MEMORANDUM

DATE: February 24, 2013

TO: Christina Robertson-Gardiner, City of Oregon City

FROM: Carl Springer, DKS Associates
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SUBJECT: Oregon City Willamette Falls Legacy Project
Draft Transportation Analysis P13114-000

This memorandum presents the multimodal transportation system analysis for the Willamette Falls Legacy Project study area. This transportation element refines the 2013 Transportation System Plan (TSP) based on the latest growth estimates and goals for the project site. The outcome includes a toolbox of potential multi-modal transportation improvements for the site, along with a list of required amendments to the TSP to implement them.

Study Purpose

The 23 acres of industrial uses encompassing the Willamette Falls Legacy Project site is intended to be rezoned as part of this study and made available for housing and economic development. Prior to establishing and as a part of adopting the needed zoning to allow for development in suitable areas, the city undertook a visioning and master planning process, which included an identification of potential multi-modal transportation improvements for the site.

As part of this effort, the city chose to establish a Multi-modal Mixed-Use Area (MMA) encompassing downtown Oregon City, generally bounded by 12th Street to the north, Tumwater Drive to the south, the bluff to the east, and the Willamette River to the west (see Figure 1). The transportation assessment will be evaluated within the MMA boundary, which includes the Willamette Falls Legacy Project site. The following 7 intersections have been identified as study intersections (see Figure 1), with their intersection control listed:

1. Main Street/McLoughlin Boulevard (signalized)
2. Main Street/6th Street (unsignalized)
3. Main Street/7th Street (signalized)
4. McLoughlin Boulevard/6th Street (unsignalized)
5. 6th Street/Railroad Avenue (unsignalized)
6. 7th Street/Railroad Avenue (unsignalized)
7. McLoughlin Boulevard/S 2nd Street (signalized)

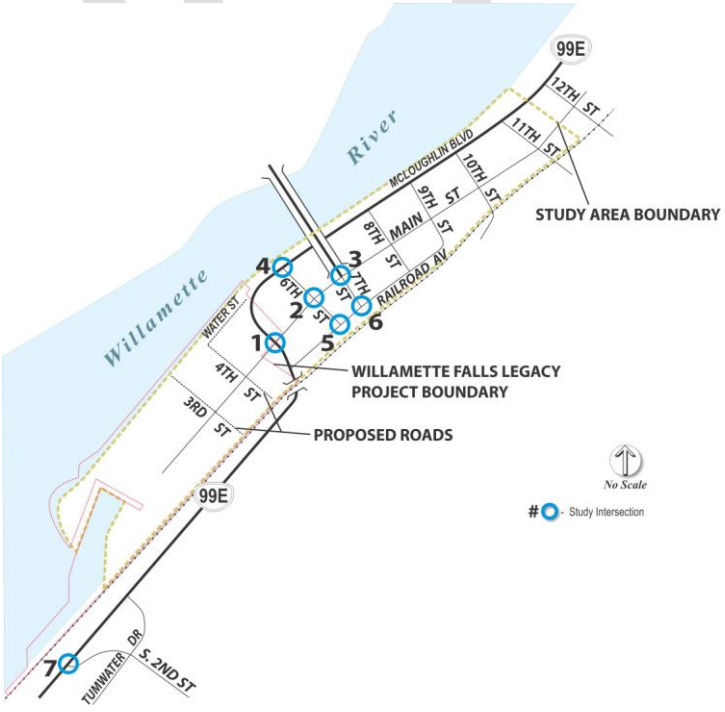

Figure 1: Study Area

Existing Transportation Infrastructure

To address the changing transportation needs within the study area associated with redevelopment of the Willamette Falls Legacy Project site, we must first look at the existing and future travel conditions. The existing transportation system was reviewed to document the walking, biking, driving and transit infrastructure. Shortfalls and limitations into how people can travel within the study area (such as lack of bike lanes or sidewalks) was also identified. Solutions for the transportation infrastructure that are determined to not maintain acceptable service levels for residents will be provided later in this document.

Roadways

Located between the Willamette River and the Union Pacific Railroad tracks, the Willamette Falls Legacy Project site has limited accessibility. Motor vehicle access to the project site is limited to Main Street, which run north-to-south through Downtown Oregon City across McLoughlin Boulevard and into the Willamette Falls Legacy Project site. A new site access is proposed just to the north of Main Street, referred to as Water Street (see Figure 1). This new street connection to McLoughlin Boulevard will likely be limited to right-in, right-out access, but will generally provide internal site circulation to Main Street, and offer drivers along southbound McLoughlin Boulevard another option to access the site.

The only street providing for higher capacity north-to-south motor vehicle movement through the study area is McLoughlin Boulevard, which is classified by the Oregon Department of Transportation (ODOT) as a Regional Highway. It also has a Special Transportation Area (STA) designation from 14th Street to Railroad Avenue. This street connects the study area to Interstate 205, located roughly one-half mile to the north. Access across the Willamette River is limited to two bridges, the Oregon City-West Linn Arch Bridge and the Interstate 205 Abernethy Bridge. Drivers in the study area wishing to reach the top of the bluff are limited to 12th Street, 10th Street and S. 2nd Street.

In addition to these routes, Main Street, Railroad Avenue and 7th Street provide collector connections between McLoughlin Boulevard and Oregon City-West Linn Arch Bridge. Most of the remaining streets in the study area are non-through routes. These streets generally provide circulation between McLoughlin Boulevard, Main Street, or Railroad Avenue and the abutting land uses and generally have less capacity. The major characteristics of the roadways in the study area are summarized in Table 1, with lane configurations and traffic controls for study intersections illustrated in Figures A1 and A2 in the appendix.

Table 1: Study Area Roadway Characteristics

Roadway (limits)	Existing Classification*	Cross section	Posted Speed	Pedestrian Facilities	Bike Facilities
McLoughlin Boulevard					
(12th Street to 10th Street)	Regional Highway	4 lanes	30 mph	Sidewalk on east side; shared-use path on west side	Shared-Use Path on west side
(10th Street to Main Street)	Regional Highway; STA	4 lanes	30 mph	Sidewalks on both sides	None
(Main Street to S. 2nd Street)	Regional Highway	4 lanes	30 mph	Sidewalk on west side	None
Main Street					
(12th Street to McLoughlin Boulevard)	Mixed-Use Collector	2 lanes	25 mph	Sidewalks on both sides	Shared Street with Sharrows
(McLoughlin Boulevard to Dead End)	Mixed-Use Local Street	2 lanes	25 mph	None	None
6th Street (McLoughlin Boulevard to Railroad Avenue)	Mixed-Use Local Street	2 lanes	25 mph	Sidewalks on both sides	None
7th Street (Main Street to Railroad Avenue)	Mixed-Use Collector	2 lanes	25 mph	Sidewalks on both sides	Shared Street with Sharrows
8th Street (McLoughlin Boulevard to Railroad Avenue)	Mixed-Use Local Street	2 lanes	25 mph	Sidewalks on both sides	None
9th Street (McLoughlin Boulevard to Railroad Avenue)	Mixed-Use Local Street	2 lanes	25 mph	Sidewalks on both sides	None
10th Street (McLoughlin Boulevard to Railroad Crossing)	Mixed-Use Major Arterial	3 lanes	25 mph	Sidewalks on both sides	None
12th Street (McLoughlin Boulevard to Railroad Crossing)	Mixed-Use Collector	2 lanes	25 mph	Sidewalks on both sides	None
S. 2nd Street (McLoughlin Boulevard to High Street)	Mixed-Use Minor Arterial	2 lanes	25 mph	Sidewalks on both sides	None

Source: *Oregon Highway Plan and 2013 Oregon City Transportation System Plan

Pedestrian/Bicycle

McLoughlin Boulevard and Main Street generally provide the only existing pedestrian connections to the project site. The existing conditions of these streets, together with several local streets, creates the context of the bicycle and pedestrian environment in the project area. Table 1 shows the roadways with pedestrian and bicycle facilities.

Main Street has low motor vehicle travel speeds (25 mph), wide sidewalks, and a buffer between the sidewalk and traveled way via on-street parking and streets trees, providing a comfortable walking environment for pedestrians from McLoughlin Boulevard to 12th Street. The slow travel speeds also make it conducive for shared biking travel, with the presence of sharrows further alerting drivers to share the street with bicyclists.

McLoughlin Boulevard generally provides a less comfortable walking and biking connection to the project site. It has comparable motor vehicle travel speeds to Main Street (30 mph versus 25 mph), but has much higher motor vehicle traffic volumes (21,000 to 23,000 vehicles per day). Sidewalks are provided on both sides of McLoughlin Boulevard north of Main Street and one side south of Main Street, however they generally abut directly up to the motor vehicle traveled way.

The sidewalks along McLoughlin Boulevard often abut directly to the motor vehicle travel way

No facilities are provided for bicyclists along McLoughlin Boulevard, with the exception of a short segment between 12th Street and 10th Street, where the Willamette River Trail, located between McLoughlin Boulevard and the Willamette River, provides for shared walking and biking travel and connects the I-205 shared-use path at Clackamette Park to downtown Oregon City via Jon Storm Park and the newly enhanced pedestrian accessible Willamette Terrace located near 12th Street.

Most of the remaining streets in the study area provide adequate accommodations for pedestrian users via sidewalks on both sides of the street. While accommodations for bicycle users are not typical on these streets (with the expectation of sharrows along 7th Street), they are generally low-volume, low-speed local streets that are suitable for shared bicycle travel.

There are pedestrian crosswalks at a large number of intersections in the study area, particularly in downtown where pedestrian activity is the highest. However, the need for additional or improved crossings of McLoughlin Boulevard is desired, where high motor vehicle volumes and speeds make the crossings difficult.

Signalized crossing opportunities of McLoughlin Boulevard are limited. They are available at several intersections in downtown, including at 10th Street and 12th Street. South of 10th Street, signalized crossing opportunities are not available for nearly a quarter mile, via a pedestrian activated signal under the Oregon City-West Linn Arch Bridge, and again via the traffic signal at Main Street. South of downtown, a pedestrian bridge over McLoughlin Boulevard is available just to the north of Tumwater Drive (at the end of the McLoughlin Promenade) and a signalized pedestrian crossing is available at 2nd Street. No additional marked pedestrian crossings (signalized or unsignalized) of OR 99E are available south of 2nd Street through the Canemah neighborhood, a distance of over a half mile.

The 2013 Oregon City TSP Update proposed bike facilities along several streets in the study area, including the installation of sharrows along Railroad Avenue and 12th Street. It also proposed extending the Willamette River Trail south, from 10th Street through the Willamette Falls Legacy Project site to the Canemah neighborhood. In addition, the need for a second pedestrian and bicycle bridge over McLoughlin Boulevard has been identified by the project team, connecting the project site to the McLoughlin Promenade. These potential improvements have been incorporated into the vision for the study area.

Transit

Transit service is provided in the study by TriMet via seven fixed bus routes connecting Oregon City to the rest of the Portland Metropolitan area, and an Americans with Disabilities Act (ADA) paratransit service. In addition, seasonal transit service is provided to residents and tourists via the Oregon City Trolley, and regional service is provided via the Canby Area Transit system, South Clackamas Transportation District and Amtrak.

The Oregon City Transit Center, located on Main Street between Moss Street and 11th Street, offers a transfer point between the seven TriMet fixed bus routes, the Oregon City Trolley and the regional bus service to Canby. The transit center offers a shelter, bench and rentable bike lockers for riders.

Oregon City Transit Center on Main Street in Downtown

Bus stops in the study area are located along Main Street, Railroad Avenue, and S. 2nd Street. Potential transit users in the Willamette Falls Legacy Project site would be about a quarter-mile from the closest bus stops at the Main Street/8th Street or Railroad Avenue/7th Street intersections.

Freight

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The designation of through truck routes provides for this efficient movement, while at the same time maintaining neighborhood livability, public safety, and minimizing maintenance costs of the roadway system. McLoughlin Boulevard through the study area is not classified by ODOT as a freight route, but it is designated as a truck route by the federal government. Federal Truck Routes generally require 12-foot travel lanes, but allow 11-foot travel lanes within STA's with lower trucks volumes. McLoughlin Boulevard has an STA designation between 14th Street and Railroad Avenue. Heavy vehicles account for approximately three to five percent of the traffic on McLoughlin Boulevard through the study area during an average weekday.

Rail

Railroad tracks are available in the study area, between the Willamette Falls Legacy Project site and McLoughlin Boulevard and between Railroad Avenue and the bluff. The tracks are owned by Union Pacific Railroad and are currently utilized by freight and Amtrak passenger trains. ODOT estimates that about six passenger trains and between 20 and 25 freight trains pass through the study area each day.[1] A gated at-grade railroad crossing is located at 10th Street, while grade separated crossings are located at 12th Street and McLoughlin Boulevard in the study area.

Water

The study area is bordered by the Willamette River on the west side. This waterway generally only serves recreational needs. The Willamette Falls Locks, located just south of Downtown Oregon City on the west side of the Willamette River, provides a canal passage for boaters wishing to travel around Willamette Falls.

Multi-modal Mixed-Use Area (MMA)

As indicated earlier in this document, Oregon City is establishing a Multi-modal Mixed-Use Area (MMA) encompassing the study area (see Figure 1). Until recently, policies implementing the transportation system have placed high importance on movement of motor vehicles. This is accomplished through transportation system performance provisions in the Transportation Planning Rule (TPR) that are implemented almost entirely through state and local volume-to-capacity ratios or level-of-service (LOS) standards. By adopting an MMA designation, the City is adopting a different set

[1] ODOT Intercity Passenger Rail Study, ODOT Rail Division, June 2009 Draft.

of values that places importance on multimodal travel and a compact, mixed-use pattern of development.

It is important to understand that the MMA designation only applies to land use decisions that involve zone changes. It does not affect development applications that are permitted with existing zoning, in which case, the prevailing mobility standard still applies (in the downtown regional center area, the maximum allowed congestion is represented by a volume-to-capacity ratio of 1.10).

In return for the additional flexibility in development that the MMA designation provides, there is a trade-off in the amount of motor vehicle congestion and longer travel times that may result. Within the MMA, low intensity and automobile-related types of development are no longer permitted in favor of pedestrian oriented development. While congestion impacts considered through mobility performance measures will not be part of the approval criteria for future plan or land use regulation amendments in MMA areas, ODOT and the City still have a responsibility for addressing safety and operation of all their facilities. For this reason, the transportation infrastructure in the study area was evaluated with a variety of measures in order to document the existing deficiencies of the transportation system. Information reviewed included safety of the roadways and intersections and motor vehicle operational performance.

Safety

Safety of the roadways and intersections in the study area was assessed through collision data to identify deficiencies. The data along the roadways and intersections was reviewed to identify potential patterns for motor vehicle, pedestrian, and bicyclist collisions.

Collision data from the past five years (2008 to 2013) was obtained from ODOT for all roadways in the study area, in addition to the seven study intersections (see Table 2). Over the past five years, 126 collisions, or an average of 25 per year, were identified. A majority of these (76 of the 126) were either rear-end or turning type and most occurred along McLoughlin Boulevard, with only about 20 percent (25 of the 126 collisions) occurring along other roadways within the study area.

Of the 101 collisions along McLoughlin Boulevard over the past five years, nearly 20 percent (or 19 collisions) occurred near the railroad undercrossing and unsignalized Railroad Avenue intersection, approximately 200 feet south of the Main Street intersection. Of the collisions at this intersection, seven were rear-end type, with most occurring along the northbound direction of McLoughlin Boulevard. This may indicate that drivers are caught off guard by stopped vehicles on the highway from Main Street. Another seven of the collisions were sideswipes, and an additional three involved drivers striking the wall of the tunnel. This may indicate that drivers are not properly maneuvering through the narrow tunnel at times.

The severity of the collisions was generally low, with most (107 of the 126 collisions) involving either property damage only (no injuries) or minor injuries. There were eight collisions involving major

injuries, eleven involving moderate injuries, and no fatalities over the past five years. Most of the major or moderate injury collisions occurred along McLoughlin Boulevard, one at the 6th Street, six at the Main Street, four at the Railroad Avenue, three at the South 2nd Street, and three at the Tumwater Drive intersections.

Pedestrian/Bicycle Collisions: There was one crash involving a pedestrian and none involving a bicyclist over the past five years in the study area (2008 to 2013). A pedestrian was involved in a crash at the McLoughlin Boulevard/6th Street intersection in 2009, suffering minor injuries. Although no crashes were reported at the pedestrian activated signal under the Oregon City-West Linn Arch Bridge over the past five years, it was noted during field observations that the crossing is difficult to see for drivers at times due to shadows and lighting issues.

Safety Priority Index System (SPIS): SPIS is a method developed by ODOT for identifying hazardous locations on state highways. The score for each 0.10-mile segment of highway is based on three years of crash data, considering crash frequency, rate, and severity. SPIS compares each segment to the overall safety of the highways throughout the state.

According to ODOT's 2010 SPIS ratings, two 0.10-mile segments of McLoughlin Boulevard through the study area rank among the top ten percent of the most hazardous sections of state highways in Oregon. The identified locations are summarized below.

- McLoughlin Boulevard from 11th Street to 9th Street

  This segment of McLoughlin Boulevard includes several accesses within a short distance. In addition, a portion of this segment has two travel lanes in each direction with no left turn lanes, and requires drivers wanting to turn left from McLoughlin Boulevard into a driveway or street to stop in the travel lane when yielding to oncoming traffic. These factors could be contributing to the amount of collisions.

- McLoughlin Boulevard from 6th Street to one-tenth of a mile south of Railroad Avenue

  This segment includes several accesses over a short distance, a narrow tunnel and two curves that generally limit sight distance for drivers along McLoughlin Boulevard. These factors could be contributing to the high amount of collisions. As detailed above, 20 percent of the collisions that occurred along McLoughlin Boulevard through the study area over the past five years occurred within this segment near the railroad undercrossing tunnel.

Table 2: Study Intersection Collision Summary

	Intersection (traffic control)	Total Collisions (2008 to 2013)	Collision Severity				Pedestrians or Cyclists Involved
			Property Damage Only	Minor Injury	Moderate Injury	Severe Injury	
1	Main Street/ McLoughlin Boulevard (signalized)	**28**	*20*	*6*	*1*	*1*	0
2	Main Street/ 6th Street (unsignalized)	**1**	*1*	*0*	*0*	*0*	0
3	Main Street/ 7th Street (signalized)	**2**	*2*	*0*	*0*	*0*	0
4	McLoughlin Boulevard/ 6th Street (unsignalized)	**8**	*7*	*1*	*0*	*0*	1
5	6th Street/ Railroad Avenue (unsignalized)	**1**	*1*	*0*	*0*	*0*	0
6	7th Street/ Railroad Avenue (unsignalized)	**0**	*0*	*0*	*0*	*0*	0
7	McLoughlin Boulevard/S 2nd Street (signalized)	**18**	*15*	*3*	*0*	*0*	0

Motor Vehicle Operations

Motor vehicle operations were evaluated by analyzing the performance of the study intersections. Since the impacts of rezoning the Willamette Falls Legacy Project site are no longer required to be monitored through mobility targets with an MMA designation, the intersection operations are being provided to assess the safety aspects resulting from the potential increase in motor vehicle congestion with the redevelopment of the Willamette Falls Legacy project site. Two methods to gauge intersection operations include volume-to-capacity (v/c) ratios and level of service (LOS).

- Volume-to-capacity (V/C) ratio: A decimal representation (between 0.00 and 1.00) of the proportion of capacity that is being used (i.e., the saturation) at a turn movement, approach leg, or intersection. It is determined by dividing the peak hour traffic volume by the hourly capacity of a given intersection or movement. A lower ratio indicates smooth operations and minimal delays. As the ratio approaches 1.00, congestion increases and performance is reduced. If the ratio is greater than 1.00, the turn movement, approach leg, or intersection is oversaturated and usually results in excessive queues and long delays.

  Metro's mobility targets for streets in the study area are based on v/c ratios. During the highest one-hour period of the day a maximum v/c ratio of 1.10 shall be maintained at all intersections. ODOT applies the same maximum value for the highway in the downtown area. For signalized intersections, this standard applies to the intersection as a whole. For unsignalized intersections, this standard applies to the worst movement. These mobility targets would only be applied in the

study area for future developments (outside of the Willamette Falls Legacy Project site) that do not require a zone change.

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

The motor vehicle performance evaluation utilized 2000 Highway Capacity Manual methodology[2] for signalized intersections and 2010 Highway Capacity Manual methodology[3] for unsignalized intersections. During the evening peak hour, all study intersections are expected to operate under capacity (or a v/c ratio of 1.00) through 2035 (see Table 3). Each of the signalized study intersections are expected to operate with v/c ratios above 0.90 by 2035, with the increased traffic resulting from the Willamette Falls redevelopment having only minor impacts on the operational results.

Table 3: Study Intersection Traffic Operational Analysis

	Intersection (traffic control)*	2013 Existing Conditions		2035 Baseline Conditions		2035 with Willamette Falls Redevelopment	
		Volume/ Capacity	Level of Service	Volume/ Capacity	Level of Service	Volume/ Capacity	Level of Service
1	Main Street/ McLoughlin Boulevard (signalized)	0.80	C	0.93	C	0.97	D
2	Main Street/ 6th Street (unsignalized)	0.02	A	0.08	A	0.09	A
3	Main Street/ 7th Street (signalized)	0.67	B	0.83	B	0.91	C
4	McLoughlin Boulevard/ 6th Street (unsignalized)	0.39	C	0.45	C	0.48	C
5	6th Street/ Railroad Avenue (unsignalized)**	-	-	-	-	-	-
6	7th Street/ Railroad Avenue (unsignalized)	0.37	B	0.47	B	0.50	B
7	McLoughlin Boulevard/S 2nd Street (signalized)	0.69	B	0.91	C	0.92	D

Note: * V/C ratio, LOS and delay reported as the intersection average at signalized locations and worst stop controlled approach at unsignalized locations
** Intersection is uncontrolled at each approach and therefore, operational results are not possible.

[2] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000
[3] *2010 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010

Motor Vehicle Queuing

Motor vehicle queuing is expected in the downtown area as compared to other parts of the City. Given the high tolerance for peak hour congestion, on-street parking and more walking and biking activity, vehicle queuing is one sign of a healthy downtown area. That said, it is important to consider cases where substantial recurring queues may heighten safety issues by backing into adjacent intersections or into areas along McLoughlin Boulevard with limited sight distance for drivers. To understand those cases in the downtown, the vehicle queues were analyzed during the p.m. peak hour. An estimate of the 95th percentile vehicle queues at the study intersections was made using SimTraffic modeling software. The 95th percentile is the queue length that would not be exceeded in 95 percent of the queues formed during the peak hour. Queuing results are summarized in Table A1 in the appendix.

It was determined that the 95th percentile queue during the p.m. peak hour at several approaches would be expected to impact adjacent intersections (based on forecasted traffic volumes). Most of the impacts from the queues would be to intersections along Main Street, although the 95th percentile queues never reach the highway.

The queue from the northbound approach to the Main Street/ McLoughlin Boulevard intersection is expected to extend beyond the railroad undercrossing tunnel by 2035 and get even longer with the Willamette Falls redevelopment. The main cause for the lengthened queue is the increase demand for left-turns from northbound McLoughlin Boulevard to Main Street, in addition to more traffic accessing or leaving the Willamette Falls site from Main Street. Potential solutions to address this issue are discussed later in this document.

Multimodal Improvements Framework

The potential multimodal improvements identified later in this document were developed with a framework of various objectives. Each potential solution was evaluated to see how the objectives match the perceived project benefits and shortfalls. Overall, 33 different options were evaluated, with multiple options identified under each objective. Each of the options considered can be found in the appendix. The six objectives utilized to develop the multimodal improvements are shown below:

- **Objective A: Identify at least one additional site access point for motor vehicles**

  Main Street currently serves as the only access point to the Willamette Falls Legacy Project site. Another access point is needed to serve some of the expected traffic demand associated with the Willamette Falls Legacy Project redevelopment

- **Objective B: Allow for safe left-turns for motor vehicle from McLoughlin Boulevard to Main Street**

  The segment of McLoughlin Boulevard at the Main Street intersection has two travel lanes in each direction with no left turn lanes, and requires drivers wanting to turn left from McLoughlin

Boulevard to Main Street (both towards Downtown or the Willamette Falls Legacy Project site) to stop in the travel lane when yielding to oncoming traffic. Today, this is not a significant issue due to the limited demand for the movement, however, the left-turn demand is expected to increase with the Willamette Falls Legacy Project redevelopment. As discussed earlier, this could potentially cause increased queuing at the intersection, thus increasing the risk for rear-end collisions along McLoughlin Boulevard.

- **Objective C: Maintain adequate operating conditions at the McLoughlin Boulevard/Main Street intersection**

  The McLoughlin Boulevard/Main Street intersection is expected to operate roughly seven percent below capacity (v/c of 0.93) by 2035 before the Willamette Falls Legacy Project redevelopment. The increased traffic demand after redevelopment at the site could cause additional delay at the intersection, reducing available capacity to about three percent (v/c of 0.97 before any mitigation).

- **Objective D: Create at least one additional safe crossing of McLoughlin Boulevard between Downtown and the site**

  Those walking or biking to the site from Downtown currently have one convenient and safe crossing, via the Main Street signalized intersection. Another safe crossing is needed to serve some of the expected walking and biking demand associated with the Willamette Falls Legacy Project redevelopment

- **Objective E: Create at least one convenient pedestrian and bicycle overcrossing of McLoughlin Boulevard and the railroad tracks at the south end of the site**

  Those walking or biking at the south end of the site currently have two safe and convenient crossings of McLoughlin Boulevard, via the S. 2nd Street signalized intersection and a highway overcrossing from the McLoughlin Promenade. However, access to the site is still limited by the railroad tracks. An overcrossing is needed to provide a direct link between the McLoughlin Promenade and the project site.

- **Objective F: Create a continuous walking and biking connection between the Willamette River Trail and the site**

- The Willamette River Trail could potentially provide shared regional walking and biking access to the Willamette Falls Legacy Project site. However, the Willamette River Trail currently drops to a narrow sidewalk at the McLoughlin Boulevard/10th Street intersection. An extension of the trail south, through the project site and to the Canemah neighborhood, was envisioned in the Metro Regional Trail and Greenways Plan, the McLoughlin Boulevard Enhancement Plan, and the 2013 Oregon City Transportation System Plan. For this extension to occur, either the McLoughlin Boulevard viaduct would need to be expanded, or the existing street width of McLoughlin Boulevard would need to be redesignated. One opportunity could involve redesignating the shoulder lane northbound on the highway to become a right-turn only lane at Main Street. The lane striping change and overhead lane signage would occur just north of the traffic signal at 2nd

Street to give motorist adequate time to move to the appropriate lanes. North of Main Street on the highway, there would be a single northbound lane until 8th Street when the striping would transition back to its current cross-section. The excess width could potentially be used for an extension of the Willamette River Trail into the project site. This concept would not alter lanes for the southbound direction.

Willamette Falls Redevelopment

Land use is a key factor in developing a functional transportation system. The amount of land that is planned to be developed, the type of land uses, and how the land uses are mixed together have a direct relationship to the expected demands on the transportation system. Understanding the amount and type of land use is critical to maintaining or enhancing transportation system operations.

The 23 acres of industrial uses encompassing the Willamette Falls Legacy Project site is intended to be rezoned as part of this study and made available for housing and economic development. In addressing changing transportation needs in the study area, the impact of the increased vehicle trip generation on the surrounding transportation system, as a result of the proposed rezone, will be evaluated through the year 2035. The new information obtained from this system analysis will be used to develop a toolbox of transportation improvements. The result will be a toolbox of potential multi-modal transportation improvements for the site that will serve as the foundation for future development.

Estimating Driving Trips

A determination of future street network needs requires the ability to accurately forecast travel demand resulting from estimates of future population and employment for the Willamette Falls Legacy Project site, and the rest of the City and Metro region. The objective of the transportation planning process is to provide the information necessary for making decisions about how and where improvements should be made to create a safe and efficient transportation system that provides travel options.

The travel demand forecasting process generally involves estimating travel patterns for new development based on the decisions and preferences demonstrated by existing residents, employers and institutions around the region. Travel demand models are mathematical tools that help us understand future commuter, school and recreational travel patterns including information about the length, mode and time of day a trip will be made. The latest travel models are suitable for motor vehicle and transit planning purposes, and can produce total volumes for autos, trucks and buses on each street and highway in the system. Model forecasts are refined by comparing outputs with observed counts and behaviors on the local. This refinement step is completed before any evaluation of system performance is made. Once the traffic forecasting process is complete, the 2035 volumes are used to determine the areas of the street network that are expected to be congested and that may need

future investments to accommodate growth. The forecasted traffic volumes can be found in Figure A2, in the appendix.

Land Use and Motor Vehicle Trip Assumptions

Since the ultimate build-out of the Willamette Falls Legacy Project site is currently unknown, a high and low land use scenario was developed to identify minimum and maximum development potential of the site. The high land use scenario consisted of about 240 housing units and over 1,600 employees, while the low land use scenario included about 215 households and over 1,200 employees. Taking a conservative approach, the transportation impacts of redeveloping the Willamette Falls Legacy Project site were based on the high land use scenario to represent the reasonable worst case. For the recent update to the Oregon City TSP, vehicle trips within the Willamette Falls Legacy Project site were estimated based on around 240 fewer housing units and with over 1,350 fewer employees (as shown in Table 4).

Vehicle trips that would be generated by the Willamette Falls Legacy Project site were estimated by applying the Metro Regional Travel Forecast model trip generation rates by land use type. Overall, the Willamette Falls Legacy Project site is expected to generate about 700 motor vehicle trips during the p.m. peak hour, or 560 more than what was assumed in the 2013 TSP.

Table 4: Land Use Assumptions for the Willamette Falls Legacy Project Site

Scenario	Housing Units	Retail Employees	Other Employees	PM Peak Hour Vehicle Trips Ends
2035 Baseline*	0	0	289	140
2035 with Willamette Falls Redevelopment	240	219	1,453	700

* The 2035 Baseline scenario was assumed for the 2013 Oregon City TSP

Trip Distribution

Trip distribution involves estimating how site generated traffic will leave and arrive at the proposed site. The trip distribution for the Willamette Falls Legacy Project site was derived from the Metro Regional Travel Demand Model. Of the site generated trips, the following distribution is expected during the p.m. peak period:

- 40 percent are expected to come via McLoughlin Boulevard to/from the north
- 25 percent across the Oregon City-West Linn Arch Bridge
- 15 percent between areas to the south via McLoughlin Boulevard

- 15 percent via Main Street Downtown, north of the Oregon City-West Linn Arch Bridge.

Multi-Modal Street System

The 2013 Oregon City TSP classified the street system into a hierarchy organized by function and street type (representative of their places). These classifications ensure that the streets reflect the neighborhood through which they pass, consisting of a scale and design appropriate to the character of the abutting properties and land uses. The classifications also provide for and balance the needs of all travel modes including pedestrians, bicyclists, transit riders, motor vehicles and freight. Within these street classifications, context sensitive design may result in alternative cross-sections. The Oregon City multi-modal street system was modified to reflect the proposed zoning designations in the Willamette Falls Legacy Project site.

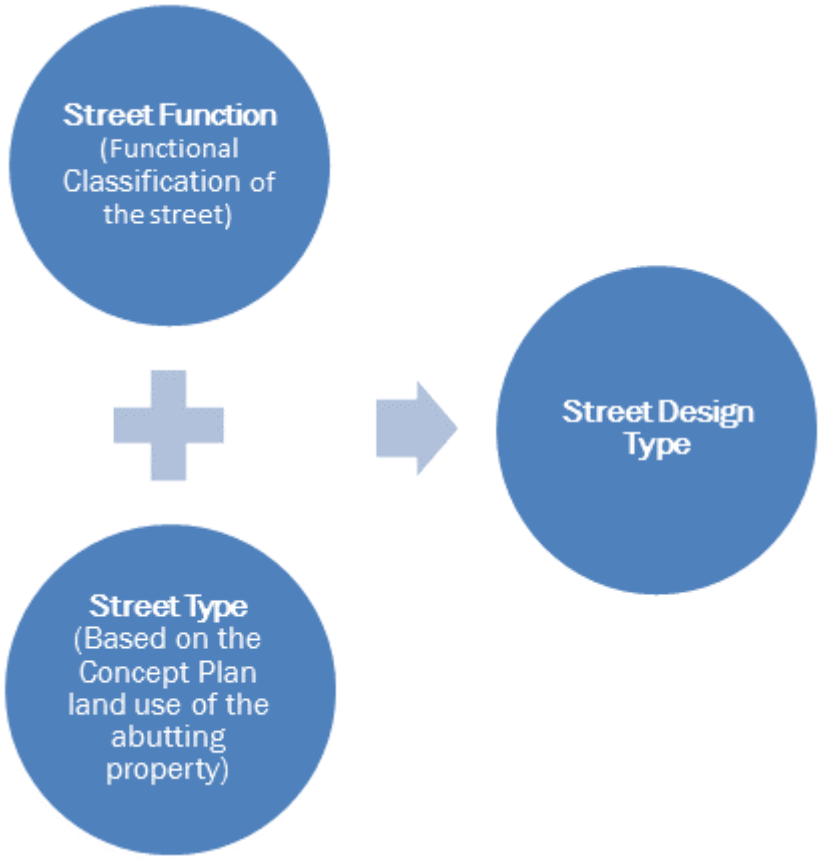

Figure 2: Oregon City Multi-Modal Street System

Multi-Modal Street Function

The functional classification of roadways is a common practice in the United States. Traditionally, roadways are classified based on the type of vehicular travel it is intended to serve (local versus through traffic). In Oregon City, the functional classification of a roadway the level of mobility for all travel modes, defining its design characteristics (such as minimum amount of travel lanes), level of access and usage within the City and region. The street functional classification system recognizes that individual streets do not act independently of one another but instead form a network that works

together to serve travel needs on a local and regional level. From highest to lowest intended usage, the classifications are freeway, expressway, major arterials, minor arterials, collectors and local streets. Roadways with a higher intended usage generally provide more efficient motor vehicle traffic movement (or mobility) through the City, while roadways with lower intended usage provide greater access for shorter trips to local destinations.

Two classifications were designated for the Willamette Falls Legacy Project site, including Collector Street (Main Street), and local streets (Water Street, 4th Street, and 3rd Street).

Multi-Modal Street Type

Oregon City further classifies the roadways within the City based on the neighborhood it serves and the intended function for pedestrians, bicyclists and transit riders in that specific area. Within the context of Oregon City's multi-modal street system, the street type of a roadway defines its cross-section characteristics and determines how users of a roadway interact with the surrounding land use. Since the type and intensity of adjacent land uses and zoning directly influence the level of use by pedestrians, bicyclists and transit riders, the design of a street (including its intersections, sidewalks, and transit stops) should reflect its surroundings.

The street types strike a balance between street functional classification, adjacent land use, zoning designation and the competing travel needs by prioritizing various design elements. All streets in the Willamette Falls Legacy Project site were designated as Mixed-Use Streets, with Main Street also designated as a Shared Street.

- **Mixed-Use Streets** typically have a higher amount of pedestrian activity and are often on a transit route. These streets should emphasize a variety of travel choices such as pedestrian, bicycle and transit use to complement the development along the street. Since mixed-use streets typically serve pedestrian oriented land uses, walking should receive the highest priority of all the travel modes. They should be designed with features such as wider sidewalks, traffic calming, pedestrian amenities, transit amenities, attractive landscaping, on- street parking, pedestrian crossing enhancements and bicycle lanes.
- **Shared Streets** are roadways where bicyclists and motorists share the same travel lane. The most suitable roadways for shared bicycle use are those with low speeds (25 mph or less) and low traffic volumes (3,000 vehicles per day or fewer). These streets serve to provide continuity to other bicycle facilities (e.g. bicycle lanes) and should include shared lane markings. Common practice is to sign the route with standard Manual on Uniform Traffic Control Devices (MUTCD) green bicycle route signs with directional arrows. Shared roadways can also be signed with innovative signing that provides directional information in terms of bicycling minutes or distance (e.g., "Transit Center, 3 minutes, ½ mile").

Design Types of Streets

Design of the streets in Oregon City requires attention to many elements of the public right-of-way and considers how the street interacts with the adjoining properties. The design of streets varies based on the functional classification and street type. Overall, there are three different design types for streets in the Willamette Falls Legacy Project site, including Mixed-Use Collector, Mixed-Use Local Street and Mixed-Use Local Street with Esplanade, as shown in Figures 3a to 3c.

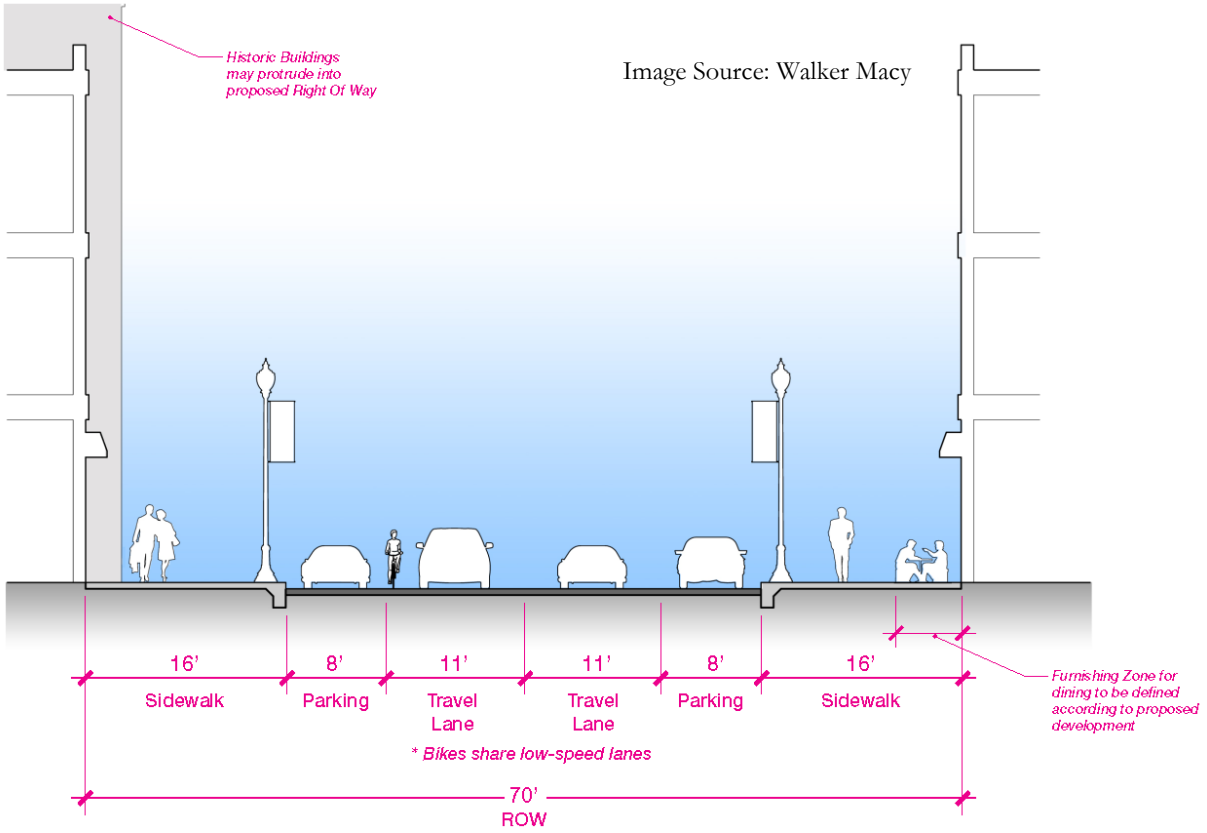

Figure 3a: Mixed-Use Collector Street (Main Street)

Image Source: Walker Macy

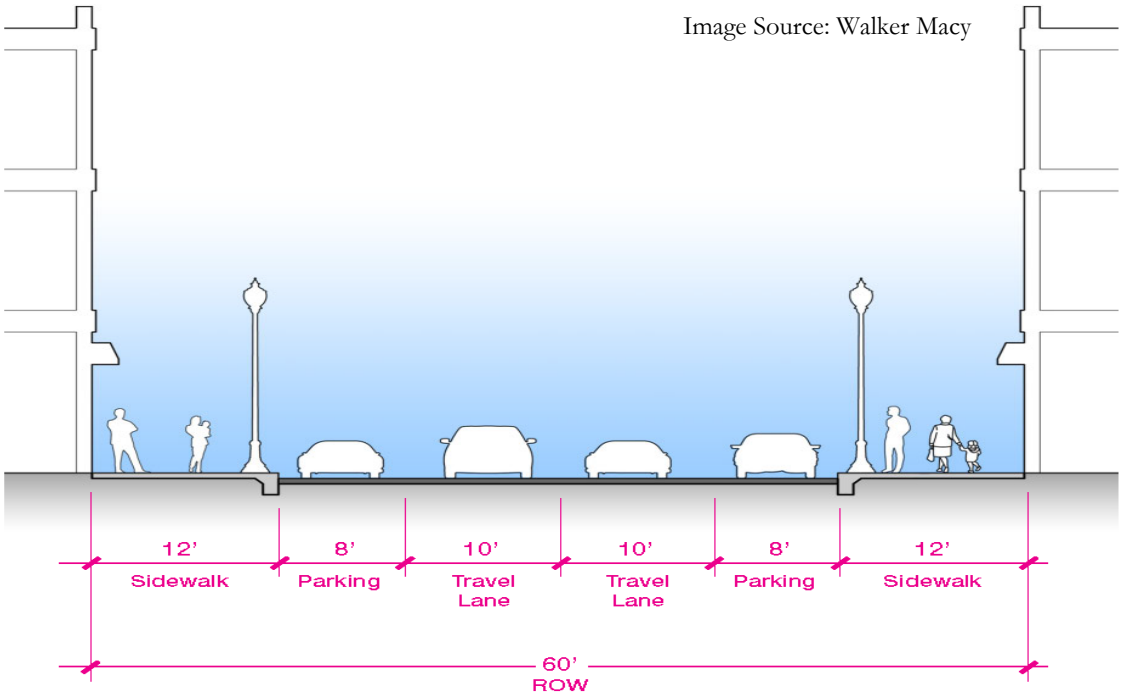

Figure 3b: Mixed-Use Local Street (3rd and 4th Streets) System

Image Source: Walker Macy

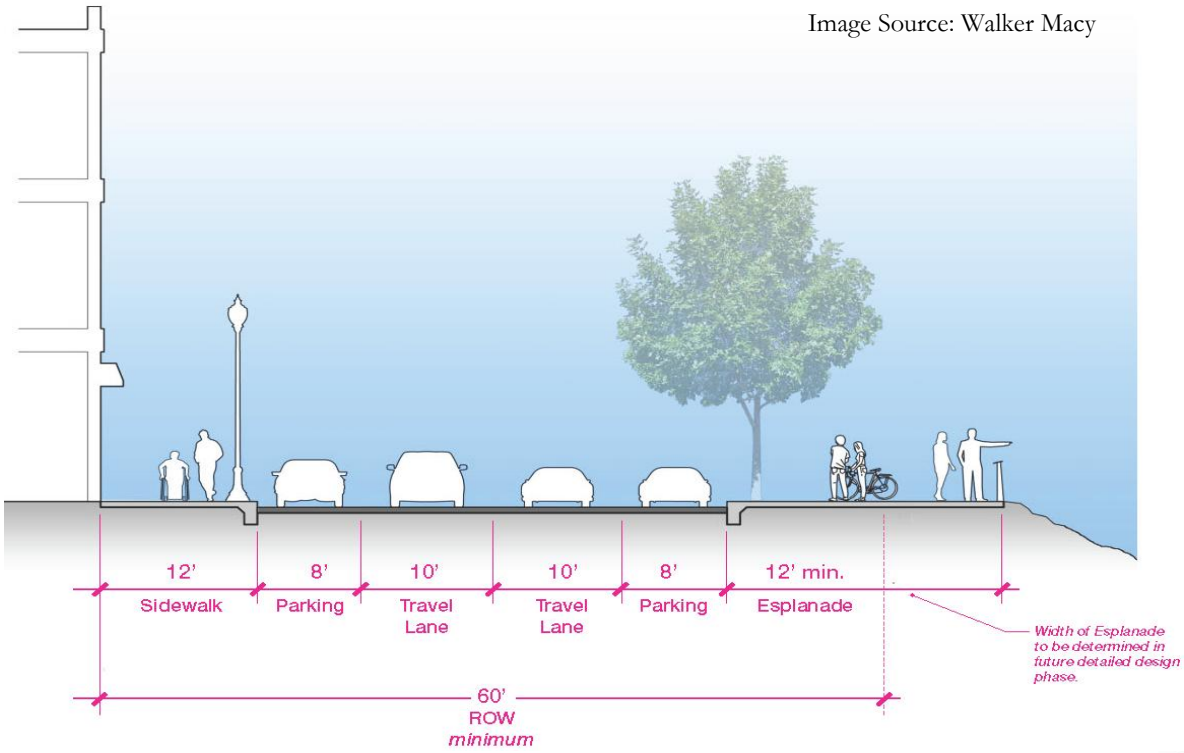

Figure 3c: Mixed-Use Local Street with Esplanade (Water Street)

Future Transit

While transit service is not currently provided in the Willamette Falls Legacy Project site, it is provided in Downtown Oregon City, with potential transit users being roughly about a quarter-mile from the nearest bus stops at the Main Street/8th Street or Railroad Avenue/7th Street intersections.

The Willamette Falls Legacy Project site redevelopment sets the stage for future transit, recognizing that the type and extent of service improvements will play out over time. Specifics of transit service will depend on the actual rate and type of development built, TriMet resources and policies, and, consideration of local options. The land use designations in the Willamette Falls Legacy Project site make transit a viable option in the future. The City should work with TriMet and developers within the area to facilitate transit.

One conceptual option has been identified:

- A route modification to the existing bus service between the Oregon City Transit Center and Clackamas Community College (Route 33) that would extend the route south from the McLoughlin Boulevard/Main Street intersection into the project site. The route would travel to the proposed 4th Street, before heading west towards the proposed Water Street and finally returning to McLoughlin Boulevard where it would continue on its normal route. A bus stop could be provided near the proposed Main Street/4th Street intersection.

Multi-modal Transportation Improvements

Residents, employees and visitors to the Willamette Falls Legacy Project site will be able to safely and efficiently travel between destinations via any number of active transportation modes, such as walking, or biking. A system of on-street sidewalks and bikeways, and shared use paths will provide quality access to key destinations—improving the overall health and livability of the neighborhood.

Walking and Biking Facilities

The proximity to the Willamette Falls and the potential for a riverfront Esplanade drawing people to a larger community park is a significant asset for the future of the Willamette Falls Legacy Project site. To better serve the access needs of existing and future residents to these scenic natural and recreational areas, a high quality network of low-stress pedestrian and bicycle facilities is envisioned. For pedestrians, this means that sidewalks will be provided on all proposed streets—completely separate from the motor vehicle travelway. For bicyclists, Main Street will include shared lane markings to demonstrate where bicyclists should operate on the roadway—outside the parking lane door zone—and alert motorists to expect bicyclists on the roadway. Wayfinding signage will also be developed to highlight key destinations, such as parks and shopping, and the best routes for pedestrians and bicyclists. These signs will improve destination and route finding for residents and visitors alike, encouraging exploration and activity.

Both the trail and on-street pedestrian and bicycle network are context sensitive, addressing the urban character of the Willamette Falls Legacy Project site, while also meeting the expressed community desire to have increased opportunities for walking and biking. Moreover, these networks will be fully integrated with the existing trail and bikeway network and the planned active transportation projects in the Metro Regional Trail and Greenways Plan, including the Willamette River Trail which currently extends to 10th Avenue north of the project site. These measures help ensure that existing and future residents, employees, and visitors of the Willamette Falls Legacy Project site can access goods and services, without the need for an automobile, within and outside of the area.

Shared Use Paths

Figure 4 illustrates the conceptual drawing of an extended Willamette River Trail into the project site and further south to the Canemah neighborhood. The emphasis of this alignment is on connecting residents to existing and future trails, as defined in the Metro Regional Trail and Greenways Plan, as well as key destinations within and near to the Willamette Falls Legacy Project site. Trail access to important viewsheds in the Willamette Falls Legacy Project site will also be taken advantage of. For example, an extended Willamette River Trail could provide a connection to a possible observatory deck of the fall. An extended Willamette River Trail will vary by context—anything from an elevated structure to concrete shared use paths for pedestrians and bicyclists. On the proposed Water Street, there is also the potential to designate a path through an adjacent shared-use path. User comfort on these trails will be maximized due to the physical distance and separation from motor vehicle traffic.

Image Source: Walker Macy

Figure 4: Conceptual Drawing of the Proposed Water Street with the Riverfront Esplanade

Street Extensions

Several street extensions will be needed to support growth in the Willamette Falls Legacy Project site. This includes a new site access to McLoughlin Boulevard, midway between Main Street and 6th Street. However, this street connection will likely be restricted to right-in, right-out access at McLoughlin

Boulevard due to limited sight distance on the curve. Additional streets to be constructed include 4th Street, which will connect Water Street to Main Street, and 3rd Street, which will primarily serve as a connector street for adjacent development.

Toolbox of Multi-modal Transportation Improvements

A toolbox of potential multi-modal transportation improvements is presented and discussed below (see Table 5). These options were identified to help mitigate potential safety and congestion impacts related to the redevelopment of the Willamette Falls Legacy Project site. Since the ultimate build-out of the site is unknown at this point, a range of options has been provided. These options should be explored and evaluated further as individual development occurs within the project site.

Left-turns from McLoughlin Boulevard to Main Street

To improve safety at the McLoughlin Boulevard and Main Street intersection, it is recommended that left-turns eventually be prohibited from the highway to Main Street. Highway widening to add left-turn lanes would likely impact existing businesses and there would likely not be enough distance between the railroad undercrossing tunnel and Main Street to provide enough left-turn storage to safely accommodate drivers wishing to access the site along northbound McLoughlin Boulevard. It is recommended that access be satisfied via indirect left-turns at the intersection. This would require advanced access signing on both approaches of McLoughlin Boulevard and on side streets to direct visitors to the project site.

For southbound McLoughlin Boulevard traffic the following options are recommended:

- Indirect left-turns via Water Avenue extension-Main Street.

For northbound McLoughlin Boulevard traffic the following options are recommended to be considered further:

- Indirect left-turns via Railroad Avenue-6th Street-Main Street.

  This option may require improved turn radius from highway to Railroad Avenue to reduce observed safety conflicts.

- Indirect left-turns via 6th Street-Main Street.

  This option would require converting 6th Street to one-way eastbound, instead of one-way westbound.

For northbound McLoughlin Boulevard traffic the following options should be explored further:

- Indirect left-turns via Main Street-6th Street-to a potential Railroad Avenue overcrossing of McLoughlin Boulevard.

  This option would require converting 6th Street to one-way eastbound, instead of one-way westbound, and would require an overcrossing of McLoughlin Boulevard near Railroad Avenue. The existing connection of Railroad Avenue to McLoughlin Boulevard would need to be closed,

with the existing northbound traffic on Railroad Avenue re-routed to Main Street. This would create significant congestion impacts at the Main Street/7th Street intersection due to the resulting increase in the left turn demand from Main Street to the Oregon City-West Linn Arch Bridge.

Queuing at the McLoughlin Boulevard and Main Street intersection

As detailed earlier in this document, the segment of McLoughlin Boulevard at the Main Street intersection has two travel lanes in each direction with no left turn lanes, and requires drivers wanting to turn left from McLoughlin Boulevard to Main Street (both towards Downtown or the Willamette Falls Legacy Project site) to stop in the travel lane when yielding to oncoming traffic. The left-turn demand is expected to increase with the Willamette Falls Legacy Project redevelopment and potentially cause increased queuing at the intersection, thus increasing the risk for rear-end collisions along McLoughlin Boulevard. In addition to the indirect left turns discussed above, a few additional options are available.

- Advanced warning sign, Option 1: Installing advanced warning lights with a "Prepare to Stop" information sign before approaching the Main Street signalized intersection on McLoughlin Boulevard. It should generally be installed to help alert motorists of the traffic signal which may not be visible to due to road geometries and the railroad undercrossing tunnel.

  It could help warn motorists in advance to a red traffic signal and that they need to prepare to stop. The lights would start flashing three seconds before the downstream traffic signal turns yellow. They would continue flashing until the end of the red signal. Hence, when the advanced warning lights are flashing, motorists should get ready to stop.

  There is generally limited opportunities to install signage along McLoughlin Boulevard, south of the railroad undercrossing tunnel due to the location of the bluff to the east and elevated sidewalk on the west side, so implementation could be challenging.

- Advanced warning sign, Option 2: Installing end-of-queue warning systems to alert approaching vehicles that the traffic ahead of them is slowing down or has stopped altogether. The system keep motorists informed as construction impacts their travel time.

  Radar detection devices are mounted in areas with potential queuing and limited sight distance and measure the speeds of approaching vehicles. Data from multiple sensors are analyzed and, as vehicles slow down, an algorithm triggers a message for display on a message signs located upstream of the traffic signal. As a result, motorists are warned well in advance of the slow-down as its happening.

  Again, there is generally limited opportunities to install message boards along McLoughlin Boulevard, south of the railroad undercrossing tunnel due to the location of the bluff to the east and elevated sidewalk on the west side, so implementation could be challenging.

- Highway road diet: Redesignate the shoulder lane northbound on the highway to become a right-turn only lane at Main Street. The lane striping change and overhead lane signage would occur

just north of the traffic signal at 2nd Street to give motorist adequate time to move to the appropriate lanes. North of Main Street on the highway, there would be a single northbound lane until 8th Street when the striping would transition back to its current cross-section. The shoulder lane could be re-purposed for wider sidewalks or other non-motor vehicle amenities. This concept would not alter lanes for the southbound direction.

Create at least one additional safe crossing of McLoughlin Boulevard between Downtown and the site

Those walking or biking to the site from Downtown currently have one convenient and safe crossing, via the Main Street signalized intersection. Another safe crossing is needed to serve some of the expected walking and biking demand associated with the Willamette Falls Legacy Project redevelopment. Three options are presented below:

- Install a traffic signal or HAWK signal at the McLoughlin Boulevard/ 6th Street intersection

  Queuing and limited sight distance for northbound McLoughlin Boulevard traffic could potentially limit the ability to install a signal at 6th Street. Forecasted queues in 2035 would extend nearly 325 feet in the northbound direction along McLoughlin Boulevard from the proposed signal at 6th Street. This queue would extend around the curve, to the approximate location of the proposed Water Street intersection (which will be limited to right-in, right-out only). Although, advanced warning devices could potentially be installed to alleviate this issue. Installing a signal here could also attract some of the left-turn demand for the Main Street to southbound McLoughlin Boulevard movement. The queues from the McLoughlin Boulevard/Main Street intersection could potentially back up to 6th Street, which could further encourage drivers to re-route to the potential signal at 6th Street.

- Upgrade the existing pedestrian crossing under the Oregon City-West Linn Arch Bridge

  The current crossing has visibility and lighting issues. Upgrading the crossing with improved lighting and potentially advanced warning devices could improve this crossing.

Table 5: Toolbox of Potential Access and Safety Improvements

Potential Project	Improvement Type
Walking and Biking Improvements	
Install a traffic signal or HAWK signal at the McLoughlin Boulevard/ 6th Street intersection	Walking/Biking Street Crossing
Upgrade the existing pedestrian crossing under the Oregon City-West Linn Arch Bridge	Walking/Biking Street Crossing
Expand the viaduct and extend the Willamette Riverfront trail west, from 10th Street into the project site	Walking/Biking Access
Create a new overcrossing of McLoughlin Boulevard, linking the McLoughlin Promenade to the project site for pedestrians and bicyclists	Walking/Biking Access
Create a new overcrossing of the railroad tracks, linking an extended Willamette Riverfront Trail with the Canemah neighborhood	Walking/Biking Access
Safety and Access Improvements	
Create a new street connection to McLoughlin Boulevard via Water Street, between Main Street and 6th Street. Turn movements should be restricted to right-in, right-out only due to limited sight distance. A median barrier may be needed on McLoughlin Boulevard to prevent left-turns. This would also require the construction of the proposed 4th Street to provide a connection to Main Street	Site Access
Upgrade overhead street lighting inside McLoughlin Boulevard railroad undercrossing tunnel and along the highway fronting the site	Safety
Implement indirect left-turns for both northbound and southbound McLoughlin Boulevard	Safety/ Congestion
Install advanced access signing on both approaches of McLoughlin Boulevard and on side streets to direct visitors	Site Wayfinding
Install advanced signal warning system to warn motorists in advance to a red traffic signal and that they need to prepare to stop. They would continue flashing until the end of the red signal.	Safety
Install an end-of-queue warning system to alert approaching vehicles that the traffic ahead of them is slowing down or has stopped altogether.	Safety/ Queuing

The following project will be added to the 2013 Oregon City TSP

Project #	Project Description	Project Extent	Project Elements	Priority
TBD	Pedestrian and Bike connection and enhancement	McLoughlin Promenade to mill site	Pedestrian and bike bridge over 99E to former blue Heron Paper Mill	Medium -term