Lake Oswego to Portland

TRANSIT AND TRAIL STUDY

Evaluation Summary
Public Review Draft

July 12, 2007

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Introduction

This Evaluation Summary highlights the findings of the Lake Oswego to Portland Transit and Trail Alternatives Analysis (LOAA), a Federal Transit Administration (FTA) sponsored study. More detail and additional findings are available in the forthcoming Evaluation Report. This document is the result of two years of study of the Lake Oswego to Portland Corridor by Metro and its partner jurisdictions, the Tri-County Metropolitan Transportation District of Oregon (TriMet), the Oregon Department of Transportation (ODOT), the cities of Portland and Lake Oswego, and Clackamas and Multnomah counties.

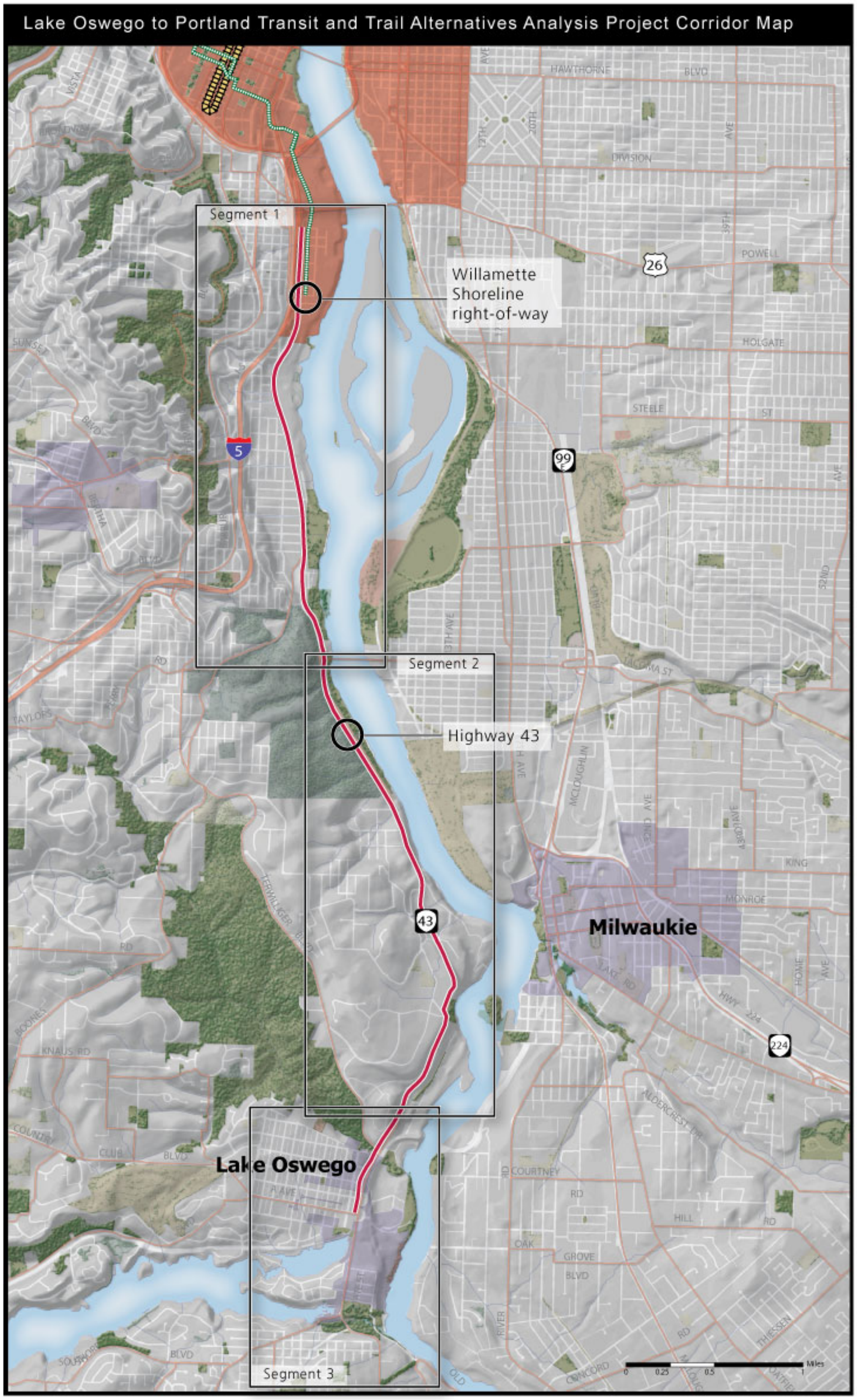
1.0 Corridor Background

This 5.7-mile long Corridor connects Portland Central City with the Lake Oswego Town Center as shown in Figure 1-1. The Corridor contains two main public rights-of-way, Highway 43, and the Willamette Shore Line Railway alignment. The highway is constrained by steep topography to the east and to the west. Early on in the process, ODOT prepared an analysis addressing why it is infeasible to widen the roadway. Metro policy, as expressed in the Regional Transportation Plan (RTP) is to improve mobility and capacity in the Corridor through transit due to the severe constraints to widening the highway. It is from this policy and through federal grants obtained from FTA and authorized by the Metro Council that the LOAA was initiated in 2005.

In 1988, the Willamette Shore Line Consortium (Consortium) purchased the 6.3-mile long Jefferson Branch line from the Southern Pacific Railroad for $2 million. The Consortium purchased the line for future passenger rail transit use. Historically, the line had been used for short-line freight operations and passenger service starting in 1887 when the line was constructed. Today, the Oregon Electric Railway Historical Society (OEHRS) operates excursion service, which keeps the line in continuous rail use. TriMet holds title for the Consortium and the City of Lake Oswego provides maintenance services funded by the Consortium. This LOAA study was designed to answer the question of whether to advance a high capacity transit solution in the Corridor to address future travel demand.

This Alternatives Analysis also includes a trail component, which was required by one of the grants funding the project. The project is charged with determining if a continuous trail between Lake Oswego and Portland can be constructed in conjunction with the transit alternatives. For this reason, the project has two separate sets of goals and objectives responding to two different purposes and needs.

Figure 1-1. Project Corridor

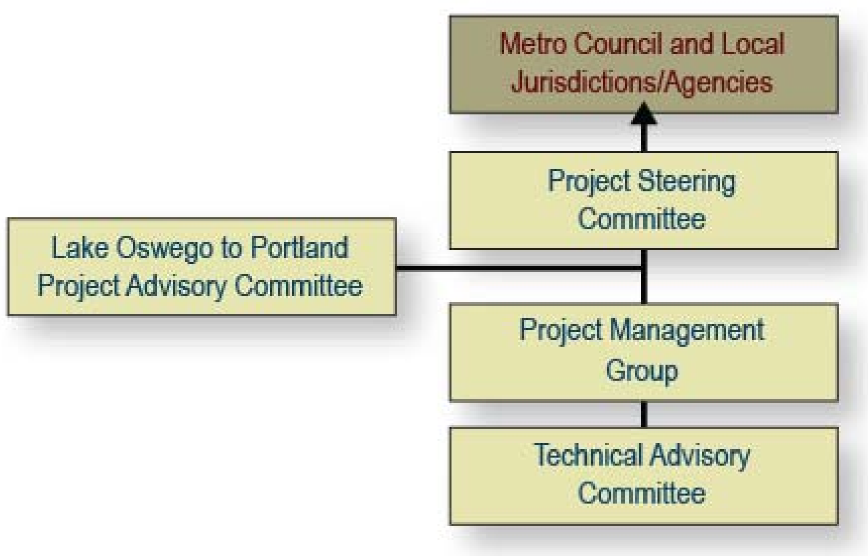


Source: Metro, 2007

2.0 Study Organization and Decision-Making

The Metro Council is charged with making a decision as to what, if any, alternatives should be advanced to the next phase of project development, a *Draft Environmental Impact Statement*. The LOAA has a committee structure including a Technical Advisory Committee and a Project Management Group made up of staff from Metro and its partner jurisdictions. The 20-member Lake Oswego to Portland Project Advisory Committee (LOPAC) consists of citizens that represent three main geographic areas of the Corridor plus the bike and trail community. The Steering Committee, made up of executives and elected officials from Metro and its partner jurisdictions, sets policy direction for the study and will receive recommendations for alternatives to be carried forward from the Project Management Group and LOPAC. They will make a recommendation that will be forwarded to local boards and commissions for adoption. Resolutions from project partners, in addition to the Steering Committee recommendation, will be forwarded to the Metro Council through the Joint Policy Advisory Committee on Transportation (JPACT), which acts as the region's Metropolitan Planning Organization (MPO) review body. Figure 2-1 shows the decision-making structure.

Figure 2-1. Decision-Making Structure



3.0 Purpose and Need of the Alternatives Analysis

The following section discusses how travel conditions in the Corridor are forecast to change between 2005 and 2025. Traffic conditions are forecast to continue to worsen in the Corridor and widening Highway 43 is not feasible. Transit mobility and capacity improvements were recognized by Metro and partner jurisdictions as the best way to improve travel conditions in the Corridor.

3.1 Need for the Transit Project

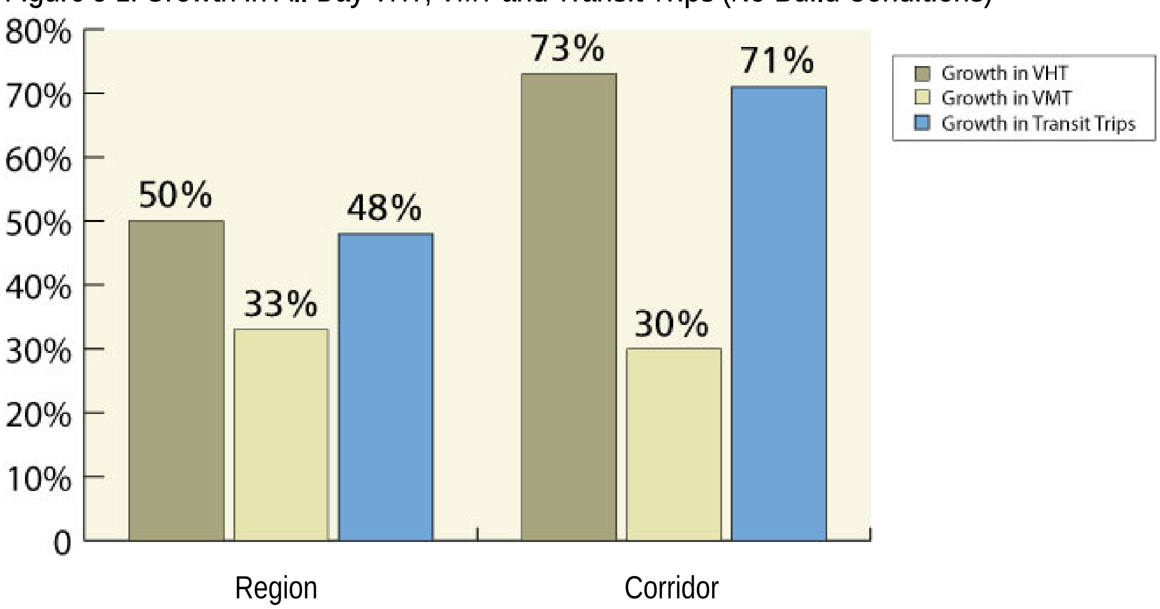
By 2025, the forecast year for the project, travel demand will grow significantly in the Corridor, putting greater pressure on the transportation system.

Between 2005 and 2025, transit trips are forecast to increase more within the Corridor than for the region as a whole, as shown in Figure 3-1. Current plans for transit service growth are constrained by available resources as defined in the financially constrained transit network of Metro’s 2004 Regional Transportation Plan (RTP). Normal growth in the transit service would occur over the next 20 years at a rate of 1.5 % annually. This constrained growth rate defines the No-Build scenario.

Figure 3-1 also shows the growth in transit trips is projected to grow more than vehicle miles traveled (VMT) in the Corridor. VMT measures the amount of travel by autos and other vehicles.

Figure 3-1, also demonstrates mobility is reduced with increased congestion. Projected growth in vehicle hours traveled (VHT) is greater than growth in VMT. This relationship illustrates that it would take longer to travel an equivalent distance on the roadways in 2025 than it would under today's conditions. This high rate of VMT compared to VHT illustrates the growth in congestion in the corridor.

Figure 3-1. Growth in All-Day VHT, VMT and Transit Trips (No-Build Conditions)



Source: Metro, 2007

It was found through this analysis that the peak period would spread to accommodate growth in travel demand in the Corridor. Even though capacity is constrained, high demand pushes congestion into more hours of the day than today.

Based on the review of transportation problems in the Corridor, LOPAC adopted Purpose and Need statements that were endorsed by the Steering Committee.

3.2 Purpose and Need Statements

The Purpose and Need Statements guide how the alternatives are developed and evaluated. They are developed in response to the problems in the Corridor and the travel markets. They represent the goals of the transit project and the bike and pedestrian trail component that accompanies each transit alternative. They also serve as the yardstick against which the alternatives are measured.

Transit Purpose and Need

The purpose of the Lake Oswego to Portland Transit Project is to develop a transit project that meets future travel demand and supports local and regional land use plans, which garners public acceptance and community support and will:

- **Increase the mobility and accessibility** within the geographically constrained Highway 43 Corridor, connecting the Portland Central City with and through the Lake Oswego Town Center.
- **Minimize traffic-related impacts to neighborhoods**.
- **Support and enhance existing neighborhood character** in an environmentally sensitive manner.
- **Leverage investment in the transit system** to cost-effectively increase Corridor and systemwide transit ridership.
- **Support transit-oriented economic development** in Portland and Lake Oswego.
- **Support community transportation, land use and development goals.**
- **Provide improved transportation access to and connectivity** among significant destinations and activity centers including Downtown Portland, Oregon Health & Sciences University, Tom McCall Waterfront Park, Willamette Park, Foothills and Downtown Lake Oswego.
- **Provide additional transportation choices in the Corridor.**
- **Be part of an integrated multi-modal transportation system.**

Bicycle and Pedestrian Trail Purpose and Need

The purpose of the pedestrian and bicycle trail is to provide a connection between the Willamette River Greenway trail at the north end of the Corridor and the Lake Oswego Town Center at the south.

- **Significantly improve the access, safety and quality** of experience for cyclists and pedestrians in the Corridor.
- **Create a connected, high-quality facility that is compatible with the transit alternatives** and which makes bicycling and walking viable transportation and recreation choices.
- **Enhance the value of the existing transportation** system by successfully integrating the bicycle/pedestrian trail into the system.
- **Be compatible with and serve the needs of surrounding neighborhoods.**
- **Connect and improve access to important pedestrian and bicycle destinations in the Corridor** such as the Willamette River, South Waterfront, Willamette Park, Sellwood Bridge, Lake Oswego Town Center, Urban Trails, Riverview Cemetery and the OHSU Tram.

4.0 Definition of Alternatives

4.1 Early Alternatives Screened Out

Options to be included in the alternatives analysis were developed through a community process. The process was designed to ensure that community concerns and issues would be identified early and addressed in the analysis phase.

A Wide Range of Alternatives phase first developed several alternatives. These alternatives were screened based on the project’s Purpose and Need statements. The following alternatives were eliminated from further study by LOPAC and the Steering Committee:

Widening of Highway 43 – Not feasible based on ODOT analysis. There are steep grades on either side of the highway. The amount of retaining walls and fill required would be extensive. Right-of-way would need to be purchased in addition to access impacts to properties.

Reversible Lane on Highway 43 – Found not to be feasible given lack of peak directionality and curvature, geometric and safety concerns with the highway.

River Transit- Recent work by the City of Portland’s River Renaissance program was reviewed, as was Metro’s 2000 River Transit study in conjunction with the South Corridor Project. Both found the commuter market for river transit limited, and operating and maintenance costs to be high relative to land-based alternatives.

Bus Rapid Transit Alignments on various streets including Boones Ferry, Taylors Ferry and Terwilliger were found to have no travel time benefit over Highway 43. This alternative had limited ridership potential based on a TriMet service planning model simulation that showed better productivity on routes traversing Highway 43 between Terwilliger and Taylors Ferry.

Streetcar on Highway 43 south of the Sellwood Bridge has safety issues pertaining to joint use of highway by traffic and streetcars given horizontal and vertical curvature, stopping distances and speed of traffic.

4.2 Alternatives Carried Forward

Three main alternatives were carried forward: No-Build, Bus Rapid Transit (BRT) and Streetcar.

The following sections present the BRT and Streetcar alignments by segments.

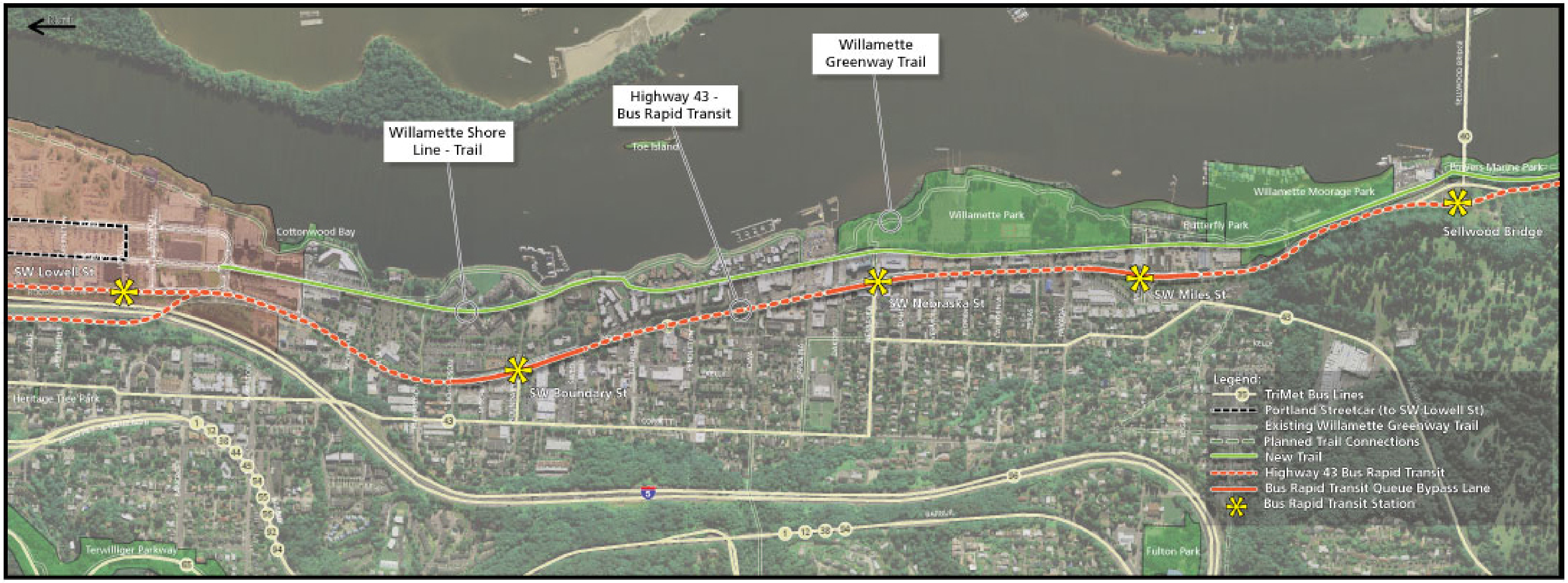


Figure 4-1. BRT Segment 1: South Waterfront to the Sellwood Bridge

The BRT Alternative would operate a frequent service bus route between Lake Oswego and downtown Portland. Queue jump lanes would be constructed to improve speed and reliability of the bus system. Other improvements include enhanced stations and safety improvements at intersections where a queue jump lane is not feasible such as SW Military Road and SW Briarwood Road.

Figure 4-2. Typical Queue Jump

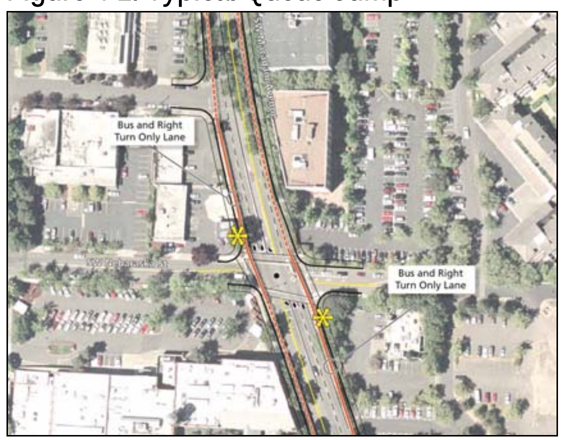


Figure 4-3. BRT on SW Macadam Avenue at SW Boundary Street

Before

After

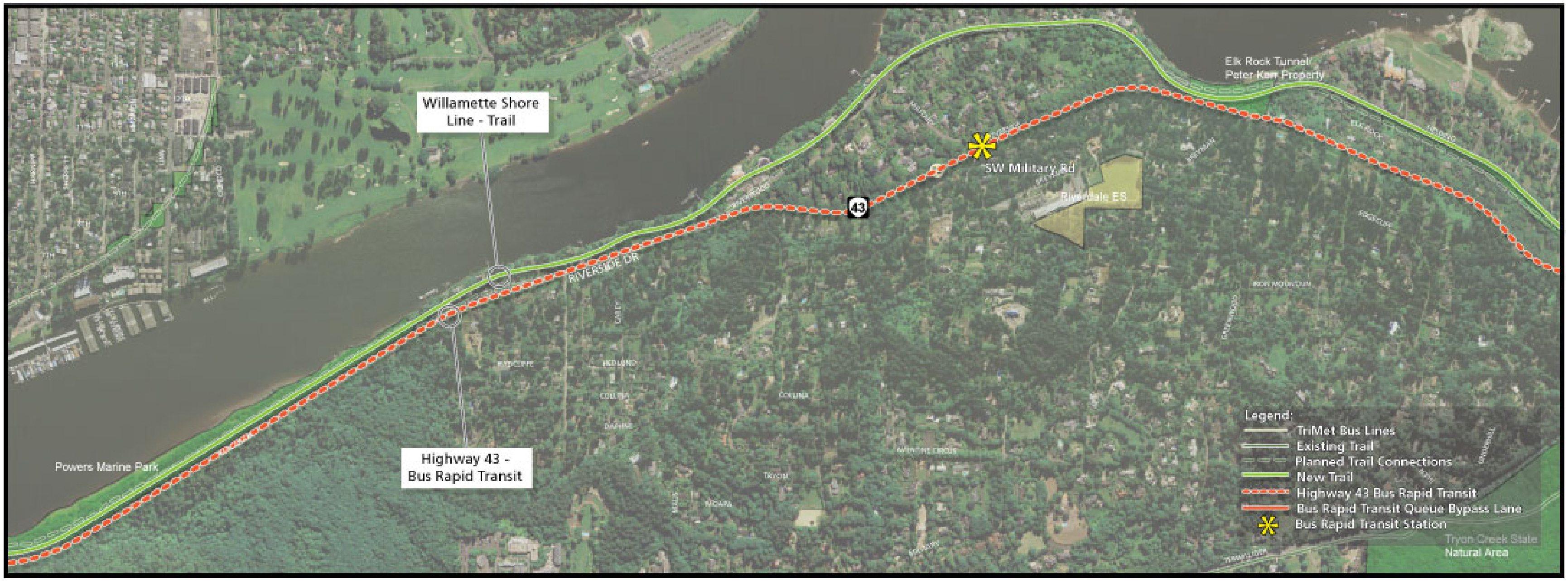


Figure 4-4. BRT Segment 2: Sellwood Bridge to Lake Oswego City Limits

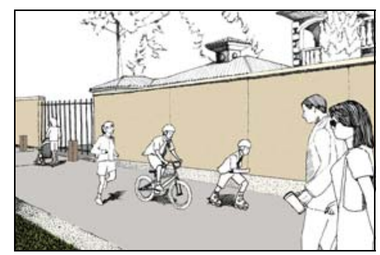
Figure 4-5. BRT Improvements at SW Military Road

Before

After

Figure 4-6. Trail Improvements on the Willamette Shore Line

Before



After

Figure 4-7. BRT Segment 3: Lake Oswego City Limits to Downtown Lake Oswego

Figure 4-8. BRT Terminus at Albertsons in Lake Oswego

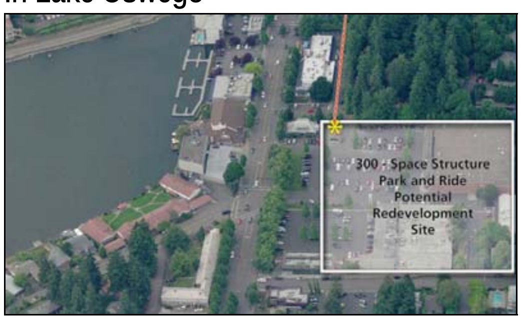


Figure 4-9. Transit Only Roadway Cross-Section in Lake Oswego

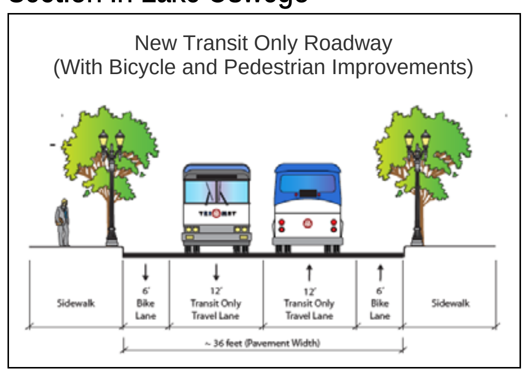
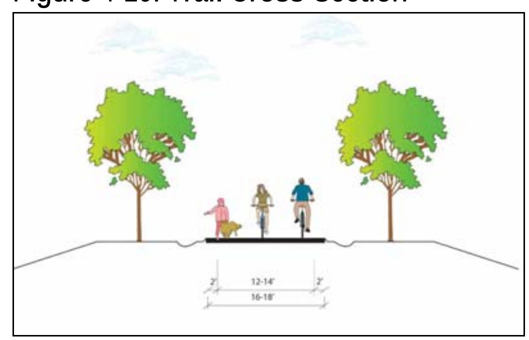


Figure 4-10. Trail Cross-Section



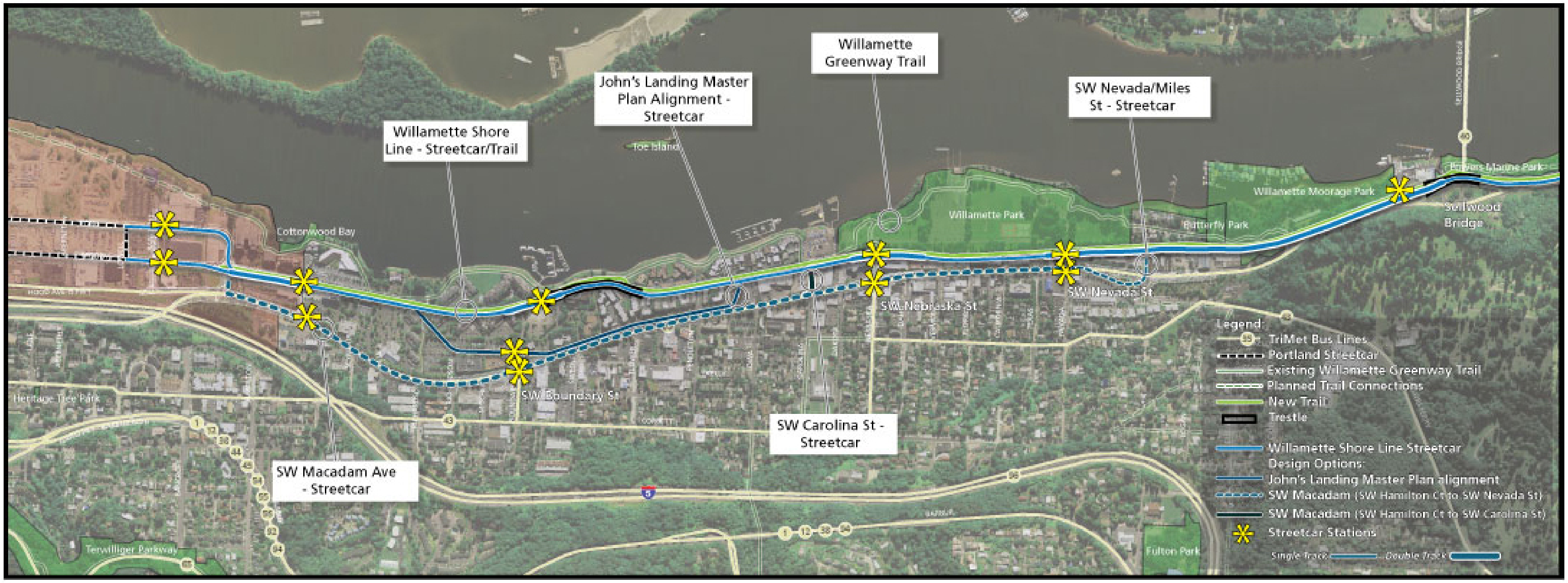


Figure 4-11. Streetcar Segment 1: South Waterfront to the Sellwood Bridge

The Streetcar alternative would operate a streetcar between Lake Oswego and downtown Portland. The Streetcar designs were developed with the goal of keeping the alignments within existing public right-of-way. There are six design options for the Streetcar alignment between SW Lowell Street and the Sellwood Bridge and three design options for the terminus in Lake Oswego. The Streetcar alternative also has a trail component between Lake Oswego and downtown Portland.

Figure 4-12. Streetcar/Trail Cross-Section

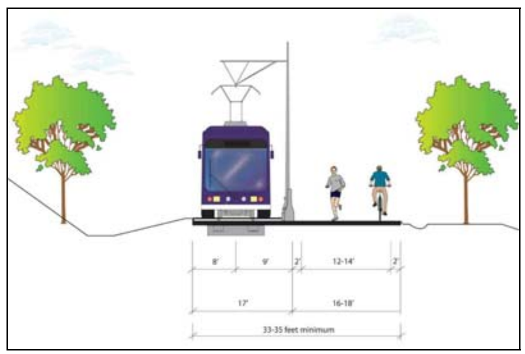


Figure 4-13. Streetcar on SW Macadam Avenue

Before

After

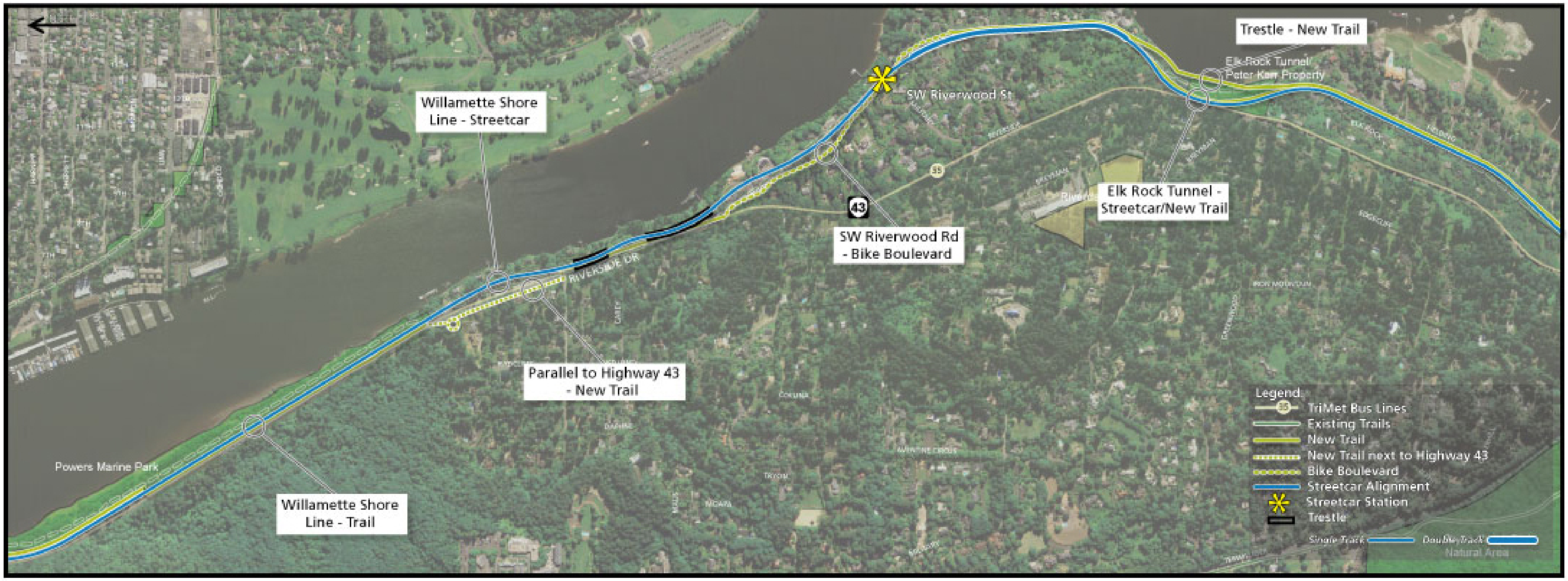


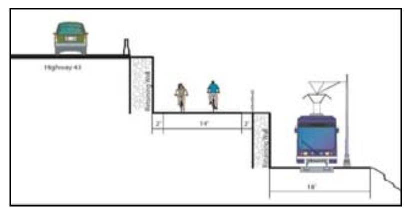
Figure 4-14. Streetcar Segment 2: Sellwood Bridge to Lake Oswego City Limits

Figure 4-15. Streetcar on the Willamette Shore Line

Before

After

Figure 4-16. Trail Cross-Section in Powers Marine Park



Steep grades and floodplains require extensive retaining walls and fill, adding to the cost of the trail and streetcar.

Figure 4-17. Example of Design Challenges – Elk Rock Tunnel

Double-track streetcar or streetcar and trail would require widening the tunnel or boring a new tunnel for the trail.

Figure 4-18. Streetcar Segment 3: Lake Oswego City Limits to Downtown Lake Oswego

Figure 4-19. Streetcar on A Avenue in Lake Oswego

Before

After

Figure 4-20. Streetcar Terminus Options

Safeway Terminus

Albertsons Terminus

4.3 Capacity Considerations

Streetcar

Streetcar capacity is determined by the number of vehicles that can be run per hour per direction. Between Bancroft and the Sellwood Bridge, much of the design for this analysis in the Willamette Shore Line alignment has been designed as single track. TriMet estimates that this would allow for approximately a 12-minute headway, or 5 trains per hour. South of Sellwood Bridge, there is less distance between double track sections which may allow for a 6-minute headway.

Each existing streetcar is designed for a maximum load of 140 persons standing and sitting. For this study, it is projected that achievable capacity over one-hour is 85% of maximum load, which would allow for 120 persons per vehicle.

At 5 trains per hour and a capacity of 120 persons, the WSL Streetcar system, as designed for this analysis, would be able to carry 600 people per hour per direction. The demand, however, is for 1,000-1,245 people per hour per direction.

To accommodate the potential demand for the WSL alignment, it was assumed that much of the track between Sellwood Bridge and Bancroft could be double-tracked, which would allow for streetcars to run at up to a 3-minute headway, and provide a capacity of 2,400 people per hour, per direction (20 trains x 120). Streetcar alignments on Macadam would have mostly double track for most of the length between Sellwood Bridge and Bancroft and are also projected to be able to operate at up to 3-minute headway.

In addition to the 12-minute all day service between Lake Oswego and Bancroft Street, peak service was added using planned turn-arounds at Bancroft and at PSU to meet peak demand. As a result, modeled combined headways were 6.5 minutes between Lake Oswego and Bancroft, 6.5 minutes between Bancroft and PSU and 10 minutes between PSU and NW 23rd Avenue.

BRT

Buses are limited in capacity by the vehicle design. For this corridor, street capacity would not limit number of buses needed to meet demand. It is not unreasonable to assume that buses could be run every two minutes and not significantly impact traffic.

Bus vehicle capacity for this corridor assumed 40-foot standard buses. These buses have a maximum load of 64 and an achievable capacity of 85%, or 55 people. In the first round of modeling, Metro applied a 12-minute headway for the proposed BRT. Model results found that there would be demand for 5-minute headway between PSU and Boundary. The demand remains high in the entire corridor. Buses would run at 5-minute headway between Lake Oswego and Union Station in Portland. There are difficulties turning buses around south of Bancroft and also at the designated bus-turn-around areas in downtown Portland. Given these physical constraints and capacity demands, buses were modeled from Union Station to Lake Oswego.

With 5-minute headways, buses would be able to carry 660 people per hour per direction. BRT speeds were estimated to accomplish 95% of auto speed on Macadam Avenue. To achieve this, it was initially assumed that 1,180 linear feet of queue bypass lanes would be constructed to help BRT bypass autos that would be queued at intersections. Through the process of analysis, it was determined that an additional 2,615 linear feet of queue bypass lanes would need construction for a total of 4,425 linear feet of queue bypass in order to reach the 95% efficiency level.

Corridor Capacity

Total person carrying capacity for transit in the corridor would be roughly the same for Streetcar on Macadam or BRT. Streetcar in the Willamette Shore Line adds a new corridor for high capacity transit and would add approximately 2,400-person carrying capacity per hour per direction.

5.0 Evaluation of Alternatives

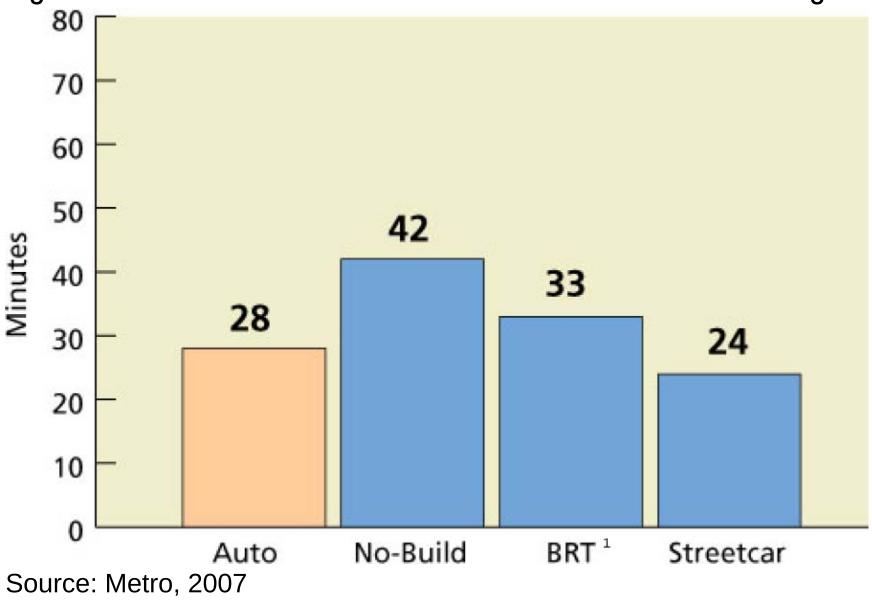
The following section presents the highlights of the technical design, travel forecasting, and development impact analysis of the alternatives. The No-Build is the basis for comparison of the alternatives. (The No-Build Alternative includes only the Line #35 with no capital improvements.)

5.1 Travel Time and Ridership

Travel time and ridership are important measures because they demonstrate the level of mobility achieved by the alternatives. The following figures show two measures of travel time in the Corridor: in-vehicle time and total transit time. The former is the time spent riding in a transit vehicle only, the latter includes time to walk to transit or to an auto, the initial wait time for the arriving bus or streetcar, and then any additional transfer time required to reach the final destination.

Figure 5-1 and Figure 5-2 show that the Streetcar is faster to Lake Oswego in the evening (PM) peak than autos making the same trip, for both in-vehicle and total travel time. Most significantly, both the BRT and Streetcar make substantial gains in travel time over the No-Build bus[1], at nine and 18 minutes, respectively.

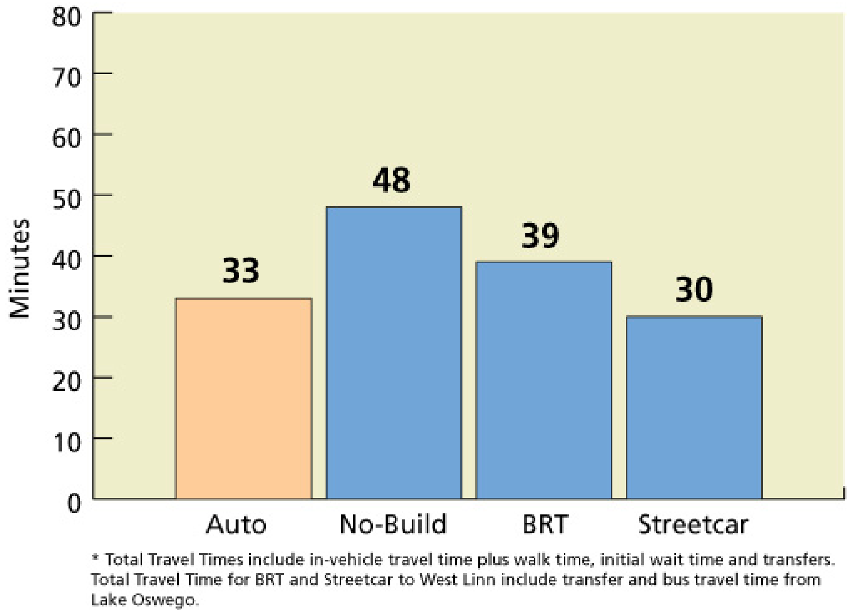
Figure 5-1. In-vehicle Travel Times Between PSU and Lake Oswego



Source: Metro, 2007

1 Initial design of the queue jump lanes of approximately 200' each would be inadequate to allow buses to bypass congestion based on the traffic analysis. Further analysis has shown that the queue jumps would have to be 500 to 1,000 feet in many areas in order to bypass 2025 congestion. See section 4.3 for details.

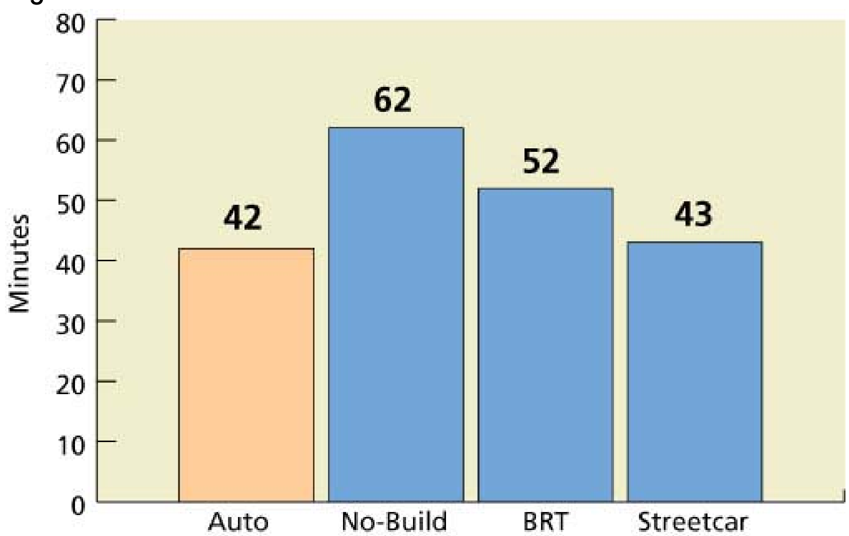
Figure 5-2. Total Transit Travel Time Between PSU and Lake Oswego



Source: Metro, 2007

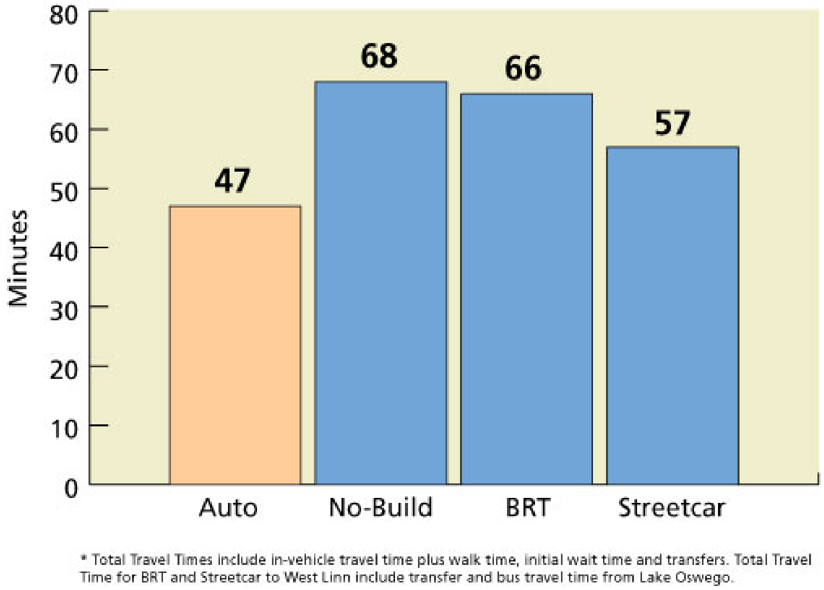
Figures 5-3 and 5-4 show the travel times for trips south of Lake Oswego to West Linn. Significantly, the Streetcar's in-vehicle travel time would be similar to that of auto, but once the transfer time in Lake Oswego is factored in for BRT and Streetcar, they would be 19 and 10 minutes slower than auto, respectively. Both BRT and Streetcar would provide a significantly faster trip than the No-Build bus with the Streetcar being 11 minutes faster than the No-Build, even when transfer and wait times are factored in. There would be a net service improvement for riders in West Linn given the increased frequencies and faster travel times, even with a transfer in Lake Oswego.

Figure 5-3. In-Vehicle Travel Time Between PSU and West Linn



Source: Metro, 2007

Figure 5-4. Total Transit Travel Times* Between PSU and West Linn

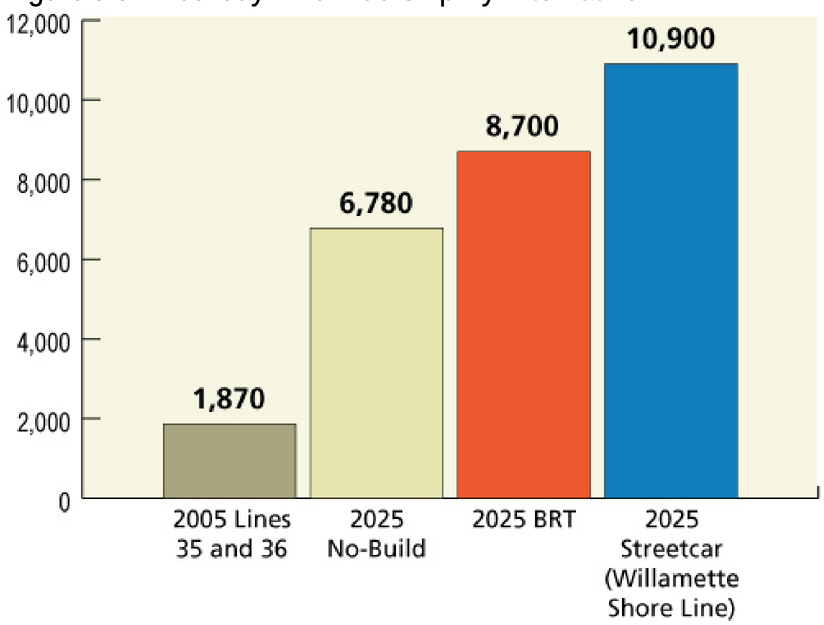


Source: Metro, 2007

Ridership is dependant upon many variables, with travel time being a key determinant. Frequency of service, reliability of the service and level of passenger amenities all play a part in ridership forecasts.

One key ridership measure is the number of trips that would occur on the main service in the Corridor, either the Line 35 Bus in the No-Build, the BRT line, or the Streetcar. Figure 5-5 shows ridership by line including 2005 actual ridership and the 2025 forecasts.

Figure 5-5. Weekday Line Ridership By Alternative



Source: Metro, 2007

Today, transit ridership in the Corridor on bus Lines 35 and 36 is 1,870. This number is projected to increase in the No-Build, to 6,780 in 2025. This increase comes from drivers who shift due to congestion, from rising population and employment, and from increasing costs to operate an auto including parking cost and parking availability. The BRT alternative would have almost 2,000 more trips than the No-Build, and the Streetcar, at 10,900, would have over 4,000 additional trips compared to the No-Build.

5.2 Design Considerations and Issues

The overarching design philosophy of the project was to create transit alternatives within the existing right-of-way, either on SW Macadam Avenue/Highway 43, or in the Willamette Shore Line right-of-way. The design of the alternatives and their related physical impacts are complicated somewhat by the presence of the complementary trail components. This adds cost, particularly when trying to fit the trail and Streetcar through the narrowest parts of the Corridor. Every effort has been made to minimize any right-of way impacts to surrounding properties.

5.3 Costs

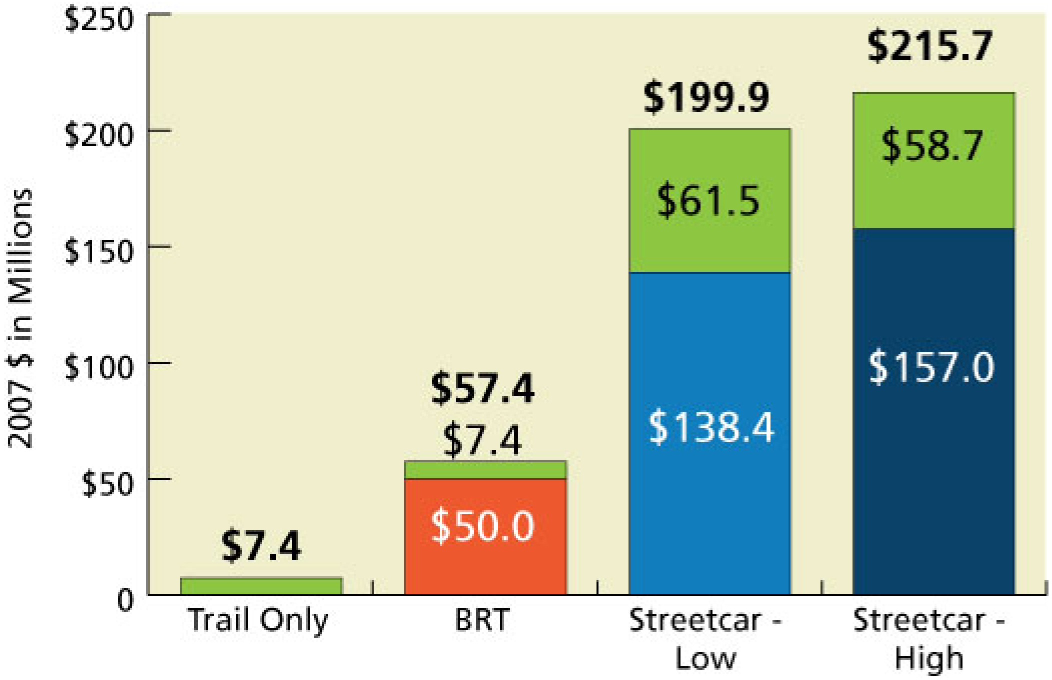
Capital Costs

The Streetcar and BRT capital costs are each presented with and without a trail component. The trail has a significant effect on the cost of the Streetcar options, as shown below in Figure 5-6. The "Trail Only" alternative refers to the cost of simply paving over the existing Willamette Shore Line railroad tracks and making modest improvements to the trestles and to Elk Rock Tunnel. This trail cost is applied to the BRT alternative, (BRT uses Highway 43 and SW Macadam Ave., which leaves the Willamette Shore Line right-of-way available for trail use). The BRT costs of $50 million include the cost of vehicles and all civil construction for the queue bypass lanes as well as signalization changes for bus priority. The Streetcar low and high figures represent the possible range for costs based on the least expensive and most expensive alignments. The low figure is for Streetcar on the Willamette Shore Line to the Trolley Terminus. The high figure represents Streetcar in Macadam south of Bancroft to Nevada Street with the Safeway Terminus in Lake Oswego.

An important element of the capital cost of the project is the effect of the value of the Willamette Shore Line right-of-way. The right-of-way was purchased in 1988 for $2 million. Current estimates value the right-of-way south of Lowell Street to be $50 million. This value will be confirmed by TriMet and will be included in the detailed Financial Analysis report, to be completed after this report. This right-of-way can be used as local match for a transit project that uses the right-of-way. If a project does not use the right-of-way, the value of the right-of-way is lost. In addition, the amount of federal funds that would match the value of the right-of-way would be lost as well. For example, if the BRT project is chosen and a trail is proposed for the Willamette Shore Line, the value of the trail would be lost ($50 million) in addition to losing the ability to match federal funds for the right-of-way value ($75 million additional).

This is a significant opportunity cost that is not captured in the capital cost estimates, but is very real in terms of trade-offs between the various alternatives. This right-of-way value will be discussed in greater detail in Section 5.7, Financial Analysis.

Figure 5-6. Capital Costs (Millions of 2007 dollars)



Source: URS, Metro, 2007

Operating and Maintenance Costs

Figure 5-7 presents operating and maintenance costs for the BRT to Albertsons and the Streetcar in the Willamette Shore Line right-of-way to the Albertsons terminus. These are costs for operating the BRT and Streetcar lines only. Systemwide operating and maintenance costs will be discussed later. The line costs presented to show the inherent characteristics of each transit mode under study. These costs are used in the cost-effectiveness section that follows.

Line Costs

The Streetcar extension from SW Lowell Street to Albertsons in Lake Oswego costs less to operate than the BRT line from Union Station to Albertsons for several reasons:

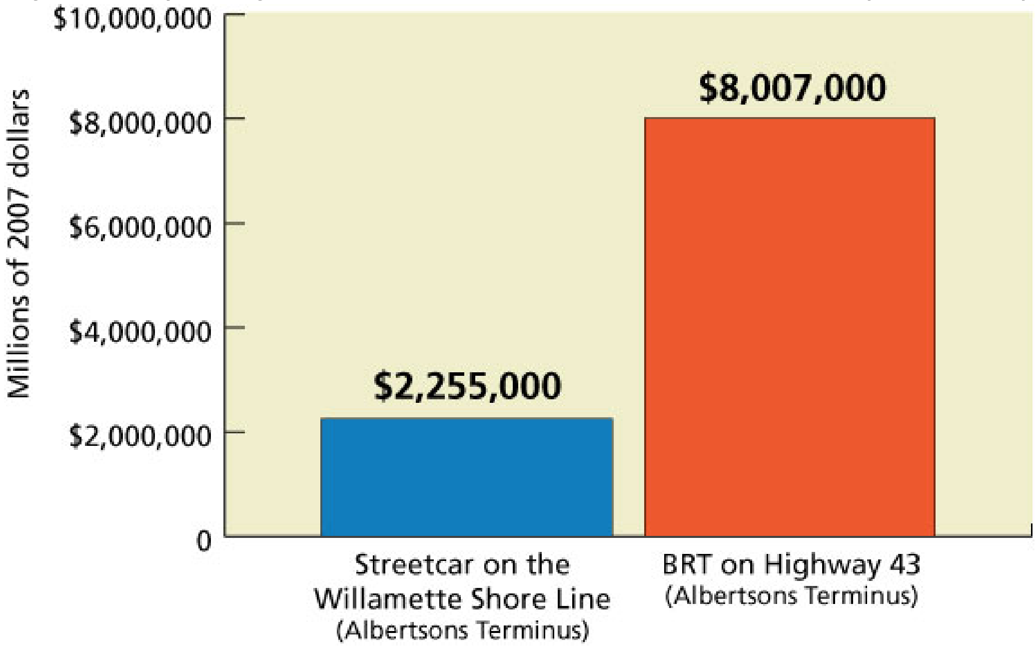
- The extension from SW Lowell Street is an extension of an existing line at comparable headways, and as such takes advantage of the efficiencies of already having a line that extends from NW Portland to Lowell. Approximately nine trains per hour are necessary to meet peak demand between SW Lowell Street and PSU. Existing Streetcar service would provide six of those trains; therefore only three trains per hour need to be added between Lowell and PSU. BRT would require twelve new trips each travel 3 miles further (6 miles round trip) than Streetcar. Since the BRT alternative is a new line and not an extension these additional trips are all new trips that would extend three miles further than Union Station to provide similar coverage to Streetcar.

- Streetcar are larger vehicles with a capacity of 140 passengers compared to buses with 64 passenger capacity.

- More bus service hours on a longer route are required to meet demand in 2025 in the BRT alternative relative to the Streetcar.

Figure 5-7 below shows the O & M cost results, with BRT costing $5.8 million more per year to operate than Streetcar.

Figure 5-7. Operating and Maintenance Costs for BRT and Streetcar (2007 dollars)

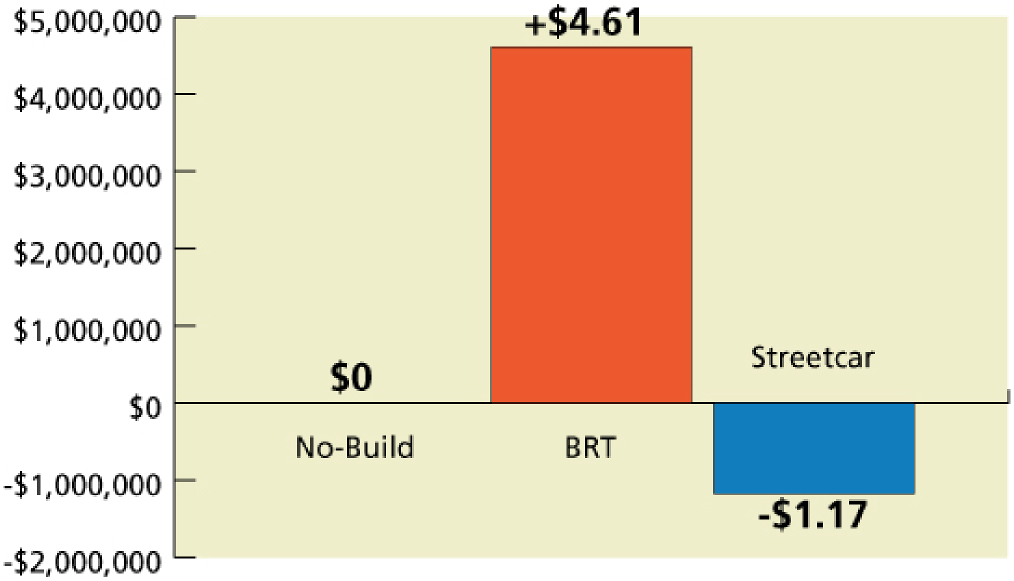


Source: TriMet, 2007

System Costs

Based on the modeled transit networks, systemwide operating cost comparisons between the No-Build, BRT and Streetcar alternatives show that the Streetcar would cost less to operate than the No-Build, as shown in Figure 5-8. This savings is due to the Streetcar's replacement of the portions of redundant service of Lines 35 and 40, with higher capacity and faster service that only has to be extended south from Lowell to Lake Oswego. TriMet could reinvest service hours in the Corridor, redeploy them to other parts of the TriMet district or invest them elsewhere in its system. BRT adds bus service, which duplicates high capacity existing Streetcar service between Lowell and downtown Portland, increasing overall system costs.

Figure 5-8. Net Operating and Maintenance Costs for BRT and Streetcar Compared to the No-Build (2007 dollars)

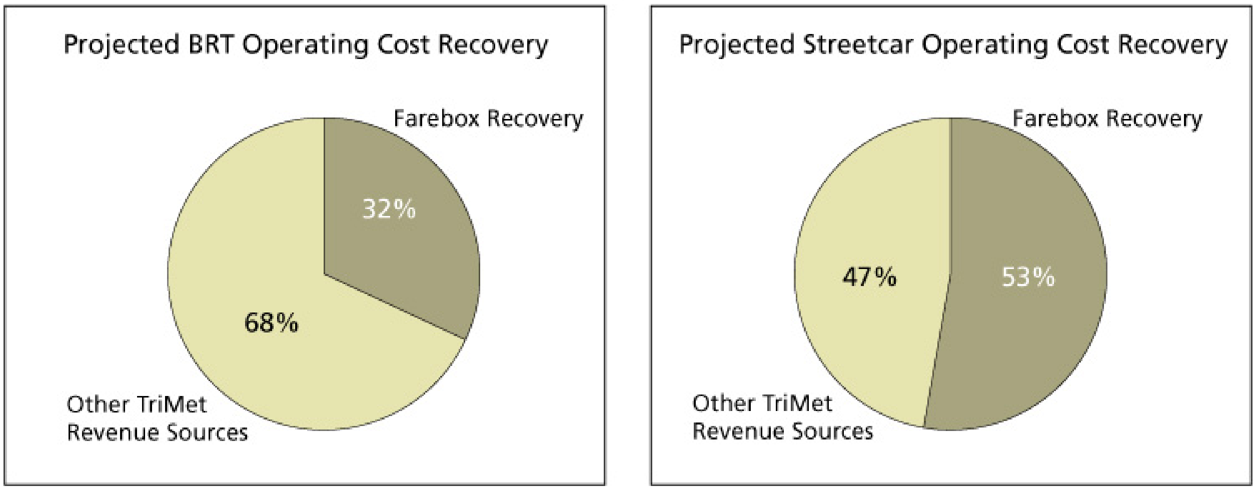


Source: TriMet, 2007

Farebox Recovery

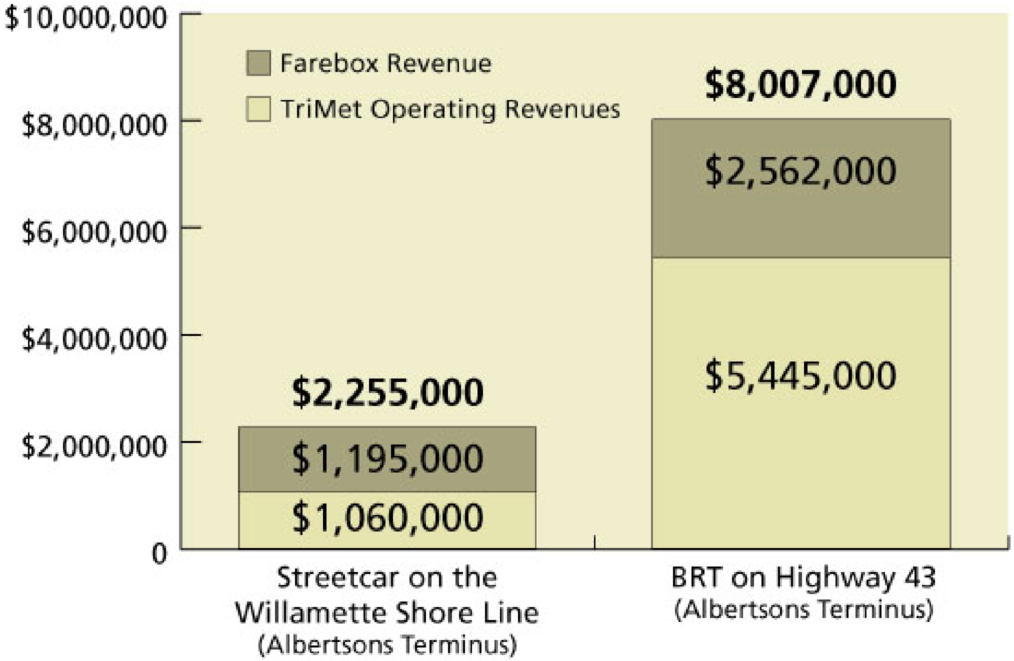
Another useful measure to better understand operating cost is farebox recovery. Using current TriMet system averages for frequent buses, the BRT line would recover 32% of its operating costs through the farebox. Because so much of the existing Portland Streetcar operates in Fareless Square today, light rail cost recovery is a more meaningful comparison than using existing streetcar estimates. Light rail recovers approximately 53% of operating costs through the farebox. This is because more passengers use a pass on buses than light rail. Figures 5-9 and 5-10 illustrate the impact of farebox revenues on overall operating cost.

Figure 5-9. Farebox Recovery of the Alternatives (2007 dollars)



Source: TriMet, Metro, 2007

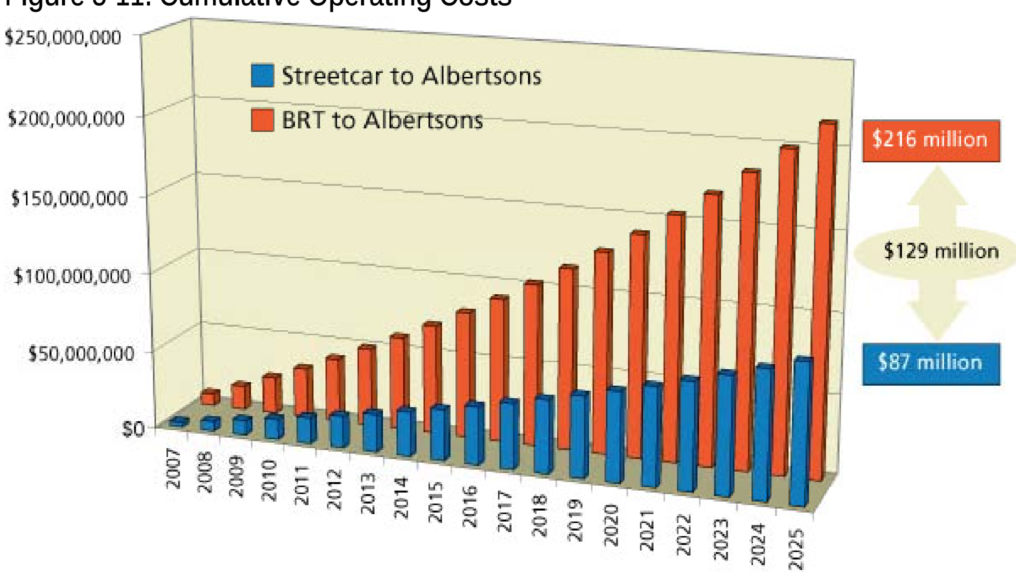
Figure 5-10. Operating Revenues (2007 $s)



Source: Metro, 2007

Figure 5-11 shows the cumulative operating cost difference between the Streetcar on Willamette Shore Line alignment to the Albertsons terminus and the BRT line to Albertsons. If, hypothetically, service started today and TriMet's annual operating costs inflated at 4.5% per year, there would be a $129 million annual difference in 2025 between BRT and Streetcar. As will be discussed later in Section 5.4, Cost-Effectiveness, there are significant trade-offs between capital costs and operating costs for these two alternatives.

Figure 5-11. Cumulative Operating Costs



Source: Metro, 2007

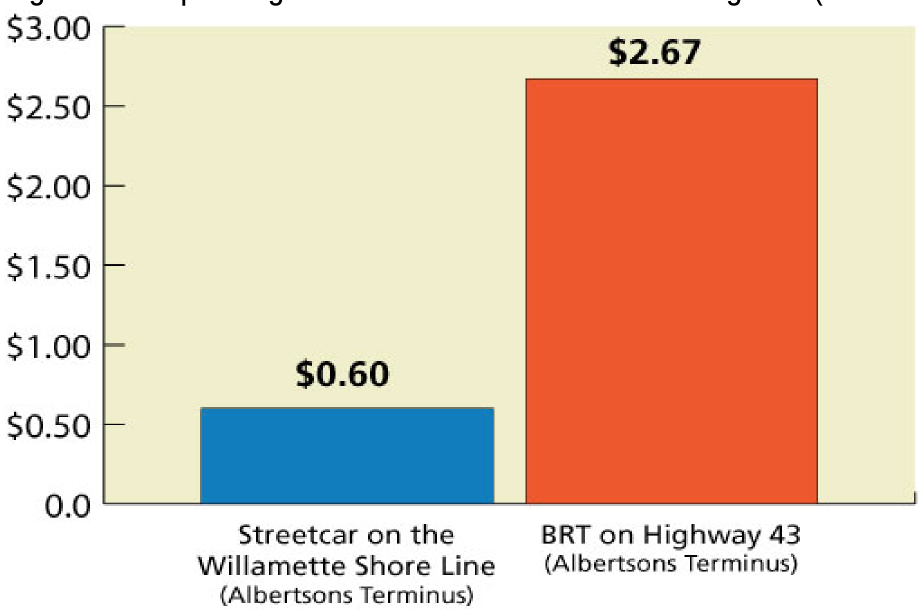
5.4 Cost Effectiveness

Cost effectiveness measures join cost and ridership data in a way that shows how much capital or operating cost would be incurred per transit trip or boarding ride. Two measures will be discussed: operating and maintenance cost per boarding ride and annualized capital cost per boarding ride. These measures will be summed to give a picture of the total cost per ride, highlighting the trade-offs between capital and operating costs.

The cost-effectiveness measures developed here reflect the total operating or annualized capital costs per boarding ride on the BRT or Streetcar. This line ridership analysis, as opposed to system totals or incremental costs per incremental riders, illustrates the relative efficiencies of the alternatives as they would be applied in this Corridor.

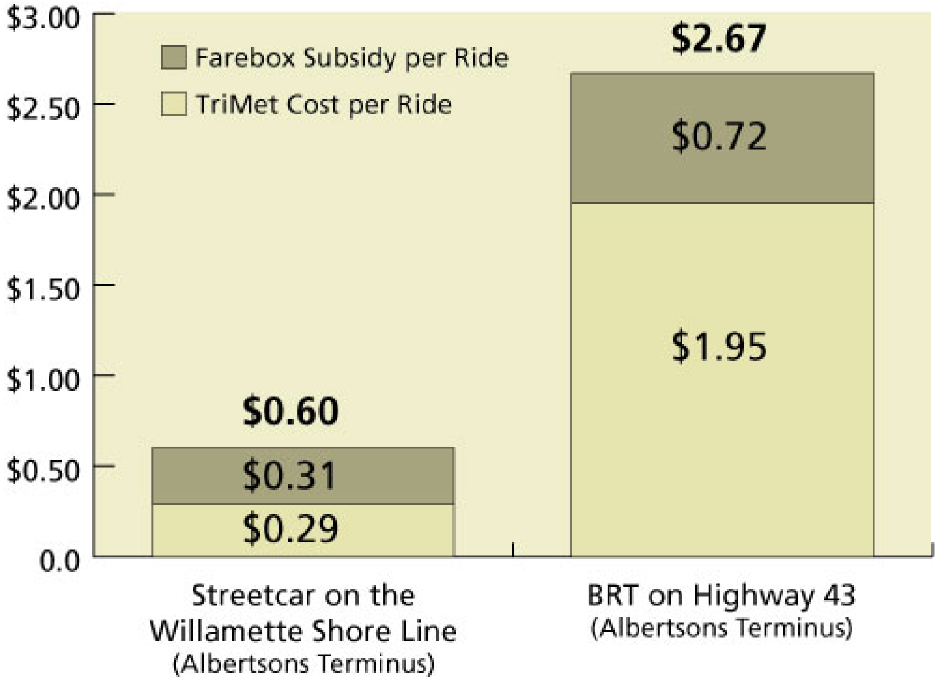
Figure 5-12 below presents the operating and maintenance cost per boarding ride for BRT or Streetcar. Because the Streetcar would have higher ridership and lower operating cost than the BRT, it would be more cost-effective. The magnitude of difference is rooted in the way in which the two modes operate in the Corridor, as discussed in the operating and maintenance cost section above. As a basis for comparison, current cost per boarding ride is $1.66 on the Portland Streetcar and $2.58 for the TriMet bus system. The current Light Rail operating cost of $1.52 per ride may be a better comparison based on the way the Streetcar would operate in the Corridor.

Figure 5-12. Operating and Maintenance Cost Per Boarding Ride (2007 dollars)



Source: Metro, 2007

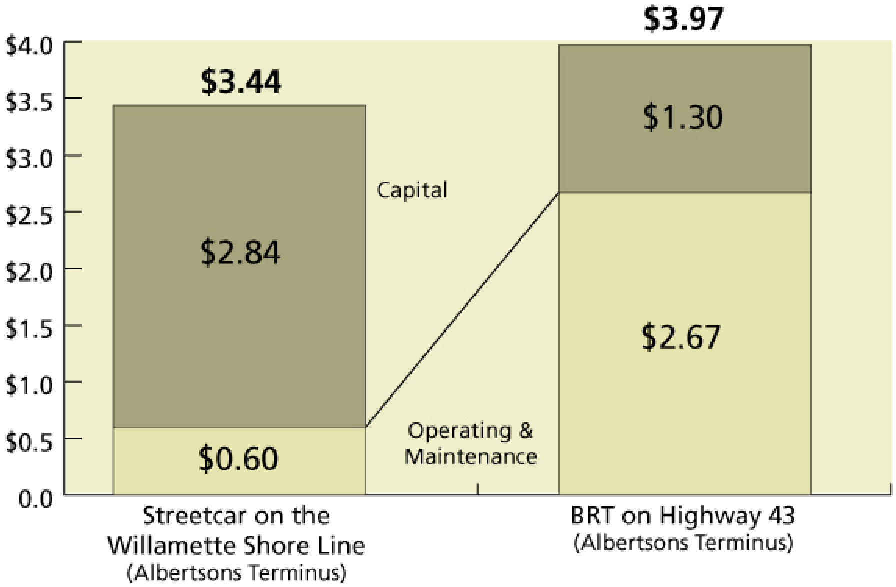
Figure 5-13. Farebox Revenue and TriMet Subsidy per Boarding Ride (2007 dollars)



Source: TriMet, Metro, 2007

Figure 5-14 adds annualized capital costs to operating costs to gauge the capital and operating and maintenance cost effectiveness of the alternatives. Because Streetcar has a higher capital cost than does the BRT, the annualized capital cost is greater for Streetcar than for BRT. Annualized capital cost is the value of the capital cost of the project expressed in a yearly total. The project's Financial Analysis will develop these values to a higher level of detail. The numbers used in this analysis are based on previous studies and do not reflect a specific construction schedule.

Figure 5-14. Annualized Capital and Operating & Maintenance Cost per Boarding Ride (2007 $s)



Source: TriMet, Metro, 2007

This comparison illustrates the trade-off between operating and maintenance costs and capital costs. One important distinction between the capital and operating and maintenance costs is that operating and maintenance costs are nearly entirely local (87%), whether paid for by the farebox or through TriMet's local payroll tax. Capital costs are 60% (or more) federally subsidized and are one-time-only costs, while operating and maintenance costs are an ongoing expense that grows over time.

5.5 *Potential Trail Demand*

With no continuous trail connection in the Corridor, there is a travel market for walking and bicycling that is not served today. Latent demand, discussed below, is the demand for trips where trips are not possible today. The following analysis serves as a benchmark to determine the general size of the travel market that could be attracted to a trail if a trail is made available.

There are several different ways to estimate latent demand. The analytical tools available to evaluate this latent demand are not as sophisticated, nor calibrated to the level of the travel demand models used to forecast travel demand for transit and highways. The method used in this study applies a "mode split", or percentage of all Corridor trips that would be made by pedestrians and cyclists, to the observed average daily traffic (ADT) volumes on Highway 43 today. The percentages are based on pedestrian and bicycle counts on Willamette River bridges.

Table 5-1. Potential Trail Demand Based on 2007 Data

	Bicycle and Pedestrian use as a percent of Auto Volumes					
	ADT on Hwy 43 (2007)	2% bike	1% ped	TOTAL	Recreational	Total*
Gibbs Street	26,900	540	270	810	2,600	3,400
Sellwood Bridge	38,900	780	390	1,170	2,600	3,770
Lake Oswego	36,700	730	370	1,100	2,600	3,700

**Note: Columns are not additive as they are based on volume at specific points along the corridor.*
Source: Metro, 2007

Today's latent demand is estimated to be approximately 3,600 users along the Willamette Shore Line. Of this amount, approximately 500 – 700 users would be bike commuters, and approximately 2,600 would be recreational. The ADT values are used from the north, middle, and southern ends of the trail alignment. By comparison, the Springwater Trail in the city of Portland currently averages 3,900 users (Technical Memo, Sellwood Bridge Bicycle and Pedestrian Demand Calculation, Alta Planning, 2007).

This analysis does not categorize demand based on distance traveled. The analysis also does not distinguish users by season of the year. It may be presumed that a much smaller percentage of total users will use the full length of the trail or use the trail outside of summer months.

Several factors in the Corridor may influence the above projections for trail use. Several schools, including Oregon Health & Science University and Lewis and Clark College, are located in proximity to the trail Corridor. In the future this Corridor may be connected to the Springwater Corridor trail system through an improved link on a new or rebuilt Sellwood Bridge. Several existing and planned parks along the Corridor also would create demand for a convenient route linking the parks.

Demand for bicycle and pedestrian trails in the Portland Metro region is growing. The City of Portland Office of Transportation has performed bicycle and pedestrian counts on Willamette River bridges since 1992. Daily usage on the bridges has averaged 10.8% average annual growth since that time. Current daily usage on the bridges ranges from 2,500 on the Burnside Bridge to over 12,000 on the Hawthorne Bridge (Technical Memo, Sellwood Bridge Bicycle and Pedestrian Demand Calculation, Alta Planning, 2007). Data on the region's trail system is less available.

A trail study will be undertaken in Fall 2007 by Metro to evaluate using the Portland and Western Railroad alignment to connect Lake Oswego and the Trolley Trail in Milwaukie. This could provide a connection to the Springwater Trail and connect to downtown Portland over the Sellwood or Hawthorne bridges. If a continuous trail is not implemented along the Willamette

Shore Line, this route could serve demand for trips originating from Lake Oswego and points south destined to downtown Portland.

More information on methods to estimate non-motorized demand can be found in the 1999 FHWA *Guidebook on Methods to Estimate Non-Motorized Travel.*

5.6 Potential Development Impacts

An economic development analysis was conducted to determine the development and redevelopment potential associated with the Streetcar alternative in Johns Landing and downtown Lake Oswego. The analysis was based on the observed development effects of the Portland Streetcar in Portland's Central City neighborhoods. The methodology used for this analysis is consistent with that which was used for the Eastside Streetcar Alternatives Analysis, and is based on a higher rate of development within one, two and three blocks of the Streetcar alignments than areas further away from streetcar.

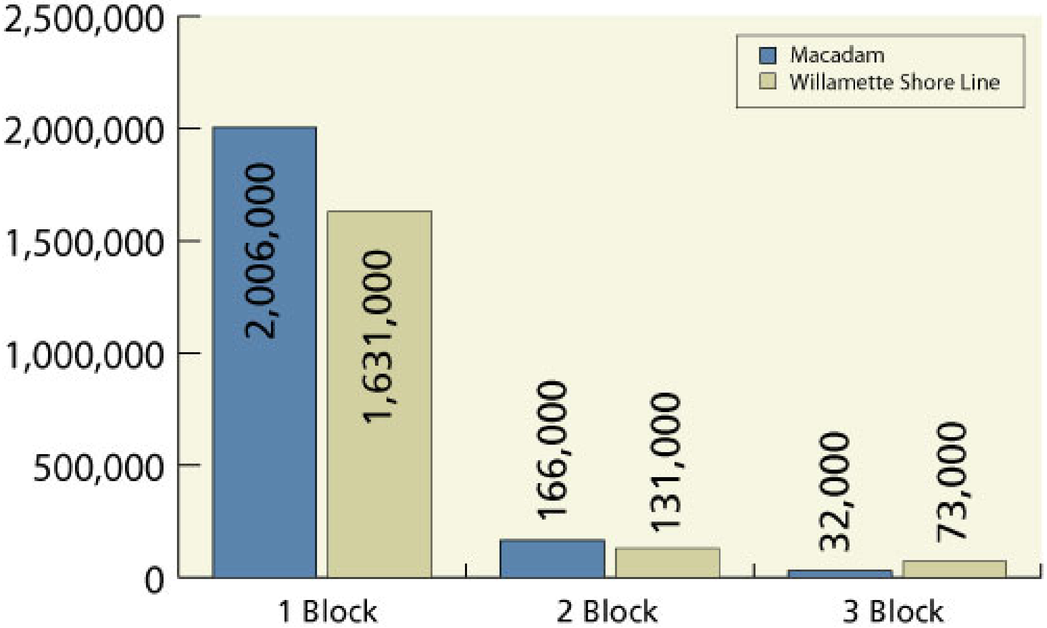
A development analysis was not conducted for the BRT alternative. Experience in the region has not shown a substantial increase in development based on the presence of high quality bus service without exclusive right-of-way or a fixed guideway. The key factor in development decisions as observed for both light rail and Streetcar is the permanence of transit service based on a fixed guideway.

It should be noted that downtown Portland is an exception to bus related development due to very unique circumstances. Development in downtown Portland was guided by a downtown plan that was built on transit access on the Transit Mall, and auto and truck access on adjacent streets. The Portland Transit Mall as originally implemented was an exclusive right-of-way for buses that supported the highest floor area ratios in downtown Portland. During peak hours, approximately 150 buses per hour per direction have operated on the mall. Because the BRT alternative would not operate on exclusive guideway and would have limited exclusive right-of-way, it would not provide the same level of certainty for development as the Streetcar alternative in the Corridor.

The development analysis does not include any parcels located between Johns Landing and Lake Oswego, as that segment of the Corridor is an established single-family neighborhood. Development potential excludes property zoned for single family residential, parks/open space, notable buildings, and lots for which redevelopment efforts are already underway.

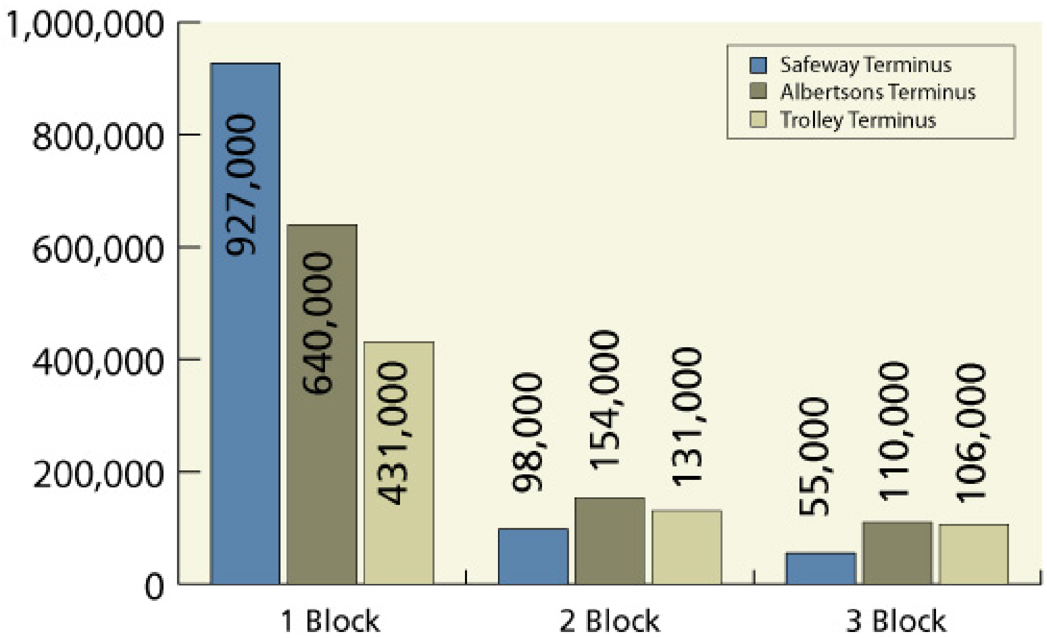
In Johns Landing, development potential was evaluated for the Willamette Shore Line (WSL) and Macadam design options. In Lake Oswego, the Trolley Terminus, Albertsons Terminus and Safeway Terminus options were evaluated. The results of the analysis are shown in Figures 5-15 and 5-16 below.

Figure 5-15. Potential Development Opportunities in Johns Landing



Source: Bonnie Gee Yosick, 2007

Figure 5-16. Potential Development Opportunities in Lake Oswego



Source: Bonnie Gee Yosick, 2007

In Johns Landing, the Macadam alignment would have more development potential, with over 2.2 million square feet of additional building development on nearly 1.3 million square feet of newly developed land area. The Willamette Shore Line alignment would have just under 1.8 million square feet of building development on just over 1.0 million square feet of newly developed land area. The ratio of development to land area is consistent with existing zoning. The geographic constraints in the Corridor affect this outcome due to the proximity of the Willamette River to the west of the Willamette Shore Line. The Macadam alignment is more centrally located in the Corridor and includes more developable land area to the east.

In Lake Oswego, the Safeway Terminus would have the greatest development potential, with nearly 1.1 million square feet of additional building development on over 520,000 s.f. of newly developed land area. This option has greater development potential, in part because over half of the land area would be within one block of Streetcar. The Albertsons Terminus would have somewhat less development potential, with just under 904,000 square feet of building development on 450,000 square feet of newly developed land area. The Trolley Terminus would have the least development potential due to its shorter alignment, at 667,000 square feet of building development on just under 340,000 square feet of land area. The proposed Foothills development area would be served by all three terminus options, and this development analysis assumed only modest increases in employment and housing for the 18-acre area.

5.7 Financial Analysis

A detailed *Financial Analysis* report will be published subsequent to the Evaluation Report and this Evaluation Summary report. This report will include a final estimate for the value of the Willamette Shore Line right-of-way (assumed for this document to be $50 million, based on a 2001 estimate), and a detailed discussion of potential funding options. In the absence of a detailed finance plan, there are several key points that will hold true for purposes of this evaluation.

It is likely that FTA New Starts funding would be sought for the Streetcar alternative, which could provide up to 60% of the project's capital funding. Initially, the project was considered to be a potential FTA Small Starts project, but that program would limit the federal share to $75 million. Given the capital cost of the project with the value of the Willamette Shore Line right-of-way included, the New Starts program could potentially offer more funding for the project.

The BRT alternative could be funded under the FTA Small Starts program, due to its lower capital cost. Small Starts funds are limited to $75 million with the federal percentage capped at 80%. It is unlikely that the maximum match ratio could be obtained which would result on a federal contribution of $40 million and a local share of $10 million. FTA discretionary bus capital funding is another possible funding source, although TriMet relies heavily on those limited dollars to replace aging buses that have reached their useful life.

The value of the Willamette Shore Line right-of-way is significant and will likely be a determining factor in the amount of local match required from other sources for the Streetcar alternative. The *Financial Analysis* report will evaluate the funding plan for various alignment options that would utilize different amounts of the Willamette Shore Line (WSL) right-of-way as local match. Table 5-3 shows the effect of the Willamette Shore Line right-of-way value to the local share of project costs that would need to be raised by other sources. Again, the $50 million value is an assumption that will be replaced with a TriMet estimate when it becomes available.

In this scenario, the project cost goes up because the right-of-way is included, and the federal percentage and local share are calculated based on the higher project cost. This leverages additional federal funding and reduces local match required from other sources.

Table 5-4 shows a Streetcar funding scenario without the value of the Willamette Shore Line right-of-way. Total project costs would be reduced by the value of the right-of-way, and the full 40% local share would be raised from other local sources of funds. Figure 5-17 shows the effect of the right-of-way on the local match requirement for the project.

Table 5-3 Example New Starts Funding Scenario for Streetcar including Willamette Shore Line right-of-way (2007 $s)

Total Expenditures	$207.0 million
Project Capital	$157.0 million
Willamette Shore Line Right-of-way	$50.0 million*
Total Revenues	**$207.0 million**
FTA New Starts (60%)	$124.2 million
Willamette Shore Line Right-of-way	$50.0 million*
Other Local Match	$32.8 million

**estimate only*

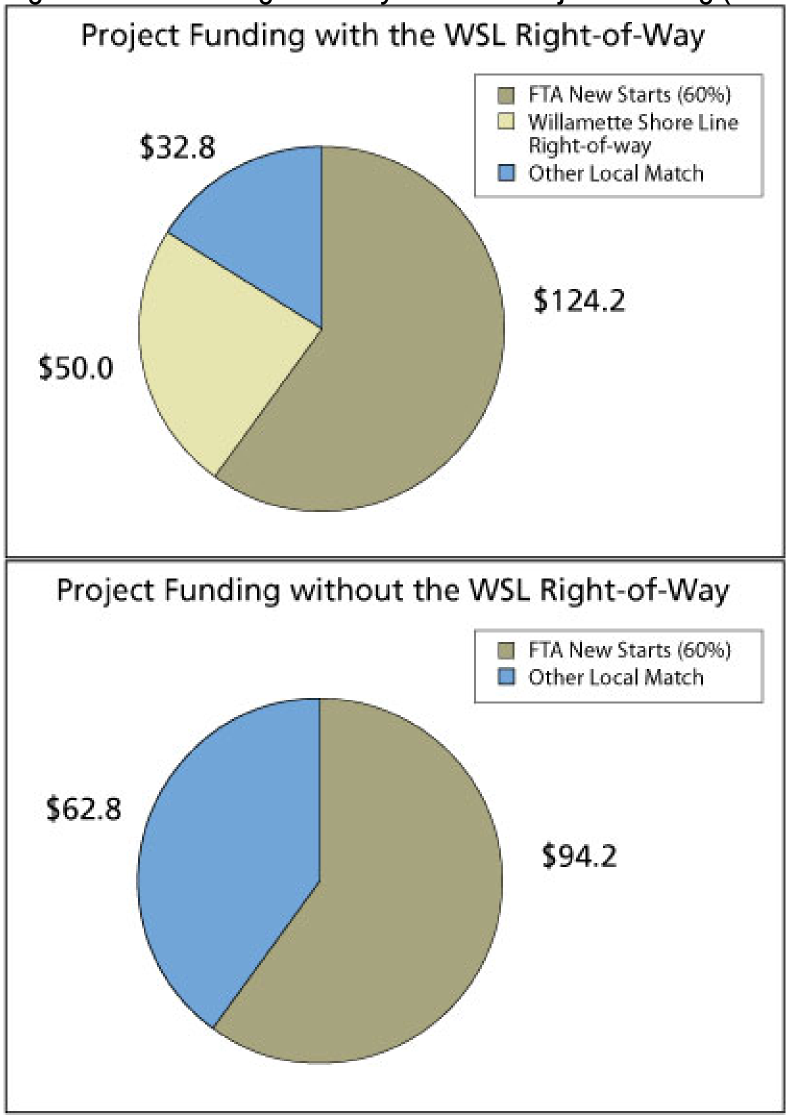
Source: Metro, 2007

Table 5-4 Example New Starts Funding Scenario for Streetcar without Willamette Shore Line right-of-way (2007 $s)

Total Expenditures	$157.0 million
Project Capital	$157.0 million
Total Revenues	**$157.0 million**
FTA New Starts (60%)	$94.2 million
Local Match	$62.8 million

Source: Metro, 2007

Figure 5-17. WSL Right-of-Way Effect of Project Funding (2007 $s)



Source: Metro, 2007

As this preliminary analysis demonstrates, opportunity cost is important. If the Willamette Shore Line right-of-way were not developed for transit purposes, the value of the right-of-way would be lost for local match. In addition, the federal funds that could be matched would also be lost.

For the Streetcar alternative, trail funding is a complex issue. The effect of a trail on the cost of the Streetcar alternative and modifications that would need to be made to the Streetcar design to accommodate the trail, would need to be clearly delineated. If a trail advances with a Streetcar alternative, the transit and trail costs would need to be developed further to isolate those costs that are eligible for FTA funding; those that are trail related would need to be funded by other sources.

If a BRT and trail project advances, the costs for transit and for trail are clearly defined. The Willamette Shore Line right-of-way would be developed for a trail and BRT would operate along Highway 43.

The Streetcar alternative on SW Macadam Avenue would have a combination of trail/Streetcar and trail only using the Willamette Shore Line right-of-way.

Based on a review of potential funding sources, there are many possible sources of funds for bike and pedestrian improvements in the corridor. It is not likely that one source could fund all of the trail improvements. Trail funds are scarce; there is substantial competition for these funds and several sources (MTIP, ODOT) have project application periods that are a year or more distant. One program, now soliciting projects is the Metro Greenspaces Bond Measure. This program requires that improvements either provide access to the Willamette River or are part of a local jurisdiction improvement proposal.

Should a trail be advanced, substantial work and resources would need to be devoted to secure trail funds. One approach toward securing trail funding would be to further identify trail segments according to their suitability for differing fund sources and then begin competing for these funds, with the eventual completion of a continuous trail even though only portions of a trail would be available for some time.

6.0 Comparison of Alternatives

6.1 Trade-Offs

This section highlights the results of the previous analysis, focusing on the major differences between the alternatives and their relative advantages and disadvantages. A summary matrix (Figure 6 –1) is included toward the end of this section. Figure 6-2. Shows how the different alignment choices for the Streetcar or BRT would affect cost and ridership.

No-Build Alternative

Since the No-Build Alternative is used as a basis for comparison with the other alternatives and includes no capital or operating improvements, it has not been evaluated to the same level as BRT or Streetcar. A No-Build Alternative would accompany any of the other alternatives into a *Draft Environmental Impact Statement*, as it is required by the National Environmental Policy Act (NEPA).

Adopting a No-Build at this time would not necessarily foreclose the option of using the Willamette Shore Line right-of-way for continued excursion rail service or from future development of Streetcar. Adopting the No-Build would also not preclude the development of a stand-alone trail on the Willamette Shore Line right-of-way, notwithstanding other possible legal issues relating to using the right-of-way for non-rail purposes.

Advantages of the No-Build are limited to costs and impacts avoided. No transit capital improvements would be made in the Corridor above those required to support the existing bus service network.

Disadvantages of adopting the No-Build include not meeting the future travel needs in the Corridor and not addressing the project's Purpose and Need. This includes not improving the speed and reliability of transit, not meeting the growing travel demand in the Corridor, not connecting key Corridor destinations and not supporting local land use and transportation plans. If the Willamette Shore Line right-of-way were never developed for transit use, the region would lose the value of the right-of-way, which has appreciated from $2 million in 1988 to an estimate of $50 million or more in 2007. Further, the local match value of the right-of-way could not be used to leverage an additional $75 million in federal funding.

Bus Rapid Transit

The BRT alternative could be advanced into a DEIS along with the required No-Build alternative. Advancing the BRT alternative would not preclude advancing the Streetcar alternative– all three alternatives could advance.

An important finding and caveat of this discussion of trade-off is that the BRT as designed would not provide sufficiently long queue jump lanes to achieve the travel time savings assumed for the ridership forecasts. In order to achieve the forecasted travel time savings over the No-Build, queue jump lane lengths would need to be more than double. This would result in increased capital costs (which could also more than double) and impacts to surrounding properties. This makes the ridership forecasts and capital costs included in the alternatives analysis difficult to achieve. Operating costs may also be underestimated because they were based on a running time that may not be achievable with the capital improvements that are included as part of the alternative.

Relative to the No-Build, the BRT alternative provides faster, more reliable service and results in an increase in ridership. The BRT alternative as developed in this alternatives analysis would cost $50 million to build and $8 million annually to operate. The BRT alternative would result in a net systemwide operating cost increase of $4.61 million compared to the No-Build, and $5.78 million compared to the Streetcar alternative. The BRT alternative is less cost effective in operating cost per boarding ride than Streetcar, but has a reduced annualized capital cost per ride than Streetcar. Because it operates in mixed traffic except at the eight intersections where improvements are planned, the BRT alternative would be less reliable than the Streetcar, which would have a higher percentage of exclusive right-of-way. The BRT alternative would provide operational flexibility and could be extended to the southern reaches of the corridor or to western areas, such as Kruse Way. The transfer assumed to be required at the Lake Oswego Transit Center between the BRT buses and connecting local buses could be eliminated, which would improve ridership.

All transit trips traversing the Corridor between Lake Oswego and Portland would benefit from the BRT improvements, regardless of their point of origin. West Linn and Oregon City riders would see improved travel times relative to the No-Build, however their total travel time would still be longer than with the Streetcar alternative.

BRT would not leverage the same development response as Streetcar, so a level of development adjacent to the BRT line would be more in line with current trends than the Streetcar, which would be expected to accelerate development in Johns Landing and Lake Oswego.

The BRT alternative could provide for a multi-use pedestrian and bicycle trail along the Willamette Shore Line right-of-way, at a cost that is substantially less than the trail option developed with the Streetcar alternative, $7.4 million compared to a range of $58.7 to $61.5 million. Another important finding is that the use of the Willamette Shore Line right-of-way solely for a pedestrian and bicycle trail has yet to be tested legally and may prove to be a hurdle to trail implementation. As mentioned earlier, the opportunity cost of not using the Willamette Shore Line right-of-way for transit purposes ranges from the value of the right-of-way, ($50 million) plus the federal transit funds it could match ($125 million).

Advantages and disadvantages of the BRT alternative are summarized below.

Advantages of the BRT alternative include:

- Higher ridership than No-Build
- Lowest initial capital costs
- Could allow the development of a trail on the Willamette Shore Line right-of-way
- Property impacts limited to eight intersections
- Operational flexibility

Disadvantages of the BRT alternative include:

- Longer queue jump lanes would be required than originally anticipated
- Ridership forecasts may be difficult to achieve
- Highest operating costs
- High opportunity cost to use of Willamette Shore Line right-of-way for a trail with no transit improvements
- No demonstrated ability to leverage transit supportive economic development

Streetcar Alternative

The Streetcar alternative could be advanced into a DEIS along with the required No-Build. Advancing a Streetcar alternative would not preclude the advancement of a BRT alternative into the DEIS; both could be advanced. The discussion of streetcar refers to the representative alignment (Willamette Shore Line with a terminus at Albertsons) unless otherwise noted.

Compared to BRT and the No-Build, the Streetcar alternative has the fastest travel times, highest reliability, highest ridership (10,900), highest capital cost ($138.4 to $157.0 million depending on the trail component) and lowest operating cost ($2.25 million annually), lowest total net system operating cost ($1.53 million less than the No-Build, and $5.78 million less than BRT). The Streetcar is also the most cost-effective in terms of operating cost per ride and highest in terms of annualized capital cost per ride. Total development potential in the Corridor is approximately 3.3 million square feet by 2025 with the Streetcar alternative.

Operationally, Streetcar would be more reliable than BRT service due to its high percentage of exclusive right-of-way. Transfers would be required at whichever Lake Oswego terminus is chosen. However, even with the required transfer in Lake Oswego, through-passengers from West Linn or points south or west would have an 11-minute faster trip to downtown (PSU) on Streetcar than No-Build and a 9-minute faster trip than BRT.

The Willamette Shore Line right-of-way is adjacent to and also bisects development in Johns Landing and unincorporated sections of Multnomah and Clackamas Counties. If the alternative is advanced into a DEIS, additional analysis would be completed to examine potential impacts and mitigation measures. Property owners closest to the Willamette Shore Line right-of-way have expressed concern about how these issues will be addressed. Concerns have also been raised about the speed of the Streetcar in proximity to residential areas, property access and crossing protection. These concerns would be addressed in DEIS.

One of the project's biggest challenges has been to fit the trail and Streetcar together in the Willamette Shore Line. Whereas the trail cost for the BRT would be $7.4 million, the cost to add a trail component to the Streetcar alternative would range from $58.7 to $61.50 million. This cost differential occurs for a variety of reasons, including the tight constraints posed by the width of the Willamette Shore Line right-of-way (as narrow as 17 feet in places), the steep topography, minimum design standards for Streetcar and the proximity of the floodplain in several areas.

Summary of advantages and disadvantages of Streetcar are below.

Advantages of Streetcar:
- Exclusive right-of-way yields higher reliability and faster travel times
- Highest ridership of all alternatives
- Lowest ongoing operating and maintenance costs
- Potential 3.3 million square feet of total new development with Streetcar by 2025 (Macadam and Safeway design options have the highest potential)
- Travel times best of any alternative

Disadvantages of Streetcar:
- Highest capital costs
- Proximity to residential areas
- Costly to develop a trail with Streetcar
- No option for through–route to West Linn or other areas

Streetcar Design Options

Johns Landing

In Johns Landing, several design options have been developed that would result in Streetcar using a combination of SW Macadam Avenue and the Willamette Shore Line right-of-way.

This summary does not address the detailed operating scenarios on inside or outside lanes or where the best crossover location would be, but highlights more fundamental differences. These comparisons are designed to show basic differences between the options.

Compared to the **Willamette Shore Line**, the **Macadam** design options have the following advantages and disadvantages:

Advantages:
- Higher development potential by approximately 500,000 square feet
- Offers possibility to locate the pedestrian and bike trail in the Johns Landing segment of the Willamette Shore Line without need to acquire additional right-of-way
- Avoids adjacent residential developments in Johns Landing

Disadvantages
- Up to six minutes slower travel time and decreased reliability
- ODOT issues with rails in Highway 43
- Loses potential local match value of Willamette Shore Line right-of-way segments that would be used for trail only
- More expensive to build by $1.4 to $6.8 million
- More expensive to operate by $300,000 to $400,000 annually
- Less ridership

Lake Oswego
In Lake Oswego, three terminus options were evaluated: the Trolley Terminus, Albertsons Terminus and Safeway Terminus. The Albertsons and Trolley termini would be located in exclusive right-of-way, while the Safeway terminus requires in-street running on A and B Avenues through central Lake Oswego. All options would site 400 park and ride spaces at one or two locations. All options would serve the emerging Foothills development with the E Avenue Station. The comparisons below show the differences between the Albertsons Terminus and the short terminus at the Trolley Station, and the downtown Safeway Terminus loop.

Compared to the **Trolley Terminus**, the **Albertsons Terminus** has the following advantages and disadvantages:

Advantages:
- Serves more population and employment
- Spreads park and ride between 100 spaces at the Trolley Terminus and 300 at a redeveloped Albertsons site
- Would have potential for approximately 237,000 additional square feet of development by 2025
- Higher ridership

Disadvantages:
- More expensive, by $5.7 million
- Would need to acquire a short stretch of right-of-way adjacent to Highway 43
- More expensive to operate by $100,000/year

Compared to the **Albertsons Terminus**, the **Safeway Terminus** has the following advantages and disadvantages:

Advantages:

- Would intercept eastbound trips at Safeway, reducing traffic impacts to access park and rides across State Street
- Would site a station and park and ride adjacent to the transit center
- Higher development potential by 2025 of 176,000 square feet
- Higher ridership

Disadvantages

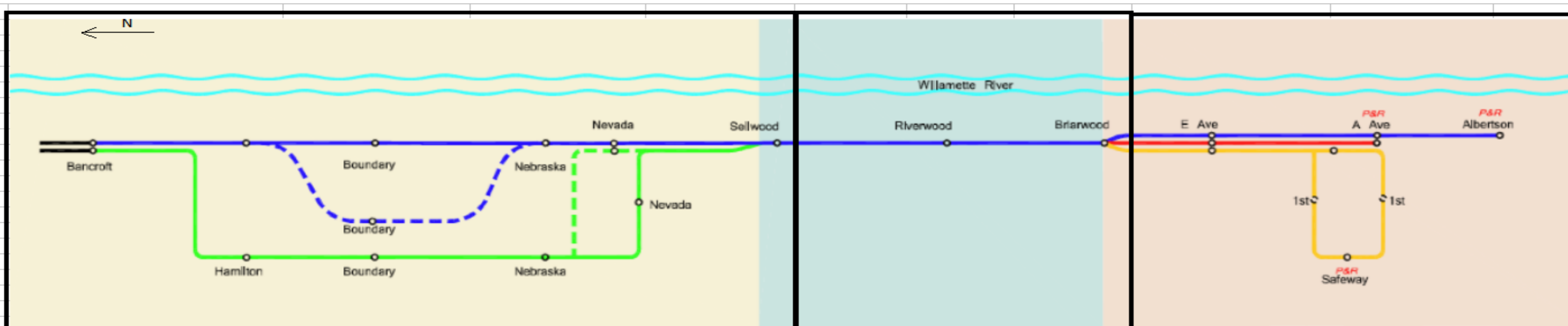
- In-street running on A and B Avenues would impact reliability
- Higher capital costs by $6.2 million
- Higher operating cost by $100,000/year
- Traffic impacts crossing State Street

Table 6-1. Advantages and Disadvantages

	Advantages	Disadvantages	Issues
BUS RAPID TRANSIT	**Strong ridership** - 8,700 daily riders on BRT line	**Ridership may not be achievable with transit priority measures** assumed in the analysis - future congestion makes intersection queues longer	**Queue jump lanes may need to double in length to achieve ridership and travel times,** potentially doubling the capital cost and increasing property impacts
BUS RAPID TRANSIT	**Low initial capital cost of $50 million** (2007 dollars). Could be funded through federal Small Starts Program	**High ongoing local TriMet operating and maintenance costs** of $8.0 million per year for the BRT line	**Operating in mixed traffic reduces reliability of service** and adds cost over time, creating a cumulative operating cost impact on TriMet's budget
BUS RAPID TRANSIT	**Could allow Willamette Shoreline to be used as a trail** with minimal improvements for a cost of $7.3 million	**Value of Willamette Shoreline right-of-way could be lost as local match** to leverage federal funds for a transit project	**Willamette Shoreline right-of-way can be used for rail transit, but legal status of trail use either alone or with rail is less clear**
BUS RAPID TRANSIT	**Property impacts limited to eight intersections** where some travel time advantage could be gained through queue jumps and signal priority	**Highway 43 operating environment is too constrained to allow for an exclusive bus lane** that would maximize speed and reliability	**Property impacts and costs could increase** if queue jump lane lengths are doubled to bypass future congestion
BUS RAPID TRANSIT	**Operational flexibility** allows for future expansion and different operating scenarios to adapt to future conditions	**Future reliability** is a function of traffic congestion and the ability to maintain schedules	**Further development of this alternative will need to address the effects of congestion** on the capital facilities in the corridor
STREETCAR	**Strongest ridership**, with 11,000 rides on the Streetcar line	**Single track sections will limit number of trains** per hour in the long term	**Further study should look at vehicle type and operating plan** to maximize future capacity
STREETCAR	**Operation in exclusive right of way yields higher reliability and faster travel time**	**Proximity to residences -** John's Landing Condos, Dunthorpe, other parcels - creates vehicle speed concerns	**Need to make sure that operating speeds are attainable and that mitigation of residential impacts is considered in DEIS**
STREETCAR	**Lower ongoing TriMet operation and maintenance costs** - $2.25 million per year	**Higher capital cost,** up to $149 million	**Trade-off between one-time only federal funding (New Starts) and ongoing local TriMet operating costs**
STREETCAR	**Design work shows that a continuous trail can be created along with the Streetcar**	**Trail adds $69.2 to $83.3 million to cost of Streetcar**	**Very expensive to create continuous trail,** may need to consider alternatives like putting bikes on Streetcar through the pinch points
STREETCAR	**Value of Willamette Shoreline right-of-way has potential to reduce local cash contribution to project**	**Value of Willamette Shoreline right-of-way for local match** is partially lost if Macadam design option (or BRT) is chosen	**Finance Plan will address different funding scenarios** and local funding mechanisms
STREETCAR	**Potential for 3.3 million square feet of total new development** in John's Landing and Lake Oswego by 2025		
TRAIL	**Continuous trail is technically possible**	**Legal uncertainty exists** about using the Willamette Shoreline right of way for anything except rail	**Need to develop alternatives** for trail connections such as the Portland and Western railroad bridge connection to Milwaukie and downtown
TRAIL	**Could meet latent demand** of up to 4,000 trips per day	**Very costly to use Willamette Shoreline right of way for a trail** due to design issues and possible property impacts	**May need to develop short segments** rather than the entire trail to avoid high costs and potential property impacts
TRAIL	**Strong public support** expressed through project meetings	**Using the Willamette Shoreline right of way for a trail prevents its use as local match** against federal transit dollars	**No identified funding source or lead agency for the next phase** of planning and development
TRAIL	**Documented economic benefits** such as avoided auto and parking costs, health benefits, support for trail-related retail sales and tourism, increased property values		

Source: Metro, 2007

Figure 6-2. Comparative Costs



Existing Streetcar
Baseline WSL
Johns Landing MP
Macadam (Nevada)
Macadam (Carolina)
Trolley Barn
Safeway

Segment 2 (millions of 2007 $s) | Segment 3 (millions of 2007 $s)

Order of Magnitude Cost

		Segment 1 (millions of 2007 $s)			Segment 2 (millions of 2007 $s)			Segment 3 (millions of 2007 $s)		
		Design Option	Without Trail	With Trail	Design Option	Without Trail	With Trail	Design Option	Without Trail	With Trail
Streetcar	**WSL ROW**	**BASE Streetcar***	**$28.70**	**$36.40**	**BASE**	**$63.90**	**$119.20**	**Albertson (BASE)**	**$36.40**	**$38.80**
	Johns Landing Master Plan		$5.40	-$3.20						
	Macadam Inside Lanes	Nevada	$1.80	$0.00				Trolley Barn	-$5.60	-$5.70
		Carolina	$1.70	-$3.80						
	Macadam Outside Lanes	Nevada	$5.40	-$1.70				Safeway	$6.20	$6.10
		Carolina	$6.80	$0.20						
BRT	BRT (total BRT Costs)	BASE BRT*	$13.50	$15.70	BASE BRT	$8.80	$13.60	BASE BRT	$22.70	$23.00

*Base costs include $2m for streetcar maintenance facility and $1m for BRT maintenance facility. Also included are 10 Streetcar vehicles (total $13 million) and 10 BRT buses (total $4 million).

O&M Cost and Ridership

		Segment 1			Segment 2	Segment 3		
		Design Option	Annual O&M Delta from Base (millions of 2007 $s)	Daily Ridership (2025) Delta from Base	No Options in Segment 2	Design Option	Annual O&M Delta from Base (millions of 2007 $s)	Daily Ridership (2025) Delta from Base
Streetcar	**WSL ROW**	**BASE**	**$2.20**	**10,900**		**Albertson (BASE)**	**$2.20**	**10,900**
	Johns Landing Master Plan		$0.10	-200				
	Macadam Inside & Outside L	Nevada	$0.50	-1,500		Trolley Barn	-$0.10	-200
		Carolina	$0.30	-800				
						Safeway	$0.10	100
			$2.80					
BRT	BRT (total costs and ridersh	BASE BRT (TOTAL)	$8.00	8,700				

Summary of Cost Comparisons (millions of 2007 $s)

	Without Trail		With Trail		Annual O&M		Daily Ridership (2025)	
	Low	High	Low	High	Low	High	Low	High
Streetcar	$138.40	$157.00	$199.90	$215.70	$2.10	$2.80	9,200	11,000
BRT	$50.00		$57.30		$8.00		8,700	

Source: Metro, 2007

7.0 Other Considerations

The purpose of this chapter is to outline the other considerations associated with a proposed transit and trail alternative in the Corridor including the Streetcar to Nevada Minimum Operable Segment (MOS) and the Milwaukie Light Rail extension to Lake Oswego

7.1 Minimum Operable Segment (MOS)

Introduction

In addition to the Streetcar options between Lake Oswego and Portland, a Minimum Operable Segment was developed that could construct a streetcar alignment between Portland and the Sellwood Bridge with a terminus at SW Nevada/Miles station.

Streetcar MOS Description

The Streetcar alignment would follow any of the six design options outlined in Streetcar Segment 1 with a terminus at SW Nevada Street.

Streetcar MOS Ridership

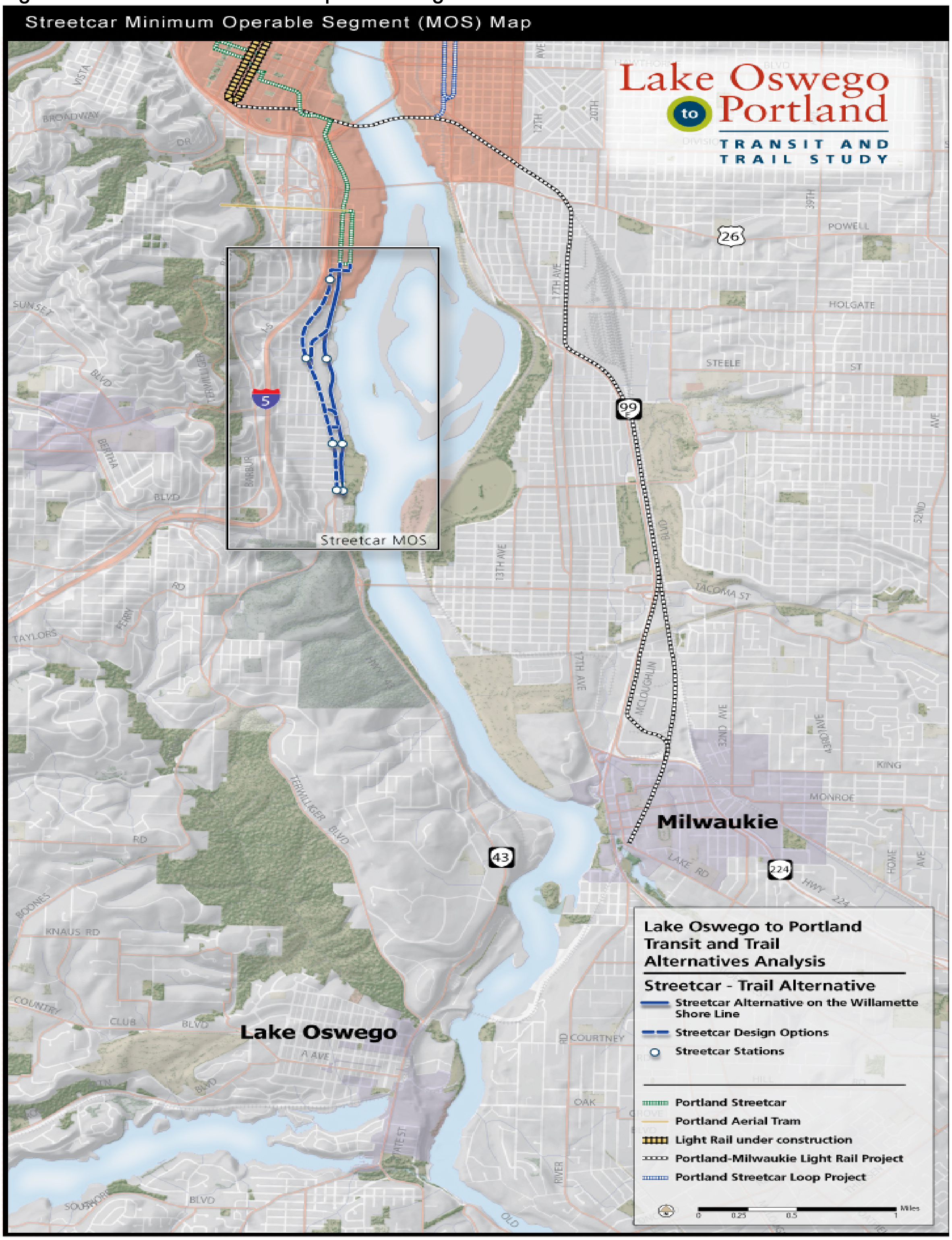
The estimated ridership for the streetcar MOS from SW Lowell Street to SW Nevada/Miles Streets (on the Willamette Shore Line right-of-way) was estimated at 3,810 daily boardings.

Streetcar MOS Order of Magnitude Cost Estimate

The cost for MOS using the Willamette Shore Line would be $34.2 million (in 2007 dollars). The cost estimate includes $3 million for vehicles and $1 million for maintenance facility.

This alignment on the WSL right-of-way does not include a trail. The cost estimate included double track to meet the peak load estimates and potential increase in headways. Since the alignment is assumed as double track, there is not sufficient right-of-way to include double track and trail the entire length, without significant right-of-way acquisition.

Figure 7-1. Streetcar Minimum Operable Segment



Source: Metro, 2007

7.2 Milwaukie Light Rail Extension to Lake Oswego

Through the public process, there has been interest in the feasibility of extending the Milwaukie Light Rail project (South Corridor Phase II) over the Portland and Western/Union Pacific rail bridge across the Willamette River to Lake Oswego. While this alternative was not considered a formal alternative, a look at the potential feasibility was conducted at the request of the Steering Committee. This section of the report summarizes the potential design considerations, design issues, potential costs, and possible ridership.

This analysis looked at two different options: constructing a new alignment next to the Portland and Western railway and a shared light rail/freight rail operations.

Light Rail Adjacent to the Portland and Western Railroad

This 2.39-mile alignment would extend from SE Lake Road in downtown Milwaukie along the Tillamook Branch line to downtown Lake Oswego with a potential terminus at the Albertsons. The design would be located directly adjacent to and east and south of the existing Portland and Western Railroad tracks.

Stations would be provided the vicinity of the Island Station area; SE Bluebird Street; Willamette View retirement center; A/B Avenue and the terminus at Albertsons.

Design Issues

The expansion would result in property impacts on both sides of the river. A new bridge would be constructed across the Willamette River parallel to the existing bridge. A new bridge would also be required to cross over Tryon Creek.

The Portland and Western Railroad currently operates service on this alignment and this is a key link to the Brooklyn rail yard. This alignment would require two creek crossings and a new crossing of the Willamette River. Acquiring the property and the rights to operate adjacent to this existing railroad could be difficult and expensive.

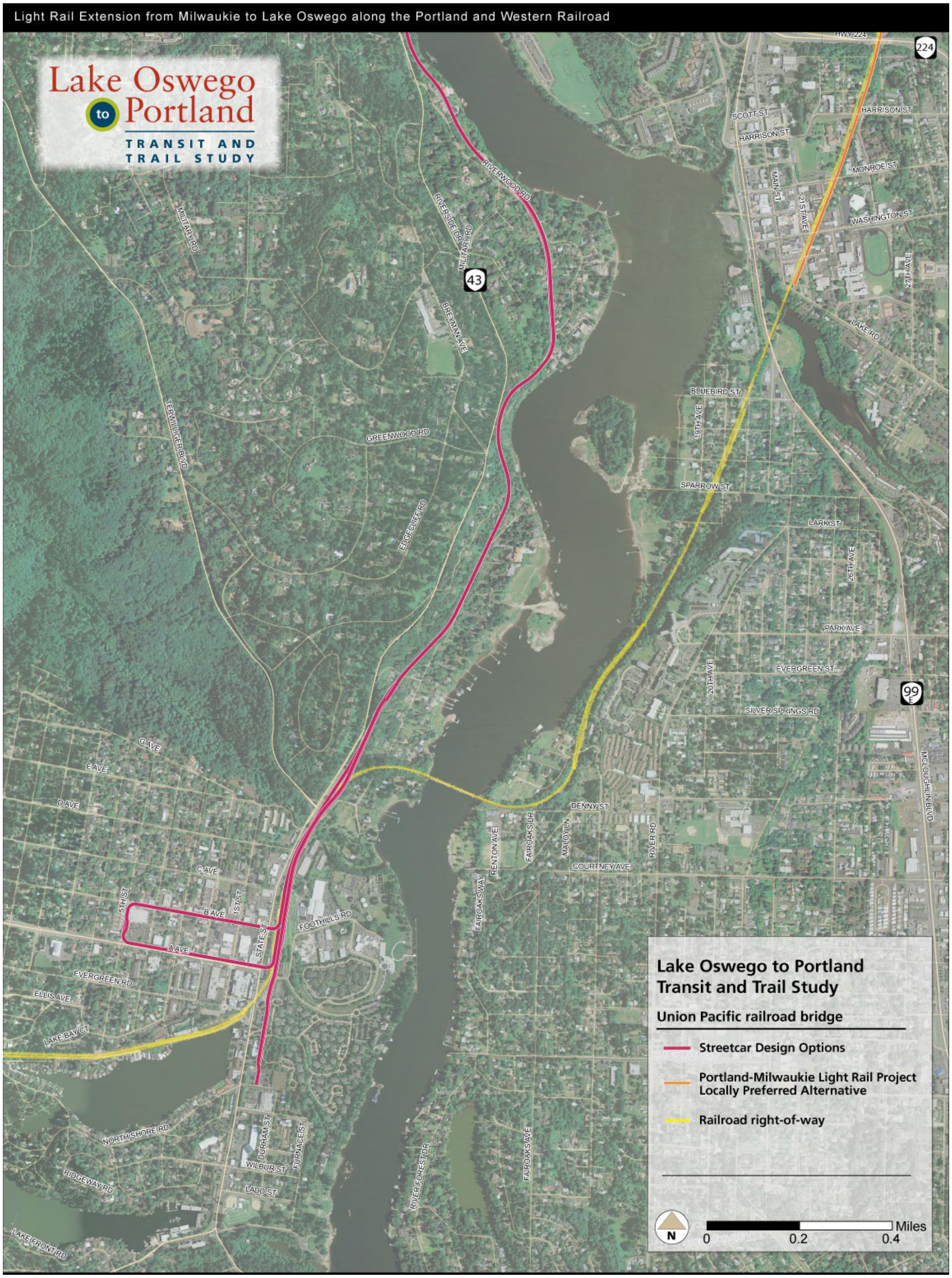
Property impacts

The alignment would impact a number of properties in the vicinity of the Willamette River.

Costs

TriMet prepared a very conceptual cost estimate and the anticipated cost in 2007 dollars is $212 million.

Figure 7-2. Milwaukie Bridge



Source: Metro, 2007

Shared Use with the Portland and Western

TriMet explored using the same tracks as the freight railroad. This would require upgrading bridges, trestles, and the Willamette River Bridge and re-building the existing tracks and adding double tracks wherever possible. This design would require that the freight trains and light rail trains do not operate during the same time period and more specifically, freight would operated between 1:00 AM and 5:00 AM.

While the improvements to the existing tracks are expected to cost $140 million (2007 $s), an estimate of the annual payments to operate on the Union Pacific and Portland and Western railway were not calculated. It is generally expected that this would be as expensive or more expensive given a life cycle cost compared to the previous estimate.

Ridership

The extension of the Milwaukie Yellow Line to Lake Oswego would add approximately 6,000 additional trips on the Milwaukie light rail line.