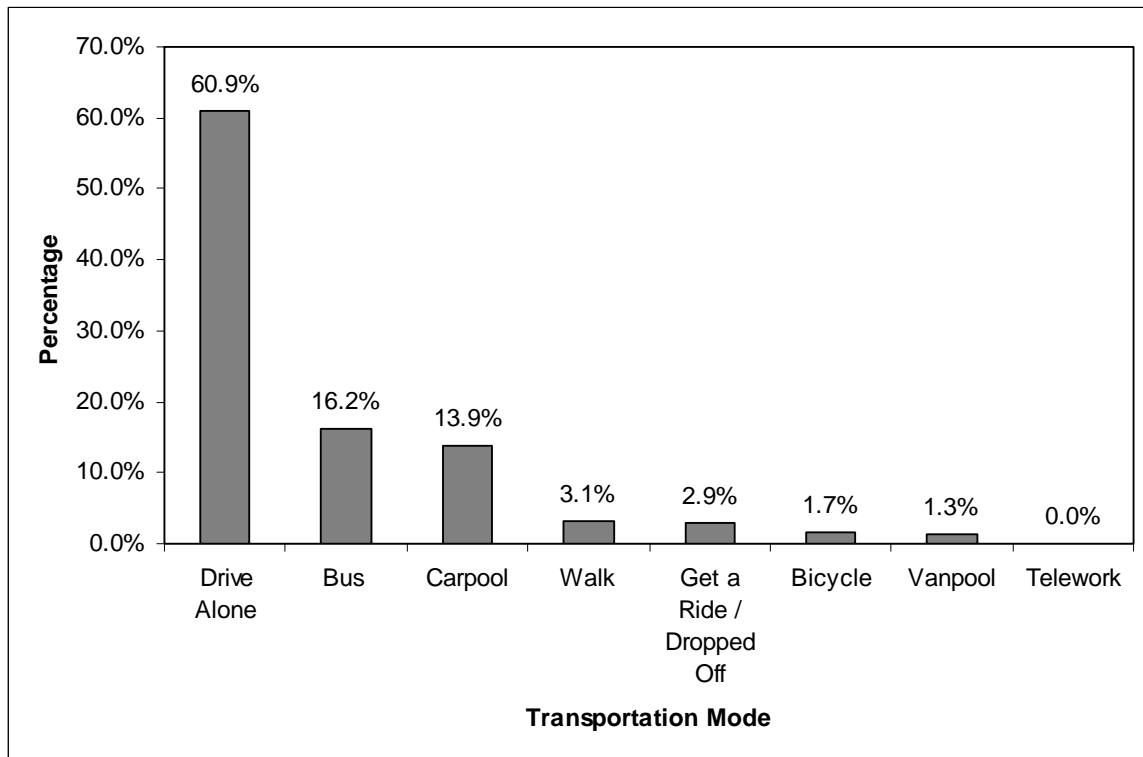


FIGURE 2: SALEM, OR PRIMARY TRANSPORTATION MODE SPLIT, CHERRIOTS SURVEY - MARCH 2008

The drive alone percentage is significantly larger than transit ridership in both the ACS and the Cherriots survey. However, the Cherriots survey reports public transportation mode split much higher than the ACS survey. One potential reason for this difference is self selection in the Cherriots survey. A large percentage of Cherriots' survey respondents disclosed themselves as current transit riders. Using the Cherriots survey data, the results were filtered to only include trips that originated west of the Willamette River. This mode split is shown in Figure 3. It can be seen that the mode split for public transportation is significantly reduced.

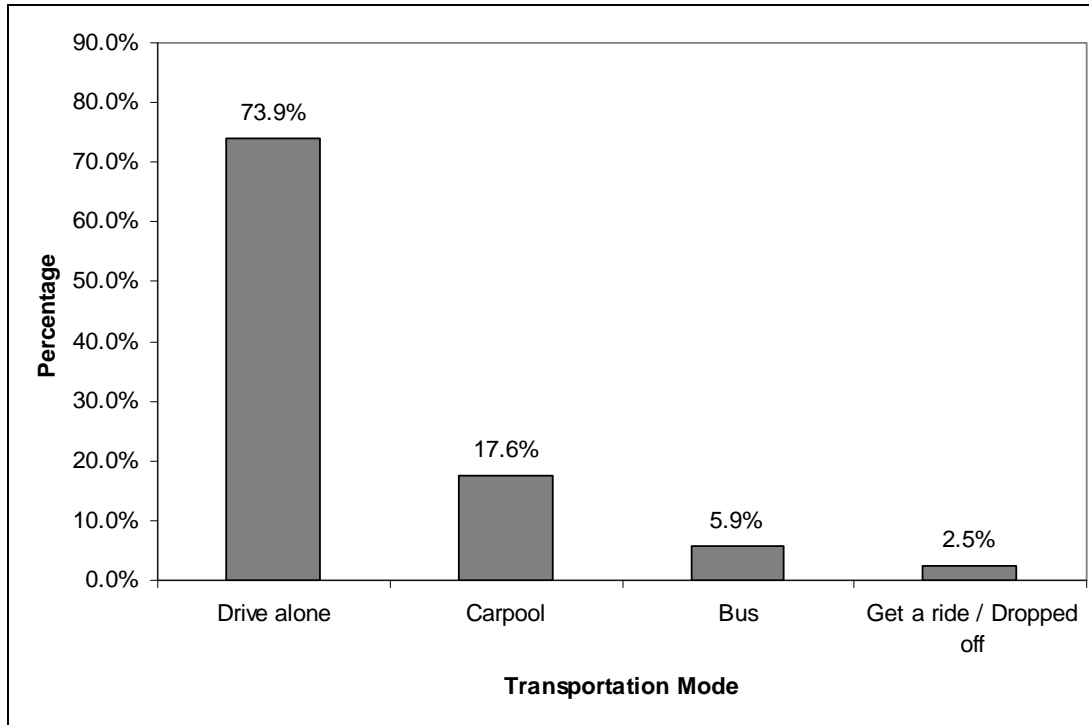


FIGURE 3: SALEM OR PRIMARY TRANSPORTATION MODE SPLIT: TRIPS ORIGINATING WEST OF WILLAMETTE RIVER, CHERRIOTS SURVEY - MARCH 2008

The March 2008 Cherriots Survey also included questions pertaining to why individuals chose their current mode of transportation and what may change their decision. When asked “What factors are most important to you when choosing how you get to work,” the most common responses were “convenience/flexibility” and “travel time.” When asked “Please check all of the following items that would influence you to use an alternative mode of transportation,” the most common responses were “shuttles from a free park-and-ride” and “discounted bus passes.”

#### Cherriots May 2008 Survey

The Salem/Keizer Transit District in May 2008 commissioned a survey among Transit District voters. The object of the survey was to identify voter opinions, attitudes, and perceptions toward the Salem/Keizer Transit District in order to assess support/opposition for a proposed operating levy. In total, 400 interviews were conducted. When asked about their knowledge of the Salem/Keizer Transit District, over twice as many respondents answered that they had “not very much knowledge” as compared to “a lot of knowledge”. Only a quarter of the respondents had ridden on a Cherriots bus, used the Cherry Lift, or Wheels service and a little over an eighth had a household member who had used the service(s). On the other hand, over half of the respondents had not used the service(s) nor had a household member used the service(s). When asked to evaluate the transit district in several areas, respondents rated “providing economical and effective public transportation” over 10% higher than “being well managed and efficient” in the excellent category. Respondents were also read several statements and then asked whether they agree or disagree. The two statements with the highest “strongly agree” percentages were “provides cost effective transportation for people as an alternative to driving a car” and “support for

public transportation is even more important during difficult times.” Finally, respondents were read several reasons why someone might vote for an operating levy. The two reasons with the highest “very good reason” percentages were “bus service is necessary to provide transportation for seniors, students, persons with disabilities, and people who cannot drive” and “bus service provides access to work and shopping to those without cars” (DRC 2008).

### **Cherriots Fall 2008 Survey**

Another survey conducted by Cherriots included 1,839 respondents to a series of questions asked in Fall 2008. The survey was undertaken in order to assist in service reductions in the current system. The survey was distributed to participants online using the website [surveymonkey.com](http://surveymonkey.com). The majority of survey participants were transit users as over 85% responded yes to the question, “Do you or someone in your family ride Cherriots?” Also, almost a third of respondents checked “the bus is my only source of transportation” and two-thirds responded that they or someone in their family rides the bus three or more days a week. When participants were asked, “What is your, or someone in your family’s main destination when riding the bus?” over half responded “work.” When asked “What are all of the routes that you or someone in your family use regularly?” nearly 20% checked route 25 – West Salem Downtown. This route is significant because it is the only route that crosses the Willamette River from West Salem to downtown. Finally, over half of respondents chose higher fares when asked, “In order to restore proposed service in the future, which of these funding options would you support?”

### **Cherriots Spring 2009 Survey**

The most recent survey conducted by Cherriots was conducted in Spring 2009, included 382 respondents, and was distributed online using the website [surveymonkey.com](http://surveymonkey.com). The survey was undertaken in order to assist in service redesign of the current system. As in the previous survey, almost all respondents (over 90%) indicated that they or someone in their family ride Cherriots. Similarly, when asked “What are the primary ways you or someone in your family travel in the Salem Keizer area (choose the most used)?” two-thirds of respondents chose the bus. In another question recipients were more supportive of neighborhood service with buses operating on neighborhood streets close to homes than of express routes with limited stops. Finally, when asked “What are all of the routes that you or someone in your family use regularly?” over a quarter of the respondents checked route 25 – West Salem Downtown.

The Oregon Department of Transportation (ODOT) also initiated an Individualized Marketing (IndiMark®) project in the cities of Salem, Keizer, Eugene, and Bend, Oregon which began in 2005 and was completed in 2007. The goal of the project was to promote environmentally friendly modes of transportation such as walking, bicycling, ridesharing, and public transportation. The project methodology, also known as the TravelSmart® campaign, consisted of segmenting households into groups and applying different marketing techniques to each group to encourage alternate modes of transportation. The results showed that after the TravelSmart® campaign, public transportation trips per person per year among the group surveyed increased by 160% in Salem. The mode share of public transportation increased by 1% (Socialdata 2007).

### Carpool/Vanpool (Cherriots' Rideshare Program)

A carpool usually consists of 2 to 6 people who live close to each other and who are going in the same direction at around the same time. Typically carpools use personal vehicles. Comparatively, vanpools are groups of 7 to 15 people who usually use a leased vehicle through their employer or a private company.

Cherriots offers a rideshare program which provides both carpooling and vanpooling options. Formed in 1975, this rideshare program was created to help alleviate parking demand in the Salem Central Business District and Capitol Mall area. (Cherriots, 2009). Originally managed by the City of Salem Public Works department, the Rideshare program eventually was moved to Cherriots.

The incentives Cherriots promotes through their rideshare program include money savings (gas, parking, wear and tear on personal vehicles), time savings, less environmental impacts (reducing car emissions), and health benefits (stress-free commute, reducing pollution).

Cherriots Rideshare program offers a free ridematching service online where potential rideshare participants can fill out an application and be matched to other people that live or work near them. Table 6 shows an output from the Cherriots Ridematching database.

TABLE 6  
Cherriots Ridematching Database Output (January 2008-April 2009)

Ridematching	Commuters
New Ridematching Applications	459
Cherriots Rideshare Commuters	3,503
Cherriots Rideshare Active for Matches	2,271

Cherriots also provided information about predominant modesplit and distance between home and work for the participants in their ride match program. Table 7 provides an overview. Of the numbers of commuters displayed in Table 7, 23 % are using carpool and 5% are using vanpool. The percent transit ridership of this sample is much higher than what is seen for Salem as a whole which also indicates that ride match participants may be predisposed to alternatives to driving alone.

TABLE 7  
Cherriots Ridematching Database Output by Mode (2008-2009 YTD (April))

Mode	Mode Use Percentage	Average Home to Work Distance (miles)
Carpool	23.06%	23.23
Vanpool	5.42%	42.69
Transit	11.66%	17.07
Bike	2.87%	5.57
Walk	1.54%	1.33
Telework	0.23%	38.01

TABLE 7  
Cherriots Ridematching Database Output by Mode (2008-2009 YTD (April))

Mode	Mode Use Percentage	Average Home to Work Distance (miles)
Drive Alone	48.58%	30
Other	2.22%	31.8
Unknown	4.41%	24.37

One of the reasons potential carpool/vanpool and transit users give as a deterrent from using transit is that they are not given other transportation options to get home in the event of an emergency. Through the Cherriots Rideshare program, participants can use the free Emergency Ride Home (ERH) incentive. Each person in the Rideshare program is provided up to four ERH rides every 12 months (Cherriots, 2009).

The City of Salem administers an on-street parking program (discussed in the parking section of this memo). As of 2003, there were over 300 preferential carpool and vanpool locations, with most located in the vicinity of the Capitol Mall. The City coordinates with Cherriots' rideshare program in the designation of vanpool parking spaces.

## Bicycle

### *2008 Bike Commute Challenge Participating Business List*

The Bicycle Transportation Alliance's annual Bike Commute Challenge (BCC) event has grown in participation each year, and Salem participation has increased as well. The BTA provided the project team with a complete list of participating businesses for 2008. Review of this list found a total of 55 Salem-area businesses participated in the 2008 BCC: three bike shops, 15 businesses or non-profits, and 37 public agencies. For the purpose of this project, the BCC participation list can provide the team with a set of local Salem-area businesses who have a demonstrated interest in promoting employee bicycling. The list does not provide information about specific TDM programs or efforts from each identified business; it is neither meant to provide an exhaustive list of bicycle-friendly workplaces, as participation in the BCC is voluntary. A possible next step would be to map the locations of BCC businesses to determine which fall within the bridge capture area. These businesses should be considered future targets of TDM efforts and beneficiaries of facility and transit service improvements.

### *Salem Transportation System Plan*

The Salem Transportation System Plan (TSP) was adopted in 1998 and most recently updated in 2007. Chapter 7 covers the Bicycle System Element, and Chapter 8 covers the Pedestrian System Element; the Neighborhood Traffic Management Element (Chapter 5) is also relevant to this study.

The Bicycle System Element defines four primary objectives to guide bicycle investments:

- Creating a comprehensive system of bicycle facilities
- Tripling the percentage of trips made by bicycle
- Reducing the number of bicyclists killed or injured in traffic crashes

- Using the City as an institutional role model, encouraging bicycle use in other public agencies and private businesses

While the TSP defines a large number of future actions needed to improve evaluation and safety, the primary information relevant to future Willamette River Bridge access is the set of shared use path opportunities and several high-priority bicycle system projects. Potential shared use path opportunities highlighted in the TSP (in vicinity of the Willamette River) include:

- A potential connection between Riverfront Park and Minto-Brown Island Park in the form of a bridge or floating path
- Along the Burlington Northern Santa Fe/Portland and Western Railroad Line (dependent on rail abandonment or rail banking)
- Along Mill Creek between Church Street NE and the Willamette River
- Along Pringle Creek between the existing Pringle Creek Path terminus and Riverfront Park

High-priority corridors targeted for bicycle system improvements (in vicinity of the Willamette River) include:

- Mission Street SE (12<sup>th</sup> Street SE to Commercial Street SE)
- State Street (12<sup>th</sup> Street SE to 24<sup>th</sup> Street SE)
- Broadway Street NE (Liberty Street NE to Salem Parkway NE)
- Center Street NE (Commercial Street NE to 17<sup>th</sup> Street NE)
- Marion Street NE (13<sup>th</sup> Street NE to Commercial Street NE)
- Commercial Street SE (Ferry Street SE to Trade Street SE)
- Commercial Street SE (Mission Street SE to Superior Street SE)
- Market Street NE (Commercial Street NE to Hawthorne Avenue NE)
- Liberty Street SE (Trade Street SE to Ferry Street SE)
- Capitol Street NE (Center Street NE to Market Street NE)

Other TSP recommendations to improve cycling conditions include developing bicycle wayfinding signage (similar to signs recently installed near the Union Street Bicycle/Pedestrian Bridge), developing bicycle parking code requirements, and establishing minimum facilities maintenance guidelines. Mentioned above, the Bicycle System Element also intends to use the City as an institutional model to promote bicycling among other agencies and businesses. Supporting policies within this overall objective include tripling the bicycle mode share among City employees (to ten percent by 2015) through various incentives, providing end-of-trip facilities at City offices, and reducing the number of bicycle crashes involving City staff.

The Salem TSP's Pedestrian System Element defines three primary objectives to guide pedestrian investments:

- Providing a comprehensive system of sidewalks and other pedestrian walkways
- Doubling the percentage of trips made by pedestrians
- Reducing the number of pedestrian-related crashes by 50 percent through education and other strategies

The TSP identifies several general “sidewalk deficient” areas (e.g., areas with fragmented or no sidewalks) throughout Salem. In West Salem, the major sidewalk deficient area in the Willamette River’s vicinity extends north and west of the gridiron street pattern near Edgewater Street NW, encompassing numerous streets west of Wallace Road NW and south of Glen Creek Road NW. Two major sidewalk deficient areas exist immediately east of the river, including:

- The area generally bounded by Liberty Street NE, Tryon Street NE, Hood Street NE, and the Willamette River
- The area generally bounded by Cherry Avenue NE, Locust Street NE, Broadway Street NE, and Pine Street NE

The TSP proposes several pedestrian infrastructure improvements to enhance the walking environment:

- Installing crosswalks at intersection legs where pedestrian crossings are currently prohibited
- Upgrading passenger infrastructure at transit stops
- Sidewalk, streetscape and intersection improvements along Broadway Street NE, Front Street NE, Edgewater Street NW, and 2<sup>nd</sup> Street NW

It should be noted that the shared use path opportunities described in the Bicycle System Element would also benefit pedestrians.

Chapter 5 defines excessive vehicle traffic in neighborhoods as a safety and livability problem caused primarily by congestion, and recommends that congestion mitigation projects be attempted before Neighborhood Traffic Management (NTM) measures are implemented. NTM measures designed to reduce vehicle speeds and volumes also contribute to safer pedestrian and bicycle conditions. Identified measures include speed humps, traffic circles, medians, reductions in street width and street curvature, chicanes, curb extensions, and pavement texture.

### *2008 Salem Bicycle Counts*

In the summer of 2008, community volunteers partnered with the City to complete the first citywide bicycle user count study for Salem. During the summer months (specific months not specified), 21 volunteers performed 40 manual counts at 32 sites around the city. Counters tallied direction, gender, and helmet use during two-hour peak traffic times, either 7am to 9am, or 4pm to 6pm. The resulting data provide baseline user counts for this study as well as an indication of current bicycling usage in the City of Salem. The 32 count sites selected include several that are directly west of the current Center Street Bridge site, including the second-highest count site, at High Street and Chemeketa, where 320 bicyclists were counted in the study time frame.

Limitations of the count data include:

- The count data does not claim to represent the total number of bicyclists in the City of Salem.
- Because past data does not exist for comparison, no trends can be identified.

- The counts did not include any sites within West Salem, a major limitation for this study. Counts were conducted on the Center Street Bridge, which serves as the primary route for bicyclists traveling between West Salem and downtown.
- The count sites may not provide data that is relevant to the eventual selected sites of crossing alignment alternatives.

### *Center Street Bridge Path Automated Count Data*

The City of Salem provided the study team with detailed results from automated hose counts performed on August 14 and 15, 2006, on the west-side 10' bicycle and pedestrian pathway on the Center Street Bridge. The counts demonstrate clear peak-hour patterns of bicycle usage, though there is some use demonstrated at most hours of the day during the Tuesday, August 15 count. On Monday, August 14, 254 cyclists were recorded, and on Tuesday, August 15, 374 bicyclists were recorded.

In addition, the 2008 Salem Bicycle Counts (see above) recorded a 2-hour peak use count of bicyclists on the Center Street Bridge and extrapolated a daily count by multiplying this figure by five (in accordance with practices used in Portland and nationally). Their final 24-hour user figure was 210 users.

In December 2008, SKATS conducted a pedestrian/bicycle count at the Marion Street and Center Street Bridges. The results of the afternoon counts are shown in Appendix B. Between 8:00 and 9:00 a.m., 3 bicyclists (Center Street Bridge) and 12 pedestrians (9 on Center Street Bridge, 3 on Marion Street Bridge) were counted. In the afternoon (2:30 to 5:00 p.m.), 72 persons were counted (33 bicyclists, 39 pedestrians), with almost 70% of these persons using the Center Street Bridge.

### *Salem Blueprint for Better Bicycling*

This report, currently being finalized by the Mid-Willamette Valley Chapter of the Bicycle Transportation Alliance, provides a general assessment of opportunities and challenges for bicycling in the Salem-Keizer area. Conclusions about cyclists' needs were drawn from a survey of 200 bicyclists. In addition, twelve specific highest-priority projects were identified. One clearly identified project is the need for improved Willamette River bridge connections. Other challenges reported include:

- Connectivity of the network that feeds the Center Street Bridge from both sides of the bridge.
- Westbound bicyclists emerge from the Center Street multi-use path on the "wrong side of the street" and must use the crosswalk to get to the "right side of the street" (Salem Blueprint for Better Bicycling, pg. 9)
- Concerns about bicycle accommodation of a future Willamette River Bridge crossing (particularly across on- and off-ramps).

Some of these projects may be specifically relevant to future alignments considered in the Bridge Draft Environmental Impact Statement (DEIS) process, including the "bicycling downtown" project. In addition, systematic challenges are identified that may inform facility improvement concepts, including the need for system benchmarking, bicycle facility sweeping and maintenance, and the establishment of formalized bicycle routes.

### *Understanding and Measuring Bicycling Behavior: a Focus on Travel Time and Route Choice*

This report, completed by Portland State University researcher Jennifer Dill, used GPS technology to record a sample of everyday cycling patterns of 164 adult bicyclists in Portland, OR collected between March and November 2007. The participants in this study were primarily regular bicyclists who usually rode more than one day per week, year-round. The study can provide data points that can be applied to this study in the absence of Salem-specific data, including: average trip distance, average number of trips per day, median bicycle trip distance, trip purpose distribution, bicycle facilities usage and demonstrated preferences, and willingness of bicyclists to travel out of direction for bicycle-specific infrastructure. Participants were also asked a series of questions about why they selected the route they did, demonstrating trends about facility preference. The report also details the difference in bicycling habits between more and less experienced riders and the difference in facility choice between women and men. This data can inform facility improvement recommendations and demand projection/usage calculations for this project.

### **Parking**

The City of Salem's Downtown Parking District, illustrated in the project Basemap, offers over 4,000 free customer parking spaces (primarily subsidized by downtown businesses). Two-hour parking signs are the type of parking controls most often used in the downtown core and parking meters are located in the Capitol Mall area. The number of hours permitted at parking spaces depends on the type of retail or business use; quick stop loading /unloading zones are usually 30 minutes; parking near larger stores or restaurants where customers need longer time to leave their vehicle offer 2 hour parking. According to the City's Parking Policy webpage, parking signs used in the downtown core have the benefit of discouraging all-day parkers and encouraging rapid turnover of parking spaces. Additionally, retail areas within Downtown Salem core benefit from the use of time-limited parking signs. Parking is not allowed at locations where vehicle-pedestrian safety is compromised. The City's Parking Services Division, together with the Salem Police Department, enforces the City-wide parking. (City of Salem, 2009).

Parking controls are necessary to assure that the on-street parking supply is used in a manner consistent with the need for downtown businesses and the demand for parking they require. The City conducts a study prior to implementing any parking controls to determine which control will be beneficial given the present use and expected utilization. (City of Salem, 2009).

Most parking meter rates are \$0.75/hour except for the Library Parkade (\$0.50/hour). Those citizens that use the parking meters frequently can purchase a CASH KEY that can be programmed with pre-paid parking (up to \$600).

Special event parking is coordinated with the Parking Services Division. Parking permits can be purchased through this division.

According to Policy 1.6 of the Parking Management Plan Element (discussed below), a Central Salem Pay-to-Park District has been designated to help manage parking resources in the high parking demand area. In this area, on-street parking is restricted through pricing or time limitations. The Downtown Free Parking District provides free on-street parking, which is paid for by area businesses.

Through the City of Salem's Parking Management Plan Element, the City has identified goals, objectives, and policies designed to better manage overall parking supply of the Salem Urban Area and reduce the amount of parking per capita. The goal of the City's parking management states "To ensure the Salem Urban Area has an appropriate supply of parking facilities that supports the goals and objectives of the Salem Transportation System" (City of Salem, 2007).

The objectives of the Parking Management Plan Element are:

- Define a role for on-street parking facilities.
- Require an appropriate supply of off-street parking facilities to promote economic vitality and neighborhood livability.
- Decrease reliance of SOV and encourage alternative modes of travel (to meet the State Transportation Planning Rule to reduce parking supply).

From these objectives, policies have been developed to identify provision of different types of parking, where parking will be removed, parking pricing, promoting alternative modes, and the monitoring of parking supply.

In June 2006, the City of Salem completed an inventory and capacity study for its downtown parking facilities (on and off-street). Since then, the City has implemented changes to its on-street supply (reductions in the number of 30 minute parking stalls and transition from all-day (no limit) stalls to two hour parking) in addition to rate restructuring in city-owned off-street facilities. To better understand the current parking activities, the City conducted a follow-up parking inventory and capacity study. This survey looked at the parking facility inventory, "typical day" parking use, parking utilization and turnover, identification of parking surpluses and constraints on the parking supply, and comparative analysis of data between study years (Salem, 2008).

This 2008 study found that more cars are visiting downtown businesses than were in 2006, and parking utilization was slightly less. In 2008, there was a 71 percent utilization of on-street parking during the peak hour (12:00 to 1:00 p.m.), which is slightly (two percent) less than 2006. For off-street parking (including parking structures), peak hour occupancy (2:00 – 3:00 p.m.) in 2008 was 45 percent compared to the 51 percent peak hour occupancy in 2006 (1:00 – 2:00 p.m.). This peak hour occupancy for both on-street and off-street parking areas indicates a substantial supply of available parking in public owned facilities.

In 2008, the average time of stay within an on-street system is 1.3 hours. The downtown turnover is fairly high. The "typical" parking space in downtown Salem turned over 7.7 times over a 10 hour period. This indicated that the Salem parking system is operating at an efficient level.

### Travel Demand Model

The Salem-Keizer Area Transportation Study (SKATS) model is a four step travel demand modeling process: trip generation, trip distribution, mode choice and trip assignment. Specifics of the SKATS model in relation to these four steps are provided as Appendix C. The model is considered an advanced state-of-practice application. It includes pre-trip generation steps to predict workers per household and auto-ownership. The auto-ownership model for instance is influenced by accessibility measures (e.g., jobs within 30

minutes by transit) that influence the number of automobiles owned by different households. The model also integrates variables to measure sensitivity to urban-form (e.g., mixed use or relationship between households and employment which influences mode choice). Though most MPOs still use four-step models, these models are widely criticized because they are not particularly sensitive to some behavioral issues impacting mode choice decision-making and associated travel behavior. Nationwide, newer activity-based models are in development that are intended to address these types of limitations, however only a handful of MPOs (mostly very large MPOs) have experience in their development and use.

### *Model Measures*

A number of model measures can be reported and analyzed by the SKATS model via the VISUM platform. Here are some key measures:

1. Auto Volumes
2. Mode Choice
3. Transit Ridership
4. Travel Time: free flow time vs. congested time
5. Speed: free flow speed vs. congested speed
6. Shortest Path
7. Origin-Destination pairs (desire lines)

### **Model's Limitations**

Long term parking costs in downtown zones affect all the trips that are destined to downtown, whereas adding frequency to one or two transit routes only affects a limited set of Origin-Destination pairs. A travel model is therefore almost always more sensitive to pricing than added services.

### **Next Steps**

Information from the data and literature review will serve as the basis for Technical Memorandum 4. Technical Memorandum 4 will assess the potential for future growth in alternative mode share between West Salem and downtown Salem.

## Appendix A: References

Apogee. 1994. Costs and Cost Effectiveness of Transportation Control Measures; A Review and Analysis of the Literature. National Association of Regional Councils.

Bicycling. 1991. A Trend On the Move: Commuting by Bicycle Bicycling Magazine. Rodale Press.

Bracher, T. 2000. Demand Characteristics & Co-operation Strategies for the Bicycle & Railway Transport Chain. World Transport Policy and Practice, Vol. 6, No. 4, 18-24.

Broadbuss, A., Litman, T., and Menon, G. 2009. Transportation Demand Management Training Document. Federal Ministry for Economic Cooperation and Development. Bonn, Germany.

Burriss, M., Byers, M., and Swenson, C. 2003. Results of Driver Survey Investigating Intersection Queue Jumps. Transportation Research Record, 1839, 25-33.

Dill, J, and Carr, T. 2003. Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them. Transportation Research Record, 1828, 116-123.

Cervero, R. and Radisch, C. 1995. Travel Choices in Pedestrian Versus Automobile Oriented Neighborhoods. UC Transportation Center. UCTC 281.

Cherriots. Cherriots Ridershare. 2009. Accessed May 14, 2009.  
[www.cherriots.org/rideshare/index.html](http://www.cherriots.org/rideshare/index.html)

Dill, J. and Carr, T. 2003. Bicycle Commuting and Facilities in Major U.S. Cities. Transportation Research Record. 1828, 116-123.

DRC Research. 2008. Public Attitudes and Perceptions toward Salem/Keizer Transit. Prepared for Salem/Keizer Transit District. Salem, Oregon.

Ewing, R. 1986. TDM, Growth Management, and the Other Four Out of Five Trips. Transportation Quarterly, Vol. 47, No. 3, 343-366.

Ferguson, E. 1998. Transportation Demand Management. American Planning Association. Planning Advisory Service. Report Number 477.

Georggi, N. et al. 2007. Measuring the Impacts of Employer-based Transportation Demand Management Programs on an Interstate Corridor. Journal of Public Transportation, Vol. 10, No. 4.

Kuppam, A., Pendyala, R., and Gollakoti, M. 1998. Stated Response Analysis of the Effectiveness of Parking Pricing Strategies for Transportation Control. Transportation Research Record 1649, 39-46.

Mielke, J. 2006. Vanpooling in North Dakota: Feasibility and Operating Scenarios. North Dakota State University. Fargo, North Dakota.

Salem Area Mass Transit District. 2009. Accessed May 5, 2009: <http://www.cherriots.org>.

- Salem, City of. Parking Management Plan Element. 2007. Accessed May 2009.  
[www.cityofsalem.net/Departments/PublicWorks/TransportationServices/TransportationPlan/Documents/tsp\\_parking\\_approved.pdf](http://www.cityofsalem.net/Departments/PublicWorks/TransportationServices/TransportationPlan/Documents/tsp_parking_approved.pdf)
- Salem, City of. Salem Parking Policies and Guidelines. Accessed April 24, 2009.  
[www.cityofsalem.net/Departments/AdministrativeServices/ParkingServices/Pages/ParkinginDowntownSalem.aspx](http://www.cityofsalem.net/Departments/AdministrativeServices/ParkingServices/Pages/ParkinginDowntownSalem.aspx).
- Salem, City of. Salem Transportation System Plan Elements. Access June 3, 2009.  
<http://www.cityofsalem.net/Departments/PublicWorks/TransportationServices/TransportationPlan/Pages/default.aspx>
- Salem, City of. Transportation System Management Element. Accessed June 3, 2009.  
[http://www.cityofsalem.net/Departments/PublicWorks/TransportationServices/TransportationPlan/Documents/tsp\\_ts\\_mgmt\\_approved.pdf](http://www.cityofsalem.net/Departments/PublicWorks/TransportationServices/TransportationPlan/Documents/tsp_ts_mgmt_approved.pdf)
- Salem, City of. Update of Parking Resources Downtown Parking Zone - Salem, Oregon. July 2008. Rick Williams Consulting, Portland, Oregon.
- Salem, City of. Salem Vision 2020 Action Plan. Accessed June 3, 2009.  
[http://www.cityofsalem.net/CityCouncil/CityProjects/Vision2020/Documents/action\\_plan\\_040708.pdf](http://www.cityofsalem.net/CityCouncil/CityProjects/Vision2020/Documents/action_plan_040708.pdf)
- Shoup, D. 2005. *The High Cost of Free Parking*. Planners Press. American Planning Association. Chicago, Illinois.
- SKATS. 2031 Regional Transportation Systems Plan. Accessed June 5, 2009.  
<http://www.mwvcog.org/transportation/skats/rtsp.asp>
- SmartTrips Downtown Interim Report. 2008.  
<http://www.portlandonline.com/shared/cfm/image.cfm?id=215711>.
- Socialdata America Ltd. 2007. IndiMark® and Behavior Change Results for the Cities of Salem-Keizer, Eugene, and Bend, Oregon. Individual Transportation Options Pilot Project, Contract No. 24872. Oregon Department of Transportation.
- Turnbull, K., Levinson, H., and Pratt, R. 2006. HOV Facilities - Traveler Response to Transportation System Changes. TCRP Report 95. Transportation Research Board.
- Ungemah, D. and Dusza, C. 2008. A Transportation Demand Management (TDM) Benchmark: Results from the 2008 TDM Program Survey. Texas Transportation Institute. Austin, Texas.
- VTPI. 2009. Online TDM Encyclopedia. Victoria Transport Policy Institute.  
<http://www.vtppi.org/tdm>.
- Wambalaba, F., Concas, S., and Chavarria, M. 2004. Price Elasticity of Rideshare: Commuter Fringe Benefits for Vanpools. Center for Urban Transportation Research. University of South Florida. Tampa, Florida.
- Zuehlke, K. and Guensler, R. 2007. Employer Perceptions and Implementation of Commute Alternatives Strategies. *Journal of Public Transportation*, Vol. 10, No. 4.

## Appendix B: SKATS Bicycle/Pedestrian Counts (December 2008)

Survey Date: 12/08/2008

Weather Condition : Dry, Partly Cloudy

Duration: 2.5

hours

<b>Center St. Bridge (Eastbound)</b>				
	2:30 pm-3:30 pm	3:30 pm-4:30 pm	4:30 pm-5:00 pm	
Bike	8	15	5	
Walk	7	11	3	
<b>Total</b>	<b>15</b>	<b>26</b>	<b>8</b>	<b>49</b>

<b>Marion St. Bridge (Westbound)</b>				
	2:30 pm-3:30 pm	3:30 pm-4:30 pm	4:30 pm-5:00 pm	
Bike	2	1	2	
Walk	9	4	5	
<b>Total</b>	<b>11</b>	<b>5</b>	<b>7</b>	<b>23</b>

<b>Hourly Totals</b>				
	2:30 pm-3:30 pm	3:30 pm-4:30 pm	4:30 pm-5:00 pm	
Bike	10	16	7	
Walk	16	15	8	
<b>Grand Total</b>	<b>26</b>	<b>31</b>	<b>15</b>	<b>72</b>

## Appendix C: Travel Demand Model

This section provides an overview of the mode choice and trip assignments steps that help comprise the SKATS travel demand model.

### Mode Choice

The SKATS mode choice model includes the six modes listed in Table B-1. The mode choice modeling process will result in daily person trips for each mode by trip purpose. The mode choice model includes six main purposes, as indicated in Table B-2 as well as school and college trips. Daily trips are converted to peak hour trips to generate AM and PM peak hour vehicle trip tables that are used for trip assignment. The following tables show all the modes in the model as well as the mode choice model calibration results.

TABLE B-1  
SKATS Modes

Mode	Type	Class
Drive Alone	vehicle	Vehicle
Drive with Passenger	vehicle	Vehicle
passenger	other	vehPass
busWalk	transit	Bus
bike	other	Other
walk	other	Other

### *Trip Purpose Definitions:*

- Home-based work (HBW)
- Home-based shopping (HBS)
- Home-based recreation (HBR)
- Home-based other (HBO)
- Non-home-based work (NHBW)
- Non-home-based non-work (NHBNW)

TABLE B-2  
SKATS Mode Choice Model Calibration: Model Results vs. Observed Target

	<b>Model</b>	<b>Target</b>		<b>Model</b>	<b>Target</b>		<b>Model</b>	<b>Target</b>
hbwda	73.57	72.27	hboda	34.14	35.41	hbrda	28.83	30.96
hbwdwp	11.02	11.42	hbodwp	25.16	25.81	hbrdwp	16.12	15.78
hbwpass	6.28	7.14	hbopass	31.83	30.71	hbrpass	39.21	37.71
hbwbus	7.06	4.6	hbobus	0.53	0.7	hbrbus	1.6	1.01
hbwbike	0.64	1.6	hbobike	1.55	1.09	hbrbike	2.27	2.1
hbwwalk	1.43	2.98	hbowalk	6.78	6.28	hbrwalk	11.96	12.44
	100	100		100	100		100	100
	<b>Model</b>	<b>Target</b>		<b>Model</b>	<b>Target</b>		<b>Model</b>	<b>Target</b>
hbsda	43.05	43.59	nhbwda	69.1	68.82	nhbnwda	32.98	32.91
hbsdwp	20.75	21.24	nhbwdwp	6.11	6.78	nhbnwdwp	28.13	28.6
hbsspass	28.06	27.15	nhbwpass	8.09	9.24	nhbnwpass	31.93	30.74
hbsbus	2.8	2.18	nhbwbus	0.41	0.63	nhbnwbus	0.1	0.04
hbsbike	0.71	0.71	nhbwbike	0.48	0.35	nhbnwbike	0.21	0.16
hbswalk	4.64	5.12	nhbwwalk	15.81	14.18	nhbnwwalk	6.65	7.55
	100	100		100	100		100	100

hbw = home-based work

da = drive alone

dwp = drive with passenger(s)

pass = passenger

bus = bus

bike = bike

walk = walk

### *Transit - Calculate Coverage Factor Percents by Choice Set*

Transit coverage factors are calculated or estimated to represent walk access to transit service in terms of households and jobs with service available at both trip ends. In other words, coverage factors are the percent of households or employment in each transportation analysis zone that is within walking distance to transit. The usual criteria are 1/4 mile to a bus line or 1/2 mile to a transit center or LRT station. Note that every zone has park-and-ride access since each zone falls within a park-and-ride shed. However, the base model for SKATS does not include park-and-ride as a mode.

NHBW and NHBW trip purposes have different coverage factors than the other home-based purposes (namely they are only a function of employment coverage not household coverage).

### ***SKATS Model Network***

The SKATS Model Network currently comprises of the following main components:

- Transport System: Car, Bus, Truck, and Walk-Access Transit
- Modes: Car, Bus
- Demand Segments: Car, Bus, External
- No bicycle or pedestrian networks – the model uses a distance matrix to estimate utility for making bike and walk trips.
- 409 Traffic Analysis Zones
- Centroid Connectors
- 14,000 Nodes
- 44,600 links

Link Types: Roadway classifications

Link type 99: no car

### **Traffic Assignment**

The SKATS model consists of assignments for three time periods: AM Peak, PM Peak, and Off Peak. Daily assignment can be conducted with Daily Demand = 12.5 Peak Hour Demand and Daily Auto Vehicle Link Capacity = 12.5 Hourly Auto Vehicle Link Capacity.

### ***Travel Skim Validation: Travel Time Study***

A major corridor travel time study was conducted in March and April 2006. The observed travel time of each segment was compared to the model travel time. The model generally over-estimates the congested travel speed by 0 to 40% on all eastbound segments while the model congested travel speed is generally higher by 0-66% on all westbound segments. In many cases, the range is between 10-20% when comparing estimated and observed. Table B-3 summarizes the travel skim study findings as calculated by PTV while calibrating the model for the Salem River Crossing EIS.

TABLE B-3

Findings from Travel Time Skim Study

Data Collected Date & Corridor Name	Direction / Length	Free Flow Speed	Obs. Free Flow Speed	Free Flow Speed: Model/Obs	Congested Speed	Obs. Congested Speed	Congested Speed: Model/Obs	Direction / Length	Free Flow Speed	Obs. Free Flow Speed	Free Flow Speed: Model/Obs	Congested Speed	Obs. Congested Speed	Congested Speed: Model/Obs
March 2006														
16Mission St - Commercial/Liberty to Lancaster	<u>EB</u>							<u>WB</u>						
	3.6	30	27.5	1.09	28	20	1.40	3.5	29	23.6	1.23	26	20	1.30
22Wallace Rd - Highway 22 to Brush College	<u>NB</u>													
	2.4	26	30	0.87	23	23	1.00							
23State St - 12th to Lancaster	<u>EB</u>							<u>WB</u>						
	2.3	30	23	1.30	28	21	1.33	2.5	30	26.7	1.12	27	25.4	1.06
April 2006														
4 Lancaster - Kuebler to Portland Rd	<u>SB</u>							<u>NB</u>						
11Kuebler - Skyline to Center	<u>EB</u>							<u>WB</u>						
	8.9	43	34	1.26	34	25	1.36	8.9	43	36	1.19	34	28	1.21
12Highway 22W - Highway 51 to Front Street	<u>EB</u>							<u>WB</u>						
	5.3	44	-		42	36.25	1.16	5.4	45	36.43	1.24	41	24.5	1.67
13Pringle/Battle Creek - Hoyt to Eastlake (past Kuebler)	<u>SB</u>							<u>NB</u>						
	3.1	29	29	1.00	27	24	1.13	3.1	29	30	0.97	28	25.33	1.11

TABLE B-3  
Findings from Travel Time Skim Study

Data Collected Date & Corridor Name	SB			NB			EB			WB				
	Direction / Length	Free Flow Speed	Obs. Free Flow Speed	Free Flow Speed: Model/Obs	Congested Speed	Obs. Congested Speed	Congested Speed: Model/Obs	Direction / Length	Free Flow Speed	Obs. Free Flow Speed	Free Flow Speed: Model/Obs	Congested Speed	Obs. Congested Speed	Congested Speed: Model/Obs
18Portland Rd: Hazelgreen to Fairgrounds to Capitol/Summer to Center	<u>SB</u>							<u>NB</u>						
	5.2	31	31	1.00	29	27	1.07	5.1	31	30	1.03	29	26	1.12
20Hawthorne - Highway 22E to Hyacinth to Verda to Lockhaven	<u>NB</u>							<u>SB</u>						
	6.8	27	17	1.59	29.44	24	1.23	6.8	27	20	1.35	25	18	1.39
25Wallace Rd - Brush College to Center @ 12th	<u>SB</u>							<u>NB</u>						
	3.3	27	22	1.23	24	19	1.26	3.8	28	27	1.04	20	21	0.95
26Silverton - Portland/Fairgrounds to Cordon Rd	<u>EB</u>							<u>WB</u>						
	3	31	27	1.15	30	25	1.20	4.6	32	25	1.28	30	23	1.30
May 2006														
2 25th - State to Madrona to Liberty	<u>SB</u>							<u>NB</u>						
	3.6	26	18	1.44	22	16	1.38	3.6	26	17	1.53	24	13	1.85
9 Highway 22 - Deer Park to Highway 51	<u>WB</u>							<u>EB</u>						
	11.8	39	34	1.15	35	31	1.13	11.7	39	37	1.05	36	37	0.97
11River Rd S - Commercial/Liberty to Viewcrest	<u>SB</u>							<u>NB</u>						
	3.3	40	41	0.98	35	40	0.88	3.3	40	41	0.98	39	41	0.95